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Supply Chain Resilience Policy: Theory, Practice, and Action

Prepared by
Sam Mulopulos

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Established by the
New Zealand government in 1995
to facilitate public policy dialogue
between New Zealand and
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IAN AXFORD FELLOWSHIP IN PUBLIC POLICY BACKGROUND

Ian Axford (New Zealand) Fellowships in Public Policy established by the New Zealand Government in 1995 to reinforce links between New Zealand and the US, Ian Axford (New Zealand) Fellowships in Public Policy provide the opportunity for outstanding mid-career professionals from the United States of America to gain firsthand knowledge of public policy in New Zealand, including economic, social and political reforms and management of the government sector.

The Ian Axford (New Zealand) Fellowships in Public Policy were named in honour of Sir Ian Axford, an eminent New Zealand astrophysicist and space scientist who served as patron of the fellowship programme until his death in March 2010.

Educated in New Zealand and England, Sir Ian held Professorships at Cornell University and the University of California, and was Vice-Chancellor of Victoria University of Wellington for three years. For many years, Sir Ian was director of the Max Planck Institute for Aeronomy in Germany, where he was involved in the planning of several space missions, including those of the Voyager planetary explorers, the Giotto space probe and the Ulysses galaxy explorer. Sir Ian was recognised as one of the great thinkers and communicators in the world of space science, and was a highly respected and influential administrator. A recipient of numerous science awards, he was knighted and named New Zealander of the Year in 1995.

Ian Axford (New Zealand) Fellowships in Public Policy have three goals:

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- To build a network of policy experts on both sides of the Pacific that will facilitate international policy exchange and collaboration beyond the fellowship experience.

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We acknowledge and thank the following sponsors that support the Ian Axford (New Zealand) Fellowships in Public Policy programme:

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Sam Mulopulos
Wellington, July 2023

EXECUTIVE SUMMARY

Recent shocks like the COVID-19 pandemic and Russia's invasion of Ukraine have demonstrated the fragility of many critical supply chains. In some cases, firms have built supply chains so fabulously long and complex that, despite the efficiency gains, they are worryingly brittle. In others, non-market autocracies have engaged in unfair trade and economic practices to promote dependency and overreliance. In response, open societies have proposed a myriad of policy interventions to make their supply chains more resilient. This includes investments in domestic manufacturing and new trade agreements to diversify sources of risk. Yet, these interventions have generally not benefited from an organized approach; plenty of practice, but little theory.

Tension exists, over the short-term, between resilient and efficient supply chains. Investments to build resilient supply chains marginally reduce their efficiency just as policies to make supply chains more efficient can undermine their resilience. The challenge for policymakers is to navigate this trade-off to find a balance which promotes societal well-being. In service of that end, this project intends to be a guide for policymakers.

It begins with a theoretical framework for supply chain resilience arguing for an approach centered on supply chain vulnerabilities. Policymakers can identify, and even quantify, various supply chain vulnerabilities, such as overreliance on China for critical minerals or excessive import reliance for personal protective equipment (PPE). Vulnerabilities, by themselves, do not cause harm. However, shocks—wars, pandemics, or natural disasters—exploit these vulnerabilities to reduce societal well-being. Policymakers can mitigate the impact of shocks by building resilience against those vulnerabilities. Since not all vulnerabilities threaten critical functions like national security or the life and health of citizens (e.g. New Zealand is heavily import dependent on furniture), policymakers should prioritize building resilience against the most critical vulnerabilities.

To build resilience, policymakers have three types of interventions available. Transparency interventions, like stress tests and supply chain reviews, help companies help themselves by improving the flow of supply chain intervention in the market. Diversification policies, such as different trade arrangements, promote resilience by spreading risk widely. And industrial interventions bring subsidies or public procurement to bear to drive investment in domestic manufacturing. However, policymakers must be attuned to the costs of deploying these interventions since, over the short-term, marginal investments in resilience mean marginal decreases in market efficiency. Just as optimizing for efficiency sees the entire production of a good produced by a foreign adversary, over-optimizing for resilience might result in crippling autarky.

To navigate these trade-offs, and identify the most effective interventions, this project proposes the Supply Chain Resilience Checklist. The Checklist is a five-step process to help policymakers ask the right questions to effectively identify vulnerabilities, winnow those to the most critical, assess what steps the private market has already taken to build resilience, and tailor an intervention to effectively seal the vulnerability. Although the economic contours of

each open society will be different, the Checklist is designed to apply broadly, giving policymakers flexibility to focus their efforts on their own country.

Having built a conceptual foundation, this project then explores the variety of recent supply chain resilience policies as they have been practiced by open societies. It selects a basket of ten countries—Australia, the European Union, India, Israel, Japan, New Zealand, Singapore, South Korea, United Kingdom, United States—from which to discuss and analyze their different transparency, diversification, and industrial interventions. In doing so it draws lessons from the positives and negatives of these interventions to further guide future policymaking in an effective direction.

Combining theory and practice, this project concludes with action. It proposes the Security and Trade Agreement for Resilience (STAR), a new plurilateral agreement for supply chain resilience. The STAR would unite open societies to deploy all three types of interventions to build resilience comprehensively. It would liberalize trade in the most critical goods, require parties to make minimum investments in domestic manufacturing, promote trade facilitation and short-supply cooperation, and include provisions targeted at the unfair practices used by non-market autocracies to undermine supply chain resilience. In proposing the STAR, this project also offers a case study for how policymakers would use the Supply Chain Resilience Checklist to effectively deploy interventions in response to supply chain vulnerabilities.

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SECTION 1: INTRODUCTION

In the decades after the Second World War, supply chains around the world were utterly transformed. The chains became longer, more numerous, and more complex. As a result, societies across the world became more prosperous.[1] About a billion people were lifted out of extreme poverty.[2] Standards of living rose.[3] Even conflict between nation's began to seem impossible as the world got smaller.[4]

But as time went on, and as trade expanded, and Gross Domestic Product (GDP) rose, some came to wonder how resilient these supply chains really were. Surely, a small shock anywhere along the line could disrupt the flow of goods? Hadn't the incentives of globalization concentrated many of these supply chains in China, a non-market autocracy that was, at best, a serious strategic competitor?

And then there was the worst global pandemic in a century. Demand for critical goods, especially medical supplies, soared. Lo and behold, it became clear many of those critical supplies were produced in China.[5] Export restrictions proliferated.[6] As the new millennium entered its second decade, the timeless questions about the tensions between market efficiency and supply chain resilience became increasingly urgent. And yet, for all the briefings, and podcasts, and whitepapers, and even laws that came as a result, the fundamental issues around supply chain resilience remain unresolved. Responses to acknowledged vulnerabilities, while necessary, remain scattered and non-strategic. In other cases, there has been no response at all.

In many ways, supply chain resilience is a key issue of our time. In building resilience against economic vulnerabilities, this issue involves several adjacent challenges facing open societies—strategic competition with China and Russia, combating human rights abuses, the

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[1] Kristalina Georgieva and Ngozi Okonjo-Iweala, *World Trade Can Still Drive Prosperity*, International Monetary Fund, June 2023, https://www.imf.org/en/Publications/fandd/issues/2023/06/world-trade-can-still-drive-prosperity-georgieva-okonjo-iweala. ("Today fewer than 1 in 10 of the world's people are poor, a fourfold reduction since 1990, as low- and middle-income countries have doubled their share of global trade. Pivotal to this leap in global income is a twentyfold increase in international trade since 1960.")

[2] The World Bank, https://www.worldbank.org/en/topic/trade/overview (last visited June 20, 2023). ("Economic growth underpinned by better trade practices has lifted more than 1 billion people out of poverty since 1990.").

[3] *Id.* ("Recent research shows that trade liberalization increases economic growth by an average of 1.0 to 1.5 percentage points, resulting in 10 to 20 percent higher income after a decade. Since 1990, trade has increased incomes by 24 percent globally and by 50 percent for the poorest 40 percent of the population.").

[4] Julian Adorney, *Want peace? Promote free trade*, Hinrich Foundation, Sept. 2020, https://www.hinrichfoundation.com/research/tradevistas/sustainable/trade-and-peace/ ("…a country in the bottom 10 percent for protectionism (meaning it is less protectionist than 90 percent of other countries) is 70 percent less likely to engage in a new conflict (either as invader or as target) than one in the top 10 percent for protectionism.").

[5] Keith Bradsher, *China Dominates Medical Supplies, in This Outbreak and the Next*, N.Y. Times (July 5, 2020), https://www.nytimes.com/2020/07/05/business/china-medical-supplies.html ("Before the pandemic, China already exported more respirators, surgical masks, medical goggles and protective garments than the rest of the world combined…).

[6] By April 2020, countries imposed 122 different export restrictions on medical goods. Simon J. Evenett, *Flawed prescription: Export Curbs on Medical Goods Won't Tackle Shortages*, *in* COVID-19 AND TRADE POLICY: WHY TURNING INWARD WON'T WORK 91 (Richard E. Baldwin and Simon J. Evenett ed., 2020).

role of innovation in a time rife with new technologies, environmental damage, and the need to create good jobs, among others. At their core, efforts to build supply chain resilience are efforts to build societal well-being.

In some cases, the well-being of a society is enhanced by its efficient access to trading partners whose comparative advantage lowers costs and improves quality. In others, societal well-being is better served by producing critical goods, such as pharmaceuticals, domestically rather than relying on adversarial foreign regimes. The purpose of this paper is to understand how to promote societal well-being by building supply chain resilience.

To this point, open societies have struggled to build resilience. While the United States and the European Union and Japan have charged ahead with new initiatives and subsidies with the intention of building resilience, this has been done without an overarching strategy. The result has been policy interventions for only the most obviously vulnerable industries, such as semiconductors and critical minerals. This is simply not enough. There are other sectors of the economy which need similar resilience building interventions, like the humble ball bearing—a product that is as ubiquitous it is overlooked, and facing non-market threats to its' industrial base to boot.[7] Or products with chokepoints, where many suppliers rely on a single country, or even firm, to provide a vital input.[8]

Shocks may be uncertain, but they are a fact of life. To fail to adequately build resilience is to play dice with the lives of citizens, the success of communities, and the competitiveness of the economy. In fact, it risks society's well-being overall. Therefore, building comprehensive supply chain resilience requires an ordered conceptual approach to understand the value of different policies and the trade-offs involved.

The first part of this report is about theory. It builds on current thinking in New Zealand and the United States to articulate a theory of supply chain resilience to serve as guide for policymakers. Section 2 describes some of the common shocks and vulnerabilities facing many open societies today. Section 3, then, lays out an intellectual framework for supply chain resilience to organize thinking about how to reduce the vulnerabilities posed by different shocks. By arguing for a vulnerability-based approach to building resilience, it hopes to help policymakers think about more than just the low-hanging fruit, like semiconductors and critical minerals, and look to more varied products and those situated deeper in the supply chain. This involves identifying supply chain vulnerabilities and ranking those vulnerabilities by how critical they are to a given society. It also develops a taxonomy of terms to guide policymaking

[7] Transcript of Hearing at 19, Tapered Roller Bearings from Korea, Inv. No. 731-TA-1380 (June 5, 2018) (Final). ("…the tapered roller bearing isn't the most flashy component nor the most famous but like the towns where it's made, places like Bucyrus, New Philadelphia, North Canton, Ohio it forms a vital part of the U.S. Economy and the American experience and just like where it's made and the over 1,000 Ohio workers who make them, these crucial American products are of the highest quality and standards.").

[8] Katherine Tai, Remarks at the National Press Club on Supply Chain Resilience (June 15, 2023) (transcript available at https://ustr.gov/about-us/policy-offices/press-office/speeches-and-remarks/2023/june/ambassador-katherine-tais-remarks-national-press-club-supply-chain-resilience).

by parsing the differences of concepts like resilience, robustness, sovereignty, and redundancy. Finally, section 3 identifies the three types of resilience building interventions—transparency, diversification, and industrial interventions—and explains their attributes.

Still in the realm of theory, section 4 organizes the elements of section 3 to introduce the Supply Chain Resilience Checklist. The Checklist is a simple flowchart for policymakers to follow. Each step includes questions for policymakers to consider, which aims to guide their work in organized and strategic ways. The Checklist also offers flexibility for policymakers who might operate in different economic contexts (i.e. in terms of trade dependency, the size of the existing industrial base, and so on).

But theory is not enough. An intellectual framework for supply chain resilience should aim not just to identify problems, but to serve as a guide to deploying solutions to those problems. Part II of this report, then, focuses on the current practice of supply chain resilience policy. Section 5 introduces the discussion of the supply chain resilience interventions of ten open societies. Likely the most comprehensive survey of its kind to date, section 6 (transparency interventions), section 7 (diversification interventions), and section 8 (industrial interventions) analyzes these efforts and extracts common lessons for policymakers.

Part III combines this theory and practice into action. Section 9 proposes the Security and Trade Agreement for Resilience (STAR), a new type of supply chain resilience policy which combines attributes from the most successful interventions thus far. In doing so, it demonstrates how policymakers can use the Supply Chain Resilience Checklist. By walking through the elements of the Checklist, section 9 shows how the STAR emerges from answers to the Checklist's questions. Section 10 concludes.

Although global supply chains are complex, reducing vulnerabilities by building resilience does not have to be. With its dual focus on theory and practice, this report is designed to be more than a guide; it is designed to be a tool that policymakers can wield to break down the complexity of this challenge into its component parts. In making the challenge of supply chain resilience more digestible, policymakers can have greater confidence that their decisions and interventions are strategic, balanced, and effective.

PART I: A THEORY OF SUPPLY CHAIN RESILIENCE POLICY

Section 2: A Survey of Supply Chain Threats

2.A. Understanding Common Shocks and Vulnerabilities

The past few years have exposed national economies to a myriad of supply chain shocks. The grounding of the *Ever Given*, which blocked the Suez Canal for six days in 2021, showed the fragility of long supply chains, but also demonstrated the market's ability to work quickly to resolve the crisis.[9] Similarly, it was the private sector that surged ferry capacity after trucking routes between Northern Ireland and the Republic of Ireland were disrupted in the wake of Brexit.[10] On the other hand, the COVID-19 pandemic exposed the fundamental unpreparedness of economies, governments, and firms in the face of a long-term, global supply chain shock.

Shocks continue post-pandemic. In 2022, Australia and the EU faced shortages of AdBlue, a fuel additive vital for diesel engines after China reduced exports of urea, a key ingredient.[11] The AdBlue experience showed that even goods constituting a small share of imports by value can have an disproportionate effect on national well-being.[12] Uniquely trade dependent Singapore witnessed disruptions in its food supply.[13] More recently, New Zealand was walloped with two cyclones in early 2023; Cyclone Gabrielle was the worst to hit New Zealand in a century.[14] More than 2,500 were displaced and the damage wreaked havoc on the country's agricultural supply chains.[15] Russia's invasion of Ukraine triggered a grain shortage.[16] On the export side, several open societies have seen their exports to China disrupted as an economic coercion tactic by Beijing. Where important supply chains ensure access to often critical goods, the disruption of export supply chains reduces well-being in often concentrated sectors in the

[9] Pippa Stevens, *The ship that blocked the Suez Canal may be free, but experts warn the supply chain impact could last months*, CNBC (March 29, 2021), https://www.cnbc.com/2021/03/29/suez-canal-is-moving-but-the-supply-chain-impact-could-last-months.html.

[10] David Skilling, *Supply chains to the last bus stop on the planet: An international perspective on strengthening New Zealand's supply chain resilience*, Prepared for the New Zealand Productivity Commission 15 (2022), https://www.productivity.govt.nz/assets/Inquiries/resilience/Supply-chains-to-the-last-bus-stop-on-the-planet.pdf.

[11] *A series of shortages threatens EU supply chains*, The Economist (Nov. 10, 2022), https://www.economist.com/business/2022/11/10/a-series-of-shortages-threatens-eu-supply-chains. *See also* Joanna Prendergast and Lucinda Jose, AdBlue supply fears as clock ticks on Australian production, ABC Midwest & Wheatbelt (Jul 4, 2022), https://www.abc.net.au/news/2022-07-04/adblue-fears-with-australian-manufacturing-to-cease/101197454.

[12] Skilling, *supra* note 10, at 14.

[13] *Id.*, at 11.

[14] Tess McClure, *Cyclone Gabrielle worst storm to hit New Zealand this century, says PM*, The Guardian (Feb. 14, 2023), https://www.theguardian.com/world/2023/feb/13/cyclone-gabrielle-new-zealand-declares-national-state-of-emergency.

[15] *Fortnightly Economic Update*, New Zealand Treasury 2 (Feb 17, 2023), https://www.treasury.govt.nz/sites/default/files/2023-02/feu-17feb2023.pdf. ("The region accounting for 63% of total apples grown domestically, along with 55% of peaches, 60% of nectarines…The Bay of Plenty grow a significant portion (45%) of avocados which are extremely vulnerable to root rot. Kiwifruit orchards in the region were impacted by the January floods with vines and roots under water for a prolonged period and are also susceptible to disease from contaminated soil. About 60% of the region's maize crops were estimated to have been lost in the January floods, and there have been reports suggesting Cyclone Gabrielle has wiped out the remainder…The region produces 95% of New Zealand's kumara…There have been reports that this year's unprecedented rainfall and weather events have decimated much of Northland's kumara production for the year.").

[16] Eric Hamilton, *The Global Supply Chain Consequences of the Russia-Ukraine War*, (Feb 21, 2023), https://news.ufl.edu/2023/02/russia-ukraine-global-supply-chain/ ("For example, many African countries rely on grain from Ukraine and Russia to support more than 50% of their domestic consumption.").

originating country making it hard for that country to protect its sovereignty in the face of such economic pressure.[17]

These shocks surprise us, but in a globalized world they shouldn't. While the world-wide diversification of supply chains has reduced some risks, global supply chains face new, greater risks as economies rely heavily on concentrated, and often adversarial, foreign sources. Swine flu in 2009 and earthquakes in Japan in 2011 strained just-in-time supply chains.[18] Also in 2011, flooding in Thailand disrupted the production of hard disk drives and even resulted in the closure of 200 factories in the region, causing supply crunches for dependent firms like Toyota and Honda.[19] In the wake of these events, some companies developed alternative sources, especially those reliant on semiconductors from the area of Japan hit by the earthquakes and tsunami.[20] In recent years, shocks have become less idiosyncratic, or one-off, and more systemic—at a time when geopolitical risk has increased to the highest levels in a generation.[21]

But in spite of these shocks, and an elevated risk environment, it appears firms and governments have again become complacent. Perhaps driven by incentives to prioritize short-term returns over long-term sustainability, Western Digital not only continued to manufacture hard disk drives in Thailand after the floods, but even closed its factory in Malaysia to concentrate more production in Thailand.[22] Truly the opposite lessons one expects to learn after a major supply chain shock.

Risk is a combination of a shock's severity and probability—to survey of the state of the world is to realize it is a risky place.[23] Research shows that every two years firms should expect a supply chain disruption of one to two weeks, and, on a cycle of just less than every five years, a disruption of more than two months.[24] In terms of severity, firms should expect, on average, shocks to cause losses equal to "42 percent of one year's earnings before interest, taxes, depreciation and amortization (EBITDA) over the course of the decade."[25] A recent study by

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[17] *See* Matthew Reynolds and Matthew P. Goodman, *Deny, Deflect, Deter: Counting China's Economic Coercion*, Center for Strategic and International Studies 51-62 (2023), https://csis-website-prod.s3.amazonaws.com/s3fs-public/2023-03/230321_Goodman_CounteringChina%27s_EconomicCoercion.pdf?VersionId=UnF29IRogQV4vH6dy6ixTpfTnWvftd6v (describing several of China's recent economic coercion events).

[18] Edward Attwood, *Swine flu highlights need for logistics resilience*, Logistics Middle East (April 30, 2009), https://www.logisticsmiddleeast.com/supply-chain/article-2123-swine-flu-highlights-need-for-logistics-resilience.

[19] Alexandra Helfgott and Duncan Wood, *Of Swans and Rhinos: Building Resilience in the Semiconductor Supply Chain*, Wilson Center for International Studies 15 (2022), https://www.wilsoncenter.org/sites/default/files/media/uploads/documents/Swans%20and%20Rhinos%20WEB.pdf.

[20] Willy Shih, *Is it Time to Rethink Globalized Supply Chains*, MIT Sloan Mgmt. Rev., https://sloanreview.mit.edu/article/is-it-time-to-rethink-globalized-supply-chains/.

[21] Skilling, *supra* note 9, at 5-6, 42.

[22] Sebastien Miroudot, *Resilience Versus Robustness in Global Value Chains: Some Policy Implications*, Centre for Economic Policy Research (2020), https://cepr.org/voxeu/columns/resilience-versus-robustness-global-value-chains-some-policy-implications.

[23] J.G. March and Z. Shapira, *Managerial Perspectives on Risk and Risk Taking*, 33 Mgmt. Science 1404-1418 (1987).

[24] Skilling, *supra* note 10, at 43.

[25] *Id.*

McKinsey noted that "the frequency and magnitude of disruptions has increased over the past twenty years."[26]

Generally, these shocks exploit common vulnerabilities possessed by open societies. Massive investments announced by the United States, the EU, Australia, and others to strengthen their manufacturing base for, and supply chains of, semiconductors reveal a common thread inspired by COVID-19 disruptions and the spectre of China's invasion of Taiwan. We might wonder why governments have prioritized these investments now, rather than after the semiconductor disruptions in 2011. Most likely, governments have recently found, in an era of renewed strategic competition, the risks associated with shocks to the semiconductor supply chain to be intolerable. As case in point, the expectation that Taiwan, the planet's premier chip-building economy, will be hobbled through blockade, sanctions, or even invasion in the near to medium term gives a unique urgency and motivation to policymakers the world over.[27] The annual cost of a Taiwan conflict is estimated to be US$2.5 trillion.[28]

There are other common vulnerabilities. Provision of a reliable supply of personal protective equipment (PPE) has been one of the most prominent lessons of the pandemic. Although the risks of single sourcing had been well described in supply chain resilience literature prior to the pandemic, single sourcing was still a "root cause" of many of the disruptions in the supply of PPE during the pandemic.[29] Many organizations relied on a lone supplier, and the medical sector overall relied mostly on a single region (and more specifically a single country, China) for the global supply of PPE.[30] Shortages occurred when firms were unable to produce sufficient quantities of PPE, especially given the overwhelming demand.[31] As a result of

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[26] Morris Cohen, Shiliang Cui, et el., *Bespoke supply-chain resilience: The gap between theory and practice*, 68 J. Operations Mgmt. 1 (2022).

[27] *See* Helen Davidson and Julian Borger, *China could mount full-scale invasion by 2025, Taiwan defence minister says*, The Guardian (Oct. 6, 2021), https://www.theguardian.com/world/2021/oct/06/biden-says-he-and-chinas-xi-have-agreed-to-abide-by-taiwan-agreement ("China will be ready to mount a full-scale invasion of Taiwan by 2025, the island's defence minister has said."). *See also* Sam LaGrone, *Milley: China Wants Capability to Take Taiwan by 2027, Sees No Near-term Intent to Invade*, USNI News (June 23, 2021), https://news.usni.org/2021/06/23/milley-china-wants-capability-to-take-taiwan-by-2027-sees-no-near-term-intent-to-invade (Stating the view of U.S. military leaders that China will have the capability to invade Taiwan by 2027).

[28] Kathrin Hille and Demetri Sevastopulo, *US warns Europe a conflict over Taiwan could cause global economic shock*, Financial Times (Nov. 11, 2022), https://www.ft.com/content/c0b815f3-fd3e-4807-8de7-6b5f72ea8ae5.

[29] Ioanna Falagara Sigala, Mikhail Sirenko, Tina Comes, and Gyöngyi Kovács, *Mitigating personal protective equipment (PPE) supply chain disruptions in pandemics – a system dynamics approach*, 42 Intl. J. of Operations. & Production. Mgmt. 128-154 (2022), available at https://www.emerald.com/insight/content/doi/10.1108/IJOPM-09-2021-0608/full/html#sec004. For discussion of the risks of single sourcing, see S. Kumar and C. Chandra, *Supply chain disruption by avian flu pandemic for US companies: a case study*, 49 Transportation J. 61-73 (2010). *See also* C. Tang and B. Tomlin, *The power of flexibility for mitigating supply chain risks*, 116 Intl. J. of Production Econ.12-27 (2008).

[30] Sunil Chopra, *The Coronavirus Has Upended Supply Chains. Here's How Companies Can Prepare for the Next Disruption*, Kellogg Insight (Mar 23, 2020), https://insight.kellogg.northwestern.edu/article/coronavirus-upended-supply-chains-how-companies-can-prepare-disruption ("Masks present a trickier problem, however, in that they are produced almost exclusively in China. Since other countries are not equipped to quickly ramp up production, shortages will likely continue.").

[31] News Release, *Shortage of personal protective equipment endangering health workers worldwide*, World Health Organization (Mar 3, 2020), https://www.who.int/news/item/03-03-2020-shortage-of-personal-protective-equipment-endangering-health-workers-worldwide ("Based on WHO modelling, an estimated 89 million medical masks are required for

shortages, medical workers were especially at risk because of the dangers of reusing scarce PPE.[32] During the first wave of the pandemic in New Zealand, nearly half of medical staff reported reusing PPE.[33] In the United States, 90 percent of frontline medical professionals reported "repeatedly reusing masks designed for single use."[34] Since then, most countries have taken steps to improve the resilience of PPE supply chains either by expanding domestic production (e.g. the United States and Australia), or by negotiating bespoke international agreements (e.g. between New Zealand and Singapore).[35]

Fertilizer, too, is a focus of common resilience-building efforts. Fertilizers are produced by only a handful of countries—Russia, China, Qatar, and Belarus dominate the global market.[36] Between Russia's invasion of Ukraine and export restrictions by China (which collectively reduced fertilizer trade by 20 percent), prices for fertilizers have recently soared.[37] This comes on the heels of reductions in fertilizer manufacturing capacity elsewhere, such as in the United States and the EU, exacerbating reliance on a handful of nations that are also strategic

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the COVID-19 response each month…To meet rising global demand, WHO estimates that industry must increase manufacturing by 40 per cent.").

[32] *See* Troy Closson, *Nurses Are Anxious and Angry in 2nd Wave: 'We're Not Prepared'*, N.Y. Times (Dec. 17, 2020), https://www.nytimes.com/2020/12/17/nyregion/nurses-coronavirus-new-york.html ("Over the summer, nurses were directed to stop labeling single-use N95 masks so they could be decontaminated and reused up to 20 times, said Mr. Fitzsimmons. But he said the reprocessed masks that he and others have been given are often discolored, stained or do not fit correctly."). For a discussion of the contamination risks of reusing PPE, see D. Doos, P. Barach, et al, *The dangers of reused personal protective equipment: healthcare workers and workstation contamination*, 127 J. of Hosp. Infection 59-68 (2022), available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9172254/ ("A new area of contamination was found in 75% of participants after each patient encounter, and by the end of five donning and doffing cycles, 100% of participants had some form of fomite contamination.").

[33] Cervantée E K Wild, Hailey Wells, et al, *End-user acceptability of personal protective equipment disinfection for potential reuse: a survey of health-care workers in Aotearoa New Zealand*, 7 Lancet Planet Health E118-E1127 (2023), available at https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(22)00333-3/fulltext ("Personally reusing PPE during the first wave was reported by 628 (45%) of the total 1411 respondents, with 396 (63%) of the 628 who reported personally reusing PPE citing multiple reuses in 1 day."). Though note that 85 percent of participants said they would "be comfortable reusing PPE after disinfection" especially if there were supply shortages.

[34] Andrew Jacobs, *Health Care Workers Still Face Daunting Shortages of Masks and Other P.P.E.*, N.Y. Times (Dec. 20, 2020), https://www.nytimes.com/2020/12/20/health/covid-ppe-shortages.html.

[35] *See* discussion *infra* Section V.

[36] Russia, China, and Qatar accounted for about one-third of all nitrogen production in 2019. It is even higher for phosphates, with China, Morocco, and Russia account for 57 percent of the market. And for potash, Canada, Russia, and Belarus have a market share of 80 percent, see Charlotte Hebebrand and David Laborde, *High fertilizer prices contribute to rising global food security concerns*, IFPRI Blog (Apr. 25, 2022), https://www.ifpri.org/blog/high-fertilizer-prices-contribute-rising-global-food-security-concerns.

[37] *Id. See also* Catherine Knight, *Food security at the heart of our cost of living crisis*, Newsroom (Jan. 24, 2023), https://www.newsroom.co.nz/sustainable-future/building-future-resilience-should-start-with-food-security (noting that prices doubled in New Zealand) and Charlotte Hebebrand and Joseph Glauber, *The Russia-Ukraine war after a year: Impacts on fertilizer production, prices, and trade flows*, IFPRI Blog (Mar. 9, 2023), https://www.ifpri.org/blog/russia-ukraine-war-after-year-impacts-fertilizer-production-prices-and-trade-flows (tracking recent spikes in fertilizer prices).

competitors.[38] As a result, the governments of the United States, Brazil, and Australia have taken steps to increase domestic fertilizer production.[39]

Similarly, countries have also identified the concentrated sources of critical minerals as an unacceptable vulnerability. Since critical minerals and rare earth elements are foundational for much of modern technology—from semiconductors to fighter jets—many open societies feel unease about the clustering of these inputs in a handful of places, mostly non-market autocracies. China is the leading producer of many critical minerals, and has de facto monopolies on yttrium, gallium, magnesium metal, tungsten, and bismuth, and about 95 percent of the planet's rare earth elements.[40] As a leading producer of platinum, tellurium, and vanadium, Russia is also dominant.[41] In contrast, the United States has increased its import reliance for critical minerals from 21 minerals to 58 minerals since 1954. The United States has less than 4 percent of the mineral processing market; the bulk of processing occurs in China.[42]

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[38] *See* Phosphate Fertilizers from Morocco and Russia, Inv. No. 701-TA-650-651, USITC Pub. 5105 (Aug. 2020) (Preliminary) ("U.S. producers' capacity and production both declined from 2017 to 2019, with capacity declines outpacing production declines, resulting in increased capacity utilization. Mosaic idled its Plant City, Florida facility in 2017 (production capacity of 2 million tons) for a period of 18 months, and then permanently closed the facility in 2019. In fourth quarter 2019, Mosaic temporarily idled its 500,000 tons Faustina, Louisiana plant…"). *See also* John Baffes and Wee Chian Koh, *Fertilizer prices ease but affordability and availability issues linger*, World Bank Blog (Jan. 5, 2023), https://blogs.worldbank.org/opendata/fertilizer-prices-ease-affordability-and-availability-issues-linger ("As of October 2022, about 70% of European ammonia production capacity had been reduced or shut down.").

[39] For U.S. efforts to expand production, see P. Scott S Shearer, *USDA considers expanding domestic fertilizer production*, National Hog Farmer (Jan. 13, 2023), https://www.nationalhogfarmer.com/news/usda-considers-expanding-domestic-fertilizer-production ("USDA announced it is considering 21 potential projects that would increase domestic fertilizer production. The project applicants are seeking $88 million through the USDA's Fertilizer Production Expansion Program."). For Brazilian efforts to expand production, see Tareq Helou, *Brazil's Reliance on Russian Fertilisers: A Vulnerability Turned Geopolitical?*, Institute on Comparative Regional Integration Studies blog (June 15, 2022), https://cris.unu.edu/brazil%E2%80%99s-reliance-russian-fertilisers-vulnerability-turned-geopolitical ("…the crisis and rising fertiliser prices have encouraged Brazilian initiatives seeking to ramp up its fertiliser production in the past months, both private and state-driven, as well as fostering alternative streams from Canada and Iran."). For Australian efforts to expand production, see *Sovereign Manufacturing Capability Plan*, Department of Industry, Science and Resources, Australian Government 5 (Oct. 1 2020), available at https://webarchive.nla.gov.au/awa/20220817042725/https://www.industry.gov.au/data-and-publications/sovereign-manufacturing-capability-plan-tranche-1.

[40] Specifically, the percentages of China's market share for each are "yttrium (99%), gallium (94%), magnesium metal (87%), tungsten (82%), and bismuth (80%), and the rare earth elements (80%)", see Marc Humphries, Cong. Rsch. Serv., R45810, Critical Minerals and U.S. Public Policy 12 (2019). *See also* Christine Parthemore, *Elements of Security: Mitigating the Risks of U.S. Dependence on Critical Minerals*, Center for New American Security (2011), available at https://www.cnas.org/publications/reports/elements-of-security-mitigating-the-risks-of-u-s-dependence-on-critical-minerals.

[41] Russia's share of the global market is 11% for platinum, 12% for tellurium, and 25% for vanadium. *See* Humphries, *supra* note 39 at 14-27.

[42] For a chart of U.S. import reliance for critical minerals, see The White House, Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-Based Growth: 100-Day Reviews under Executive Order 14017 (2021) 159, available at https://www.whitehouse.gov/wp-content/uploads/2021/06/100-day-supply-chain-review-report.pdf [Hereinafter 100-day Review]. Furthermore, the United States is heavily reliant on foreign sources for the processing of critical minerals as well, see *Opportunities and Challenges Facing Domestic Critical Mineral Mining, Processing, Refining, and Reprocessing*, 117th Cong. (Mar. 31, 2022) (statement of Abigail Wulf, Vice President, Critical Minerals Strategy, Securing America's Future Energy), available at https://www.energy.senate.gov/services/files/79FD8935-292A-4DB3-BD9B-2C0195B9C2FB ("The United States "by contrast, possess[es] less than 4 percent of all minerals processing, produce zero

The vulnerabilities associated with this extreme reliance are not hypothetical. In 2010, China curtailed exports of rare earth elements to Japan after the latter arrested a fisherman who collided with two Japanese coast guard vessels in Japan's waters.[43] Since then open societies, such Canada, Australia, the EU, Japan, New Zealand, and the United States have pursued policies to increase supply from their respective critical mineral deposits.[44]

But critical minerals are not the only goods ripe for economic coercion. Selling exports in great concentrations to countries that do not share the exporter's values creates an economic coercion risk, no matter how sundry the goods involved. And recently, that risk of economic coercion has heightened. After Australia called for an independent investigation into the origins of COVID-19 (among other things), China exercised its monopsony leverage to restrict imports of coal, lobster, wine, barley, and other goods from Australia.[45] China also deployed an embargo and a more extensive secondary boycott of goods made in, or containing components from, Lithuania after the latter opened a Taiwan (rather than Taipei) Representative Office in its capital; this was taken as an affront to the One China principle.[46] As a major exporter of energy, Russia has cut off the flow of gas to Europe as a coercive tactic.[47] Small countries are particularly exposed to economic coercion risks "becom[ing] far too dependent on cooperation with regimes that do not share our common values", in the words of Finland's former Prime Minister Sanna Marin—which has inspired moves towards "strategic autonomy" or a derisking and diversification away from dependencies in critical sectors.[48] Whether they pertain to lobster or barley, economic coercion risks remind us that not all vulnerabilities are import-based, and not all vulnerable goods are the sexy semiconductors that have attracted so much attention as of late.

2.B. Open societies versus non-market autocracies

Although most stark when it comes to the risk of economic coercion, underlying every question of supply chain resilience are the key differences between open societies and non-market autocracies. Open societies are defined by electoral democracy, the rule of law, and a

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percent of cathodes and anodes, and are more than 50 percent import reliant on all of those minerals except for copper and lithium. Even minerals produced here will likely be sent to China for processing into useable goods—this is a problem.").

[43] Keith Bradsher, *China Bans Rare Earth Exports to Japan Amid Tension*, CNBC (Sept. 23, 2010), https://www.cnbc.com/id/39318826.

[44] 100-day Review, *supra* note 41 at 162-165. For New Zealand's role in the critical mineral sector, see Press Release, New Zealand Government, Government invests in game changing lithium recovery technology (Feb. 22, 2022), available at https://www.beehive.govt.nz/release/government-invests-game-changing-lithium-recovery-technology.

[45] Reynolds and Goodman *supra* note 16, at 10 (discussing the origins and consequences of China's economic coercion against Australia).

[46] *Id.,* at 11 (discussing the context of China's economic coercion against Lithuania).

[47] Jonathan Hackenbroich and Filip Medunic, The Kremlin's Energy Warfare, European Council on Foreign Relations (Apr. 29, 2022), https://ecfr.eu/article/the-kremlins-energy-warfare/.

[48] Marin's full quote was 'In increasingly critical areas of our societies – from medical equipment to new technologies to energy – we have become far too dependent on cooperation with regimes that do not share our common values… Our dependencies are becoming our weaknesses faster and in more important areas of our societies than we would have wished. The right lesson for Europe is to build strategic autonomy in key sectors with its trusted partners'. Sanna Marin, Prime Minister, Finland, Remarks at the Lowy Institute (Dec. 2, 2022) (transcript available at https://www.lowyinstitute.org/event/sold-out-address-sanna-marin-prime-minister-finland).

commitment to the free market, rather than the state, as the driver of prosperity.[49] Non-market autocracies, like Russia and China, reject democracy and free markets for authoritarian political systems, arbitrary rule of law, and economies marked by high levels of state intervention.[50] Lacking the legitimacy of open societies, non-market autocracies must constantly prove themselves to citizens by delivering more and more economic growth.[51] They also see their path to greater power and prosperity contingent on making open societies weaker.[52]
As a geopolitical matter, this view is embodied in the thought of China's President Xi Jinping: "our state's ideology and social system are fundamentally incompatible with the West."[53] Another textbook of Xi Jinping Thought titled *Strategic Support for Achieving the Great Chinese Rejuvenation*, elaborates on this zero-sum view explaining that:

> "The Westphalian System was founded on the notion of a balance of power. But it has proven unable to achieve a stable world order. All mankind needs a new order that surpasses and supplants the balance of power. Today, the age in which a few strong Western powers could work together to decide world affairs is already gone and will not come back. A new world order is now under construction that will surpass and supplant the Westphalian System."[54]

A combination of this worldview and the legitimacy imperatives of non-market autocracies have resulted in supply chain vulnerabilities for open societies in the form of degraded industrial capacity and concentrated overreliance on non-market autocracies for critical goods.

To achieve these aims, non-market autocracies—most notably, China—have deployed a range of non-market interventions designed to bolster their domestic industrial capacity and concentrate supply chains. China has utilized subsidies, state-owned enterprises (SOEs), forced labor, and lax environmental standards to dominate many key industries. The State-owned

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[49] Stefan Brunnhuber, *Open Societies versus Autocratic Experiments or Why the Latter are Parasitic, Cannibalizing and Self-Limiting*, 4 CADMUS, 216-225 (2021).

[50] Branko Milanovic, *The Clash of Capitalisms*, 99 Foreign Affairs (2020).

[51] *Id.* ("Political capitalism needs to sell itself on the grounds of providing better societal management, higher rates of growth, and more efficient administration (including the administration of justice). Unlike liberal capitalism, which can take a more relaxed attitude toward temporary problems, political capitalism must be permanently on its toes.").

[52] Marco Rubio, Remarks at the Heritage Foundation (Mar 29, 2022) (transcript available at https://www.rubio.senate.gov/public/index.cfm/2022/3/icymi-rubio-speaks-on-the-threat-of-communist-china-at-the-heritage-foundation). ("They [China's Communist Party] don't believe in concepts such as "universal rights," "global engagement," and "international law" — all these terms that are thrown around. Because their geopolitics reflects human nature. They believe in raw power. They believe because they are a big country, their smaller neighbors must be their tributaries. And they believe the only way for them to become more powerful is to make others weaker, particularly America.").

[53] *Hearing on the Chinese Communist Party's Threat to America*, 118th Cong. 6 (2023) (statement of Matthew Pottinger, China Program Chairman, Foundation for the Defense of Democracies), available at https://docs.house.gov/meetings/ZS/ZS00/20230228/115402/HHRG-118-ZS00-Wstate-PottingerM-20230228.pdf. (The full quote reads: "Xi Jinping has emphasized that our state's ideology and social system are fundamentally incompatible with the West. Xi has said 'This determines that our struggle and contest with Western countries is irreconcilable, so it will inevitably be long, complicated, and sometimes even very sharp.'").

[54] *Id.*

Assets Supervision and Administration Commission of the State Council (SASAC) controls all of China's SOEs, including half the Chinese companies on the Fortune 500 as of 2016.[55]

China places restrictions on foreign ownership which pushes foreign firms to transfer technology to competitors under the requirements of joint ventures.[56] U.S. firms have been forced to license technologies to Chinese companies on non-market-based terms.[57] China has intentionally invested in, and acquired, foreign firms to gain possession of new technologies.[58] And China has outright stolen intellectual property (IP), with an estimated value of up to $600 billion annually.[59] Today China, alone, manufactures "54 percent of the world's steel, 51 percent of float glass, as well as 75 percent of the world's electric vehicle (EV) batteries, 80 percent of polysilicon utilized in solar panels, and 80 percent of active pharmaceutical ingredients and components."[60] Not to mention the world's reliance on China for nearly all the world's processing of critical minerals. Not to be outdone, Russia is a top global producer of energy, aluminium, nickel, palladium, vanadium, and fertilizers.[61] Significantly, Russia produces over 43 percent of the world's palladium, upon which open societies are uniquely reliant.[62]

Unfortunately, existing multilateral rules have often failed to constrain the anti-resilient behavior of non-market economies. World Trade Organization (WTO) rules do not contain significant disciplines for SOEs.[63] This gap dates to the origins of the General Agreement on Tariffs and Trade (GATT) in 1947. The GATT was negotiated by market economies with limited thought given to how the rules would apply to non-market autocracies.[64] Moreover,

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[55] Mark Wu, *The China, Inc. Challenge to Global Trade Governance*, 57 Harv. Int'l L.J. 270 (2016).

[56] U.S. TRADE REPRESENTATIVE, FINDINGS OF THE INVESTIGATION INTO CHINA'S ACTS, POLICIES, AND PRACTICES RELATED TO TECHNOLOGY TRANSFER, INTELLECTUAL PROPERTY, AND INNOVATION UNDER SECTION 301 OF THE TRADE ACT OF 1974 (2018), available at https://ustr.gov/sites/default/files/Section%20301%20FINAL.PDF, 19-48.

[57] *Id.*, at 48-62.

[58] *Id.*, at 62-153.

[59] *Hearing on the Chinese Communist Party's Threat to America*, 118th Cong. 3 (2023) (statement of Scott. N. Paul, President, Alliance for American Manufacturing), available at https://docs.house.gov/meetings/ZS/ZS00/20230228/115402/HHRG-118-ZS00-Wstate-PaulS-20230228.pdf.

[60] *Id.*, at 2.

[61] ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, THE SUPPLY OF CRITICAL RAW MATERIALS ENDANGERED BY RUSSIA'S WAR ON UKRAINE (2022), available https://www.oecd.org/ukraine-hub/policy-responses/the-supply-of-critical-raw-materials-endangered-by-russia-s-war-on-ukraine-e01ac7be/.

[62] *Id.* ("Russia accounts for 43% of global palladium production and 21% of world palladium exports. Many countries depend on Russia for a substantial share of their palladium imports, among them Japan (43%), United States (37%), United Kingdom (30.5%), China (28.5%), Italy (26%), Germany (21%), and Korea (20%).").

[63] Ting-Wei Chiang, *Chinese State-Owned Enterprises and WTO's Anti-Subsidy Regime*, 49 GEO. J. INT'L L. 846 (2018) ("Chinese SOEs present major challenges to the multilateral trading system, as their rise was largely unforeseen when the World Trade Organization agreements were negotiated. Because the WTO agreements were based on the assumption that Members would be free-market economies, today's multilateral trading rules remain neutral with respect to property ownership and do not prevent Members from maintaining or establishing SOEs.").

[64] *See* John Jackson, *State Trading and Non-Market Economies* 23 INT'L LAW 891–93 (1989). Prior to the Uruguay Round, only two non-market economies joined the GATT. These were Poland in 1967 and Romania in 1971. *See* Petros C. Mavroidis & Merit E. Janow, *Free Markets, State Involvement, and the WTO: Chinese State-Owned Enterprises in the Ring*, 16 World Trade Rev. 575 (2017).

some interpretations of existing rules have limited the ability of open societies to police non-market practices, such as restrictions on trade remedy authorities disciplining subsidies provided by SOEs and utilizing out-of-country benchmarks in their calculations.[65]

In other cases, non-market autocracies do not even play by the multilateral rules on the books. Where open societies, like the United States, brought WTO cases against China, open societies did manage to win. And yet, China did not "change the underlying policies," causing meaningful reform to remain "elusive."[66] China also has objected to reforms to the WTO system which would discipline its non-market practices and continually limits the ambition of WTO members to pursue new trade liberalization.[67] Russia brazenly keeps tariffs on certain industrial goods above their WTO bound rates. Russia also operates a scheme of export and import restrictions designed to protect domestic industry.[68] According to its own data, the Kremlin's share in the Russian economy may be as high as 70 percent.[69] During China's accession to the WTO, one negotiator summed up this situation up saying, "the GATT wasn't written with a socialist market economy in mind."[70]

Open societies, individually and collectively, have taken steps in response to these challenges, but with mixed success. Most recently, Australia, Canada, Japan, New Zealand, the United Kingdom (UK), and the United States issued a joint declaration on economic coercion and non-market practices.[71] In strong terms, the parties criticized non-market policies and practices and pledged to cooperate to address these challenges, including at the WTO. Collaboration pursuant to this effort will have to be seen, but the authorship of the joint declaration underscores the tension between open society systems and those of non-market autocracies, and that tension's impact on questions of trade and supply chain resilience.

2.C. Conclusion

While globalized supply chains have created new vulnerabilities, and made it more difficult for firms to recognize and manage resulting risks, they have also made it easier to source

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[65] U.S. TRADE REPRESENTATIVE, REPORT ON THE APPELLATE BODY OF THE WORLD TRADE ORGANIZATION (2020), available at https://ustr.gov/sites/default/files/Report_on_the_Appellate_Body_of_the_World_Trade_Organization.pdf, 82-90, 105-110.

[66] U.S. TRADE REPRESENTATIVE, 2022 REPORT TO CONGRESS ON CHINA'S WTO COMPLIANCE (2023), available at https://ustr.gov/sites/default/files/2023-02/2022%20USTR%20Report%20to%20Congress%20on%20China's%20WTO%20Compliance%20-%20Final.pdf 3.

[67] *Id.*, at 3-4.

[68] *See generally* U.S. TRADE REPRESENTATIVE, 2022 REPORT ON THE IMPLEMENTATION AND ENFORCEMENT OF RUSSIA'S WTO COMMITMENTS (2023), available at https://ustr.gov/sites/default/files/2022-12/2022%20Report%20on%20Russia's%20WTO%20Compliance.pdf.

[69] Letter from Rob Portman, Senator, et al. to Gina Raimondo, Secretary of Commerce (May 3, 2020), available at https://www.collins.senate.gov/imo/media/doc/russian_market_economy_letter.pdf.

[70] Raj Bhala, *Enter the Dragon: An Essay on China's WTO Accession Saga*, 15 Am. U. Int'l L. Rev. 1480 (2000).

[71] Press Release, U.S. Trade Representative, Joint Declaration Against Trade-Related Economic Coercion and Non-Market Policies and Practices (June 9, 2023), https://ustr.gov/about-us/policy-offices/press-office/press-releases/2023/june/joint-declaration-against-trade-related-economic-coercion-and-non-market-policies-and-practices.

substitutes or shift into new markets as the result of a disruption.[72] Resilience policies should recognize, and resolve, this tension. Building resilience against vulnerabilities must be strategic—rather than a scattered effort by decisionmakers to shower policy interventions upon a handful of charismatic sectors. This is perhaps because of an asymmetry in our understanding of vulnerabilities. Policymakers have plenty of information about the vulnerabilities associated with semiconductors and can respond accordingly. But they know next to nothing about the nature of other vulnerable areas of the economy, which manifests as a lack of resilience building work throughout the economy as a whole. Policymakers should also be attuned to the unique challenges non-market autocracies present to the imperative for supply chain resilience.

Section 3: A Conceptual Framework for Resilience

Having laid out some of the common risks and vulnerabilities shared by open societies, we can ask a key question: how should we understand those risks as part of a unified theory of resilience? Not all risks are created equal, and not all responses to those risks are necessary or effective. Even key terms such as resilience, efficiency, and vulnerability are often bandied about without first settling on shared definitions. It's no wonder that policymakers' efforts at supply chain resilience feel so scattershot. When there is little time spent on developing a coherent plan of action, the alternative is a non-strategic something-must-be-done spurt of policymaking, which is not always effective at solving a recognized problem. Policymakers would be wise to not confuse motion with movement. The following section explores this issue by defining what resilience is and what it is not. It goes on to offer a theoretical framework with which to understand resilience as one prerogative—the other being economic efficiency—for promoting societal well-being overall.

Our current situation calls to mind the advice of statistician and engineer, W. Edwards Deming: "if you can't describe what you are doing as a process, you don't know what you are doing."[73] In order to reposition decisionmakers' focus from a reactive one towards one that prioritizes supply chain resilience—and to place them on a firmer footing for future action—it is first necessary to layout a framework for understanding resilience and identifying responses. With that theory in hand, we can then articulate a process for developing supply chain resilience policies. Such a process will ensure that policymakers act strategically when considering vulnerabilities, and interventions to seal those vulnerabilities.

3.A. Categorizing Supply Chain Shocks

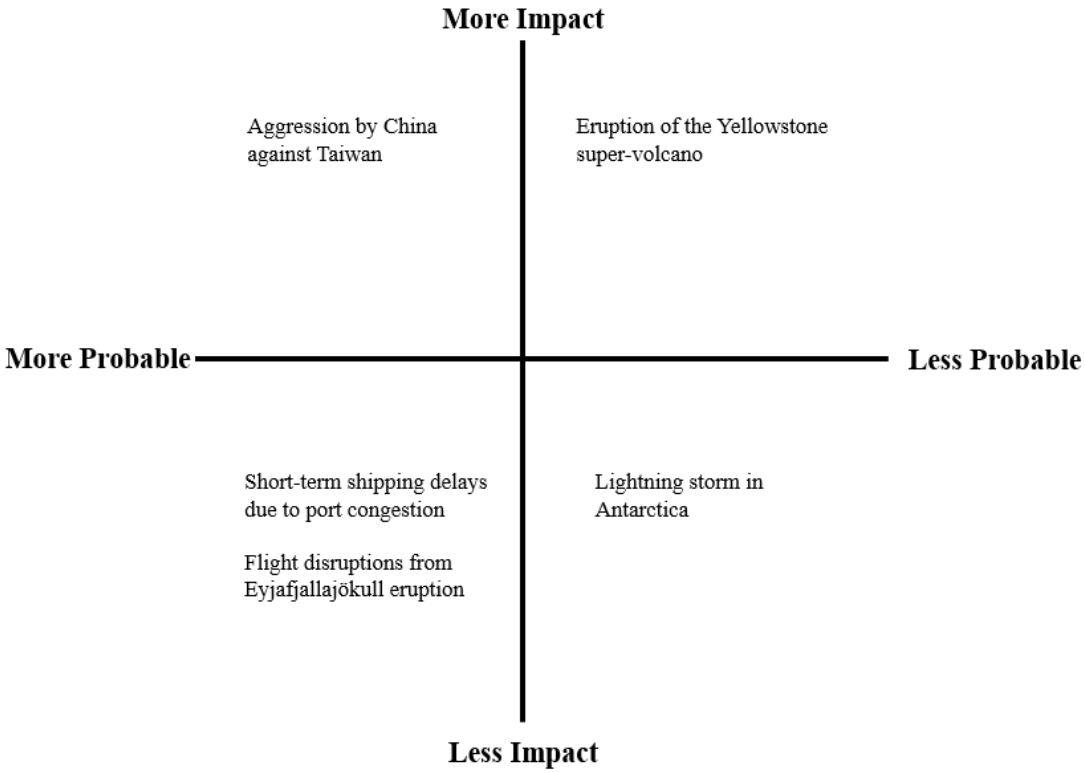
Shocks, whether a volcanic eruption or port congestion, vary by their probability and intensity. Figure 1 categorizes different shocks according to these axes. Importantly, shocks are not a source of vulnerability, but rather events that bring pain by capitalizing on an economy's pre-existing vulnerability. Policies that chronically undermine a country's industrial base or

[72] New Zealand Productivity Commission, Improving Economic Resilience Issues Paper (2023) 6, https://www.productivity.govt.nz/assets/Inquiries/resilience/Resilience_Issues_Paper_Final_17-Feb-2023.pdf. [Hereinafter Issues Paper]

[73] Brainy Quote, https://www.brainyquote.com/quotes/w_edwards_deming_133510 (last visited June 21, 2023).

disinvest in its infrastructure with respect to natural hazards may be worthwhile from a pure efficiency standpoint in the short-term before some shock occurs, but they create exploitable vulnerabilities.[74] Understanding the likelihood of shocks helps rank vulnerabilities by urgency. The supply chain vulnerabilities associated with a long-tail risk, like the super-volcano resting (for now) dormant under Yellowstone National Park, are less in need of urgent resilience building interventions than the much more likely vulnerabilities associated with China's aggression towards Taiwan.

Figure 1. The Four Types of Shocks



But the cost of a shock is more than just its' probability. It is the size of the impact as well.[75] Some shocks, like COVID-19, are ample but infrequent. Others, like minor floods and earthquakes, can be less impactful but happen more often, and in all sorts of different locations. The size of a shock's impact, along with its probability, helps channel policymaking towards vulnerabilities most urgently in need of resilience.

[74] For an implicit critique of the distinction between shock and vulnerability, see Wells King and Chris Griswold, *State Capacity in Short Supply: Assessing the Biden Administration's Industrial Strategy*, 4 American Affairs (2022), available at https://americanaffairsjournal.org/2022/08/state-capacity-in-short-supply-assessing-the-biden-administrations-industrial-strategy/ ("The name given to the Biden administration's "Supply Chain Disruptions Task Force" reflects this short-sighted limit on an otherwise worthwhile initiative, focusing on "disruption" by exogenous forces rather than atrophy from endogenous weaknesses.").

[75] *See* Markus Brunnermeier, The Resilient Society, 20-30 (2021) (using the terms frequency and amplitude to categorize shocks).

Two analogies help us understand, and categorize, the likelihood of different events (in this case shocks). "Black swan" events, a term popularized by Nicholas Nassim Taleb, are shocks that we are unable to predict, or that are so exceedingly unlikely that we struggle to predict them accurately.[76] At the other extreme are Michele Wucker's "gray rhino" events. These are high-impact, high probability shocks; "like a two-ton rhinoceros aiming its horn in our direction and preparing to charge."[77] Like black swan events, gray rhinos often go ignored: not because of their unrecognizability but rather their obviousness, enormity, and complexity make these types of shocks difficult to solve.[78] The centralization of nearly all rare earth mineral processing in China is a gray rhino vulnerability—despite frequent lamentation by officials in a number of countries about the risks, very little has been done to change course.

To put the finest point on it: shocks exploit vulnerabilities. The fewer vulnerabilities an economy has, the fewer impacts it will face from a given shock. Of course, different shocks exploit vulnerabilities in different ways. Addressing a vulnerability with respect to an earthquake might be different than addressing it with respect to a war. Because there is inherent uncertainty in predicting when shocks may occur, what they might be, and whether they will be temporary or persistent, building resilience is most effective when it is generally shock agnostic.[79] Vulnerabilities are vulnerabilities no matter the impact and frequency. Old buildings in London are still vulnerable to earthquakes, even if the odds of an earthquake in that city are slim. However, because London earthquakes are so rare, it makes little sense to earthquake-proof the city's skyline when there are other vulnerabilities much more likely to be exploited. This is to say that not all vulnerabilities are equally in need of resilience, especially since limited resources necessitate their prioritization in the resilience queue (there is further discussion on recognizing *critical* vulnerabilities below).

A generally shock-agnostic approach to building resilience does not mean policymakers should ignore shocks or be insensitive to some of their more frequent types. Where there are vulnerabilities exploitable by probable shocks—say, earthquakes in New Zealand—policymakers should make resilience against those vulnerabilities a higher priority. To do so would only be prudent. But policymakers should also focus on more than just the most probable shocks, especially if this comes at the expense of building resilience to address other vulnerabilities. A slavish focus on charismatic shocks (floods, earthquakes, and pandemics come to mind) might not make for the most resilient economy, especially against black swan and gray rhino events.

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[76] *See generally* Nasim Taleb, The Black Swan (2008).

[77] Wai Yan, Summary of *The Gray Rhino* (Apr. 15, 2021), https://waiyancan.com/summary-the-gray-rhino-michele-wucker/.

[78] Helfgott and Wood, *supra* note 18 at 16.

[79] Issues Paper, *supra* note 72 at 12 ('Another insight is that it can be difficult to distinguish a temporary shock from a persistent one as a crisis unfolds. For example, the 1973 oil crisis was persistent (but initially treated as temporary), while the 1979 oil crisis was temporary (but initially treated as persistent). It is also not easy to predict whether responses that worked in the past or in similar countries can be successful, although any opportunity to learn from experience is helpful for understanding and identifying potential responses.").

3.B. Defining Resilience

If we are to shift our thinking away from shock-specific resilience towards vulnerability-based resilience, we need a consensus definition of what resilience is, and is not. Practitioners and academics offer a seemingly inexhaustible reserve of definitions.

Resilience has been said to be "the ability of a system that is exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficiency manner."[80] A pithier definition has it that resilience is "resistance to a shock and recovery after a disruptive event."[81] The academic literature on supply chain management offers resilience as "the ability of a system to return to its original state or move to a new, more desirable state after being disturbed."[82] This definition is closest to the formal mathematical one—reversion to the mean, or better.[83]

For the purposes of this paper, supply chain resilience is the ability to absorb and adapt to shocks that affect societal wellbeing. This means that an economy, or an element thereof, is positioned such that when a shock occurs the economy can weather the shock and adapt to the new normal once the shock has passed. Adapting to a new post-shock normal does not necessarily mean that well-being is better than it was before the shock. Some shocks are so bad that when the economy bounces back, it does not reach the same height. When the UK entered the European Common Market in 1973, New Zealand lost its privileged market access to the UK; this sent the economy into a long period of decline. Although New Zealand's institutions were resilient enough to weather this decline and bounce back after major economic reforms in the 1980s, the New Zealand economy—despite being better off in absolute terms today—is still less prosperous than it was projected to be had the loss of privileged UK market access not occurred.[84]

An economy riddled with vulnerabilities will not survive a shock, let alone thrive in its wake. PPE shortages during the COVID-19 pandemic offer a good example. If before the pandemic, more countries had had greater capacity to produce PPE, and a continued ability to import PPE from partners once the pandemic had started, there would not have been such shortages with the advent of surging cases. As it happened, offshoring of PPE production, combined with a rash of export restrictions by PPE- producing economies, combined to cause shortages in many

[80] Andrew Dowse and John Blackburn, *Improving Supply Chain Resilience Through Preparedness*, 16 Security Challenges 90 (2020).

[81] Keith B. Belton, Michael Mandel, and Thomas J. Duesterberg, *Policies to Enhance the Resilience of U.S. Manufacturing*, Indiana University Pub. Pol'y Inst 5, https://policyinstitute.iu.edu/doc/mpi/2020/belton-mandel-duesterberg-2020.pdf.

[82] Martin Christopher and Helen Peck, *Building the Resilient Supply Chain*, 15 INT'L. J. LOG MGMT. 4 (2004).

[83] Brunnermeier, *supra* note 75 at 20-30.

[84] Kevin B. Grier and Michael C. Munger, *New Zealand's 1973 experience suggests Brexit will be economically harmful for the foreseeable future, and the losses will not be easily made up*, London School of Economics Blog (Sept. 13, 2021), https://blogs.lse.ac.uk/politicsandpolicy/new-zealand-brexit/ ("Compared to the…counterfactual, we find that New Zealand was almost 20% poorer a decade after the loss of privileged access for 50% of its exports.").

countries.[85] These shortages posed risks to both medical professionals and civilians.[86] Ideally, a most resilient PPE sector would have had sufficient domestic manufacturing capabilities, and the ability to import components and finished PPE from trading partners overseas, to meet demand.

We can consider policy interventions to achieve that kind of resilience as building either absorptive or adaptive capacity. Absorptive capacity permits an economy to maintain its well-being in the event of a shock. Ensuring the free flow of trade in PPE during the pandemic would be an intervention to provide absorptive capacity. On the other hand, adaptive capacity helps an economy learn to live with a long-term, or even permanent, disruption. To continue with the PPE example, policies intended to promote domestic or regional production are adaptive, because they ensure a steady supply regardless of foreign export restrictions on PPE. Similarly, flexible regulatory settings allow textile producers to adapt to changes in demand during a shock by retooling to manufacture PPE. Not all sectors of the economy need to be buttressed with absorptive or adaptive capacities, but these terms help policymakers understand the two major ways they can build resilience into industries when they wish to do so.

There are, of course, many more definitions for resilience.[87] One cannot help but wonder if the present scattershot approach to supply chain resilience policy has been hindered by the lack of a consensus definition. The United States, for instance, has made simultaneous use of different definitions, both too broad and too narrow, depending on the sector. President Biden's supply chain Executive Order, which set in motion the administration's 100-day Supply Chain Review, defines resilience to the extent that it has attributes unrelated to risk reduction. Resilience supply chains will "rebuild domestic manufacturing capacity…advance the fight against climate change, and encourage economic growth in communities of color."[88] Laudable goals, but what if a policy intervention to promote *resilience* does not achieve those aims too?

The sector-specific supply chain review reports complied by different governmental agencies at the direction of the Executive Order do not define resilience at all.[89] Instead, in many

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[85] *Hearing on COVID-19 Part II: Evaluating the Medical Supply Chain and Pandemic Response Gaps*, 117th Cong. (2021) (statement of Kimberly Glas, President, National Council of Textile Organizations), available at https://www.hsgac.senate.gov/wp-content/uploads/imo/media/doc/Testimony-Glas-2021-05-19.pdf (describing how offshoring of the textile industrial base make it difficult to respond to PPE shortages caused by the pandemic).

[86] Press Release, World Health Organization, Shortage of Personal Protective Equipment Endangering Health Workers Worldwide (Mar 3, 2020), available at https://www.who.int/news/item/03-03-2020-shortage-of-personal-protective-equipment-endangering-health-workers-worldwide.

[87] *See* Ismail Golgeci, Harun Emre Yildiz and Ulf Andersson, *The Rising Tensions Between Efficiency and Resilience in Global Value Chains in the Post-COVID-19 World*, 27 Transnational Corporations (2020) ("In simple terms, resilience is viewed by many practitioners and thought leaders in practitioner outlets as the ability to return to normal operations after disruption…[and] as the adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function".). *See also* R. Martin, *Regional Economic Resilience, Hysteresis and Recessionary Shocks*,12 Journal of Economic Geography 1-32 (2012) (describing resilience as a mixture of "resistance, recovery, reorientation and renewal.").

[88] Exec. Order No. 14,017, available at https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/24/executive-order-on-americas-supply-chains/.

[89] *See* King and Griswold, *supra* note 74 ("This lack of consistency understandably jeopardizes the coherence the assessments might have offered in their diagnoses. But more fundamentally, the overreliance on the term "supply chain resilience"

contexts, resilience is frequently reduced to a shorthand for "industrial policy." This can constrain policymakers into certain types of interventions that may be more distortive than is necessary to close a given vulnerability.[90] Or given the toxicity of the phrase in some circles, preclude interventions entirely, even when "industrial policy" is the intervention best fit for the purpose at hand. As if this was not enough, outside of government, scholars have warned that resilience is the wrong term entirely, and that "immunity" is preferable because immunized supply chains are purportedly less wasteful and more agile.[91]

Given the multiplicity of conflicting conceptions of resilience, and the debate about whether it is even a useful concept at all, it is worth clarifying which resilience is not. This will help further understand our definition and the relationship between absorptive and adaptive capacities. Importantly, resilience is not the same as robustness. Robustness is an "ability to resist."[92] Like an oak tree, a robust system appears indestructible, even in high stress scenarios—until it is not.[93] While robust systems are key to continuity of operations amid a shock, comprehensive robustness is expensive. At some point it becomes more prudent to adapt to the new normal wrought by the shock.[94] Since robustness focuses only on absorptive capacity, the two-pronged definition of resilience—incorporating both absorptive and adaptive capacity—is vital.

Redundancy and sovereignty are two terms that are adjacent to resilience. Redundancy is a type of resilience that addresses a vulnerability by ensuring a backup capability.[95] When shortages

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betrays the myriad purposes of industrial policy and the very need for a national economic strategy, rather than a set of near-term policy fixes.")

[90] *See Id*. (arguing that "supply chain resilience" has been used as a "euphemism" for industrial policy). *See also* Megan Lamberth, Martijn Rasser, Ryan Johnson, and Henry Wu, *The Tangled Web We Wove: Rebalancing America's Supply Chains*, Center for New American Security (2022) ("Policymakers and business leaders alike must rethink how government and industry engage each other on supply chain matters as part of a new form of industrial policy.").

[91] Robert Handfield, *We Need Supply Chain Immunity, not Resiliency: A Position Paper*, North Carolina State University (2022), https://scm.ncsu.edu/scm-articles/article/we-need-supply-chain-immunity-not-resiliency-a-position-paper ("Although many experts talk about creating supply chain resilience, our position is that resilience is the equivalent of putting concrete around the trees and steel poles into their trunks to make sure they don't break before a hurricane! Resilience is the easy way out – it involves carrying a lot of inventory and redundancies in the supply chain that are wasteful. There is a better way – one that is determined through the laws of medicine applied to create supply chain immunity.")

[92] Brunnermeier, *supra* note 75 at 12.

[93] *See* The Oak and the Reed https://aestheticrealism.net/poems/the-oak-and-the-reed-by-jean-de-la-fontaine/ (last visited July 11, 2023) ("Your compassion, answered the shrub/Arises from a kind nature; but leave off this care./The winds are less fearful to me than to you./I bend and do not break.").

[94] E. Brandon-Jones, B. Squire, et al, *A Contingent Resource-based Perspective of Supply Chain Resilience and Robustness*, 50 Journal of Supply Chain Management 55-73 (2014). *See* Miroudot, *supra* note 21 ("Robustness is the ability to maintain operations during a crisis.") For a discussion of the sometimes paradoxical relationship between resilience and robustness see Issues paper, *supra* note 72 at 11 ("The volatility paradox highlights the difference between robustness and resilience over time. While the emphasis on robustness in the face of disruptions may initially help industries and communities avoid the strain associated with change and adaptation, it can also result in a cumulative build-up of imbalances. When these imbalances result in a crisis, the impacts are often more severe than in industries and communities that embrace resilience and prioritise gradual adaptation to smaller changes. The paradox is that periods of stability that encourage robust responses to disruptions often result in crises. By contrast, periods of higher volatility that encourage resilience are less likely to result in social and economic ruptures brought about by major crises.").

[95] Brunnermeier, *supra* note 75 at 15.

of infant formula rocked the United States, it was because the manufacturing base for infant formula was not redundant. Four companies control 90 percent of the U.S. market, and trade restrictions mean only about two percent of formula is imported.[96] Similarly, New Zealand's carbon dioxide shortage was, in part, due to a temporary shutdown of the country's only food-grade carbon dioxide plant.[97] Economies can build resilience against shocks, like the unexpected shutdown of infant formula or carbon dioxide factories, by having access—either domestically or via foreign imports—to more numerous producers of those goods. In that way, establishing redundancy creates resilience.

Similarly, sovereignty, which refers to a country's ability to regulate "its internal affairs without foreign interference," can contribute to resilience.[98] Policies to protect sovereignty can double as policies to build resilience, such as when an economy diversifies access to foreign markets to reduce monopsony effects and guard against economic coercion. Sovereignty is also invoked as part of efforts to reshore manufacturing, such as the industrial policy agenda found in Australia's Sovereign Manufacturing Capability Plans.[99] In this way, promoting sovereignty, and sovereign capabilities, builds adaptive capacity. But resilience is more than just the ability to make more stuff. In fact, producing more stuff may even undermine resilience, if the focus on the assembly of final goods domestically ignores continued dependence on key foreign inputs which remain vulnerable to shocks.[100]

Taking all these factors into account, resilience is the ability of an economy to survive shocks, and bounce back from those shocks. Associated concepts like redundancy, sovereignty, or industrial policy are ways to build resilience and ultimately to promote well-being for the economy overall.

3.C. Resilience vs. Efficiency

Promoting resilience is not without cost. Policymakers must balance obligations promoting the common good—in this case, the well-being brought about by supply chain resilience—with the costs of doing so. This balancing act boils down to navigating trade-offs between resilience and efficiency; a firm will often situate its production and supply chains "at the most cost-

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[96] Eric Berger, *Why is there a baby formula shortage in the US, and what can parents do?*, The Guardian (May 18, 2022), https://www.theguardian.com/us-news/2022/may/18/baby-formula-shortage-why-is-there-none-what-to-do-causes-explained.

[97] Emma Gleason, *Everything You Need To Know About New Zealand's CO2 Shortage*, NZ Herald (Feb. 28, 2023), https://www.nzherald.co.nz/viva/food-drink/everything-you-need-to-know-about-new-zealands-co2-shortage/NVD7HD4UHVFSLEKJEA7UVSQLEI/.

[98] Dowse and Blackburn, *supra* note 80 at 82.

[99] AUSTRALIAN GOVERNMENT, SOVEREIGN MANUFACTURING CAPABILITY PLAN: TRANCHE 1 (2021). [Hereinafter Tranche 1]

[100] Derek Scissors, *The First Step in Improving Supply Chains*, American Enterprise Institute (2022), https://www.aei.org/wp-content/uploads/2022/07/The-First-Step-in-Improving-Supply-Chains.pdf?x91208. *See* INTERNATIONAL MONETARY FUND, WORLD ECONOMIC OUTLOOK (APR. 2022) 89. ("The chapter shows that resilience to shocks may be gained by further diversification of inputs across countries and by making inputs from different countries more substitutable. Diversification substantially reduces global GDP losses in response to shocks in key upstream suppliers. It also reduces GDP volatility following productivity shocks to multiple countries that are correlated, in line with what is observed in historical productivity data over the past 25 years.").

efficient point, running its activities in a most efficient way."[101] Efficiency refers to that optimal use of resources, or the pursuit of firms to stretch each dollar they have by reducing costs or increasing productivity.[102]

For example, the vulnerabilities created by the systematic loss of manufacturing in the United States was a result of the prioritization of efficiency in the form of short-term incentives towards offshoring, including labor and environmental arbitrage.[103] To have prioritized resilience, which in some cases would have meant preserving domestic production in certain sectors, would have been the short-term economically inefficient choice, even if it was the right thing to do. Over the short-term, resilience and efficiency exist in tension with each other as Figure 2 shows. However, when taking a *longer-term* view, investments in resilience can also be efficient since disruptions create their own inefficiencies. Since policymakers are responsible for *generally* managing trade-offs in the present, a discussion of the ways in which efficiency and resilience may be compatible over the longer-term is confined to Appendix IV.

Figure 2. The Efficiency-Resilience Spectrum

This means that, as a general matter, over-investing in resilience can come at the expense of the economy's overall efficiency. One version of extreme resilience to exogenous disruptions is autarky, where the economy is self-sufficient with very low trade dependence.[104] In that scenario, the economy experiences welfare losses from its inability to access the benefits of specialization and trade.[105] But policymakers hardly need to move to the resilience extreme to excessively sacrifice efficiency. An investment in resilience the cost of which exceeds the cost from the anticipated shock will reduce efficiency below the point where the well-being-maximising efficiency—resilience trade-off exists on the spectrum. Since, on average, 75 percent of the costs of Fortune 500 firms are supplier costs, government-mandated interventions to build resilience, such as stockpiling requirements or requirements to shift

[101] Golgeci, et al., *supra* note 87. *See* Issues Paper, *supra* note 71 at 10 ("Adding the resilience perspective into economic decision-making has potential to help industries and communities reduce the adverse impacts of disruptions and seize new opportunities created by disruptions. Because there are risks around both under-investing and over-investing, ensuring that decisions are informed through the participation of multiple stakeholders can help to maximise resilience and wellbeing.").

[102] *See* P.F. Drucker, Management: Tasks, Responsibilities, Practices (1974) (noting that firm efficiency is about maximizing the output-to-input ratio of the firm).

[103] Tai, *supra* note 8 ("The system itself, then, created an incentive for countries to compete by maintaining lower standards, or by lowering their standards even further, as companies sought to minimize costs in pursuit of maximizing efficiency. This is the race to the bottom, where exploitation is rewarded and high standards are abandoned in order to compete and survive.").

[104] Though note that this does not mean the autarky is resilient from endogenous disruptions. North Korea may be resilient against import disruptions, but as a result, its food supply remains vulnerable to a bad harvest.

[105] The United States underwent a nearly autarkic period between 1807 and 1809 as a result of President Jefferson's trade embargo. During that time U.S. Gross National Product (GNP) fell by 5 percent! *See* Douglas A. Irwin, *The Welfare Cost of Autarky: Evidence from the Jeffersonian Trade Embargo, 1807-1809*, NBER Working Paper No. w8692 (2001).

production between countries could increase these costs beyond the benefits wrought by increased resilience.[106] This would cut into the remaining 25 percent of costs, namely employment costs, which would jeopardize jobs and the firm's overall ability to be successful and deliver for customers. In other words, a loss of societal well-being. Especially where the cost of the anticipated shock is small, overkill resilience can undermine well-being by reducing economic efficiency.

But underinvesting in resilience leaves an economy exposed to shocks. Just like losses from inefficiency, the occurrence of shocks reduces well-being. Few would support constructing buildings along fault lines that are not earthquake-proof, and many countries have some national reserve of medical supplies or fuel. These investments in resilience are worth trade-off because, without the resilience-building intervention, the costs post-shock would be unacceptably high. An intervention to build resilience may even be the most efficient policy over the long-term.[107]

The question for policymakers, then, is to determine the ideal spot on the spectrum for a particular good or part of the economy. Should an economy's supply chain for butter be more efficient or resilient? How about its supply of guns? If more efficiency is the answer, it is likely no intervention is necessary. If resilience is the answer, policymakers then have a justification to propose an intervention.

So how should policymakers select—between efficiency and resilience—the spot that maximizes well-being? There are, of course, challenges with this. Governments, always prey to rent seeking, are not well positioned to know what arrangement will maximize well-being. But an overreliance on firms to proactively invest in resilience does not inspire confidence. Firms have time horizons and vantage points that are different from those of government. In the short-term, industry may be comfortable operating with greater risk, because leaving vulnerabilities open yields greater efficiency, and thus profits. Alternatively, a small economy may import a critical good overwhelmingly from a multinational firm whose sales to that country only comprise a miniscule percentage of its sales globally.[108] This will create a

[106] Kent Mahoney, Leverage Procurement to Build Resilience, 103 Strategic Finance (2021).

[107] There is room for debate about whether efficiency and resilience are mutually exclusive, as detailed in Appendix IV. In the meantime, consider this analogy: the layout of the QWERTY keyboard was intentionally designed to slow the user's typing speed. This was because the QWERTY keyboard was designed for typewriters, where to type too quickly meant more mechanical breakdowns. While the efficient choice at the time (better to sacrifice a bit of typing speed to reduce excessive breakdowns), with the advent of digital keyboards, users remain stuck using a keyboard layout which is inefficient because keyboard arrangements exist which permit higher word per minute rates. Given the lack of research in this vein about the trade offers between resilience and efficiency, and the ways in which they are, and are not, mutually exclusive, others are encouraged to fill the gap. *See* Golgeci, *supra* note 87 ("There have been a growing number of calls in practitioner outlets to move away from efficiency to resilience with no definitive answer about whether efficiency and resilience are mutually exclusive and whether firms have to sacrifice one to achieve the other. Against this background, little is known about the potential implications of the resilience imperative for GVCs and the efficiency-driven management paradigm that has dominated the contemporary discourse on GVC expansion and governance."). For more on the QWERTY keyboard, see Brunnermeier, *supra* note 75 at 164-165.

[108] Skilling, *supra* note 10 at 24 (In addition, firms are not likely to price the full costs of the risks to the supply of essential goods – which have impacts throughout the economy, extending well beyond the direct exposure of the firms. It may be that society at large is more risk averse with respect to these type of risk events, and prepared to pay a higher 'insurance

principal-agent problem, whereby the firm will tolerate more risk from a shock than the small country, since, in the event of shock, the small country could lose access to the key import.

History is full of the consequences of imprecise positioning on the spectrum. When the price of wool collapsed in the 1960s New Zealand intervened in the market to subsidize agricultural producers. When those subsidies became fiscally untenable and were eliminated, the industry fell even harder than it would have if it had been permitted to adjust to the original shock.[109] The offshoring of U.S. textile manufacturing to low-cost places of production left certain firms better off but proved not to have been the most resilient choice when the lack of a textile manufacturing base limited the country's ability to ramp up PPE production during the COVID-19 pandemic.[110] As long as actors in government and industry take a "best case" view of the future, they remain susceptible to downplaying the total costs to well-being that are imposed when an economy is not prepared for shocks. For decisionmakers, it is worthwhile to remember that even "the cheapest cost comes at a high price in a time of crisis."[111] This is especially true for geopolitical risks, which are challenging for firms to price accurately.[112]

The key, then, is to deemphasize time horizons and specific types of shocks when finding the well-being maximizing spot in Figure 2. Instead, policymakers should focus on places in the economy where there are recognizable, and ideally quantifiable, weaknesses. We can represent this as an equation.

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premium' to strengthen resilience against supply chain shocks. Competitive pressures may create reluctance by firms to bear costs for a long-term event where their competitors are not doing so. Strengthening resilience may put them at a near-term competitive disadvantage, even if it is a rational choice over a longer horizon.").

[109] Story: Sheep Farming, https://teara.govt.nz/en/sheep-farming/page-7 (last visited July 11, 2023) ("Government subsidies kept farming buoyant despite the falling prices and increasing costs. In 1982 sheep numbers peaked at 70,301,461. In 1985–86 the government abruptly removed all subsidies for farmers, and sheep numbers dropped precipitously. Ten years after their historic peak they had fallen 25%, and in the next decade they fell another 25%."). *See* Neil Gow, New Zealand Government's Involvement In Agriculture – The Road To Non-Sustainability, Lincoln University, available at https://researcharchive.lincoln.ac.nz/bitstream/handle/10182/418/07_N_Gow.pdf ("Direct subsidies to farmers became a growing part of their annual income so that by 198 the overall PSE figure had reached 34% on average and 90% on sheepmeat. The political and economic changes of the mid 1980's were, dramatic and necessary, to stop farmers mainlining on the drug of Government support.") *See also New Zealand wool farmers to lose price support*, Agra Europe (Feb. 15, 1991), https://link.gale.com/apps/doc/A10661868/AONE?u=per_tre&sid=bookmark-AONE&xid=0e209b32. ("New Zealand's wool farmers face their toughest year since before world war two after their Wool Board accepted bankers' advice to follow Australia's example and abandon price support schemes… New Zealand's agriculture minister, John Falloon, said government subsidies would only delay the pain some farmers will feel.").

[110] Press Release, Homeland Security and Governmental Affairs Committee, Experts Witnesses Agree with Portman that the United States is too dependent on China for Critical Public Health Supplies (May 19, 2021) https://www.hsgac.senate.gov/media/minority-media/expert-witnesses-agree-with-portman-that-the-united-states-is-too-dependent-on-china-for-critical-public-health-supplies/ ("Senator Portman: In 1991, 56 percent of all clothes purchased in the United States were made in the United States. By 2012, it was 2.5 percent, so we have had a big reduction in our textile manufacturing here. Has the general trend in the offshoring of apparel and textile products that we've seen over the last generation contributed to this specific lack of manufacturing of PPE during the pandemic?" Witness: "Undoubtedly, Senator Portman. Absolutely, 100 percent.").

[111] Dowse and Blackburn, *supra* note 80 at 84.

[112] Skilling, *supra* note 10 at 24 ("We are increasingly moving into a supply chain environment characterised by uncertainty and ignorance as much as by conventional risk – which makes it difficult for firms to understand and price all the relevant risks. For example, it is particularly difficult for firms to respond to geopolitical risk, and to understand whether diversification is an appropriate investment to make.").

Figure 3. Calculating the Desired Level of Resilience.

Level of resilience = (Vulnerability of a given good + Criticality of the good to the economy) – Cost to achieve the necessary resilience

Where there is little cost, or where the critical vulnerability is enormous, policymakers can shift towards the resilience end of the spectrum. Where the vulnerability is small and the cost of marginally less efficiency (that is marginally *more* resilience) high, efficiency should prevail. This exercise is akin to deciding what insurance to purchase against some risk. If resilience is insurance, then the premium is the amount of lost economic efficiency in the short-term? Do the benefits of that resilience justify the cost of the premium?

3.D. Vulnerable and Critical Goods

It is redundant and costly to build resilience in parts of the economy which are not vulnerable. Building resilience in response to specific vulnerabilities makes the best use of scarce resources. It also ensures policymakers don't need to predict the future. Before the COVID-19 pandemic, 87 percent of supply chain executives agreed that it was "extremely difficult to predict … supply chain disruptions."[113] We can't always know what type of shock will occur—for instance, a pre-pandemic Australian resilience effort was short-sightedly tasked with only preparing for natural disaster-related supply chain shocks—but we can know where in the economy shocks will wreak the most havoc.[114]

"Vulnerability" refers to any aspect of the economy which is unduly exposed to shocks. Import vulnerabilities exist where, for example, in the event of a shock, demand for a good exceeds the supply of that good.[115] In this instance, we would say that the supply chain for this good is vulnerable. Such vulnerability could come about, for example, as the result of a concentrated reliance on a single producer.[116]

An export vulnerability is where a country relies on few export markets (or even just a single one) to sell a particular good, or is a concentrated exporter of a particular product. Concentrated markets for exports could become a vulnerability if, for example, the reliance on that market gives the importing country leverage to coerce the exporting economy on foreign policy or national security issues. Admittedly, the importing country also incurs some cost by exercising such leverage—such as by forgoing the good in question—but the either importer may find the cost acceptable considering the foreign policy benefits they get from engaging in coercion, or

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[113] Joe Berti, *The Supply Chain Battles Back: Building Resilient, Flexible Supply Chains in the Post-Covid Era*, 75 Plant Engineering (2021).

[114] Dowse and Blackburn, *supra* note 80 ("The National Resilience Taskforce, established in 2018, developed a risk framework as well as an analysis of causes and cascading effects of disasters. Although its risk framework approach was cogent, the taskforce's work was limited to dealing only with natural disasters. This was a significant limitation.").

[115] Scissors, *supra* note 100.

[116] *See* Dowse and Blackburn, *supra* note 80 at 83 (The behaviours of a number of countries during the early stages of the pandemic means that our blind faith in the largely foreign-owned market to meet all our needs in a crisis, without taking precautionary measures such as stockholding or diversification, is foolhardy.").

the importer has access to substitutes which minimize the reduction in their own well-being. Similarly, being a concentrated seller of a product creates a unique pain point that the purchasing country can squeeze as a coercive tactic.

It is not always a vulnerability to be highly import dependent. For instance, New Zealand is a concentrated importer of furniture. And Australia's highly concentrated imports include wrist watches and Christmas decorations.[117] A shock could easily disrupt the flow of tennis rackets, but life would go on. In that case a policy intervention for tennis rackets would be a waste of resources, and needlessly distort the market to boot. Especially when there are suitable alternatives.[118] A focus on *critical* vulnerabilities serves as a brake on self-defeating interventions by requiring a strong justification and the deployment of resources towards the sectors which genuinely need more resilience.

A critical good is one that is fundamental to ensuring health and life, such as medical supplies or water treatment chemicals. A good can also be critical if it is necessary for a national security function, a country's strategic competitiveness (especially of its industrial base), or the everyday functioning of its economy. AdBlue might not be critical for life in the most literal sense, but it certainly is necessary to operate the heavy trucks an economy needs to function. Antimony is used to produce armor-piercing rounds and night vision goggles; semiconductors are in just about everything.[119] An export vulnerability may be critical if the importing country is a strategic competitor or adversary. An unfriendly importer will be more inclined to use its monopsony leverage to coerce the exporter to change its policies in ways contrary to the exporter's desires. Of course, not all countries will consider the same things to be critical. The differences will depend on the structure of the economy—a small economy may be less likely than a major military power, for example, to view access to semiconductors (in their capacity as components for larger goods) as critical.

3.E. Identifying Policy Interventions

Strengthening supply chains isn't about intervening in the market for the sake of it. The purpose of intervention is to build resilience where it would not be otherwise. There *are* critical goods which are not vulnerable because the market has taken measures on its own to ensure a reliable supply. New Zealand is dependent on imports of grain, but firms already source nearly the entirety of those imports from Australia, a partner with low risk for supply disruption.[120] In general, market actors will take steps to promote the resilience of their business.[121]

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[117] Australian Productivity Commission, Vulnerable Supply Chains Study Report (2021) 175, https://www.pc.gov.au/inquiries/completed/supply-chains/report/supply-chains.pdf. [Hereinafter Study Report]

[118] Skilling, *supra* note 10 at 25.

[119] Bryant Harris, *The US is Heavily Reliant on China and Russia for its Ammo Supply Chain. Congress Wants to Fix That*, Defense News (June 9, 2022), https://www.defensenews.com/congress/budget/2022/06/08/the-us-is-heavily-reliant-on-china-and-russia-for-its-ammo-supply-chain-congress-wants-to-fix-that/.

[120] New Zealand imports $134.22 million worth of cereals from Australia, or 86.8 percent of total imports. New Zealand's second biggest source of cereals is Thailand, which accounts for just $6 million in imports. New Zealand International Trade, https://statisticsnz.shinyapps.io/trade_dashboard/ (last visited July 11, 2023). [Hereinafter Stats NZ]

[121] Brunnermeier, *supra* note 75 at 81-82 ("Markets react quickly and are self-stabilizing. They are resilient when faced with small or medium shocks. As the world evolves, markets adjust and drive change. They typically ensure an efficient but not

Where firm efforts fall short of ensuring resilience in specific instances, or throughout the economy, either because of market or governmental failure, policy intervention is warranted to address vulnerabilities before a shock can occur.[122] A 2020 survey by the National Association of Manufacturers found that half of corporate respondents to their survey did not have an emergency response plan in place for supply shocks.[123] To the extent those companies produce, either at home or abroad, critical products whose absence would threaten the life, health, and security of the country and its people, there could be a role for government to intervene to build resilience. Additionally, lack of supply chain resilience by the private sector promotes a moral hazard—why invest in resilience if governments will offer bailouts and backstops during a shock? Pre-emptive interventions can reduce this moral hazard by building resilience prior to the shock.

Mitigating a vulnerability can also be thought of as building a "critical capability."[124] The task for policymakers is to identify what capabilities the economy needs to react to, survive, and thrive in the face of shocks. For example, a vulnerability might be that a national road network is prone to wash outs after a natural disaster. To close that vulnerability would be to foster the technical knowledge—the capability—to build infrastructure quickly in an emergency. Another vulnerability might be a lack of tanks during a major war. A way to close that vulnerability would be to ensure a domestic capability to produce tanks such as with long-term government purchases of tanks, which sends consistent demand signal to manufacturers even during peacetime.[125] The reliance of PPE imports from a handful of countries might be addressed by ensuring the capability to access PPE from other sources. In this instance,

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necessarily fair allocation of resources. Markets, in collaboration with government, can play an essential role in supporting the social contract. As initially stressed by Ludwig von Mises, the price of goods signals their relative abundance or scarcity. In March 2020, soaring prices aggregated dispersed information and signalled the scarcity of and need for face masks. This induced existing manufacturers to scale up production, and it encouraged new firms to enter the market.") *But see* Barry C. Lynn, *Why Economists Can't See the Economy*, The American Prospect (Mar. 19, 2007), https://prospect.org/features/economists-see-economy/ ("We merged our national industrial system with the industrial systems of many other nations, in the process we know as globalization. At the same time, we encouraged…the process of disintegration we call "outsourcing." Add these two processes together, and the result is a single, global, networked system of production marked by extreme and growing specialization of activity. In theory, there is absolutely nothing wrong with a networked system of production. On the contrary, we can easily imagine industrial networks -- even ones global in scale -- that are not merely more efficient but actually more safe, both economically and politically, than the compartmentalized systems of the past. The catch is to understand that networks are not safe by nature, but by design. A network will organize into dispersed compartments that isolate risk only if humans program it to do so.").

[122] Belton, *supra* note 81 at 4 ("We assume that firms in the private sector will make adjustments to enhance resilience. Our aim is not to interfere with these adjustments. Instead, we focus on the role of government to provide capabilities that the private sector cannot be expected to develop on its own or might develop but at a slow pace. There is a public good, market failure, or government failure justification for the policies we identify.").

[123] *Id.*, at 2.

[124] *Id.*, at 9 ("To assuage our concerns, we recommend that policy makers focus foremost on growing US capabilities, which indirectly will bring back offshored jobs. Capabilities—not simply jobs—define resilience.").

[125] *See* Rob Portman, *Fight to Keep JSMC Open Paying Off*, Lima News (Dec. 18, 2016), https://web.archive.org/web/20161220115340/http://limaohio.com/news/219782/portman-fight-to-keep-jsmc-open-paying-off ("Stopping production would have actually cost taxpayers more money than it would have saved and it would have risked losing many highly skilled workers and a critical supply chain. Russia, China, and other of our rivals have been modernizing and improving their militaries…We shouldn't be shutting down production; we should be upgrading our capabilities…In the dangerous and unpredictable world we live in, it only makes sense to always be prepared and to give our troops the tools they need.").

building the capability would involve diversifying PPE trade or promoting domestic manufacturing.[126] Understanding the mitigation of vulnerabilities through the lens of capabilities helps protect policymakers against unknown unknowns; rather than building capabilities anew in response to predictions future shocks, economies can rely on established capabilities to absorb and adapt to the disruption.[127]

Intervention, then, is a means to foster capabilities. It comes in three forms: transparency policy, diversification policy, and industrial policy. Transparency policies can be some of the least distortive, because by improving the flow of information between market actors, and with the government, these policies can help the market close vulnerabilities and respond to shocks. These policies also acknowledge that the best information about supply chains rests with industry professionals who operate at a level of granularity impossible for government to know on its own.[128]

Most companies are punching below their weight on supply chain transparency. In a recent study, 84 percent of companies reported "lack of visibility" as their greatest supply chain problem.[129] Shockingly, 90 percent of all supply chain data companies collect is not used.[130] Transparency interventions can help companies help themselves with respect to supply chain information and analysis. The reverse is also true. Policies that require information sharing with the government can give policymakers new insights into supply chains which can improve response times when a shock occurs, and position market and governmental actors to better anticipate where vulnerabilities will crop up so that they can design more effective, evidence-based interventions for supply chain resilience.[131]

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[126] Note that building domestic manufacturing capacity does not necessarily require the manufacturing of the PPE products itself, but creation of manufacturing platforms flexible enough to switch to producing PPE during a crisis. *See* Phoebe Wall Howard, *Miracle in Plymouth: UAW worker celebrates Ford making 1M face shields in 13 days*, Detroit Free Press (Apl. 6, 2020), https://www.freep.com/story/money/cars/ford/2020/04/06/ford-uaw-make-million-face-shields-nypd-nyfd/2951650001/ ("Within hours, the automaker decided to pivot from building cars to manufacturing medical devices…").

[127] Issues Paper, *supra* note 72 at 11 ("While preparation for predictable risks often justifies resilience-enhancing investments, some less-predictable or genuinely unknown risks can hardly be anticipated and prepared for. In such cases, industries and communities need to rely on their generic capabilities to absorb and recover from disruption.").

[128] *See* Duncan Wood, Cordell Hull, and Jasper Jung, *Confronting Challenges in Supply Chain Policy*, 46 Wilson Quarterly (2022) ("And so industry is really going to be a leader in a number of these spaces and hopefully in close collaboration with our friends in government to ensure that we have a unified US policy, that we're not putting things in executive orders or the code of federal regulations or statute that industry simply can't implement, and we end up creating more problems than we solve…nobody knows their supply chain, like particular companies in their industry. And so having that dialogue back and forth is critical to making this work."). *See also* Cohen, *supra* note 26 ("Company managers want to understand the specific obstacles that companies similar to their will most likely need to overcome. They will also benefit from an analysis that is granular enough to acknowledge the complex multi-dimensional issues that reside at the business unit or product group level, and that can lead to differentiated solutions."). Importantly, this does not mean industry has *all* the information about its supply chain. Many firms cannot see beyond their second or third tier suppliers. But this is to say that firms do possess more information—even if it is scant—about their business than any government agency.

[129] Berti, *supra* note 113.

[130] *Id.* It is worth asking why firms underperform so dramatically in this regard. Is it because market incentives push firms to prioritize efficiency and deemphasis resilience? Or because firms have a higher tolerance for supply chain risk than the economy overall? While investigating these motivations is beyond the scope of this project, it is a topic worthy of future research.

[131] *See* Skilling, supra note 10 at 24 ("although firms will be the primary actors responsible for managing supply chain risk exposure, there is a potential role for government in supporting firms to assess and price risk and to take additional actions

Another related transparency policy is stress testing. Mandated widely for the financial services sector in the wake of the 2008 financial crisis, stress tests for supply chains would evaluate how companies react to different types of shocks—loss of transportation infrastructure to a natural disaster, or destruction of a key distribution center—by assessing the maximum time that the firm has to survive the shock, and the time it would take the firm to recover from the shock. Where the time to recover lasts beyond the time the firm has to survive, it would be said to fail the stress test.[132] Information sharing and stress tests can inform another type of transparency intervention: further identification of high-risk supply chains. Only recently have governments identified their critical supply chain vulnerabilities. Policies to regularly identify high-risk supply chains would ensure that resilience efforts are iterative, rather merely post-hoc and improvised.[133]

Generally, more interventionist than transparency policies, diversification policies promote resilience by spreading risk widely. Evidence from shocks to cities, shows that urban areas with diverse economies are more resilient than those with a single specialized industry.[134] Research on the U.S. hurricane season found that firms with more diversified supply chains were less impacted by those natural disasters.[135] Relatedly, sourcing critical imports from a variety of countries can hedge against shocks occurring in specific places—a paradigm shift to just-in-case from the long prevailing view that supply chains be just-in-time."[136]

But even geographic diversification of sources can fail to address vulnerabilities caused by excessive reliance on lower-tier suppliers with one-of-a-kind capabilities. For example, the Taiwan Semiconductor Manufacturing Corporation (TSMC) produces half of all the world's semiconductor chips.[137] While TSMC has diversified the location of its manufacturing, Apple and Qualcomm are still totally reliant on TSMC for advanced chips. And TSMC itself is reliant on a lone Dutch company, ASML, for advanced lithography equipment, critical for producing

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to ensure resilience against supply chain shocks."). *See also* Handfield, *supra* note 91 (proposing an "orbital regime" for supply chain transparency by analogizing supply chain surveillance to the use of space-based satellites).

[132] David Simchi-Levi and Edith Simchi-Levi, *We Need a Stress Test for Critical Supply Chains*, Harvard Business Review (Apr. 2020), https://hbr.org/2020/04/we-need-a-stress-test-for-critical-supply-chains (Noting that "this approach provides companies with a way to financially quantify the cost of disruptions and prepare mitigation plans for the most critical parts of the supply chain that could be applied in different scenarios.").

[133] Belton, *supra* note 81. ("Reminding that the Government Accountability Office in the United States regularly identifies federal programs at high-risk for waste, fraud, and abuse, and acknowledging the need for a similar effort for supply chains.").

[134] Andrew Coleman, Dave Maré, and Guanyu Zheng, *New Jobs, Old Jobs: The Evolution of Work in New Zealand's Cities and Towns*, New Zealand Productivity Commission 28 (2019), available at https://www.productivity.govt.nz/assets/Documents/bcea812a17/New-jobs-old-jobs-Working-paper.pdf. ("Nevertheless, the results as presented here support the contention that small urban areas that were specialised in primary product manufacturing were less successful than larger urban areas in diversifying into other industries when they experienced negative employment shocks to their manufacturing industries.")

[135] Katharina Längle, Ankai Xu, and Ruijie Tian, *Assessing the Supply Chain Effect of Natural Disasters: Evidence from Chinese Manufacturers*, WTO Staff Working Papers ERSD-2021-13 (2021) ("We find that firms with more diversified suppliers tend to be less affected by the US hurricane in their imports of intermediate inputs and their exports.").

[136] Brunnermeier, *supra* note 75 at 388.

[137] *See* Yen Nee Lee, *2 charts show how much the world depends on Taiwan for semiconductors*, CNBC (Mar. 15, 2021), https://www.cnbc.com/2021/03/16/2-charts-show-how-much-the-world-depends-on-taiwan-for-semiconductors.html ("So TSMC, if you just have a look at market share, I believe manufactures around 50% of all semiconductors in the world.")

semiconductors. In turn, ASML procures a vital part—an optical engine—from a single factory in Germany.[138] This arrangement may be efficient now, but it contains three levels of vulnerability; surprisingly brittle, especially given how critical semiconductors are for the economy of every country. Diversification is best accomplished at both the geographic and firm level—the ideal is lots of firms producing in lots of locations.

Types of diversification policies include trade agreements and international arrangements to vary the sources of imports and destination of exports. Most common are traditional trade agreements that comprehensively reduce tariff and regulatory barriers to imports and exports and prohibit restrictions on exports to agreement parties. Access to a multitude of markets provided reduces firm risk by spreading operations over a number of countries, or even regions.[139] During a disruption in supply, trade openness allows the importation of substitutes that can help smooth spikes in demand.[140] After Bangladesh was hit by a major flood in 1998, the government liberalized trade with India to incentivize imports of rice to stabilize domestic prices and provide food security to hungry citizens.[141] In theory, but not always in practice, traditional trade agreements use trade liberalization to reduce risk in that way. Similarly, trade facilitation policies, often a component of comprehensive free trade agreements, reduce port congestion and enable critical goods to clear customs faster during a crisis.[142]

All else being equal, unfettered trade can also cause fragility by incentivizing concentrated, just-in-time supply chains, as well as set rules which constrain the policy space of open

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[138] Shih, *supra* note 20.

[139] *See* WORLD TRADE ORGANIZATION, WORLD TRADE REPORT: THE ROLE OF TRADE IN ECONOMIC RESILIENCE (2021) 88, available at https://www.wto.org/english/res_e/booksp_e/wtr21_e/04_wtr21_e.pdf ("Trade can also enhance the economy's capacity to endure disruptions by diversifying supplier and customer networks."). *See also* Mark Samuels, *How free trade agreements could strengthen our resilience*, Confederation of British Industry (Apr. 2022), https://www.cbi.org.uk/articles/how-free-trade-agreements-could-strengthen-our-resilience/#:~:text=Specifically%2C%20free%20trade%20agreements%20could,two%20countries%20for%20many%20medicines ("…free trade agreements could allow us to strengthen our resilience by diversifying where we obtain essential products from…"). *See also* Giorgia Giovannetti, Michele Mancini, Enrico Marvasi, and Giulio Vannelli, The Role of Global Value Chains in the Pandemic: Impact on Italian Firms, Confindustria Servizi (2020), available at https://www.confindustria.it/wcm/connect/6140eed7-5828-4733-af7e-69436b9a41e0/English+version_Giovannetti_et_al_RPE_n2_2020_Confindustria.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE-6140eed7-5828-4733-af7e-69436b9a41e0-nyjgcZy (Finding that "internationalised companies seem to have coped with the [COVID-19] crisis better than companies that operate only in the domestic market.").

[140] World Trade Report, *supra* note 138 at 86.

[141] While the government of Bangladesh also provided rice, it paled in comparison to private sector rice imports which were 6.1 times greater than the government's distribution of rice. It is estimated that without the imports, rice prices would have surged 40-60 percent. Carlo Del Ninno, Paul A. Dorosh, and Lisa C. Smith, *Public Policy, Markets and Household Coping Strategies in Bangladesh: Avoiding a Food Security Crisis Following the 1998 Floods*, 31 World Development 1221-1238 (2003).

[142] World Trade Report, *supra* note 138 at 85 ("A key problem observed in the surveyed countries was that customs would not release goods until payment of customs duties or other fees had been made in full, which resulted in containers piling up at customs when humanitarian relief goods started to arrive. Procedures that would have allowed goods to be released without waiting for duties to be paid would have relieved pressure in the immediate aftermath of the crisis.").

societies to pre-emptively close vulnerabilities.[143] Trade agreements can also create asymmetries in market access that promote unhealthy concentration. Since concluding its trade agreement with China, New Zealand's trade with Beijing has become much more concentrated, because New Zealand received market access terms from China more favorable than it received from those countries with which it did not have a trade agreement.

Weak rules of origin are another reason that traditional trade agreements can promote excessive supply chain concentration. An agreement's rules of origin are criteria to determine the location of where products are produced. More specifically, it refers to the amount of a good that must originate in the territory of a country party to the agreement to earn preferential trade treatment.[144] The purpose of a trade agreement is to promote freer trade between the parties; parties who have made mutual concessions for the privilege of market access. Generally, the rules of origin ensure that a country which is not party to the agreement does not get the benefit of agreement's preferential access.[145] However, if the rules of origin are too loose, then a final good produced in territory of one of the parties can still receive preferential access, despite containing all sorts of components produced outside the territory of any party.

Recently, the United States updated the North American Free Trade Agreement (NAFTA), in part due to concerns about its loose rule of origin. NAFTA required 62.5 percent of an automobile to be produced in either the United States, Canada, or Mexico to earn tariff-free access to the rest of the North American market. But that still amount allowed for 37.5 percent of the vehicle to be produced outside any of the three countries. Although the final assembly of NAFTA-originating automobiles occurred in North America, often those vehicles included many components from China, a country not party to the agreement[146] After renegotiating NAFTA, the new U.S.-Mexico-Canada Agreement (USMCA) tightened the automotive rules of origin by increasing the amount of content needed to originate in one of the three countries to 75 percent, with additional rules for specific core parts.[147] Analysis by the U.S. International Trade Commission found that these stronger rules will promote more parts production in the USMCA countries. As the case of USMCA demonstrates, a strong rule of origin can promote

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[143] Timothy Meyer, *Trade Law and Supply Chain Regulation in a Post-COVID-19 World*, 114 AM. J. INT'L. L. 637–646 (2020) (arguing that free trade agreement and WTO rules "foreclose aggressive preventative regulation of supply chain risks in favor of crisis management…[creating a] system that courts more crises.").

[144] Joseph A. LaNasa III, Rules of Origin and the Uruguay Round's Effectiveness in Harmonizing and Regulating Them, 90 AM. J. INT'L. L. 626 (1996) ("Preferential rules of origin are used to determine whether a product originates in a preference-receiving country or trading area and hence qualifies to enter the importing country on better terms than products from the rest of the world.").

[145] Beth Baltzan, *The Modern Agreement of Amity and Commerce*, Open Society Foundations (2020) 8-9, available at https://www.opensocietyfoundations.org/publications/the-modern-agreement-of-amity-and-commerce-toward-a-new-model-for-trade-agreements.

[146] *See* Dollar & Sense, *Sen. Rob Portman on the Importance of a Fair Global Trading System*, (Oct. 28, 2019), https://www.brookings.edu/wp-content/uploads/2019/10/DollarAndSense_SenatorRobPortman_Transcript.pdf ("China right now is taking advantage of the rules of origin. So they're bringing in cars to the United States that get the NAFTA treatment, which is a duty-free treatment, but in fact they have a lot of Chinese components in them and so on. So we've both tightened up those standards and also increased the percentage that has to come from North America.")

[147] Press Release, U.S. Trade Representative, United States-Mexico-Canada Trade Fact Sheet: Rebalancing Trade to Support Manufacturing (Oct. 2018), https://ustr.gov/about-us/policy-offices/press-office/fact-sheets/2018/october/united-states%E2%80%93mexico%E2%80%93canada-trade-fa-0.

resilience by reducing concentrated reliance on foreign sources, while still achieving the benefits of trade diversification.

Questions about the strength of rules of origin and their impact on resilience loom especially large with respect to China, since that country is a non-market autocracy and concentrated producer both finished and intermediate goods. A trade agreement among open societies with a rule of origin permitting China to produce, in some cases, most content for a good and still allow that good to earn the benefit of the agreement's preferential access is a resilience mirage.[148] Sure, the agreement diversifies the sources of finished products. But that only fosters a shallow resilience as it would allow the second, third, and fourth tier components to still originate in a single country. In that way the diversification intervention fails to live up to its potential by rewarding the overreliance status quo. These exact concerns about the consequences of rules of origin and what they mean for reliance on China was a key objection raised by many U.S. policymakers to the Trans-Pacific Partnership which culminated in U.S. withdrawal from the agreement in 2017.[149]

Shaped by these concerns, alternative trade arrangements can be used to promote resilience by shortening supply chains without sacrificing the benefits of diversity. Reagan-era policies in the United States to tilt the playing field against Japanese auto manufacturers in favor of investment in the United States were successful in onshoring production.[150] Alongside those investments in auto assembly came investments in a diverse, nearby supplier base. Toyota's factory in Georgetown, Kentucky has more than 350 suppliers in the United States and more than 100 in Kentucky.[151] In this way, a policy intervention promoted diversification without sacrificing the gains from *just-in-time* efficiency (although not without costs for *other types* of efficiency).[152]

Regulatory policies can also promote diversification. Industry is keen to build resilience by entering new markets. One survey found that to build resilience, a majority of firms sought to

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[148] Letter from Robert Casey, Senator, et al. to Katherine Tai, U.S. Trade Representative (Sept. 10, 2021), available at https://www.casey.senate.gov/imo/media/doc/letter_to_ustr_tai_on_rules_of_origin_for_nmes2.pdf ("That is, half the content of goods entering into the United States under a trade agreement could come from China…Rather than integrating our supply chains with democratic and like-minded countries, these trade rules may further enmesh our dependency on supply chains from foreign adversaries, and Nations which do not adhere to high standards on labor or environment.").

[149] Robert Lighthizer, *Just Say No to Rejoining TPP*, American Compass (Mar. 30, 2022), https://americancompass.org/just-say-no-to-rejoining-tpp/ ("The TPP, by contrast, encourages producers to ship jobs overseas by requiring that only 45% of a car be made in the TPP region to obtain duty-free treatment. So, a product could be 45% made in Vietnam and 55% in China, despite China not belonging to the TPP, and it would qualify for special treatment in the United States.").

[150] Admittedly, the rationale behind Reagan's auto policies was not "resilience," but to the extent it reduced reliance on overseas supply chains, and diversified production of vehicles to more than just Japan, we can consider it to have some resilience building results. *See* Wells King and Dan Vaughn Jr., *The American Camry*, National Review (Oct. 17, 2022), https://www.nationalreview.com/magazine/2022/10/17/the-american-camry/.

[151] Shih, *supra* note 20.

[152] Note that the increase in domestic auto production as a result of government intervention was not without any cost, such as those costs associated with public subsidies. *See* Reuters Staff, *Factbox: U.S. States Woo Automakers with $17 billion in Subsidies Since 1976*, Reuters (Aug. 5, 2017), https://www.reuters.com/article/us-toyota-mazda-jobs-factbox-idUSKBN1AK2BI.

enter into new markets, and 47 percent aimed to introduce new products.[153] Additionally, 84 percent of respondents in the United States, and 76 percent in the United Kingdom, said they had already changed suppliers in the past year as part of resilience building efforts.[154] Governments can adopt policies that promote such behavior. For example, the United States imposes hefty regulatory restrictions on foreign infant formula, including on producers like New Zealand and the EU.[155] Easing those restrictions would expand sourcing opportunities, and increase supply in the face of shocks, such as when the limited production in United States went offline which led to nationwide shortages. Another example are the regulatory restrictions that restrict the mining and processing of critical minerals in the United States. Mine permitting can take up to ten years in the United States, while permitting takes only two to three in Canada and Australia.[156] Even new, less environmentally intensive technologies, such as phytomining, which harvest minerals accumulated in plants, remain unviable because of regulatory burdens and uncertainty.[157] Other supply chain regulations include rules around the use of conflict minerals in corporate supply chains.[158] While not a resilience building effort, conflict mineral rules show that governments can use policy to alter supply chains in ways that promote the public good.

The most distortive type of pro-resilience intervention in the economy are industrial policies. Industrial interventions are not primarily, or even necessarily, a resilience strategy. They are pursued with a variety of motivations, such as to make an economy more competitive against foreign competitors, or to promote the creation of certain types of jobs or capabilities. These motivations are not mutually exclusive, however. When pursued for the sake of resilience, industrial policy can involve providing subsidies to incentivize domestic production of key goods, using government procurement to drive investment in desired manufacturing sectors, or stockpiling the goods needed to weather shocks. Stockpiling—which, by holding more inventory than efficient, can be expensive for firms—is a role governments have already

[153] Mahoney, *supra* note 106.

[154] *Id.*

[155] As a result of tariffs as high as 17.5 percent and a slew of nontariff barriers, imports represent just 1.6 percent of the U.S. infant formula market. *See* Scott Lincicome, Gabriella Beaumont-Smith, and Alfredo Carrillo Obregon, *Formula for a Crisis: Protectionism and Supply Chain Resiliency—the Infant Formula Case Study*, Cato Institute Briefing Paper No. 146 (Jan. 11, 2023), https://www.cato.org/briefing-paper/formula-crisis ("However, the FDA made no clear, long-term changes to its onerous system nor did it consider more ambitious plans for permanently opening the U.S. market, such as by entering into formula-specific mutual recognition agreements with the health and safety authorities of high-standard countries in Europe, Australia, and New Zealand.").

[156] National Mining Association, https://mineralsmakelife.org/policy/?utm_campaign=mml2020&utm_source=search&utm_medium=cpc&utm_content=policy (last visited July 16, 2023).

[157] Maria J. Krol-Sinclair and Thomas Hale, *The United States Needs to Innovate New Mineral Production Technologies. Here's One.*, Center for Strategic and International Studies (Mar. 24, 2023), https://www.csis.org/analysis/united-states-needs-innovate-new-mineral-production-technologies-heres-one ("Operators of phytomining plants would be both farmers and toxic waste handlers and would likely need to bear the regulatory burden of both industries in a way that might be conflicting or even impossible. The regulatory burden on phytomining might stymie any new operation before it was able to scale.").

[158] *EU Conflict Minerals Regulation vs. U.S. Dodd-Frank Act Section 1502*, Source Intelligence (Aug. 8, 2022), https://blog.sourceintelligence.com/blog/eu-conflict-minerals-vs-us-dodd-frank-act-section-1502.

assumed for the most critical of goods, like oil and medical supplies.[159] This redundancy creates "breathing room", which gives time for market actors to respond in a shock by ramping up supply.[160] Of course, this assumes the stockpile is well-managed, something that was not always the case, as was seen with medical supplies during the COVID-19 pandemic.[161]

The use of subsidies and public procurement to drive resilience are similar interventions. Both emphasize the value of domestic production as a resilience strategy and aim to tilt the incentive structure in favor of onshoring. Since government can attach rules—domestic content requirements, for instance—to the goods it purchases, public procurement is a way to steer market investment towards the things procured.[162] Governments also purchase consistently and in large quantities; government procurement is one-third of public spending in most countries.[163] This consistent demand signal provides the certainty market actors need for the government's policy objectives to be met successfully. But policymakers should be cautious about using public procurement in response to all vulnerabilities. Policymakers must recognize that despite its significant size, public procurement is still small compared to the size of the private market and cannot be expected to redirect private investment in all cases.

In this way, subsidization aims to hit a broader slice of the economy. Subsidies include more than just grants, and can include tax advantages, loans with below market interest rates, and low-cost land and inputs, like electricity.[164] Subsidies have been used successfully to promote domestic manufacturing. China has used them to dominate the global steel and aluminium markets, with steel subsidies peaking at $1 billion in 2015.[165] China now produces roughly half

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[159] Paul Michelman and Yossi Sheffi, *Building a Resilient Supply Chain*, Harvard Business Review (Aug. 14, 2007), https://hbr.org/2007/08/building-a-resilient-supply-ch%20May%2011 ("Theoretically, a resilient enterprise can be built by creating redundancies throughout the supply chain. The organization could hold extra inventory, maintain low-capacity utilization, have many suppliers, etc. Yet, although redundancy can provide some breathing room to continue operating after a disruption, typically it is a temporary—and very expensive—measure."). Though note that not all countries stockpile physical goods, see MINISTRY OF BUSINESS INNOVATION AND EMPLOYMENT, FUEL SUPPLY RESILIENCE WITHOUT A DOMESTIC OIL REFINERY (2021), available at https://www.mbie.govt.nz/dmsdocument/17733-fuel-supply-resilience-without-a-domestic-oil-refinery-proactiverelease-pdf ("New Zealand is, in many respects, an outlier among comparable countries because it does not maintain domestic fuel reserves.").

[160] *Id.*

[161] S. Comm. on Homeland Sec. and Gov. Affairs, 117th Cong., Report on the Federal Government's Pandemic Preparedness and Initial COVID-19 Response (Dec. 2022), https://www.hsgac.senate.gov/wp-content/uploads/imo/media/doc/221208_HSGACMajorityReport_Covid-19.pdf ("The SNS contained only a small portion of the PPE needed for the initial pandemic response. As shown below, as of January 1, 2020, the SNS contained approximately 12.5 million N95 respirators, many of which turned out to be expired and unusable, in comparison to an estimated 350 million needed respirators per month. The SNS also did not contain testing supplies, such as nasal swabs, transport media, and pipette tips.").

[162] For a discussion of the transformation of public procurement as a tool for broader policy goals, see Barbara Allen, *Broader Outcomes in Procurement Policy – A Case of New Zealand Pragmatism*, 21 Journal of Public Procurement 318-341 (2021).

[163] ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, ENHANCING THE CONTRIBUTIONS OF SMES IN A GLOBAL AND DIGITALISED ECONOMY (2017), available at https://www.oecd.org/mcm/documents/C-MIN-2017-8-EN.pdf.

[164] Shinya Matano, *The Impact of China's Industrial Subsidies on Companies and the Response of Japan, the United States, and the European Union*, Mitsui & Co. Global Strategic Studies Institute 2 (Jan. 2021), https://www.mitsui.com/mgssi/en/report/detail/__icsFiles/afieldfile/2021/02/19/2101c_matano_e.pdf.

[165] *Id.*

of all the steel in the world.[166] Despite the fact that these subsidies have caused an overcapacity crisis in the global steel market, which threatens the steel industries of market economies, even critics of China's policies admit that they achieved their primary goal of greatly boosting production, creating domestic jobs, and harming the foreign competition. Even open societies have been known to dabble in industrial policy. The most well-known instances are the efforts by the United States, EU, and others to subsidize domestic production of semiconductors in the wake of chip shortages.[167] A less well-known example is in the aluminium sector, where countries far freer than China have provided state support to domestic firms.[168]

3.F. Conclusion

Regardless of whether policymakers choose transparency, diversification, or industrial policy options to build resilience, they must ensure that these interventions are effective. In other words, policymakers must consider whether certain policies are so distortive that they reduce well-being unnecessarily, possibly by imposing higher costs for certain goods, which can disproportionately impact the least well-off segments of the population. A "whatever it takes" resilience policy sounds good in a theoretical world of limitless resources, but not if it leads policymakers to later wonder, "oh gosh, what have we done?"[169] Seeing resilience on a spectrum with efficiency helps policymakers strike that balance. Building policy interventions out from identified vulnerabilities avoids the pitfalls inherent to predicting unknowns and associated with special interest rent seeking. For policymakers, the next step is to turn this theoretical approach into something, which can be deployed in a variety of contexts across differently situated open societies. The next section proposes a Supply Chain Resilience Checklist for that purpose.

Section 4: The Supply Chain Resilience Checklist

The question for policymakers tasked with building more resilient supply chains is whether the efficiency costs of government intervention are worth the benefits in resilience. In answering that question, the challenge is to determine which resilience interventions will maximize well-being, and to identify the spot on the spectrum between resilience and efficiency best positioned to strike the balance most favorable to overall well-being. To do that policymakers can deploy

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[166] Jim Zarroli, *China Churns Out Half The World's Steel, And Other Steelmakers Feel Pinched*, National Public Radio (Mar. 8, 2018), https://www.npr.org/2018/03/08/591637097/china-churns-out-half-the-worlds-steel-and-other-steelmakers-feel-pinched.

[167] Alexandra Alper, *U.S, E.U will seek to head off subsidy race over chip production, official says*, Reuters (May 16, 2022), https://www.reuters.com/technology/us-eu-will-seek-head-off-subsidy-race-over-chip-production-official-says-2022-05-16/.

[168] ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, MEASURING DISTORTIONS IN INTERNATIONAL MARKETS: THE ALUMINIUM VALUE CHAIN (2019), available at https://www.oecd-ilibrary.org/docserver/c82911ab-en.pdf?expires=1688945570&id=id&accname=guest&checksum=9D0A4CF03C1111677B3F0312853DE375 ("Alcoa, Norsk Hydro, and Rio Tinto obtained relatively little support from their home countries of the United States, Norway, and Australia respectively, but were, however, able to attract more generous support from the other countries in which they operate, in particular Brazil, Canada, and GCC countries.").

[169] Brunnermeier, *supra* note 75 at 242.

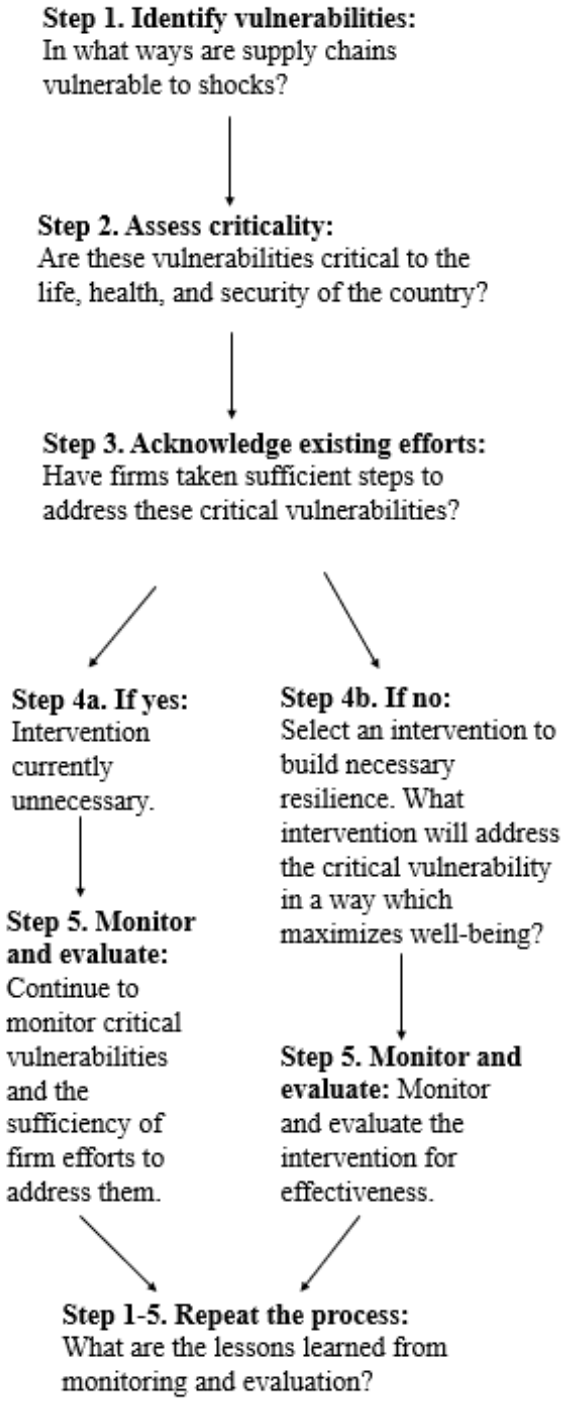
a five-step checklist, which expands on similar work begun by the Australian Productivity Commission.[170]

First, policymakers must identify supply chain vulnerabilities by looking across the economy for where there are high levels of concentration or overreliance. Second, policymakers winnow those vulnerabilities to the most critical, or those most impactful to life, health, or national security. Third, policymakers then survey the actions taken by firms to build resilience against those critical vulnerabilities. If firms are already taking steps to address those vulnerabilities government intervention may not be needed. If government intervention is warranted because of insufficient efforts by industry, the fourth step for policymakers is to decision an intervention to build resilience against the critical vulnerability. At this stage, policymakers weigh the pros and cons of deploying transparency, diversification, or industrial interventions (or a combination of those policies). The fifth step calls for monitoring of the intervention and the critical vulnerability so that policymakers can adjust their efforts in response to changing conditions.

Some vulnerabilities are unknowable until exposed by a shock. Therefore, the Checklist may be insufficient to identify and address all vulnerabilities. In that way, policymakers should not ignore broad-based resilience policy settings (e.g. competition rules to promote diversification). However, this does not negate the overall usefulness of the Checklist as a resilience boosting tool—the Checklist still facilitates the identification of most vulnerabilities.

[170] *See* Study Report, *supra* note 117 at 151.

Figure 4. The Supply Chain Resilient Checklist



4.A. Step 1: Identify Vulnerabilities

The first step in the checklist is to understand the ways in which the economy is vulnerable to supply chain shocks. That analysis begins by identifying a particular vulnerability in a good that would reduce well-being if the economy were exposed to a shock. Since it is difficult to predict the future, and even firms trying to forecast future uncertainties tend to underestimate those likelihoods, the vulnerability-first analysis reduces the process's uncertainty.[171] A vulnerability is still a vulnerability even if the odds of a shock capitalizing on that weakness are long. Of course, for some open societies some shocks are so common—like earthquakes in New Zealand—that it would be unwise to ignore them entirely. However, the important thing is to not overly focus on shocks because it can obscure the full range of vulnerabilities. Moreover, a shock-based analysis can tend to treat shocks as independent events, rather than intertwined or cascading events: this can cause preparations to focus on one significant risk to the exclusion of others.[172] The COVID-19 pandemic generated a potpourri of shocks: shortages of key medical goods, semiconductors, and other critical goods; disruptions in international transportation; and a dearth of workers, especially in vital fields. Similarly, Russia's invasion of Ukraine has triggered shortages of neon gas (a key input for producing semiconductors), auto parts, grain, critical minerals, fertilizers, and disrupted energy supplies.[173] Since a vulnerability approach better accounts for concurrent shocks, policymakers can be sure that interventions to close gaps yield more value for money, because the combined cost of current and future concurrent shocks is high.

Vulnerability is largely quantifiable. Policymakers can know the supply—it is possible to determine the number of masks produced domestically and imported each year—and estimate the size of demand spikes in response to different shocks. In its supply chain resilience review, the U.S. Department of Defense noted its concerns about the vulnerability of rare earth minerals but did not offer data on the extent of supply that would be necessary to meet the military's needs.[174] Neglecting to quantify those supply needs is a missed opportunity. Information about

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[171] Dowse and Blackburn, *supra* note 80 at 85 ("Mintzberg refers to the difficulty of forecasting an uncertain future as the fallacy of prediction. Even when businesses undertake risk planning, those who adopt a probabilistic approach based upon past events will underestimate the strategic impact of future change."). Furthering noting the difficulty of predicting different shocks, see Belton, *supra* note 80 at 4 (""A further complication: the next supply shock could occur anywhere and may or may not be a pandemic. For instance, the tsunamis in Japan and Southeast Asia severely disrupted manufacturing supply chains in recent years in 2010, the Chinese reduced supplies of critical raw materials to severely disrupt global production of high technology products.")

[172] Dowse and Blackburn, *supra* note 80 at 85 ("Another pitfall in efforts to develop resilience through identification and mitigation of risks may be the assumption that those risks are independent events. This assumption may lead organizations to prepare for one significant risk, but not multiple significant risks…However, significant events such as a pandemic are likely to generate multiple concurrent risks, such as loss of international transport, increased need for supply, unavailability of workforce, security threats, etc.")

[173] David Simchi-Levi and Pierre Haren, *How the War in Ukraine Is Further Disrupting Global Supply Chains*, Harvard Business Review (Mar. 17, 2022), https://hbr.org/2022/03/how-the-war-in-ukraine-is-further-disrupting-global-supply-chains. *See also* Hamilton, *supra* note 16.

[174] Scissors, *supra* note 100 ("Even if military uses of rare earth oxides are classified, no data are provided on global or American demand for them in 2019 or later--nor are there projections of crisis demand and supply. The paper mentions titanium but provides no information about demand for it either. Researchers and policymakers cannot evaluate vulnerability to Chinese supply cut offs, much less responses, if DOD does not provide information on what it expects to use.").

available supply and projected demand is relatively easy to gather and quantifies the vulnerability in a way that sets a target for policymakers considering an intervention. It is one thing to say titanium is vulnerable and the United States needs more, and quite another to know exactly the number of tons per year the country needs to incentivize the mining of, or import from allies. Similarly, a country's exposure to import risks can be quantified by looking at which goods are sourced mostly from a single trading partner where that trading partner is also the majority global exporter of the good. Global market dominance by a single exporter indicates a lack of alternative sources for the good. New Zealand, which, along with Australia, has been a leader in this context, considers an imported good highly concentrated "where more than half of … imports come from a country that controls more than half of the global market for the given good."[175]

To identify areas of the economy which are vulnerable, policymakers should ask:

- Which imported goods are highly concentrated? Of those goods, which are imported from countries holding the majority share of global exports of that good?
- Which highly concentrated imports are produced in open societies? Which highly concentrated imports are produced in strategic competitors or adversaries?
- Which imported goods are comprised of inputs produced by countries that are the dominant producer of those inputs? Which inputs are produced by strategic competitors or adversaries? What are the sources of inputs of inputs?
- Which goods are most susceptible to supply shortages because of spikes in demand (from the most likely shocks)?

4.B. Step 2: Assess Criticality

After winnowing the potential range of goods to those identified as vulnerable, the next step is to determine which vulnerable goods are critical. Just because a good is vulnerable does not mean that a shortage of it will degrade the well-being of citizens, or the functioning of the economy or military.

Critical goods, whether imported or produced domestically, are those that are most fundamental for well-being. This includes those necessary to preserve and promote the health and life of the population. This category includes fertilizers, medical supplies and pharmaceuticals, and water treatment chemicals.[176] It also includes those goods needed to promote national security interests or autonomy against foreign interference or economic coercion; examples include semiconductors, military hardware, and critical minerals used in weapons systems. [177]

There are also goods core to national or strategic competitiveness objectives, which go beyond pure military significance. An economy needs an industrial base not for national security alone.

[175] Issues Paper, *supra* note 72 at 18. *But see* Study Report, *supra* note 117 at 4 (Defining concentrated when "a single trading partner accounts for over 80 percent of total imports of that good.").

[176] Issues Paper, *supra* note 72 at 16. Though note that land can still be farmed without fertilizer, but with less efficiency.

[177] Wood, *supra* note 127 ("F-35 Joint Strike Fighter, our most advanced airplane, there was a single component that had a Chinese alloy in it, and it essentially shut the program down for several weeks while trying to figure out the supply chain on this.").

As the United States learned during the Second World War, and more recently the COVID-19 pandemic, there is value in possessing generic industrial capacity which can be retooled to produce other types of goods suddenly necessary to survive a shock.[178] These critical goods might include raw material inputs necessary to sustain general industrial processes like energy, alloys, ore, and textiles.

Exported goods can also be critical too. Exported critical goods also include those related to life, health, national security, and the other archetypes mentioned above. But they also can be goods that on their face appear to have little value to life, health, or national security at all. Where a country exports in concentrated amounts from a strategic competitor or adversary, the latter can use this concentration as leverage to pressure the former to make policy changes it not otherwise. Rock lobsters might not sound as critical as semiconductors but, given that China buys almost all New Zealand's exports of rock lobster[179], the concentration poses a unique economic coercion risk. In this way, critical exported goods are often more generic because there are all sorts of common products which are exported to concentrated destinations.

A final archetype of critical goods, which can exist on the import and export sides, are those whose disruption imposes significant distributional costs. Again, the example of New Zealand's rock lobster is instructive. Given fishing's disproportionate role in the Māori economy, loss of market share in China for rock lobster exports represents a concentrated blow to that community, even if it represents a fraction of New Zealand's overall economic output.[180] Looking holistically at economic vulnerabilities guards against utilitarian approaches that sacrifice certain sectors or actors at some altar of the greater good.

Of course, not all economies are similarly situated. While countries may generally share life, health, and national security archetypes, different distributional contexts and strategic postures might change the definition of "critical". There is no one-size-fits-all answer to criticality. The goods a trade-dependent economy considers critical might be different than those a nation with a large pre-existing industrial base considers critical.[181] Small economies are not miniature versions of large ones—each will make different policy decisions based upon their economic

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[178] *See* Clyde Prestowitz, The Betrayal of American Prosperity (2010) ("Having produced less than 14,000 airplanes total in the 20 years before the war, the United States was turning out 96,000 planes per year by 1944."). *See also* Phoebe Wall Howard, *supra* note 126. The focus here does not diminish the fact that there are reasons for why a country might need a strong industrial base separate and apart from pure supply chain resilience (e.g. well-paying jobs, robust civic culture, economic innovation and productivity).

[179] In 2021, 99.7 percent of all New Zealand rock lobster exports were to China. *Situation and Outlook for Primary Industries*, Ministry for Primary Industries (June 2021) 48-49, https://www.mpi.govt.nz/dmsdocument/45451-Situation-and-Outlook-for-Primary-Industries-SOPI-June-2021.

[180] Maori own one-fifth of New Zealand's fishing quota by value, with rock lobster as the single most valuable specie overall. Additionally, a single Maori-owned company accounts for 23 percent New Zealand's lobster exports. John Reid, Matthew Rout, Jason Paul Mika, *Mapping the Māori Marine Economy*, Sustainable Seas National Science Challenge (2019) 23, 81, https://www.sustainableseaschallenge.co.nz/assets/dms/Reports/Mapping-the-Maori-marine-economy/MME20JMika20Mapping20the20Maori20Marine20Economy20LR_0.pdf.

[181] Note that while a good, such as food, is essential for both large and small economies, the former is more likely to produce sufficient quantities whereas the latter is more likely to rely on imports. In that case, only the small economy may be likely to consider food a critical good.

make-up and historical, geographical, and political context.[182] Consider how, given the benefits of the single market, small economies that are European Union members will have different perspectives on criticality than small, stand-alone economies far from hubs of economic activity.[183]

To identify which vulnerabilities are critical, policymakers might ask:

- Would disruptions in the supply of this good threaten the life and health of citizens, or degrade the general functioning of the economy?
- For which goods would a supply chain disruption undermine national security, including in terms of the ability to successfully defeat military threats, or present an opportunity for interference or coercion by foreign powers?
- For which goods would a supply chain disruption undermine national competitiveness, for example, in terms of the economy's innovativeness or other non-military sources of power?
- Would disruptions greatly reduce the well-being of certain communities or the competitiveness of sectors key to economic growth overall?

4.C. Step 3: Acknowledge Existing Efforts

Although the very existence of critical vulnerabilities portends a rush by policymakers for economic intervention, intervention may not be necessary. Firms and market actors may already be taking steps to address critical vulnerabilities in their own way. By understanding existing private-sector efforts, and their shortcomings, policymakers can design interventions which are that much more tailored—and thus more likely to succeed—because those interventions are attuned to present market realities.

In some cases, firms may already have undertaken efforts to build resilience against supply chain vulnerabilities, making governmental interventions unnecessary. Many firms understand the cost of shocks to their supply chains and take measures accordingly. Samsung and Apple did not experience serious production delays during the pandemic, and Apple even managed to release four new models.[184] Within three months of starting production on COVID-19 test kits, South Korea successfully used its diverse supply chains to become one of the world's top exporters with 40 companies making test kits for over 100 countries.[185] As a result of the pandemic, and because of increasing geopolitical tensions, and other supply chain disruptions, 62 percent of manufacturers have said they intend to bring production back to the United States

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[182] Skilling, *supra* note 10 at 17 ("Small advanced economies are not simply scaled-down versions of larger economies…economic scale is only one factor that shapes policy options and responses: economic structure, the nature of the import dependences, physical geography, and the institutional context probably matter more than direct measures of economic scale.").

[183] *Id.*

[184] ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, COVID-19 AND GLOBAL VALUE CHAINS: POLICY OPTIONS TO BUILD MORE RESILIENCE PRODUCTION NETWORKS 6-7 (2020), available at https://www.oecd.org/coronavirus/policy-responses/covid-19-and-global-value-chains-policy-options-to-build-more-resilient-production-networks-04934ef4/.

[185] *Id.*

or nearby countries to make their businesses more resilient.[186] Additionally, the proliferation of 3D printing and additive manufacturing has contributed to firms' reshoring production from abroad.[187] Firms are also increasingly deploying emerging technology—such as artificial intelligence and blockchain—to enhance resilience.[188]

Yet, even where firms are proactive in managing risks, they may still understate the size of vulnerabilities relative to the society at large. For example, a firm may have an appetite for risk that sees it diversify production of PPE to several countries but still keep all of that production overseas. But the society at large, fresh from the consequences of PPE-shortages, may have a smaller appetite for risk, which demands onshoring of at least some domestic PPE production, in addition to firms' extant diversification efforts.

Firms may be unable or unwilling to build resilience on their own. They may not know the risks associated with overreliance on single sources for key inputs. Or firms, despite awareness of the risks, react to short-term incentivizes at profit-maximization by either failing to build resilience or actively creating new vulnerabilities.[189] Pressure to deliver quick returns to shareholders "often leads to an unhealthy focus on short-term profits at the expense of long-term strategy, growth, and sustainability," where a longer-term view would make society "stronger, more resilient, and more competitive."[190]

Firms may lack the resources to build resilience. Given the distortions in the semiconductor market as a result of long-running subsidies by some governments, firms in other countries have needed to call upon their own governments to intervene with new subsidies to build resilience in semiconductor supply chains.[191] No firm could compete with foreign subsidies

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[186] Bryce Baschuk, *US Manufacturers 'Pumped Up' About Supply-Chain Reshoring Trend*, Bloomberg (Nov. 2, 2022), https://www.bloomberg.com/news/articles/2022-11-02/us-manufacturers-pumped-up-about-supply-chain-reshoring-trend?in_source=embedded-checkout-banner ("Pandemic and geopolitical events have reminded us of the need for a more distributed set of sourcing options, ensuring reliability and flexibility in securing critical materials and equipment," said Irving, Texas-based Commercial Metals Co. CEO Barbara Smith. "Eventually, we expect reshoring to extend well beyond the areas we just discussed.").

[187] Bryan Crutchfield, *How 3D Printing Fits Into A Mind Shift In Manufacturing*, Forbes (Aug. 10, 2021), https://www.forbes.com/sites/forbesbusinesscouncil/2021/08/10/how-3d-printing-fits-into-a-mind-shift-in-manufacturing/?sh=3906be2e2446 ("…they experienced halting of shipments with replacement parts from China. They were able to find a solution that fits well enough to prevent assembly stoppages by including 3D printing in its supply chain strategy.")

[188] Ziyang Fan, *How TradeTech can build resilience in global value chains*, World Economic Forum (Apr. 5, 2021), https://www.weforum.org/agenda/2021/04/how-tradetech-can-build-resilience-in-global-value-chains/ ("Digitizing is the core component of providing visibility and managing supply chain risk, and the first step towards building a resilient GVC.").

[189] Beth Baltzan, *COVID-19 and the End of Laissez-Faire Globalization*, Open Markets Institute (Aug. 5, 2020) 5, https://www.openmarketsinstitute.org/publications/covid-19-and-the-end-of-laissez-faire-globalization.

[190] Jamie Dimon and Warren Buffett, *Short-Termism Is Harming the Economy*, Wall Street Journal (June 6, 2018), https://www.wsj.com/articles/short-termism-is-harming-the-economy-1528336801. *See also* Dennis Carey, Brian Dumaine, Michael Useem, and Rodney Zemmel, *Why CEOs Should Push Back Against Short-Termism*, Harvard Business Review (May 31, 2018), https://hbr.org/2018/05/why-ceos-should-push-back-against-short-termism ("A 2014 global survey of more than 600 C-suite executives and directors, conducted by the non-profit Focusing Capital for the Long Term (FCLT), reported that two-thirds of those surveyed said pressure for short-term results had increased over the previous five years.").

[191] For a discussion of semiconductor subsidies, see *infra* Section 8.A.

alone.[192] By understanding the different contours in each supply chain, governments can be sure that interventions are justified, and effectively tailored to build resilience.

To ascertain the existence, extent, and effectiveness of existing firm-level efforts, policymakers should ask:

- Have firms identified these critical vulnerabilities on their own? Is the appetite for risk of those firms equal to the appetite for risk by the society at large?
- Have firms taken sufficient steps to address these critical vulnerabilities on their own?
- What are the reasons firms have failed to build supply chain resilience on their own?

4.D. Step 4a: Do Nothing

It is possible that, after conducting the survey in Step 3, policymakers find the market has already taken the steps necessary to build resilience against the identified vulnerability. In that instance, there is likely no need for government intervention—the vulnerability has been addressed. In this instance, policymakers can turn their attention to unresolved critical vulnerabilities, and skip ahead directly to Step 5.

4.E. Step 4b: Select an Intervention

However, it is also possible that the survey in Step 3 has revealed shortcomings in market actor's efforts to build supply chain resilience. In this instance, intervention to build resilience against the vulnerability identified may be warranted.

With the list of vulnerabilities narrowed to the most critical, policymakers can design interventions in response to those exposures. As a general matter, interventions establish capabilities that seal the critical vulnerability, with the overall purpose being to build resilience in a way no more distortive than necessary to reduce the vulnerability.[193] Overkill interventions risk degrading economic well-being by needlessly hampering efficiency, just as underdone interventions riskily prioritize economic efficiency while leaving the economy vulnerable to shocks.

Especially for deeper interventions, like industrial policies, decisionmakers should still aim to ensure the best value for money, including by seeking to understand whether an investment will bring additional capabilities, rather than overinvesting in the same capability (e.g. it may

[192] Rob Portman, Remarks in the Senate on CHIPS Act Funding (July 19, 2022) (transcript available at https://www.c-span.org/video/?521802-8/sens-portman-cornyn-computer-chip-funding).

[193] One might argue that as a result of unfair practices (e.g. subsidies, labor and environmental arbitrage, currency manipulation) global markets are already distorted, and so policymakers should be less hesitant about the distortive effects of resilience-building interventions. The existence of these distortions is undeniable, especially in the context of trade with non-market autocracies. However, it is still appropriate to recognize the distortions potentially created by interventions. First, not all trade between countries is necessarily distorted (or is less distorted relative to other countries). For instance, trade between New Zealand and the United Kingdom is less distorted than trade between arguably any country and China. In the former, the addition of distortions because of interventions should be acknowledged and the costs and benefits weighed. Second, global markets as they exist now are the baseline. Changes to that baseline, such as by intervening in the market to create a more level playing field between countries, or to build supply chain resilience, are by their nature distortive, just in ways which are positive and desired.

be better to have two oil refineries than merely to expand an existing facility),[194] or whether an investment is economically viable on its own.[195] An investment or project requiring indefinite support by the government should require exceptional justification. An intervention should aim to promote conditions where the industry, or firm, can eventually stand on its own two feet rather than survive thanks to an indefinite drip of state subsidies. Moreover, policymakers might reflect on the dynamic nature of vulnerabilities and resilience. One country's investment in resilience might reduce the need for other countries to make the same investment. New Zealand's exposure to a shock associated with Taiwan's semiconductor production is reduced by semiconductor investments made by the United States, Japan, and the EU. As interventions to build resilience are deployed, policymakers should be attuned to the ways in which those interventions change the nature, and scope, of vulnerabilities.

To design an appropriate intervention, policymakers must ask:

- Is the vulnerability due to firms' inability to coordinate during a crisis?
- Is the vulnerability due to firms' (or government's) lack of knowledge about the extent to which supply chains are exposed to risk, and the location of that risk?
- For the good in question, can the vulnerability be addressed by expanding the sources of imports from countries that are not strategic competitors or adversaries?
- Can the vulnerability be addressed by increasing imports of substitutes for the good in question?
- Can the vulnerability be addressed by expanding the destinations for exports of the good in question?
- Can the vulnerability be addressed by decreasing imports from existing sources (e.g. with tariffs or other trade restrictions) so as to relatively make alternative sources of imports more competitive?
- To what extent must the economy produce the good domestically because it cannot rely on foreign sources? How much more resilience would be created for the public cost of such onshoring?
- Can public procurements stimulate sufficient demand to support investments in domestic production in ways that reduce a given vulnerability?
- Are there regulations that make it difficult for firms to pursue resilience on their own, by diversifying sources of expanding production domestically? How should those regulations be changed to make it easier for firms to build resilience in those ways?
- If subsidies are granted, will those subsidies build additional resilience capabilities beyond what the economy currently possesses? Is the project economically viable without subsidies within a reasonable frame of time?

4.F. Step 5: Monitor and Evaluate

As they reach the end of the Checklist, policymakers should continually re-evaluate their decisions. Where policymakers decide no intervention is needed, they should still review that decision by iteratively assessing whether firms continue to build the necessary resilience on their own. Where intervention is justified, policymakers should be especially attentive to the

[194] Belton, *supra* note 80 at 9.

[195] *Id.*

impacts of such intervention. Governments are fallible, and the myriad costs of interventions that fail to build resilience are high. For this reason, each step in the checklist should be accompanied by robust consultation processes to ensure policymakers learn from stakeholder insights and perspectives before testing new resilience proposals. It will be necessary to assess the effectiveness of an intervention, and to re-evaluate the decisions which led to that intervention (by asking "Is the good in question still vulnerable?" "Is it still critical?"), to ensure supply chains are, in fact, resilient.

4.G. Conclusion

As a conceptual framework, the Supply Chain Resilience Checklist proposes to guide policymakers through the difficult task of promoting societal well-being in a world of supply chain disruptions. Neither a thumb on the scales for intervention, or an acquiescence to the status quo, the Checklist offers a means to balance resilience and efficiency.

PART II: THE PRACTICE OF SUPPLY CHAIN RESILIENCE POLICY

Section 5: Introducing Supply Chain Resilience Interventions in Open Societies

Whether or not they employ a conceptual framework for supply chain resilience, open societies are keen to emphasize resilience as a feature of trade and supply chain policy. In many cases, this keenness has sparked a rethinking of long-standing presumptions about global value chains. In this context, open societies are not retreating from globalization, but rather shifting globalization structurally away from hyper-distant, just-in-time supply chains to more resilient alternatives, emphasizing regionalization and reshoring.

As the world's biggest open societies, the United States and the EU have led this change; there have been calls from the former for a level playing field in global economic relations and calls for "strategic autonomy" by the later.[196] Often this rhetoric is backed up with investments in reshoring and domestic manufacturing as a means to mitigate supply chain vulnerabilities. Smaller, advanced economies have followed suit. South Korea has adopted a more resilient trading posture with domestic manufacturing as a priority in the wake of what it calls a "fundamental shift" in supply chains.[197] Even trade-open New Zealand has witnessed the call of industrial policy.[198]

In many ways, this restructuring towards resilience is not new. Global value chains have been shortening since 2011; the biggest impact has been on the international segments of those

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[196] *See* James A. Lewis, *Implementing Supply Chain Resiliency*, Center for Strategic and International Studies (2021) 1, https://www.jstor.org/stable/resrep37713 ("For more than two decades, the U.S. depended on a global supply chain that provided lower cost and greater efficiency. Two things broke that global supply chain. The first is the rise of a predatory China that will use any means to displace competitors in its quest for global primacy. The second is the COVID-19 pandemic, which produced an understandable desire in many nations to reduce their dependence on foreign suppliers and instead rely on national capabilities." *See also* Charles Michel, Remarks at the Bruegal think tank on Strategic Autonomy for Europe (Sept. 28, 2020), https://www.consilium.europa.eu/en/press/press-releases/2020/09/28/l-autonomie-strategique-europeenne-est-l-objectif-de-notre-generation-discours-du-president-charles-michel-au-groupe-de-reflexion-bruegel/ ("It also means economic and social security. That calls for a favourable environment for investment and trade, both within our market and with the rest of the world. Upholding fair market conditions and reciprocity with our trading partners is one of our priorities. We advocate free and open economies, and we are opposed to protectionism. But access to our large market cannot be given away for free. The lower your compliance with standards, the more restricted your access. Whether you're leaving our Union, or building closer ties with it. Economic security also means securing our supply of critical resources: medical products, rare earth elements... And also microprocessors, which are so essential for our digital sovereignty – this is another key aspect of our strategic autonomy, which is vital for our digital transformation.").

[197] Christian Davies and Song Jung-a, *South Korea's Trade Minister Says Supply Chain Resilience Must Be Post-Pandemic Focus*, Financial Times (Dec. 29, 2021), https://www.ft.com/content/72976edc-beae-4a43-b504-5271fe07b2ca ("The coronavirus pandemic has forced a "fundamental shift" in global trade policies as governments increasingly focus on supply-chain resilience and securing access to next-generation technology, according to South Korea's trade minister.").

[198] Charles Finny, *Hedging Against Trade Dependency Post-Covid 19*, Small States and the New Security Environment (May 10, 2020), https://www.canterbury.ac.nz/media/documents/oexp-arts/research-centres/ssanse/Hedging-against-trade-dependency-post-COVID-19.pdf ("We need to re-start export manufacturing immediately. New Zealand's processed wood, mechanical machinery, electrical machinery, optical measuring devices, wood pulp and paper, iron and steel, wool, plastics, textiles, paper and vehicle parts exports are worth close to $9 billion. These are an important part of our export story and if we keep this sector closed they will lose contracts and be severely harmed. Without this flow of exports we will start to see international shipping lines start reducing the frequency of their services.").

supply chains.[199] But this trend has, so far, been led mostly by firms that have recognized the benefits of building resilience into their operations regardless of the direction they receive from national governments. Yet it is new that national governments are now playing a more active role in this supply chain rethinking. COVID-19 and rising geopolitical tensions have indicated to governments that there are vulnerabilities which the market has left unaddressed. Weaknesses—such as the concentration of the production of PPE and critical minerals processing in closed societies and competitor nations—are what motivates governments to design interventions.

In part I we discussed the theory behind three types of supply chain resilience interventions: transparency interventions, diversification interventions, and industrial interventions. This section gathers examples from ten major open societies—Australia, the EU, India, Israel, Japan, New Zealand, Singapore, South Korea, the UK, United States—to examine these different interventions in practice. These countries were chosen because they have undertaken a wide range of policies, those policies are generally easy to comprehend from open-source materials, and the countries represent a healthy mix of large and small economies.

One word of caution: most of these policies are very new or still largely unimplemented and so it is difficult to truly assess their usefulness and understand what the unintended consequences might be. It would be impossible at this stage to determine whether the policymakers who created these policies optimized for societal well-being in the trade-off between efficiency and resilience. But we do know the attributes and features of what makes for successful transparency, diversification, and industrial interventions, and we can by analogy make rough approximations of how some these country-specific policies stand up.

All these policies were selected because of their role in the supply chain resilience efforts of each country. There is a cornucopia of transparency, diversification, and industrial interventions that modify the structure and nature of global value chains, and in doing so might promote supply chain resilience. However, not all those policies were instituted with the primary purpose of fostering supply chain resilience, and so they are not discussed here. One example is the tariffs levied by the United States on China. Although those tariffs have helped build resilience by shifting some supply chains out of China to other countries in the region, the United States did not impose the tariffs in order to improve the resilience of its supply chains, but rather to rectify imbalances and inequities in the trading relationship after years of intellectual property theft and unfair trade practices by China.[200] In contrast, the policies

[199] *See* Sébastien Miroudot and Håkan Nordström, *Made in the World Revisited*, RSCAS Applied Network Science Working Paper No. 2019/84, European University Institute (2019), https://cadmus.eui.eu/bitstream/handle/1814/64724/RSCAS%202019_84.pdf?sequence=1.

[200] For a discussion of the supply chain diversion effects of the tariffs on China, see David Dollar, *The Future of Asia-Pacific Value Chains in USMCA Forward 2023*, Brookings Institution (2023), https://www.brookings.edu/wp-content/uploads/2023/03/USMCA-Forward-2023.pdf ("They have certainly had some effect as U.S. imports from China have declined modestly, and there has clearly been diversion of certain products to Southeast Asia. Between 2018 and 2021, China's share of U.S. manufactured imports declined from 24 percent to 20 percent… U.S. imports from Vietnam increased by more than 100 percent between 2018 and 2021, reaching $100 billion and making Vietnam America's sixth largest source of imports… Some production has moved to other ASEAN countries, such as Thailand and Malaysia, but Vietnam so far has been the big winner."). But the trade diversion alone may not be building supply chain resilience, see Chad Brown,

discussed in the following section are initiatives each country has pursued with resilience top of mind, rather than for which resilience is more than just a happy side effect.

Governments need not be siloed when developing future supply chain resilience interventions. The efforts of others can spark inspiration, provide warning, and demonstrate a best practice. Learning those lessons from the current crop of supply chain resilience interventions is the aim of this section.

Section 6: Transparency Interventions

Transparency interventions are policies which build supply chain resilience by improving the flow of information among firms, or between firms and a government. Transparency policies also aim to identify, and shine a light on, an economy's vulnerabilities or the economic sectors which lack resilience. This ensures that market actors have sound information about supply chain risks which promotes more fulsome firm-level decisions and investments. Transparency interventions are also generally less distortive than other resilience-building interventions because improving the quality and quantity of information available to market actors helps make markets work better.[201] Transparency policies are a relatively popular intervention among open societies. They mostly take the form of supply chain reviews, including efforts to identify critical vulnerabilities by mapping key supply chains.

6.A. Supply Chain Reviews

The present focus on supply chain reviews underscores how little governments know about the nature and location of vulnerabilities in their economy. It also serves as a recognition by governments of their need to catch-up and quickly understand the contours of relevant global value chains. After decades of generally taking a hands-off approach to trade and its dispersion throughout the world, governments are now keen to at least have an eye on the ways in which trade networks are laid out, especially for critical goods. At the centerpiece of these investigative efforts is the United States' 100-day Supply Chain Review, which was launched by the Biden administration shortly after the president took office in 2021. Motivated by a belief that the just-in-time policies of the past must be revisited, the review was a high-profile

Four Years into the Trade War, Are the US and China Decoupling?, Peter Institute for International Economies (Oct. 2022), https://www.piie.com/blogs/realtime-economics/four-years-trade-war-are-us-and-china-decoupling ("Such redundant investments may have complex and offsetting effects. On the one hand, such investments could improve resiliency if the diversification is useful. If the original US import arrangement involved single sourcing through concentrated suppliers in China, future buyers may find that adding non-Chinese assembly facilities lowers the risk of geographically concentrated disruptions due to climate change (floods, droughts, wildfires), health (pandemics), or geopolitics (military conflict)…On the other hand, redundant investments come with higher costs. There is the initial, one-time expenditure of establishing the new assembly plant. But there may also be additional (and ongoing) costs associated with operating two supply chains, each on a smaller scale than previously when it was all being done in China.").

[201] INTERATIONAL MONETARY FUND, TRANSPARENCY (2001), available at https://www.imf.org/external/np/exr/ib/2001/042601b.htm ("Transparency promotes the orderly and efficient functioning of financial markets by making participants better informed. It can enhance economic performance by encouraging more widespread discussion and analysis of policies.").

effort to understand the supply chains for several key sectors of the economy, the ways in which those sectors have atrophied, and how they might be strengthened and made resilient.[202]

The 100-day Supply Chain Review was launched via an executive order that argues for building resilient supply chains in specific key sectors (semiconductors; large capacity batteries; such as those for electric vehicles; pharmaceuticals; and critical minerals) through a combination of domestic manufacturing and supply chain diversification.[203] Although compiled by different lead agencies, the reports for each sector, taken together, present a story of industrial decay complemented by market incentives that cut against resilience. This has entailed inadequate domestic manufacturing capacity as a result of labor and environmental arbitrage with low-wage economies, subsidization by non-market economies, and flat-lining productivity in the U.S. manufacturing sector overall;[204] an emphasis on short-term thinking by firms who have prioritized quick, but vulnerable, profits over long-term investments in innovation and domestic manufacturing which might be more resilient;[205] industrial policies by competitor and allied economies that undermine U.S. competitiveness through unfair economic practices;[206] a geographic concentration of key inputs globally as a result of firms chasing low production costs;[207] and a lack of sufficient collaboration among trading partners

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[202] Noting that at its core the 100-day Supply Chain Review aims to correct for, as it argues, sins of past globalization policy, see Katie Rogers and Brad Plummer, *Biden Administration Moves to Fix Supply Chain Bottlenecks*, N.Y. Times (June 8, 2021), https://www.nytimes.com/2021/06/08/us/politics/biden-supply-chain.html ("This cannot be an issue that divides us on either side of the political spectrum," Mr. Vyas said in an interview. "We need to do a lot of makeup work from the past 25 to 30 years.")

[203] *See* Exec. Order No. 14,017, *supra* note 88 ("More resilient supply chains are secure and diverse — facilitating greater domestic production, a range of supply, built-in redundancies, adequate stockpiles, safe and secure digital networks, and a world-class American manufacturing base and workforce. Moreover, close cooperation on resilient supply chains with allies and partners who share our values will foster collective economic and national security and strengthen the capacity to respond to international disasters and emergencies."). The White House also launched a task force to respond to short-term supply chain shocks and bottlenecks in the construction, transportation, semiconductor, and agricultural sectors. Rogers and Plummer, *supra* note 202 ("'[The task force is] going to be bringing together all stakeholders to really diagnose the problems, understand what's going on out there in these markets and see what actions can be taken to close those vulnerabilities,' said Sameera Fazili, the deputy director of the National Economic Council.").

[204] Stephen Orava, J. Michael Taylor, Christine Savage, et al., *Client Alert: Biden Administration Issues 100-Day Supply Chain Review Report*, King & Spaulding (June 2021), https://www.kslaw.com/attachments/000/008/838/original/Biden_Administration_Issues_100-Day_Supply_Chain_Review_Report.pdf?1623679538 ("According to the report, the United States lacks sufficient manufacturing capabilities in each of the identified key sectors for a variety of reasons, including competition from low wage nations and stagnating productivity that impacts opportunities for continued innovation.").

[205] *Id.* ("The Biden Administration found that short-term profit concerns, such as low-wage workforces and stock buybacks, negatively impacted productivity and reduced long-term investments, such as research and development and new facilities.").

[206] *Id.* ("The report concluded that industrial policies adopted by the EU, Taiwan, South Korea, Singapore, and, China (especially), have hurt U.S. competitiveness .As to geopolitical competitors, the report notes that 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.").

[207] *Id.* ("The report states that the search for low-cost production and intensive efforts to attract investment by other nations "has led to geographic concentrations of key supply chains in a few nations, increasing vulnerabilities for United States and global producers." As one example, the report notes that "China dominates the processing of strategic and critical materials, giving it de facto control over the flow of material through the supply chain.").

to harness the benefits of comparative advantage for comprehensive supply chain resilience.[208] The 100-day Review also notes the lack of information about key supply chains, especially as one looks deeper through the tiers of suppliers.[209]

With its focus on the vulnerabilities posed by the loss of manufacturing capacity and its emphasis on domestic manufacturing over trade expansion, the 100-day Review is very much a pro-resilience document.

The 100-day Review has already been a guide for policymaking. In some of the review's specific sectors, the United States has enacted resilience-building interventions, including $76.7 billion in subsidies to establish new semiconductor manufacturing capacity in the United States[210] and changes to electric vehicle tax credits to promote vehicle batteries generally made in the United States from friendly critical minerals sources.[211] Some of the critiques of the 100-day Supply Chain Review have already been discussed—overall, however, the review has been helpful.[212] The review exposed vulnerabilities in key sectors and has spurred action (in some cases bipartisan) to address those vulnerabilities with resilience-building interventions.

But not all supply chain reviews have found the same success. Across the Atlantic, the UK undertook a similar effort to review its supply chains. Known as Project Defend, the effort aimed to understand where the UK had unique reliance on foreign sources broadly, in contrast to the narrower focus in the United States on the national security and strategic competition aspects of supply chain resilience. This was partly motivated by Brexit, which disrupted UK supply chains and demonstrated a need to understand vulnerabilities writ large. The UK is highly import dependent, especially for food products.[213] Post-Brexit, the UK saw stock levels at major stores drop to their lowest point in roughly 40 years, and nearly one-third of British

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[208] *Id.* ("According to the report, the "United States cannot manufacture all needed products at home" and "has not systematically focused on building international cooperative mechanisms to support supply chain resilience.").

[209] *See* Scissors, *supra* note 100.

[210] Some $52.7 billion is for semiconductor manufacturing, R&D, and workforce development, with another $24 billion worth of tax credits for chip production. Justin Badlam, Stephen Clark, Suhrid Gajendragadkar, et al, *The CHIPS and Science Act: Here's What's In It*, McKinsey & Co. (Oct. 4, 2022), https://www.mckinsey.com/industries/public-sector/our-insights/the-chips-and-science-act-heres-whats-in-it#/.

[211] Steven R. Phillips, Paul Hemmersbaugh, Matthew Larson, and Ted Loud, *Inflation Reduction Act Seeks to Jumpstart Electric Vehicle Market*, DLA Piper (Aug 18, 2022), https://www.dlapiper.com/en/insights/publications/2022/08/inflation-reduction-act-seeks-to-jumpstart-electric-vehicle-market (discussing the supply chain resilience requirements of changes to the electric vehicle tax credits).

[212] For the critiques of the 100-day Supply Chain Review, see King and Griswold *supra* note 73.

[213] Philip Garnett, Bob Doherty and Tony Heron, *Vulnerability of the United Kingdom's food supply chains exposed by COVID-19*, 1 Nature Food 315 (June 2020) ("The UK imports almost half of its food and 84% of it is fresh fruit.").

firms experienced some supply chain disruption.[214] Of manufacturing firms, nearly 90 percent reported Brexit-related disruptions.[215]

In this environment, Prime Minister Boris Johnson stood up Project Defend to investigate, and reduce, the UK's import reliance on 65 key products.[216] Although details on the exact focus and findings of Project Defend are scarce, one example of its scope is its call for the reshoring of pharmaceutical manufacturing back to the UK.[217] Ideally, Project Defend would have become an iterative and living program to identify emerging vulnerabilities and collaborate with industry to address them; that was certainly its intent, especially in terms of its proposal to create a technology platform to share real-time supply chain data.[218] But Project Defend was quietly dropped—possibly because it had outlived its usefulness in the post-Brexit and post-COVID-19 supply chain shock environment.[219] Ultimately, it seems clear that Project Defend has not been as successful as the 100-Day Supply Chain Review. It does not appear to have galvanized broad-based resilience building efforts like those in the United States. Although that might be due to the lack of available information about the initiative and its findings. It is clear that, as a short-lived initiative, it has not directed latent energy for building supply chain resilience into new policies.

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[214] Richard Partington and Joanna Partridge, *UK plunges towards supply chain crisis due to staff and transport disruption*, The Guardian (Aug. 24, 2021) ("Britain's economy has been plunged into a supply chain crisis, with major retailers' stock levels at their the lowest since 1983 as a result of worker shortages and transport disruption caused by Covid and Brexit. In a development that suggests recovery from the pandemic could be at risk, the Confederation of British Industry (CBI) said stock levels in relation to expected sales fell to their lowest level in August since it began tracking retail industry trends almost four decades ago."). Holly Williams, *UK firms overhaul supply chains after Brexit and pandemic cause havoc – ONS*, The Independent (Mar. 8, 2022) ("Nearly a third of firms across Britain's manufacturing, wholesale and retail trade sectors have suffered supply chain problems as the pandemic and Brexit wrought havoc, according to new figures. The Office for National Statistics (ONS) said 30% of businesses in those sectors reported global supply chain disruption in January, according to data from its regular business insights and conditions survey.")

[215] Daniel Thomas, *UK manufacturers 'reshore' supply chains after pandemic and Brexit*, Financial Times (May 15, 2022) ("Make UK's study reveals that more than 90 per cent of manufacturers said the pandemic had disrupted supply chains, with a similar number citing Brexit as a cause.").

[216] Will Green, *Project Defend maps critical supply chains to boost UK resilience*, CIPS (May 21, 2021), https://www.cips.org/supply-management/news/2021/may/project-defend-maps-critical-supply-chains-to-boost-uk-resilience/.

[217] Sam Roscoe, *Building Supply Chain Resilience: a reflection on 'Project Defend' and the reshoring of manufacturing*, UK Trade Policy Observatory (May 28, 2020), https://blogs.sussex.ac.uk/uktpo/2020/05/28/building-supply-chain-resilience-a-reflection-on-project-defend-and-the-reshoring-of-manufacturing/ ("The call for the 'repatriation' of manufacturing is particularly strong for critical pharmaceutical products. The majority of generic drugs sold in the UK have a complex multinational supply chain with about 70 per cent of active pharmaceutical ingredients (APIs) made in China and the majority of manufacturing and packaging done in India. Overall, between 80 to 90 per cent of the UK's supply of generic medicines are imported.").

[218] *Id.* ("…the next step would be to reduce manual processes and pull together information held on different systems, creating "industry standard data requirements that everyone is adhering to and ideally a common platform so it becomes more real-time and collaborative".).

[219] *UK's plans to end reliance on Chinese imports has been quietly scrapped*, TBS News (June 21, 2022), https://www.tbsnews.net/worldbiz/europe/uks-plans-end-reliance-chinese-imports-has-been-quietly-scrapped-444294("But a letter sent by Foreign Office Minister Lord Ahmad of Wimbledon said the project was quietly dropped last year. 'It supported critical winter planning in 2021 and supported Government departments and industry to identify options for building more resilient supply chains.'…Last night a Government source said Project Defend was restricted to Covid supply issues, and that after the pandemic, the Foreign Office was 'toughening up in this area rather than weakening'.").

6.B. Other Transparency Interventions

Not all transparency policies are supply chain reviews. Other countries have experimented with alternative transparency interventions. Japan was the first country to establish a new minister for economic security, as part of a set of governmental reorganizations to bolster resilience building capacity and expertise in government.[220] Although the minister does not have direct authority over the government's economic security policy levers, by centralizing information, insight, and accountability into a single principal-level position, the role is certainly more than ceremonial. The first minister was pivotal in drafting the economic security legislation Japan recently enacted, a sweeping set of resilience-oriented industrial policies.[221]

Singapore—as a small, highly trade-dependent advanced economy—has worked to leverage data for supply chain resilience with two new initiatives. The first is the Singapore Trade Data Exchange (officially abbreviated as the SGTraDex), a shared data infrastructure allowing firms and other supply chain stakeholders to safely swap supply chain information. The Exchange is a sort of public-private partnership run by the Alliance for Action on Supply Chain Digitalisation, an industry group organized by the Singaporean government to promote new thinking on supply chain issues.[222] In developing the Exchange, the Alliance built two nodes to improve the city-state's supply chain resilience posture. The trade finance node gives financial institutions visibility into the physical location and movement of goods, which will give those institutions information to better respond to demand from the firms responsible for the transportation of those products.[223] In its first use, the Exchange served as the platform for a firm to provide its bank with a purchase contract for marine fuel, a document required for the bank to serve the customer's trade finance needs.[224] The container flow node aims to reduce container congestion at ports by giving shippers[225] and logistics firms visibility into the movement of containers through the supply chain.[226] Through a mixture of transparency and optimization, the Exchange is predicted to "unlock" $100 million in value for participating

[220] As part of the reorganization the government also established a new research center known as the Security and Safety-Related Think Tank Project, a major move in Japan where national think tanks are rare. Koki Shigenoi, *Economic Zeitenwende? Lessons from Japan's Economic Security Policy*, 49 Security, https://fourninesecurity.de/2022/12/07/economic-zeitenwende-lessons-from-japans-economic-security-policy.

[221] Sheila A. Smith, *Japan Turns Its Attention to Economic Security, Council on Foreign Relations* (May 16, 2022), https://www.cfr.org/blog/japan-turns-its-attention-economic-security. For a full discussion of Japan's new economic security legislation see *infra* Section 8.b.

[222] Eileen Yu, *Singapore to pilot common data platform in bid to plug supply chain gaps*, ZDNet (Nov. 17, 2020), https://www.zdnet.com/article/singapore-to-pilot-common-data-platform-in-bid-to-plug-supply-chain-gaps/.

[223] *Id.*

[224] Jude Chan, *Singapore launches trade data sharing platform to cut supply chain inefficiencies, rebuild trust*, The Business Times Singapore (June 1, 2022), https://www.businesstimes.com.sg/companies-markets/energy-commodities/singapore-launches-trade-data-sharing-platform-cut-supply ("The successful document exchange and the ease of use of the platform give us confidence in SGTraDex's vision of connecting supply-chain ecosystems via a trusted and secure data-sharing infrastructure.").

[225] Supply Chain 4.0, https://www.a-star.edu.sg/artc/programmes_initiatives/supplychain, (last visited July 16, 2023).

[226] Yu, *supra* note 222.

firms, demonstrating the usefulness that transparency interventions offer for building resilience without sacrificing efficiency.[227]

The second transparency effort in Singapore is the Supply Chain 4.0 Initiative, an S$18 million two-year collaboration between the Agency for Science, Technology, and Research and two major Singaporean universities.[228] The Initiative researches and develops ways to strengthen supply chains by leveraging new technologies. This includes the Supply Chain Control Tower, a testbed for new supply chain technologies.[229]

Not to be outdone, the EU has also rolled out policy to facilitate supply chain information flows. Unlike Singapore, the EU proposal—the Single Market Emergency Instrument (SMEI)—is meant to be deployed in the event of an emergency in which EU members retreat behind their national borders. Such was the experience of the EU during the pandemic, when countries, such as France, Germany, and the Czech Republic imposed controls on the export of PPE in response to widespread shortages.[230] The European Commission (EC) argues that by strengthening the integrity and functionality of the single market during a crisis, it can ensure a greater level of supply chain resilience than it had during the worst of the pandemic.[231] The SMEI is designed to prevent EU members from adopting protectionist measures by mixing enhanced information flows with forced restraint. It aims to improve transparency by establishing early warning mechanisms necessary to pre-emptively mitigate threats to the

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[227] Eileen Yu, *Singapore officially launches digital platform to ease supply chain data flow*, ZDNet (June 2, 2022), https://www.zdnet.com/article/singapore-officially-launches-digital-platform-to-ease-supply-chain-data-flow/.

[228] Sharon See, *Supply chain resilience strengthens with ITAP 2021 deals*, The Business Times Singapore (Nov. 23, 2021).

[229] Supply Chain 4.0, *supra* note 225.

[230] Michael Anderson, Martin McKee, Elias Mossialos, *Covid-19 Exposes Weaknesses in European Response to Outbreaks*, BMJ (2020), available at https://www.bmj.com/content/368/bmj.m1075.full ("For example, France, Germany, and the Czech Republic have introduced limits on exports of protective medical equipment such as face masks, despite severe shortages elsewhere."). These restrictions may have violated Article 35 of the Treaty on the Functioning of the European Union (TFEU) which bars members from restricting exports to other members. However there is an exception for public health-based restrictions, see Paola Mariani, *The EU Market in Times of a Global State of Emergency: Internal and External Trade Barriers in the Age of Pandemics*, 48 Legal Issues of Economic Integration 7 (2021).

[231] *See* Christa Tobler, *EU corona emergency law: Restrictions on the export of protective equipment, notably from the EU into third countries like Switzerland*, EFTA Studies 11-12 (Mar. 30, 2020), https://www.efta-studies.org/_files/ugd/15fad1_e21dbdd78034493dbd22857b4f2da0cd.pdf ("The shortages in the supply of PPE in recent days have lead some Member States to take certain measures at national level. At the same time, preserving the integrity of the single market is one of the objectives pursued by the Commission during the current crisis to enhance jointly the response to the challenge of health protection in the context of limited PPE supplies. The Implementing Regulation was adopted with the understanding that Member States should revoke any restrictive national actions taken, formally or informally, concerning either exports to third countries or trade between the Member States within the Single Market, going beyond actions designed to ensure priority access to such material by those who need it most (e.g. hospitals, patients, healthcare workers, civil protection authorities).)." See also Mariani, *supra* note 230 at 17 ("In order to build a European response to an EU-wide crisis and avoid unilateral responses by the Member States, it is necessary to strengthen the institutional role of the Commission. The emerging concept of health solidarity within the Union has been crucial for the Commission to convince the Member States to give up export bans and to restore the normal operation of the Internal Market. But this is not enough. A preventive EU mechanism of control of intra EU export restrictions in case of serious cross-border threats to health would be crucial to ensure the protection of the health of all the people living in the EU and to ensure that essential goods go where they are most needed.").

single market.[232] The SMEI's vigilance mode would monitor emerging supply chain vulnerabilities and risks, and could require member states to stockpile critical items if voluntary stockpiling is insufficient.[233] In some circumstances, the EC could require firms to share supply chain information with the government, or prioritize product orders for critical goods.[234] The SMEI would also demand that restrictions on free movement of goods and people during a crisis be "evidence-based" and "time-limited", if pursued at all.[235] In doing so it would enumerate certain prohibited restrictions on free movement.[236]

The EC argues that had it existed during the pandemic, the SMEI would have reduced supply chain disruptions. It contends that had firms, individuals, and member governments had quality information about travel restrictions and goods shortages, and an overall coordination mechanism to work through national export restrictions, there would have been a greater supply of critical goods for EU members.[237] However, some member states are concerned the purpose of the SMEI will drift from crisis management into an effort by the EC to control the direction of industries.[238] Currently, the SMEI is stalled as the European Parliament and EC work through these concerns, as well as challenges about the compatibility of the SMEI with existing EU law, and judicial interpretations thereof.[239] Although it is a heavy-handed approach, the SMEI understandably aims to promote resilience by leveraging the size of the single market during a crisis, similarly to the way in which the United States, unhampered by state-based export controls, was likely better able to address supply shortages in different pockets of the country.

Where the SMEI involves sharing information between foreign governments (albeit EU members), the UK and Australia have embarked on an initiative to share supply chain information and best practices. The UK-Australia Supply Chain Resilience Initiative offers "a joint program, sharing our insights and experience on supply chain resilience."[240] The Initiative

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[232] Press Release, European Commission, Questions and Answers: Single Market Emergency Instrument (Sept 19, 2022), https://ec.europa.eu/commission/presscorner/detail/en/QANDA_22_5444. [Hereinafter SMEI FAQ]

[233] Jillian Deutsch, *EU Will Propose Crisis Tool for Supply Chain Emergencies*, Bloomberg (Sept. 1, 2022).

[234] Single Market Emergency Instrument, https://single-market-economy.ec.europa.eu/single-market/single-market-emergency-instrument_en (last visited July 17, 2022). [Hereinafter SMEI Summary]

[235] Deutsch, *supra* note 235.

[236] SMEI Summary, *supra* note 234.

[237] SMEI FAQ, *supra* note 232.

[238] Jillian Deutsch and Jorge Valero, *EU Nations Warn Brussels Over Crisis Plan for Supply-Chain Gaps*, Bloomberg (June 8, 2022) ("…the nine countries, including Belgium, Denmark, and the Netherlands, warned the Commission in a letter sent late last week that its plan is heading in the wrong direction, focusing less on emergency measures and "more about steering industries in a non-crisis environment, to prepare for future unknown crises.").

[239] János Allenbach-Ammann, *LEAK: EU Council legal opinion slams Single Market Emergency Instrument*, Euractiv (Apr. 5, 2023), https://www.euractiv.com/section/economy-jobs/news/leak-eu-council-legal-opinion-slams-single-market-emergency-instrument/ ("Basing itself on case law from the European Court of Justice, the Council Legal Service (CLS) wrote that "the proposed measures go beyond what the Court has so far found compatible," referring to the legal basis that the Commission chose to base its proposal on."). The leaked compromise draft suggests that the language about compulsory information sharing by firms may be dropped.

[240] UK-Australia Supply Chain Resilience Initiative: Introduction Module, https://www.gov.uk/government/publications/uk-australia-supply-chain-resilience-initiative/uk-australia-supply-chain-resilience-initiative-introduction-module (last visited July 16, 2022).

contains modules with four functions: a framework to assess supply chain risks, a suite of options for each country to mitigate such risks, monitoring of resilience-building efforts in a changing global environment, and the creation of internal entities to coordinate response to a supply chain disruption. Still nascent, the Initiative offers a model under which like-minded countries could share information and best practices about building resilience in ways that are practical and pre-empt a supply chain shock.

6.C. Learning from Current Transparency Interventions

Although all transparency-related in their own ways, the foregoing policies reveal the extent of variation within just this single category of intervention. So what can these different efforts teach us? First, when it comes to the identification of vulnerabilities, transparency policies should be long-standing and iterative. It is defeating to only look at vulnerabilities as a snapshot in time. Because economies are dynamic, the ways in which they lack resilience are dynamic too. To this end, countries should institute regularized assessments of critical vulnerabilities. The vigilance mode of the SMEI or the monitoring module of the UK-Australia Supply Chain Resilience Initiative are good examples. On the other hand, there does not seem to be an effort in the United States to institute the 100-day Supply Chain Review as a recurring exercise.

The snapshot approach could also be a reason for the apparent lack of success of Project Defend. As far as we can tell from the public domain, by focusing heavily on COVID-19 and Brexit-related disruptions, it appears Project Defend was too narrow and short lived to be successful. This is perhaps because it did not react to the specific supply chain visibility problems facing UK industry. Only 13 percent of UK manufacturers have full visibility into their supply chains; this number has increased only slightly since 2009, despite the proliferation of shocks since.[241] Supply chain assessments should help respond to the challenges posed by firms rather than just undertake some broad-based analysis for the sake of governmental interest. Otherwise, the analysis may not be useful to the market actors who face vulnerabilities every day. To that end, it can help for a government to designate a single point of contact through which those in government and industry can interface when it comes to supply chain resilience issues. Japan's new economic security minister is a good example. Similarly, and although it was not done for primarily resilience-building reasons, the United States has created a new Made in America Office in the White House to oversee efforts to strengthen the use of public procurement to bolster domestic manufacturing, including its use a resilience building tool. [242]

Second, transparency policies are most successful when they give market actors the information they need to make informed decisions. Just as governments inform their citizens about the risks of traveling to certain dangerous countries, governments can make firms aware of the risks inherent in investing and relying on certain countries or regions. For example, the

[241] *Operating without Borders – Building Global Resilient Supply Chains*, Make UK (May 2022).

[242] David Shepardson, White House taps Commerce official to run 'Made in America' office, Reuters (Oct. 12, 2022), https://www.reuters.com/world/us/white-house-taps-commerce-official-run-made-america-office-2022-10-12/.

U.S. Foreign Commercial Service publishes guides to help firms understand the context of doing business in each country.[243]

Of course, better information flow does not build resilience alone—firms are aware of the risks associated with doing business in China, to seemingly little effect on persistent overreliance on that country for key goods—but that is not to say transparency policies are useless. Rather, other policies might be necessary to complement transparency policies in instances where, despite increased information flow, firms continue to choose supply chain arrangements that create vulnerabilities in terms of the health, life, and security. Consider the Singapore Trade Data Exchange and the Supply Chain Control Tower, which propose to build resilience (and increase efficiency) by giving companies exceptionally timely information about the movements of markets and the goods in them. The same can be said about the SMEI (if only in crisis situations). These measures are designed to make more information available to firms and governments to improve resilience by ensuring the smooth flow of goods across borders during a crisis, but are not, on their own, able to reduce vulnerabilities associated with a lack of supply to begin with, or concentrated overreliance on foreign sources.

Although such initiatives are new and remain untested, we can assess them by analogy, and look to the public procurement sector to understand the benefits of making more information available to market actors. It is known in procurement policy that transparency can help level the playing field in ways that benefit firms, taxpayers, and governments, which desire to purchase high-quality products. By using information to level the playing field, governments permit more firms to compete in the market.[244] The United States recently expanded its procurement transparency through the *BuyAmerican.gov Act* which requires waivers to a procurement's domestic content rules to be made publicly available.[245] Procurement transparency can help build resilience in so much as it can increase the number of domestic firms participating in the market and thus reduce the government's reliance on firms abroad.[246] Procurement information sharing also builds resilience by promoting "cross-border sharing of information on risk management and on the availability of essential goods, prices and contracts

[243] For example, see the guide for Laos. Laos—Country Commercial Guide, https://www.trade.gov/country-commercial-guides/laos-trade-barriers?navcard=11879 (last visited July 11, 2023).

[244] ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, REFORMING PUBLIC PROCUREMENT: PROGRESS IN IMPLEMENTATING THE 2015 OECD RECOMMENDATION 84 (2019) ("Open and inclusive governing builds trust between citizens and governments, and promotes a transparent and accountable government. Open government also supports a level playing field for businesses, and this contributes to economic development.").

[245] Subtitle B of Title IX of Division G of Infrastructure Investment and Jobs Act, Pub. L. No. 117-58. For an explanation of the law's transparency benefits, see S. Rept. 117-227—BuyAmerican.gov Act of 2021 (2022) ("The solution to the opacity surrounding the approval of Buy American waiver requests is to improve transparency in the federal procurement process. This bill promotes transparency by requiring a public website for Buy American waiver requests. The domain, BuyAmerican.gov (already owned by GSA), will publish information about pending or granted Buy America waiver requests for public awareness and comment. The bill requires agencies to justify applications for Buy American waivers on the website, potentially reducing the incentive to utilize these waivers as "loopholes." The existence of this website will give American businesses the opportunity to notify government agencies when they have the capability to fulfill a contract with domestic products.").

[246] *See* Simon J. Evenett and Bernard M. Hoekman, *Government Procurement: Market Access, Transparency, and Multilateral Trade Rules*, 21 European Journal of Political Economy 182 (2005) ("Elimination of a non-transparent procurement procedure will have another effect, namely expanding the number of domestic firms willing to sell to the government.").

… [and] regional or bilateral standardisation of procurement procedures, joint procurement agreements, and lending agreements."[247] The latter "can help smooth over temporary disruptions in the flow of goods by implying cross-border transactions."[248] This is all to say that, just as better information in the field of procurement (an industrial policy which will be discussed in greater depth later) can improve resilience, better flow of information through the supply chain can do the same: it promotes the sharing of better risk management practices, smooths disruptions by sending sound price signals, and reduces transaction costs overall.

Ultimately, transparency policies can help firms identify vulnerabilities and avoid them. This builds resilience. And because these policy interventions generally complement the firms' operations, they are achievable with low levels of market distortion. But they are not always sufficient, because firms lack the desire to close vulnerabilities on their own despite newfound awareness of risks, or because addressing certain vulnerabilities are too big for any one company, or because firms, despite awareness of the risks, opt for the status quo since to change operations in favor of resilience would make them uncompetitive against peers. Or even because where a firm could address a vulnerability it cannot do so without some government intervention in the market. These are the scenarios that implicate the next two types of interventions, which involve greater government involvement in the market in the name of promoting a kind of "common good" around resilience that the market has been unwilling or unable to achieve.

Section 7: Diversification Interventions

Diversification policies have an intuitive appeal. Everyone knows it is unwise to put all the eggs in one basket. And yet policymakers seem to underutilize diversification policies. Diversification policies mostly take the form of trade liberalization. Skittishness about free trade's political downsides, a recognition of the ways in which some traditional trade agreements have undermined resilience, and a rethinking about the nature of globalization in an era of strategic competition have contributed to the prioritization of transparency and industrial policies over trade ones.[249]

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[247] Marcin Szczepański, *Resilience of Global Supply Chains: Challenges and Solutions*, European Parliamentary Research Service 5 (Nov. 2021), https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698815/EPRS_BRI(2021)698815_EN.pdf.

[248] *Id.*

[249] Recent speeches by U.S. leaders have stressed the desire to rethink the just-in-time nature of globalization. *See* Jake Sullivan, Remarks at the Brookings Institution on Renewing American Economic Leadership (Apr. 27, 2023) (transcript available at https://www.whitehouse.gov/briefing-room/speeches-remarks/2023/04/27/remarks-by-national-security-advisor-jake-sullivan-on-renewing-american-economic-leadership-at-the-brookings-institution/) ("Much of the international economic policy of the last few decades had relied upon the premise that economic integration would make nations more responsible and open, and that the global order would be more peaceful and cooperative—that bringing countries into the rules-based order would incentivize them to adhere to its rules. It didn't turn out that way."). *See also* Marco Rubio, Remarks for the Henry Clay Lecture in Political Economy at Hillsdale College's Kirby Center (Dec. 8 2021) (transcript available at https://www.rubio.senate.gov/public/index.cfm/2021/12/rubio-delivers-lecture-on-how-the-bipartisan-economic-consensus-is-destroying-american-greatness) ("It stems from that decision 20 years ago to allow Communist China to join the World Trade Organization... Why was it a mistake? Because it was rooted in a flawed assumption. The assumption that global economic integration was more important than anything else. More important than dignified work for Americans. More important than our ability to make things. And more important than our national security.").

7.A. Traditional Trade Agreements

The most common form of diversification policies are traditional comprehensive free trade agreements (FTAs). These open markets between countries by reducing tariffs or lowering non-tariff barriers to reduce the costs of trading. In doing so they create an alternative source for goods in addition to a country's domestic market. The existence of an alternative source can build resilience by either fostering redundancies or expanding the export destinations for products that might pose an economic coercion risk.[250] Supply chains for a particular good are more resilient when there are more suppliers globally.[251] Increased trade can also improve the productivity of domestic firms.[252]

Recognizing these benefits, some countries have continued to pursue traditional FTAs as part of their attempts to build resilience. Leading the pack is the United Kingdom. After a deluge of supply chain shocks as a result of Brexit and COVID-19, the UK has placed diversification as the top element within its Supply Chain Resilience framework.[253] In 2022, trade coming into the UK from outside the EU has been delayed 21 percent of the time, and trade from within the EU 38 percent of the time.[254] Concomitantly, the UK has faced shortages of goods as varied as fuel, chicken, and milkshakes—in 2021, 52 percent of UK businesses said it was hard to export their goods and 60 percent reported difficulties importing.[255] Considering these challenges, the UK has pursued a vigorous free trade agenda. It now has agreements with over 69 countries and has negotiated its own agreements with New Zealand, Australia, and Japan.[256] It is also negotiating an agreement with India and recently joined the Comprehensive and Progressive Agreement for Trans-Pacific Partnership.[257]

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[250] *See* Evenett, *supra* note 6 (arguing that trade openness and not protection builds supply chain resilience).

[251] *See* Farok Contractor, *The World Economy Will Need Even More Globalization in the Post-Pandemic 2021 Decade*, 53 Journal of International Business Studies 159 (2022) ("Resilience of the GVC increases…based on..number of suppliers worldwide for the item; geographical diversification…[and] weighted average of the political and geographic distance from supply sources to the point of assembly or demand…").

[252] Nina Pavcnik, *Trade Liberalization, Exit, and Productivity Improvements: Evidence from Chilean Plants*, National Bureau of Economic Research Working Paper 7852 (Aug. 2000) 6, https://www.nber.org/system/files/working_papers/w7852/w7852.pdf ("Second, I find support for productivity improvements related to trade liberalization. I show that after trade liberalization, the productivity of plants in the import-competing sectors grew 3 to 10% more than in the nontraded-goods sectors. This finding is robust to several econometric specifications and measures of foreign competition. It suggests that exposure to foreign competition forced plants in sectors that used to be shielded from the outside competition to trim their fat.")

[253] Supply Chain Resilience Framework, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1118092/dit-supply-chains-resilience-framework.pdf (last visited July 17, 2023).

[254] Brendan Murray, *Brexit Costs, Delays Still Weigh on UK Companies: Supply Lines, Bloomberg Law* (Jan. 11, 2023), https://news.bloomberglaw.com/international-trade/brexit-costs-delays-still-weigh-on-uk-companies-supply-lines.

[255] Georgina Hutton and Andrew Powell, *UK Supply Chain Problems*, House of Commons Library Research Briefing No. CBP 9350 (Oct. 22, 2021), https://researchbriefings.files.parliament.uk/documents/CBP-9350/CBP-9350.pdf.

[256] Tom Edgington, *Brexit: What trade deals has the UK done so far?*, BBC (Sept. 20, 2022), https://www.bbc.com/news/uk-47213842.

[257] Philip Inman, *UK joins Asia-Pacific CPTPP trade bloc that includes Japan and Australia*, The Guardian (Mar. 31, 2023), https://www.theguardian.com/business/2023/mar/31/uk-joins-asia-pacific-cptpp-trade-bloc-that-includes-japan-and-australia#:~:text=UK%20joins%20Asia%2DPacific%20CPTPP%20trade%20bloc%20that%20includes%20Japan%20and%2

As a small open economy, New Zealand has also placed diversification at the center of its resilience work. The country's Trade Recovery Strategy emphasizes diversification to build supply chain resilience so that New Zealand is in "the best possible position" to come out ahead in the wake of the pandemic and amidst an uncertain geopolitical environment.[258] At the center of the Strategy is an effort to "reinvigorate the international trade architecture" by strengthening rules at the WTO and pursuing a suite of bilateral and plurilateral FTAs. This includes recently concluded negotiations with the UK and the EU, and new negotiations with the Gulf Cooperation Council and India.[259] These efforts to expand trade are intended to ensure a diverse and reliable source of the goods New Zealand needs to maintain and grow its economy. As an exporter of primary products, New Zealand, like other small economies, needs foreign market access to purchase products it cannot produce locally. To put it simply: New Zealand exports predominantly agricultural products so that it can import goods like medicines and automobiles.[260] This builds resilience because it ensures New Zealand can maintain access to critical goods.[261]

In the case of the economic coercion risks posed by concentrated exports (such as the fact that almost all New Zealand rock lobster is exported to China), liberalizing export markets not only helps ensure a steady stream of imports but also gives alternatives to primary producers in the event of an economic coercion shock. This is what occurred to the Australian barley industry when China ceased purchases in response to Australia's foreign policy positions. Cutting against the benefits of alternative market access is that sometimes the Chinese market pays such a premium that, while switching away is possible, it comes at its own cost. [262] Market access alone is insufficient to change the destination of sales because other markets, such as those in Europe, will not pay the prices China offers. However, having access to alternative

0Australia,-This%20article%20is&text=Britain%20has%20joined%20the%2011,nearly%20two%20years%20of%20negotiations.

[258] Trade Recovery Strategy 2.0, https://www.mfat.govt.nz/en/trade/trade-recovery-strategy/trade-recovery-strategy-2-0/ (last visited July 16, 2023) ("addressing vulnerabilities exposed or exacerbated by the pandemic, and strengthening New Zealand's trade against future shocks. This includes promoting diversification of trade, mitigating supply chain pressures, and working with other cross-government economic strategies, particularly for emissions reduction.").

[259] *See* Free Trade Agreements Concluded but Not in Force, https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-concluded-but-not-in-force/ (last visited July 16, 2023). *See also* Free Trade Agreements Under Negotiation, https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-under-negotiation/ (last visited July 16, 2023).

[260] Trade for All Advisory Board, *Trade For All Report*, Ministry of Foreign Affairs and Trade (2019), https://www.mfat.govt.nz/assets/Trade-General/Trade-policy/Trade-for-All-report.pdf ("Pragmatically, New Zealanders need to trade with producers, distributors and consumers in other countries because many of the products and services that New Zealanders take for granted – from mobile phones to medicines – are not produced locally. To pay for these, the country must produce a surplus in other sectors. In New Zealand's case the surpluses are generated largely by exports of our primary products, education services and tourism. These will continue to be the mainstays of our exports for the foreseeable future.").

[261] However, one open society's effort to build resilience might not build resilience for others, or for open societies as a whole. This is especially true if efforts to build resilience perpetuate overreliance on countries which are competitors or adversaries.

[262] Richard McGregor, *Chinese Coercion, Australian Resilience*, Lowy Institute (Oct. 20., 2022), https://www.lowyinstitute.org/publications/chinese-coercion-australian-resilience.

markets ensures that even though some producers can make hay while the sun shines, as soon as the storm clouds brew, they have alternatives.[263]

As part of the effort to provide a level playing field for exporters, New Zealand has increased its export promotion and assistance functions alongside its trade negotiations. This has included expanding New Zealand Trade and Enterprises's (NZTE) International Growth Fund to "re-connect companies with international markets" and adding services for small- and medium-sized businesses with their Regional Business Partner network.[264] At a cost of NZ$216 million over four years, these efforts are likely to be good value for money.[265] In this way, the public investment in export diversification not only complements traditional trade expansion, but offers an extra resilience boost for the investment made.

Like New Zealand and the UK, Australia has been keen to utilize trade expansion to build resilience. Partnering with India, the two countries have a new FTA—called the Economic Cooperation and Trade Agreement (ECTA)—which entered into force in late 2022. The agreement provides some duty-free access and represents India's first such agreement with a developed country in more than a decade.[266] It has an emphasis on critical minerals aiming to promote greater investment, collaboration, and trade in those products.[267] But ECTA is still only a beginning. Building on ECTA's success, India and Australia have resumed talks on the more ambitious Comprehensive Economic Cooperation Agreement (CECA) to further

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[263] David Parker, Remarks to the Trade for All Advisory Board on the State of International Trade (July 23, 2020) (transcript available at https://www.beehive.govt.nz/speech/trade-all-and-state-international-trade) ("Where exporters send their products is ultimately a commercial decision for them, but if we provide more options by levelling the "playing fields", they can diversify their options and help to build a more resilient export profile for New Zealand.").

[264] New Zealand's COVID-19 Trade Recovery Strategy, https://www.mfat.govt.nz/assets/Trade-General/Trade-Recovery-Strategy/Trade-Recovery-Strategy-8.6.20.pdf (last visited July 16, 2023).

[265] Parker Remarks, *supra* note 263. *See* Yasuyuki Todo and Hiroyasu Inoue, *Geographic Diversification of the Supply Chains of Japanese Firms*, 16 Asian Economic Policy Review 319 (Feb. 2021) ("Other less costly measures include the collection of information by public institutions and the provision of subsidies to Japanese firms to participate in international trade fairs, both of which are evidenced to be effective. For example, using randomized experiments Kim et al. (2018) find that informational seminars to SMEs in Vietnam for export promotion is effective to capable firms. Makioka (2020) shows that when Japanese firms are supported by the Japan External Trade Organization (JETRO) and participate in international trade fairs, they are 10% more likely to engage in exporting activities than others. These policy measures should be fully utilized.").

[266] *India, Australia free trade agreement to come into force from December 29*, The Economic Times (Nov. 30, 2022), https://economictimes.indiatimes.com/news/economy/foreign-trade/india-australia-free-trade-agreement-to-come-into-force-from-december-29/articleshow/95879168.cms ("The agreement, which was signed on April 2, would provide duty-free access to Indian exporters of over 6,000 broad sectors, including textiles, leather, furniture, jewellery and machinery in the Australian market."). Kirtika Suneja, *Oz delegation to focus on agri, critical minerals, infra*, The Economic Times (Sept. 25, 2022), https://economictimes.indiatimes.com/news/economy/agriculture/oz-delegation-to-focus-on-agri-critical-minerals-infra/articleshow/94440050.cms?from=mdr ("It is India's first trade agreement with a developed country after more than a decade and Canberra's first where dairy has not been included.").

[267] Suneja, *supra* note 266 ("A 106-member business delegation from Australia i s visiting India this week to forge ties across agriculture, critical minerals, infrastructure, digital health and education. The visit comes ahead of the implementation of the India-Australia Economic Cooperation and Trade Agreement (ECTA). "This visit is all about those commercial partnerships…to get business here to star t talking. We have primarily focused on eight critical minerals including lithium, graphite, and titanium that are of equal value to both India and Australia," said Denise Eaton, trade and investment commission er, Australian Trade and Investment Commission.").

liberalize trade and bring the two countries closer together.[268] And India's efforts have not stopped with Australia. New Delhi has been active, pursuing or concluding agreements with the UK, United Arab Emirates (UAE), Canada, Israel, Oman, Namibia, South Africa, and the EU, among others.[269]

So too has Israel, which has emphasized trade expansion. The country has not generally implemented new policies specific to building resilience, because it has long been attuned to its economic and national security threats and has worked consistently to develop the ability to recover swiftly from exploitations of vulnerabilities.[270] But notable trade expansion initiatives include Israel's new agreement with the UAE and its negotiations with India. The historic agreement with the UAE is intended to broaden Israel's supply chains connections to "redraw" trade routes in favor of regionalization.[271] While talks between India and Israel continue, both countries are keen to capitalize on the vast amount of bilateral trade—over $4.6 billion in the 2020-21 fiscal year—already taking place.[272] Amidst this trade expansion, there are concerns that Israel's reliance on imports for food has created an overdependence on foreign sources and undermined domestic food production capabilities.[273] For a small country that ranks poorly among Organization for Economic Cooperation and Development (OECD) countries for food security, this is a worrisome vulnerability. Collaborations like the India-Middle East Food Corridor are attempting to address this vulnerability by promoting food supply chain investment and the sharing of technical expertise as a complement to existing, and forthcoming, FTAs.[274]

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[268] Australia-India Comprehensive Economic Cooperation Agreement (CECA), https://www.dfat.gov.au/trade/agreements/negotiations/aifta/australia-india-comprehensive-economic-cooperation-agreement (last visited July 16, 2023).

[269] Trade Agreements, https://commerce.gov.in/international-trade/trade-agreements/ (last visited July 17, 2023).

[270] Livia Dewaele and Rebecca Lucas, *Policymaking to Support Resilience in Democratic Countries: An Examination of Sweden, Israel, and Australia*, 10 European Journal of Futures Research (2022) ("Unlike Sweden and Australia, Israel has not implemented new measures that enhance resilience following a recent update to its threat forecasting: Israel has always faced significant challenges to national security, and thus has had certain resilience-enhancing measures in place for decades.")

[271] Maya Margit, *Emirati Investor: UAE-Israel FTA Will Regrow Ailing Global Supply Chain*, Jerusalem Post (June 2, 2023). ("The direct effect is that you're going to see new trade routes redrawn," said al-Binali, a seasoned Emirati investor and business executive. "As you know, the UAE is a trade hub. This link now with Israel will see changes in the global supply chain. This might actually be hastened with some of the global events that we're seeing.").

[272] *India & FTA: Series of Bilateral Deals to Pump Up Supply Chains*, Newswire (April 28, 2022), https://www.newswire.lk/2022/04/28/india-fta-series-of-bilateral-deals-to-pump-up-supply-chains/ ("Meanwhile, India and Israel are engaged in FTA talks and want to sign a deal by mid-2022 as the year marks 30 years of formal diplomatic ties. Total merchandise trade between India and Israel amounted to $4.67 billion in FY 2020-21.").

[273] Ayal Kimhi, *Food Security in Israel: Challenges and Policies*, Shoresh Institution for Socioeconomic Research 20-21 (Nov. 2022) ("Importing food exposes Israel even more to global risks, and requires the formulation of a risk management strategy. Such a strategy must include strengthening local production, especially in products where Israel does not have a significant relative disadvantage...Specifically, the reduction of tariffs on fruits and vegetables – which, despite their increase in price in recent years, are still cheaper in Israel than in most developed countries – endangers local production capacity and exposes the Israeli consumer to greater future risk.").

[274] Michael Tanchum, *The India-Middle East Food Corridor: How the AE, Israel, and India are Forging a New Inter-Regional Supply Chain*, Middle East Institute (July 2022), https://www.mei.edu/sites/default/files/2022-07/Tanchum%20-%20India-Middle%20East%20Food%20Corridor.pdf (discussing the Corridor, its history, and its operations).

7.B. Alternative Trade Agreements

While these resilience building efforts are useful, relying too heavily on FTAs to guarantee supply chain resilience is like relying exclusively on your garden hose for problems around the house. The garden hose is useful for growing food in the vegetable garden, but it is insufficient in the face of a shock like a house fire. In that instance, what's needed is something different, like a fire extinguisher. FTAs can help make us all better off and, in some cases, potentially even more resilient (just as your vegetable garden keeps you healthy) but they are inadequate in other ways. Instead of building redundancies, trade liberalization can actually promote the offshoring of critical goods and the concentration of those goods in new places.[275]

Concerns about the downsides to traditional FTAs, in terms of the vulnerabilities they create and the resilience they fail to build, has led some policymakers to propose new trade models. These alternative arrangements aim to capture the resilience- building benefits of diversification while minimizing the downsides of FTAs, such as excessive import reliance. Consider that, despite the UK reaching an FTA with the EU to reduce Brexit-related supply chain shocks, UK firms still desire to move towards more resilient supply chain models.[276] More than half of UK businesses believe they need to strengthen their supply chains, and 84 percent intend to move away from the just-in-time model.[277] This suggests that even firms themselves recognize the limits of the traditional FTA approach and are looking for alternatives to address their supply chain vulnerabilities, especially those that persist despite the traditional-trade-expansion-as-resilience paradigm.

In this vein the United States has proposed the Indo-Pacific Economic Framework (IPEF), as an alternative agreement intended to be more attuned to supply chain resilience. IPEF is innovative in the sense that it proposes an array of efforts—known as pillars—on issues like supply chain resilience, clean energy, and anti-corruption. Countries can join all, or just some, of the pillars.[278] These pillars are an effort to regain the economic and foreign policy ground

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[275] For the discussion of the ways in which traditional trade agreements undermine resilience, see *supra* Section 3.e.

[276] Noting the need for an agreement with the EU to reduce supply chain disruptions, see Tommaso Aquilante, *Mind the Import Gap: UK Supply Chains in Brexit Times*, Industrial Analytics Platform (Dec. 2022), https://iap.unido.org/articles/mind-import-gap-uk-supply-chains-brexit-times ("In 2021, trade with the EU and beyond was likely significantly affected by Brexit, with the TCA reducing goods trade with the EU by around 15% relative to non-EU trade. Interestingly, while goods exports have returned pre-pandemic levels relatively quickly, UK goods imports from the EU have struggled to reach pre-pandemic levels until March 2022.").

[277] Press Release, SAP News, Supply Chain Crisis: Over 85% Of UK Businesses Plan To Move From 'Just In Time' To 'Just In Case' Model And Prioritise UK-Based Solutions To Overcome Challenges (June 8, 2022), https://news.sap.com/uk/2022/06/supply-chain-crisis-over-85-of-uk-businesses-plan-to-move-from-just-in-time-to-just-in-case-model-and-prioritise-uk-based-solutions-to-overcome-challenges/ ("SAP SE (NYSE: SAP) today announced new research revealing that almost every UK organisation admits their supply chain needs improving, and over half (58%) think their supply chain needs a lot/ significant improvement. In response, 84% of UK businesses are planning to move on from the 50-year-old 'just in time' supply chain model, which prioritised costs above all else when selecting suppliers, to a 'just in case' approach…66% of businesses have experienced delays in production of goods/delivery of services").

[278] Indo-Pacific Economic Framework holds value, but it's unclear if it will counter China's influence says Senior Economist David Dapice, https://ash.harvard.edu/indo-pacific-economic-framework-holds-value-it%E2%80%99s-unclear-if-it-will-counter-china%E2%80%99s-influence (last visited July 16, 2023) ("The IPEF identified various areas such as the digital economy, supply chain resilience, clean energy and anti-corruption measures which were less contentious in the US and

thought to have been lost with withdrawal from the Trans-Pacific Partnership (TPP) in a way that is more politically palatable and beneficial to U.S. economic interests.

While narrow, IPEF does keep the United States engaged in the Indo-Pacific region and—acknowledging that IPEF is still under negotiation—some of its pillars could offer concrete commitments. However, IPEF is very much not a traditional trade agreement. It explicitly contains no tariff liberalization, and seemingly limited market access requirements. Countries who end up party to IPEF will not have to make market-opening concessions to other parties. This undermines the agreement's ability to build meaningful resilience through substantive diversification, ideally with strong rules of origin. This has raised concerns that the lack of IPEF's ambition will prevent the United States from securing the concessions needed to enhance U.S. leadership and economic interests in the region.[279] IPEF has also been challenged on the grounds that, even as an alternative to the traditional FTA model, it will not stop the labor and environmental arbitrage—and concomitant offshoring—that undermines resilience.[280] But even without tariff reductions on the table, U.S. trading partners see IPEF as a welcome engagement and an opportunity for limited market opening with respect to customs facilitation, digital trade, and regulatory cooperation.[281] IPEF also offers a benefit in its flexibility, which recognizes that potential parties will have varying levels of ambition, at least at the outset of talks. Participating countries have a choice about which of IPEF's pillars they want to join.[282]

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more easily agreed to without Congressional approval. IPEF also allows Asian countries – thirteen in all – to sign on to individual initiatives without fully participating in all of them.").

[279] *Hearing on The Promise and Challenge of Strategic Trade Engagement in the Indo-Pacific Region*, 117th Cong. (2022) (statement of Kelly Ann Shaw, Partner, Hogan Lovells), available at https://www.finance.senate.gov/imo/media/doc/Shaw.Testimony.SFC.Mar15.2022.fin.pdf ("It is difficult to imagine IPEF having a meaningful impact on long-term U.S. economic interests without enforceable commitments on market access, rules of origin, technical barriers to trade (TBT), services, intellectual property, investment, or state-owned enterprises to name a few. A trade pillar focused exclusively on digital trade, forced labor, or trade facilitation is not enough to extract meaningful concessions from our trading partners or shape the region moving forward. Congress should push the Administration to broaden its ambition so that we are setting rules, not merely making suggestions.").

[280] Letter from Rosa DeLauro, Representative, et al. to Katherine Tai, U.S. Trade Representative, et al. (Aug. 1, 2022), available at https://www.warren.senate.gov/imo/media/doc/DeLauro_Warren_IPEF%20Letter%20Final_8.1.22.pdf ("But in addition to proposing participation of countries with records of worker abuses, the administration has yet to make concrete commitments to condition participation in any pillar of IPEF or APEP on countries' agreement to adopt in their domestic laws and enforce the obligations of the International Labor Organization's (ILO) core labor standards. As the Labor Advisory Committee for Trade Negotiations and Trade Policy (LAC) noted in comments to the Commerce Department on IPEF, 7 labor-related requirements must "build on the strong labor standards and enforcement mechanisms contained in the United States-Mexico-Canada Agreement (USMCA)," and, at the very least, should include: compliance with the ILO's eight Core Conventions to protect basic labor rights; a ban on the importation of goods made with forced or child labor; an affirmative obligation to investigate and prosecute cases of threats or violence against workers and unions for exercising their labor rights; and a dispute resolution and enforcement mechanism modeled on the USMCA's rapid response mechanism."

[281] Indo-Pacific Economic Framework for Prosperity, https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-under-negotiation/indo-pacific-economic-framework-for-prosperity/ipef-overview/ (last visited July 16, 2023) ("The IPEF is not a Free Trade Agreement, and will not include market access for goods or services through traditional schedules, though we think that there may be commercial opportunity for New Zealand in the Trade pillar through the negotiation of rules on Trade Facilitation, on Digital Trade, and on Regulatory Cooperation among other things.").

[282] Brock Williams, Mark Manyin, and Rachel Fefer, Cong. Rsch. Serv., IN11814, Biden Administration Plans for an Indo-Pacific Economic Framework (2022).

As a tool to strengthen supply chains, IPEF proposes to "establish criteria for critical sectors and goods," "increase resilience and investment in critical sectors and goods," "establish information-sharing and crisis response mechanism," "strengthen supply chain logistics," and "improve supply chain transparency."[283] In doing so, IPEF aims to break the extreme concentration in certain supply chains by promoting increasing "co-investment opportunities in IPEF to develop a balanced and resilient industrial ecosystem in the process of supply chain reconfiguration."[284] These are more than laudable goals. The key question will be whether IPEF can take these objectives and validate them through practical application.

Another alternative, which demonstrates that small economies do not need to be rules takers in the international system, are recent efforts championed by New Zealand. As a general principle, New Zealand—concerned by the strain that larger powers have put on the multilateral trading system—has emphasized a need for open plurilateralism in trade, both to protect global and regional public goods and to ensure trade access for small (advanced) economies.[285] It is in this context that New Zealand has thought creatively about new trade arrangements to promote resilience. During the COVID-19 pandemic, New Zealand leveraged its status as a trading nation to ensure access for needed medical countermeasures.

Early in the pandemic, the New Zealand-Singapore Air Freight Project was launched as an initiative to maintain bilateral access to critical medical supplies. New Zealand upgraded this bilateral effort to a new bespoke agreement committing parties to "sustain trade and supply chain connectivity."[286] As a stop-gap measure negotiated early in the pandemic, the Joint Ministerial Statement, which was joined nine other countries, committed signatories to refrain from export controls, tariffs, or non-tariff barriers on the flow of essential goods and medical supplies during the pandemic.[287]

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[283] Han-Koo Yeo and Wendy Cutler, *Strengthening Regional Supply Chain Resiliency Through the Indo-Pacific Economic Framework*, Asia Society Policy Institute (May 2023), https://asiasociety.org/sites/default/files/2023-05/ASPI_RegSupplyChain_issuepaper_finalize.pdf.

[284] *Id.*, at 6.

[285] *See* Vangelis Vitalis, *The End of the Golden Weather: New Zealand's Trade Policy During a Time of International Transition*, in From Asia-Pacific to Indo-Pacific: Diplomacy in a Contest Region 294-300 (Robert G. Patman, Patrick Kollner, and Balazs Kiglics eds., 2022) ("In practical terms, an intensified emphasis on advancing concerted open plurilateralism, with small- and medium-sized economies in particular, will be a way of protecting and preserving as much as possible of the existing (trade) rules-based system.").

[286] Parker *supra* note 263 ("The agreement commits parties to "sustain trade and supply chain connectivity. There are now 12 ministerial signatories, with China having joined on 2 July. We operationalised this commitment by suspending tariffs on medical and PPE-related goods.").

[287] Joint Ministerial Statement affirming commitment to ensuring supply chain connectivity amidst the COVID-19 situation – updated, https://www.mfat.govt.nz/en/trade/covid-19-and-trade/joint-ministerial-statement-affirming-commitment-to-ensuring-supply-chain-connectivity-amidst-the-covid-19-situation-updated/ (last visited July 16, 2023). In addition to New Zealand and Singapore, the other signatories were Australia, Brunei, Canada, Chile, China, Laos, Myanmar, Nauru, the United Arab Emirates, and Uruguay. Though note that prior to signing China did impose export restrictions on critical medical products, see Karen M. Sutter, Andres B. Schwarzenberg, and Michael D. Sutherland, Cong. Rsch. Serv., R46304, COVID-19: China Medical Supply Chains and Broader Trade Issues (2020) ("Subsequently, China's imposition of new export quality checks for PPE, particularly masks— implemented by China's National Medical Products Administration (NMPA)—further slowed exports. On March 30, 2020, China's Ministry of Commerce (MOFCOM) announced new qualifications for medical supply exports.").

A few months later, New Zealand and Singapore again led negotiations over a second joint ministerial statement, which built upon the original statement and articulated specific actions signatories were encouraged to take to the ensure the unfettered movement of critical goods and services. These specific commitments covered:

- expediting customs processes to reduce wait times and associated customs burdens to keep the flow of critical goods moving;
- prohibiting export restrictions, tariffs, and non-tariff barriers on critical goods, such as food, drugs, and medical countermeasures, and ensuring that any such measures imposed were "targeted, proportionate, transparent, temporary, and consistent with WTO rules"; and
- developing and sharing best practices to restore the free movement of goods and people to promote pandemic recovery and support for the rules-based trading system.[288]

In ensuring the free flow of medical countermeasures between countries, the agreement also aimed to remove non-tariff barriers on a range of food and agricultural products.[289] In this way, New Zealand and Singapore were able to promote confidence in the trading system during a time of crisis while also finding a mutually beneficial arrangement leveraging their comparative advantages. New Zealand was able to receive key medical supplies from Singapore, and Singapore—which grows very little of its food supply—was able to source food from New Zealand.

The expansion of the New Zealand-Singapore bespoke agreement to include other countries (Canada, Australia, Chile, Brunei, and Myanmar) is perhaps an indication of the hunger many economies have for trade leadership and a willingness to look favourably on alternatives to the traditional comprehensive FTA model. Singapore and Australia are now looking at a supply chain resilience arrangement between the two countries focusing on comparative advantage, involving a supply chain working group and a bilateral food agreement.[290]

In this vein, another alternative model is the Supply Chain Resilience Initiative (SCRI) developed by Australia, India, and Japan as a guard against supply chain shocks associated with future pandemics and geopolitical tensions, especially those related to import reliance on China. At present, the SCRI has focused on the trilateral sharing of supply chain resilience best

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[288] Kelly Buchanan, *New Zealand; Singapore: New Declaration on Trade in Essential Goods for Combating the COVID-19 Pandemic*, Library of Congress Global Legal Monitor (Apr. 17, 2020), https://www.loc.gov/item/global-legal-monitor/2020-04-17/new-zealand-singapore-new-declaration-on-trade-in-essential-goods-for-combating-the-covid-19-pandemic/.

[289] *Id.*

[290] Lim Min Zhang, *S'pore, Australia set up working group to strengthen supply chains*, The Straits Times (Oct. 19, 2022) ("Asked how Singapore and Australia are seeking to maintain security and cooperation in supply chains amid increasing geopolitical instability, he said that while countries are going for self-resilience, it is not possible to be self-sufficient. "We're too interdependent," [PM Albanese] added. "You may produce a lot of minerals, you may have a lot of talent, but the world is a big place, and you need to work with and develop partnerships with other countries.",,, "At the press conference, Mr Albanese thanked PM Lee and Singapore for the critical role that the city state played in supporting Australia through the Covid-19 pandemic, "both by air and by sea". "Along with personal protective equipment, along with ventilators, Singapore played such a critical role," he said. "Singapore is a reliable economic partner. It is a great trading nation." In a joint statement after Tuesday's annual meeting, the prime ministers also agreed to begin work on a bilateral food pact. This is to enhance supply chain resilience and increase trade and investments in both countries' food supply.").

practices, and investment promotion events to encourage the diversification of supply chains away from China and towards the members of the Initiative, and even other countries in the region.[291] But the Initiative does not seek to decouple from China. Rather, it is another attempt to build resilience by creating alternatives to China-focused supply chains.[292] In particular, India sees the SCRI as an alternative to the traditional tariff cutting trade agreements, like the Regional Comprehensive Economic Partnership (RCEP), championed by China as the future of Indo-Pacific economic integration. India, which is not an RCEP member, may push Australia and Japan to deploy the SCRI as a more explicit alternative model to RCEP going forward. [293] In orienting supply chains around resilience, rather than efficiency the SCRI may need to increase the scope of its work to other partners in the region.[294]

Ultimately, the success of all these alternative agreements is predicated on a do no harm principle with respect to other trade negotiations. Open societies should be cognizant of the ways in which their useful resilience-building efforts may be undermined by counterproductive actions on other topics. The most glaring own goal in this regard would be China's accession to TPP. By dramatically increasing China's market access throughout the region, these initiatives to diversify trade away from China would founder in free trade Charybdis; TPP membership making China's economic pull perhaps too strong from these initiatives to counteract.

7.C. Other Diversification Policies

Before extracting some lessons from the various diversification interventions being deployed by open societies, it is worth briefly mentioning two other diversification tools that are explicitly not trade agreements, traditional, bespoke, or otherwise, but that have been used to build supply chain resilience. The first is unilateral diversification. While a lot of longer-term efforts have focused on reducing overreliance on China, during the pandemic the United States actually expanded trade with China by lifting tariffs so as to add Beijing as another source of tariff-free medical supplies. The United States will continue to exempt those goods from the

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[291] Press Release, Department of Foreign Affairs and Trade, Joint Statement on the Supply Chain Resilience Initiative by Australian, Indian and Japanese Trade Ministers (Mar. 15, 2022), https://www.dfat.gov.au/news/media-release/joint-statement-supply-chain-resilience-initiative-australian-indian-and-japanese-trade-ministers-0.

[292] Jagannath Panda, *The Structural Limits of the Supply Chain Resilience Initiative*, Pacific Forum (July 8, 2021), https://pacforum.org/wp-content/uploads/2021/07/PacNet31.2021.07.08.pdf ("The initiative is a product of strategic necessity brought about by the pandemic, yet this emphasis on supply chain management is frequently ignored in media and scholarship in favor of strategic positioning vis-a-vis China… Instead, it seeks to build alternative, resilient supply chains to reduce over-dependency, diversify risk, and enhance ability to absorb future market disruptions. Rather than isolating China, the aim is to ensure national economies can withstand adversity.").

[293] *China labels India, Australia, Japan supply chain plan as 'artificial' and 'unfavourable' to global economy*, South China Morning Post (Apr. 28, 2021) ("Goh said India, which has not signed the RCEP deal, might want to exert some trade influence through the SCRI and boost its exports to Japan and Australia, both who are members of RCEP.").

[294] Amitendu Palit, *The Resilient Supply Chain Initiative: Reshaping Economics Through Geopolitics*, The Diplomat (Sept. 10, 2020) ("This is different from fundamental economic ones, particularly cost efficiencies, that typically determine growth of supply chains. However, migration of supply chains out of China on largely non-economic grounds would still require support of some of the economic factors in order to be successful… The [SCRI's] long-term success depends significantly on the extent to which Japan, India, Australia, and Southeast Asian countries join it and are able to work out common rules for effective growth of supply chains.").

tariffs until at least September 2023.[295] Originally, the tariffs on medical goods and PPE were a result of broad-based tariffs imposed by the United States on China for unfair trade practices and intellectual property theft. While some argued this was necessary during the immediate pandemic crisis to expand import sources to ensure maximum supply in response to unprecedented demand, the continued unilateral tariff reduction has undermined the ability to build resilience among those same COVID-related products. The continued tariff removal has made it less competitive to produce those goods in the United States, thus perpetuating overreliance on China, and ultimately harming efforts to build resilience.[296]

The other non-trade agreement intervention is a new international collaboration on critical minerals called the Mineral Security Partnership (MSP). This is a new initiative to build resilience in the supply chains for critical minerals, which—as discussed in Part I—are seriously concentrated in a handful of countries.[297] Bringing together open societies—Australia, Canada, the EU, Finland, France, Germany, Japan, South Korea, Sweden, the UK, and the United States—with a shared interest in critical mineral resilience, MSP members will submit projects of value to, and collaborate with, each other and industry to secure financing for the projects in mining, mineral processing, and recycling, among others. [298] Interestingly, the MSP has attributes of all three types of resilience building interventions. It promotes transparency by improving the flow of information between global market actors about critical minerals. It diversifies access to critical minerals by promoting mining and processing in different locations. And it brings member's export financing and development finance entities to bear as a sort of industrial policy to spur on the critical mineral projects that the market has otherwise failed to undertake. Although still nascent, the MSP is a creative initiative and one which might benefit from expansion to include critical mineral producing economies in other regions, like Latin America.[299]

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[295] Press Release, U.S. Trade Representative, USTR Extends Certain COVID-Related Exclusions from China Section 301 Tariffs (May 12, 2023), https://ustr.gov/about-us/policy-offices/press-office/press-releases/2023/may/ustr-extends-certain-covid-related-exclusions-china-section-301-tariffs.

[296] Elizabeth Brotherton-Bunch, *Extending Tariff Exclusions on Face Masks and Medical Goods Gives China an Unfair Advantage*, Alliance for American Manufacturing (June 1, 2022), https://www.americanmanufacturing.org/blog/biden-administration-gives-china-an-edge-by-extending-tariff-exclusions-on-face-masks-and-medical-goods/ ("Thankfully, we also have new production capabilities to make PPE and other medical equipment needed to protect health care workers and treat patients. But for how much longer? Extending these exclusions gives China an unfair advantage, and puts the progress we've made at risk.").

[297] Press Release, U.S. Department of State, Minerals Security Partnership, (June 14, 2022), https://www.state.gov/minerals-security-partnership/ ("The goal of the MSP is to ensure that critical minerals are produced, processed, and recycled in a manner that supports the ability of countries to realize the full economic development benefit of their geological endowments. Demand for critical minerals, which are essential for clean energy and other technologies, is projected to expand significantly in the coming decades. The MSP will help catalyze investment from governments and the private sector for strategic opportunities —across the full value chain —that adhere to the highest environmental, social, and governance standards.").

[298] Hannah Northey, *The Diplomat Securing Responsibly Sourced Critical Minerals*, Politico (Jan. 25, 2023), https://www.politico.com/newsletters/the-long-game/2023/01/25/the-diplomat-securing-responsibly-sourced-critical-minerals-00079397.

[299] Sam Howell, *Latin and South America Are a Key to the United States' Critical Minerals Puzzle*, The Diplomat (May 5, 2023), https://thediplomat.com/2023/05/latin-and-south-america-are-a-key-to-the-united-states-critical-minerals-puzzle/ ("Argentina and Brazil attended a convening of the MSP as observers in September 2022. Welcoming them and other key mineral producers — like Bolivia, Chile, and Peru — as full members could help attract needed investment to the region and

7.D. Learning from Current Diversification Interventions

So, do diversification policies work? In short, yes. Research from firms is clear that when suppliers are dispersed across countries, the impacts from supply chain disruptions are less because of the ability to fall back on sources from alternative suppliers.[300] Rather than rehash the pros and cons of traditional trade agreements, we will focus on the new alternative models which have generated interest in the wake of the pandemic.

Generally, these policies are still too new to allow us to have confidence of their success in building more resilient supply chains. But they do offer promise. IPEF stands to offer some resilience-enhancing improvements by improving trade facilitation and diversifying supply chains. But the agreement may underperform if it cannot secure robust and enforceable commitments from the parties, in part because the parties don't feel they will gain enough for the concessions they make.[301] IPEF does enjoy an advantage of being big—thirteen countries have joined the United States at the negotiating table. In this sense, quantity becomes its own kind of quality as it permits IPEF to cover such an array of different economies and volumes of trade.

At the other end of the spectrum is the small SCRI. Without bringing on additional economies that also experience supply chain resilience equities, like IPEF has, the SCRI may end up being duplicative of other efforts.[302] In this way, the SCRI might benefit from New Zealand's open plurilateralism approach which applies a big-tent strategy to resilience building. New Zealand's bespoke model provides an archetype of how small economies can punch above their weight in global affairs to set norms and develop new rules, which contribute to building resilience.[303] The bespoke agreement is also laudable for the way in which it leverages comparative advantage (i.e. food for medical supplies) to maximize well-being for its members. Although

advance responsible mineral mining, processing, refining, and recycling practices. The Americas' inclusion in the MSP would also help align the priorities of like-minded mineral-rich countries, facilitate best practice sharing, and foster discussion about supply chain resilience.").

[300] Todo Yasuyuki, *Toward Developing Resilient and Innovative Supply Chains*, Research Institute of Economy, Trade, and Industry (2022), https://www.rieti.go.jp/en/columns/a01_0704.html ("As a result of those analyses, it has been found that when suppliers are dispersed and diversified across countries, the impact of a disruption in supply of products or parts from a certain supplier can be minimized, by sourcing from alternative suppliers."). *See also* Yuzuka Kashiwagi, Yasuyuki Todo, and Petr Matous, *Propagation of Economic Shocks Through Global Supply Chains—Evidence from Hurricane Sandy*, 29 Review of International Economics (2021) ("Finally, our findings suggest a policy implication that diversifying supply-chain partners can mitigate the propagation of shocks through supply chains and thus, lead to economic resilience.").

[301] But note recent remarks by National Security Advisor Jake Sullivan arguing against underperformance, see Sullivan, *supra* note 249 ("Had IPEF been in place when COVID wreaked havoc on our supply chains and factories sat idling, we would have been able to react more quickly— companies and governments together— pivoting to new options for sourcing and sharing data in real-time."). Though facilitating better response times to pandemic-related supply shocks, while better than the actual response, may still be an underperformance relevant to alternative interventions.

[302] Panda, *supra* note 292 ("…no clear vision currently exists among SCRI founders on how to shape their initiative. To succeed, a clear plan or charter is vital. The lack of a guiding document risks hampering cooperation…[and] the SCRI remains limited to its founding members. With its focus on recalibrating global supply chains, expansion to include the United States must be explored.").

[303] Vitalis, *supra* note 285 at 284 (Arguing that things like the NZ-Singapore agreement and other plurilateral agreements "show that small- and medium-sized states can contribute to structuring norms, behaviours and rules that are not solely dependent on support from a hegemon.")

the immediate need for the New Zealand-Singapore agreement has passed, open societies, particularly small ones, should look to it for inspiration—perhaps this model could even be expanded beyond its range of pandemic-related products to other vulnerable products.

Ultimately, all these new and emerging diversification policies help spread risk widely enough to mitigate vulnerabilities. They are also somewhat less distortive because they are broad-based. To a degree, the broad-based approach ensures such policies do not shower benefits on favored sectors, let alone favored firms, like grants and subsidies do. However, diversification interventions can fall victim to race-to-the bottom trade dynamics, such as labor and environmental arbitrages. This concentrates production abroad and reduces domestic industrial capacity. In this way, diversification interventions are the gas pedal for building supply chain resilience. But an all-gas, no-brake approach is as unsustainable as it is dangerous. In the case of supply chain resilience, the brake is industrial policy, which we turn to next.

Section 8: Industrial Interventions

At a time when policymakers the world over are rethinking the fundamentals of globalization, it is no surprise that the most popular form of recent resilience-building interventions is industrial policy. Usually more distortive than transparency or diversification policies, industrial policies aim to bring public money and state capacity to bear as a corrective for ways in which market outcomes have failed to coincide with desired policy objectives for resilience.[304] With these policies the trade-off between resilience and efficiency is most stark—by their nature, industrial interventions tug the market in a direction it would have preferred not to go. If market actors so prioritized efficiency that they source all a country's water treatment chemicals from a single country, then the resilience-building industrial policies response (subsidies for domestic producers of such chemicals, perhaps?) represents a stark trade-off. In this case, left to its own devices the market optimized for efficiency at a clear risk to resilience. But given the importance of clean drinking water, intervening in the market to build resilience is still undoubtedly the right thing to do.

Many of the industrial policies open societies currently deploy involve various forms of subsidization, either to bolster the productive capacity of key sectors (like semiconductors) or to incentivize firms to diversify their production locales (e.g. move out of China). In this way, the linkages between resilience and national security imperatives in an era of strategic competition are especially tight for industrial interventions. Given this, the range of potential industrial policies could be very broad. To stay as focused on resilience as possible we will discuss industrial interventions for specific sectors, industrial interventions agnostic of sector, and the use of public procurement to build resilience.

[304] *See* Covid-19 and Global Value Chains, *supra* note 184 at 9 ("Moreover, tools that are available to implement reshoring policies include subsidies, tariffs, local content requirements, and investment restrictions. Such measures are known to introduce economic distortions reducing the income of countries and the welfare of citizens.").

8.A. Industry-specific Industrial Interventions

A number of countries surveyed have committed subsidies for specific industries in vulnerable sectors. The best known is the semiconductor industry. In recognition of the vulnerabilities associated with the manufacturing of, and the supply chain for, semiconductor chips, in 2020 the United States authorized the creation of a subsidies program to incentivize the construction of greater semiconductor fabrication capacity in the United States.[305] But the subsidy program remained unfunded. That changed after the global economy suffered a shortage of semiconductors. In response, the United States finally appropriated funds to activate the incentive program.[306]

Yet, the United States has hardly been alone in using industrial policy to strengthen the resilience of the semiconductor supply chain. Other open societies want a piece of the pie.[307] Alongside U.S. investments in chip capacity, the EU proposed to spend $46 billion to increase the EU's global market share of chip production from 9 percent to 20 percent.[308] Japan is proposing $4.42 billion in financing and subsidies worth up to 50 percent of setup costs for semiconductor production.[309] India is committing $30 billion to enhance semiconductor self-sufficiency.[310] The UK is committing $1.2 billion in chips money mostly focused towards research and development (R&D).[311] And Taiwan has thrown even more subsidies (e.g. tax credits and land acquisition and electricity subsidies) at industry to preserve its dominant position in the sector.[312] However, none of these efforts compares to the ambition of South Korea, which has put huge tax credits towards its chip industry with the goal of creating the largest semiconductor supply chain in the world by 2030. This includes "50 percent tax credits for R&D investments and 20 percent tax credits for manufacturing investment."[313] Not to be

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[305] Karen M. Sutter, John F. Sargent Jr., Manpreet Singh, Cong. Rsch. Serv., R47558, Semiconductors and the CHIPS Act: The Global Context (2023). For the unique vulnerabilities of the semiconductor supply chain, see Wassen Mohammad, Adel Elomri, and Laoucine Kerbache, *The Global Semiconductor Chip Shortage: Causes, Implications, and Potential Remedies*, 55 IFAC-PapersOnLine 480 (2022) ("More than 65% of the global market share could be held within one region across 50 points in the SSC supply chain, regardless of the region's level of risk. All of these regions are considered as single points of failure as there could be disruptions caused by natural disasters, geopolitical tensions, shutdowns, etc.").

[306] Specifically, the impact of the chip shortage on auto manufacturing galvanized action with the U.S. Senate Auto Caucus calling for passage of necessary funding as the centerpeice of a policy response to the shortage, see Letter from Rob Portman, Senator, et al. to Brian Deese, Director of the National Economic Council (Feb. 2. 2021), available at https://www.brown.senate.gov/imo/media/doc/210128%20-%20SemiconductorLetter.pdf.

[307] It is worth noting that these new chip investments come on top of longstanding subsidies provided by countries to sustain and promote their semiconductor industries. Countries in East Asia have long supported their semiconductor industries, like South Korea, Taiwan, Japan, Malaysia, and Singapore. Sutter, et al., *supra* note 305 at 1.

[308] Cheng Ting-Fang and Lauly Li, *The Resilience Myth: Fatal Flaws in the Push to Secure Chip Supply Chains*, Financial Times (Aug. 5, 2022), https://www.ft.com/content/f76534bf-b501-4cbf-9a46-80be9feb670c.

[309] *Id.*

[310] *Id.*

[311] *Britain Unveils $1.2B Strategy to Boost Computer Chip Industry*, Associated Press (May 19, 2023), https://apnews.com/article/computer-chips-semiconductor-strategy-britain-75a38608b059773f0c1b130c482df84e.

[312] Ting-Fang and Li, *supra* note 308.

[313] *Id.*

out done, China is putting up over $50 billion plus a corporate income tax exemption for certain semiconductor firms to reduce dependencies on the West and cultivate national champions.[314]

Even Australia has made semiconductor industry investments. As a smaller economy, Australia is worried that the country might not merit priority during a future chip shortage. And while Australia has a footprint in the semiconductor supply chain with some design and silicon irradiation capabilities, the lack of serious domestic production has left the economy exposed to high-impact risks.[315] Australia's interest in semiconductor supply chains is not a one-off fascination. Rather, it is part of a more holistic effort to build resilience in vulnerable sectors.

In autumn 2020, Australia undertook a rigorous analysis of its supply chains —known as the Sovereign Manufacturing Capability Plan (SMCP)—to ascertain which goods the country relied upon most. Starting from the premise that vulnerable goods were those "essential for the health and well-being of Australians" and highly import dependent, the Government worked with industry to study the origins of raw materials, manufacturing processes, transportation networks, and final storage of different vital products. It then stress tested those findings.

Arguing that "government investment … is appropriate where the likelihood and consequences of a disruption poses substantial risks to the national interest despite wider government efforts and reasonable steps by business," the SMCP proposed targeted co-investment with industry in those sectors to establish, or expand, onshore production. The result was the Supply Chain Resilience Initiative (SCRI)—no relation to the trilateral project of the same name—which provided over $100 million in grants to industry over two equally funded rounds, for which semiconductors were included in round two. In addition to semiconductors, the SMCP identified four sectors as critically vulnerable: agricultural chemicals such as fertilizers, medicines, water treatment chemicals, and semiconductors.

For each of these vulnerable goods, the research noted that there was limited existing domestic manufacturing capacity for these goods, and given the dangerous nature of many agricultural chemicals, stockpiling was infeasible.[316] Grants for these four goods were spread over the two rounds of the SCRI. Tranche One grants were specific to medicines and agricultural chemicals, and Tranche Two grants to water treatment chemicals and semiconductors. Companies applied for grants in each tranche, and could use the funds for activities like diversifying their supplier network, improving transparency of their supply chain, and investing in domestic production capacity.

Alongside the targeted SCRI, Australia also has launched the Modern Manufacturing Initiative (MMI) as a broad industrial strategy. The MMI identified six manufacturing sectors of the economy in which Australia enjoys a competitive advantage but also has room to grow: critical minerals processing, recycling and clean energy, food and beverage manufacturing, medicine, space, and defence. To promote growth and resilience in these sectors, the MMI calls for a

[314] *Id.*

[315] AUSTRALIAN GOVERNMENT, SOVEREIGN MANUFACTURING CAPABILITY PLAN: TRANCHE 2 (2021).

[316] Tranche 1, *supra* note 99 at 4-5.

framework which gets the "economic conditions right", makes "science and technology work for industry", and focuses on "areas of advantage", including by improving the reliability, and decreasing the cost, of natural gas, which powers about 40 percent of Australia's manufacturing sector. It also called for investing $454.2 million in science research; and implementing a target for 10 percent of all Australian corporate boards to have one member with a technology background.[317]

Of particular note is the MMI's focus on critical minerals processing. In this sector, Australia is unique. It has a significant homegrown advantage since it is one of the few countries outside of China with substantial critical mineral reserves and capabilities.[318] Unsurprisingly, mining has long been a major industry for Australia. In 2019, the sector employed 200,000 workers and had $97 billion in revenue.[319] However, although Australia takes the minerals out of the ground, it most frequently sends what is extracted overseas for processing.[320] By expanding its critical mineral processing capability, Australia hopes to realize greater value from its fortuitous geology.

One challenge to such expansion has been the industry's inability to attract capital due to the reluctance of domestic investors who see the industry as stodgy and sclerotic.[321] The MMI argues that access to financing requires the industry to expand into markets beyond Australia, adopt cutting-edge technologies, and grow their base of customers.[322] To do this, the MMI proposes investments in technologies to make better use of mine waste, utilize autonomous mining vehicles, and convert mine tailings into soil.[323]

Naturally, other open societies have followed Australia's lead and implemented critical minerals initiatives of their own. We have already discussed the U.S. leadership, which created the MSP. In terms of domestic investments, the UK and the EU stand out.[324] Separate from Project Defend, the UK has prioritized resilience in critical minerals supply chains with a mix

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[317] AUSTRALIAN GOVERNMENT, MAKE IT HAPPEN: THE AUSTRALIAN GOVERNMENT'S MODERN MANUFACTURING STRATEGY (2020) 12-22.

[318] Less discussed are the large lithium reserves in New Zealand, see Gavin Evans, *Taupo Lithium Resource Potentially Economic – GNS*, Scoop News (May 29, 2019), https://www.scoop.co.nz/stories/BU1905/S00860/taupo-lithium-resource-potentially-economic-gns.htm.

[319] AUSTRALIAN GOVERNMENT, RESOURCES TECHNOLOGY AND CRITICAL MINERALS PROCESSING: NATIONAL MANUFACTURING PRIORITY ROADMAP (2021) 3.

[320] *Id.*

[321] *Id.*, at 5.

[322] *Id.*

[323] *Id.*, at 6-9.

[324] While not an industrial policy intervention in the literal sense, it is worth noting the interest in using investment screening to strengthen critical mineral supply chains. DEPARTMENT FOR BUSINESS, ENERGY, AND INDUSTRIAL STRATEGY, CRITICAL MINERALS REFRESH: DELIVERING RESILIENCE IN A CHANGING GLOBAL ENVIRONMENT (2023), available at https://www.gov.uk/government/publications/uk-critical-mineral-strategy/critical-minerals-refresh-delivering-resilience-in-a-changing-global-environment-published-13-march-2023#contents ("Governments are also using investment security measures to safeguard critical mineral supply chains. For example, in November 2022, the government of Canada ordered the divestiture of Chinese holdings in three Canadian critical mineral companies, reflecting updated policy guidance on the Investment in Canada Act to scrutinise the involvement of State-Owned Enterprises in Canada's critical minerals sector.")

of subsidies and targeted investments. Driven by its 2022 Critical Minerals Strategy, the UK has focused on building resilience for critical mineral supply chains, especially with an eye to vulnerabilities created by concentration of those supply chains in China.[325] To execute the strategy, the UK launched the Circular Critical Materials Supply Chains (CLIMATES) fund with £15 million.[326] This will support innovations in the recycling of rare earth elements, as well as R&D, engagement with international partners and activities to identify and support future skills needs. The Government has used the Automotive Transformation Fund, a program designed to support and strengthen UK industry, to invest in the UK's first magnet materials refinery and a new lithium refinery.[327]

The EU has also proposed a critical minerals strategy of its own, as part of its overarching drive for "strategic autonomy".[328] Like other open societies, the EU is excessively reliant on China for critical minerals.[329] Where other critical mineral assessments and interventions merely assert the sector's vulnerabilities—and they are obvious vulnerabilities—the EU's critical mineral investments benefit from an upfront effort to quantify the exact amount of minerals needed to meet projected demand. This stands in contrast to one critique of the 100-Day Supply Chain Review: that is was insufficiently focused on quantifiable demand projections.[330] According to EU calculations, to meet demand "for electric vehicle batteries and energy storage, the EU would need up to 18 times more lithium and 5 times more cobalt in 2030, and almost 60 times more lithium and 15 times more cobalt in 2050, compared to the current supply to the whole EU economy."[331]

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[325] *Id.* ("China is the biggest producer of 12 out of the 18 minerals assessed as critical in the 2021 UK criticality assessment.").

[326] Press Release, Department of Business and Trade, £15 Million Funding Boost to Strengthen Supply of Critical Minerals, (Feb. 27, 2023), https://www.gov.uk/government/news/15-million-funding-boost-to-strengthen-supply-of-critical-minerals. CLIMATES stands for "CircuLar crItical MATErials Supply chains."

[327] Press Release, Department for Business, Energy, and Industrial Strategy, UK's First Magnet Refinery Given Huge Financial Boost as First Ever Strategy for Supply of Critical Minerals Published, (July 22, 2022), https://www.gov.uk/government/news/uks-first-magnet-refinery-given-huge-financial-boost-as-first-ever-strategy-for-supply-of-critical-minerals-published. Press Release, Department for Business, Energy, and Industrial Strategy, UK's First Large-scale Merchant Lithium Refinery Announced, (Nov. 7, 2022), https://www.gov.uk/government/news/uks-first-large-scale-merchant-lithium-refinery-announced.

[328] EUROPEAN COMMISSION, A NEW INDUSTRIAL STRATEGY FOR EUROPE (2020) ("Europe's strategic autonomy is about reducing dependence on others for things we need the most: critical minerals and technologies, good, infrastructure, security, and other strategy areas.") *See also* EUROPEAN COMMISSION, CRITICAL RAW MATERIALS RESILIENCE: CHARTING A PATH TOWARDS GREATER SECURITY AND SUSTAINABILITY (2020) [Hereinafter Charting a Path] ("In its proposal for the European recovery plan, the Commission sees critical raw materials as one of the areas where Europe needs to be more resilient in preparation for future shocks and to have more open strategic autonomy. This can be achieved by diversifying and strengthening global supply chains including by continuing to work with partners around the world, reducing excessive import dependence, enhancing circularity and resource efficiency, and, in strategic areas, by increasing supply capacity within the EU.").

[329] Charting a Path, *supra* note 328 at 3. ("The supply of many critical raw materials is highly concentrated. For example, China provides 98 % of the EU's supply of rare earth elements (REE), Turkey provides 98% of the EU's supply of borate, and South Africa provides 71% of the EU's needs for platinum and an even higher share of the platinum group metals iridium, rhodium, and ruthenium. The EU relies on single EU companies for its supply of hafnium and strontium.").

[330] *See* Scissors, *supra* note 100.

[331] Charting a Path, *supra* note 328 at 4-5.

In response to these projections, the EU launched the European Raw Materials Alliance "to build resilience" with new financing and research funding.[332] This will reduce barriers to the success of critical mineral projects and direct investment, spurred by financing from the European Investment Bank, into those projects.[333] The initiative leverages existing R&D infrastructure to develop new methods to reuse waste from critical minerals and tailings.[334]

8.B. Industry-agnostic Industrial Interventions

While much policy focus has been on sectors like critical minerals and semiconductors which undergird the modern world, there has been less attention paid to other sectors. The former benefits from specific interventions, capacity-expanding subsidies, preferential financing, and plentiful R&D investments. What of the sundry sectors which are often no less critical and vulnerable? To their credit, some governments have focused attention on those sectors and begun to deploy industrial interventions which are sector-agnostic but targeted in ways intended to build supply chain resilience for the economy overall. These interventions include subsidies to move production out of certain countries to other places. While such policies intend to deliver the benefits of diversification, they are more like industrial interventions in that they provide public money to favored industries to correct a market failure; for whatever reason, the market has not delivered the desired diversification on its own.

The leader in this regard is Japan. Tokyo has rolled out several policies to incentivize the diversification of supply chains, including the reshoring of production. This has been motivated by a concern about relying on a single country for key imports, and the economic coercion risk presented by that reliance.[335] Notably, many Japanese imports contain significant content from China. 50 percent of the content in imported electrics are from China, and for auto parts the figure is 40 percent and rising.[336] As a result of this dynamic, which was magnified by the intensity of the COVID-19 pandemic, Japan announced two relocation subsidy programs in 2020.[337]

The first was the Program for Promoting Investment in Japan to Strengthen Supply Chains, which funds projects to reshore the production of essential goods, such as aircraft and auto

[332] *Id.*, at 8.

[333] *Id.*

[334] *Id.*, at 9-11 (For example, "more than 50% of some metals such as iron, zinc, or platinum are recycled and they cover more than 25% of the EU's consumption.").

[335] Akihiro Furusho, *Japan, the US, and the Quest for Secure Supply Chains*, The Diplomat July 30, 2021) ("Also, dependence on a single source poses a risk that the supply of strategic materials may be interrupted in emergencies. For example, China targeted Japan with an embargo on rare earth exports in 2010. Afterward, Tokyo reviewed the supply chain and developed alternative technologies. Japan's experience showed the necessity of diversifying the supply chain with trustworthy allies and partners to secure a stable supply of strategic materials.").

[336] Todo, *supra* note 300.

[337] In the words of PM Abe: "There are some concerns over the impacts of the decline in product supply from China to Japan on our supply chains. In light of that, as for those products with high added value and for which we are highly dependent on a single country, we intend to relocate the production bases to Japan. Regarding products that do not fall into this category, we aim to avoid relying on a single country and diversify production bases across a number of countries, including those of the Association of Southeast Asian Nations (ASEAN)." Shin Kawashima, *Is Japan Pulling Its Companies out of China?*, The Diplomat (May 11, 2020).

parts, fertilizers, electronics, and medical countermeasures. Whereas some open societies, like the United States, are taking a siloed, sector-by-sector approach to industrial interventions, Japan is centralizing efforts to support sectors in a single program, and expanding the number of sectors eligible for support, which reduces favoritism towards any particular sector. The Program has selected 354 projects totalling $4.7 billion in investment over two rounds; a third round was opened in 2022.[338] The second was the Program for Strengthening Supply Chains. This initiative is aimed at diversifying supply chains in the face of overreliance on China. However, funded projects are not about moving production out of China. Rather, the Program supports firms to expand production in locations in addition to their presence in China. So far, the Program has selected 92 projects, with roughly $168 million appropriated towards the Program in 2020.[339]

It is inaccurate to describe these as decoupling subsidies. The subsidies are targeted, and, in some cases, intended to promote the duplication rather than the replacement of supply chains. Japan still intends to trade with China. It merely desires such trade to be less vulnerable—which is to say less overly reliant—than it currently is.[340] Japan also recognizes that not everything can be reshored; it is not competitive to produce everything, even possibly essential products, domestically. For that reason, Japanese firms relocating production to India and Bangladesh are also eligible.[341]

Despite these moves, Japan recognizes that merely expanding the investment destinations for subsidy beneficiaries is likely to be insufficient to build the comprehensive supply chain resilience it desires. Neither does it satisfy some of the national security aims of its supply chain resilience work. As a result, Japan doubled down on its industrial policy approach to resilience with its Economic Security Promotion Act, a comprehensive proposal to strengthen economic security, in part by building supply chain resilience.

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[338] In 2020, there were "57 projects totalling around $530 million (57.4 billion yen) in July, and 146 projects totalling around $2.3 billion (247.8 billion yen) in November." In 2021 there were, "151 projects totalling around $1.9 billion (209.5 billion yen)." Of these, 66 were for small and medium-sized businesses. In April 2022, third round was opened with a budget of $5.2 billion (60 billion yen). Shino Watanabe, *Japan's Initiatives to Secure Supply Chains and Its Key Challenges*, Italian Institute for International Political Studies (Mar. 17, 2022), https://www.ispionline.it/en/publication/japans-initiatives-secure-supply-chains-and-its-key-challenges-34186.

[339] *Id. See also* Staff Writers, *Japan reveals 87 projects eligible for 'China exit' subsidies*, Nikkei Asia (July 17, 2020), https://asia.nikkei.com/Economy/Japan-reveals-87-projects-eligible-for-China-exit-subsidies ("The government earmarked 220 billion yen (this number is more trustworthy) in the fiscal 2020 supplementary budget to create a subsidy program to encourage companies to move plants to Japan. Of that amount, 23.5 billion yen was set aside to promote the diversification of production sites from China to Southeast Asia.").

[340] Kawashima, *supra* note 337 ("Where some see this as Japan trying to decouple from China it is more targeted than the term decouple would suggest. Which is to say it is more of a targeted resilience building policy with economic security overtones. In particular, the shift to domestic production and diversification of China-reliant products are hardly new phenomena, and indeed have already taken place to a certain extent. In this sense, it is not so much that the Japanese government has suddenly started instigating a decoupling, but rather that the government is simply saying that it will provide support to Japanese companies in China if they wished to come back to Japan in light of the pandemic, with some conditions attached.").

[341] Takako Gakuto, Japan adds India and Bangladesh to 'China exit' subsidy destinations, Nikkei Asia (Sept. 4, 2020), https://asia.nikkei.com/Economy/Japan-adds-India-and-Bangladesh-to-China-exit-subsidy-destinations.

Although the Act has a broad scope, only its second chapter focuses on supply chains. [342] The law directs the government to identify "specified key products" of which the country needs a "stable supply". The aim of its policies, therefore, is to "support efforts by private sectors to secure stable supplies of specified key products and their production goods."[343] It specifies that "when it is not enough to secure stable supplies of specified key products and their production goods by providing support to private sectors, the government itself shall take the necessary measures."[344] Specified key products are defined much as this project defines critical goods: products which are "vital for lives," "significant factors of living conditions," critical for the production of goods "for which the nation or its citizens excessively depend…on outside sources", "critical for national security," and products for "which an uninterrupted stable supply is particularly necessary."[345]

For products within these categories, the minister competent over the "business of producing, importing, and selling of relevant specified key products" is empowered to propose plans—known as the Policy on Initiatives for Ensuring Stable Supply—which will build resilience in the relevant supply chains.[346] Firms then apply to the competent minister for project funding to support the goals of the Policy on Initiatives for Ensuring Stable Supply.[347] The minister then selects which projects will be supported with subsidies or loans.[348] By specifying the government's supply chain resilience needs up front, and requiring firms to apply to the competent minister, the law puts firms at the center of resilience building efforts by giving them the information and financial support necessary to align their market-based business strategies with the nation's desire for resilience. Importantly, the law also includes provisions to ensure multiple firms can provide key goods to build redundancy into the economy and protect against unwitting monopolization as a result of policy interventions.[349]

Japan has put significant resources towards resilience-building industrial policy, but it is hardly the only open society to experiment with this approach. Even with a recent change in government, South Korea has remained consistent in its efforts to build resilience by reducing concentrated import reliance.[350] Core to this effort is a new fund to secure sources of essential

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[342] The law has 4 pillars: "Resilience of supply chains for key products or their producers' goods; Ensuring security and reliability of essential infrastructure functions; A framework for fostering and supporting critical technologies in the public and private sectors; Preventing divulgence of sensitive inventions by non-disclosure of selected patents." Izumi Koyu, Chihara Takahiro, Hirosaki Takuto, et al., *Japan's Economic Security Promotion Act: Background and Overview*, 29 Asia-Pacific Review 30. (2022)

[343] *Id.*

[344] *Id.*, at 31

[345] *Id.*, at 32-33

[346] *Id.*, at 33.

[347] *Id.*, at 33-34

[348] *Id.*

[349] *Id.*, at 35.

[350] Jung Suk-yee, *Korean Government Announces a New Supply Chain Strategy*, Business Korea (Nov. 24, 2022), http://www.businesskorea.co.kr/news/articleView.html?idxno=104701 ("The strategy is to reduce supply chain risks by relying less on China. The [new] government is planning to assist in relocation of South Korean companies."). *See also* Kim Bo-eun, *Can Indo-Pacific Help Korea Reduce Reliance on Chinese Market?*, Korea Times (May 21, 2022) ("In the first three quarters of last year, 3,941 out of 12,586 items that South Korea imported had a minimum 80 percent dependency on a

raw materials and a supply chain "control tower" to identify and monitor supply chain shocks, and direct funding in ways most effective at building resilience.[351] This includes a "Vietnam plus" strategy to diversify supply chains outside of Vietnam and China to other locations in the region.[352] Alongside the control tower and fund, South Korea has provided grants to incentivize foreign direct investment in the economy's industry, with bonuses for investments in "national strategic technologies."[353] This has included an industry "support package" of $1.7 billion to "expand reshoring support" through foreign investment, and larger subsidies and regulatory relief for investments aimed at reshoring technology.[354]

8.C. Public Procurement as Industrial Intervention

The last common type of resilience building industrial intervention is the use of public procurement to strengthen supply chains by fostering domestic manufacturing capacity. This intervention has been most pronounced in the United States, which recently passed a massive expansion of the domestic content requirements in its federal procurement law.

The *Make PPE in America Act*, passed as part of the *Infrastructure Investment and Jobs Act* (IIJA), requires that PPE purchased by the Departments of Homeland Security, Veterans Affairs, and Health and Human Services be entirely U.S.-made. Known as the Berry Amendment, this is the same standard required for military textile procurements.[355] This law grew out of general concerns about the lack of PPE available in the United States and the country's extreme reliance on PPE from China. And the decision to use procurement as an intervention came about specifically as a result of a decision by federal agencies to prioritize purchases of foreign-made PPE at the expense of U.S. producers; a good example of short-term cost considerations unfortunately triumphing over longer-term views about resilience.[356]

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particular country, data from the Korea International Trade Association showed. Some 1,850 items, or almost half, had at least an 80 percent dependency on China. Electrical and electronic equipment account for the largest portion of imports from China, including unfinished semiconductors that are completed in Korea. South Korea imported $17.93 billion of semi-finished chips from China in 2020, which made up 39.5 percent of the total value of imported semiconductors. The country also relies on China for rare earths — a key component for electric vehicle batteries, of which Korea is a top five global producer.").

[351] Cynthia Kim, *South Korea to Create a Fund to Cope with Supply Chain Challenges*, Reuters (Feb. 14, 2022).

[352] *South Korea Looks to Tap ASEAN Supply Chains as Trade Deficit with China Adds to Worries of Overreliance*, South China Morning Post (Nov. 25, 2022). South Korea is also leveraging its trade promotion functions to provide Korean firms entering the Chinese market with information and expertise at building supply chain resilience, see Suk-yee, *supra* note 350 ("The government explained that its assistance for South Korean companies newly entering the Chinese market would be increased separately from the strategy. 'The strategy does not mean an evacuation from China and, rather, export assistance for green business, healthcare, medical appliances, and so on will be increased in step with China's latest market trends and carbon neutrality policies,' it said.").

[353] *MOTIE Announces Amended Cash Grant Program to Attract FDI*, Contify Energy News (July 19, 2022).

[354] South Korea, https://asiasociety.org/policy-institute/supply-chains-shifting-indo-pacific/south-korea (last visited July 16, 2023).

[355] The Berry Amendment, https://www.trade.gov/berry-amendment#:~:text=The%20Berry%20Amendment%20is%20a,reprocessed%2C%20reused%2C%20or%20produced%20in (last visited July 16, 2023).

[356] *See* Letter from Rob Portman, Senator, et al. to Ellen Lord, Under Secretary of Defense for Acquisition and Sustainment (June 24, 2020), available at https://www.brown.senate.gov/imo/media/doc/200624%20-%20Letter%20to%20JTAF%20PPE.pdf ("Unfortunately, the pandemic will not have ended after 90 days, and we know that

However, the *Make PPE in America Act* recognizes the current difficulties of sourcing PPE made entirely in the United States.[357] As such, it gives flexibility to procuring agencies by requiring a tiered approach. Top priority is to be given to Berry Amendment-compliant PPE. But when that supply chain reaches its limit, agencies can procure PPE produced overseas from U.S. materials (which is to say, usually, PPE produced in other countries in the western hemisphere).[358] Only when that supply chain reaches its limit can PPE be procured from anywhere in the world.

Where the *Make PPE in America Act* targets a particularly vulnerable critical good for key agencies, the *Build America, Buy America Act* takes a broader approach. Given the vast amount of money to be spent on infrastructure under the *Infrastructure Investment and Jobs Act*, Congress decided that new infrastructure funds—even those appropriated in the future, and beyond the *Infrastructure Investment and Jobs Act* itself—should adhere to strong "Buy America" requirements. While less of a response to a specific supply chain shock (as the *Make PPE in America Act* is), the *Build America, Buy America Act* is a response to the current desire of policymakers to reduce vulnerabilities in industrial goods by investing in domestic manufacturing. It does that by requiring that all iron, steel, manufactured products, and construction materials used in federal infrastructure projects to be made in the United States. The law also has standard exceptions for higher costs, domestic non-availability of products, and the public interest.[359]

Alongside these two laws, the United States also recently expanded the benefits of government procurement to allies. In 2022, the United States expanded its National Technology and Industrial Base (NTIB) to include New Zealand.[360] The NTIB "consists of the people and organizations engaged in national security and dual-use research and development, production, maintenance, and related activities within the United States," and now its Five Eyes partners.[361] The NTIB has been periodically expanded to include close allies amid concerns that "innovation may be increasingly conducted overseas with technology more readily available to potential adversaries than to the U.S. military because of the lack of civil-military integration

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our country must be prepared for similar crises in the future. In order to achieve that, the Task Force must send a strong, and consistent, demand signal to American industry so as to incentivize the re-shoring of PPE production to the United States. Supply chains that were created in a matter of days will disappear if we do not put the long-term structures in place that will help realize significant investment in the United States.").

[357] S. Rept. 117-269—Make PPE in America Act (2022).

[358] One reason for the likely utilization of hemispheric produced PPE under the Act are the rules of origin in the Dominican Republic-Central America Free Trade Agreement (DR-CAFTA), Beth Baltzan and Jamila Thompson, *From the Heartland of Our Nation's Fabric*, Office of the U.S. Trade Representative (Mar. 21, 2023), https://ustr.gov/about-us/policy-offices/press-office/blogs-and-op-eds/2023/heartland-our-nations-fabric ("Some of these companies believe that trade agreements with the right rules can help. For example, the supply chain rules in our trade agreement with Central America and the Dominican Republic – the "yarn forward" rule – incentivize the use of American-made yarns, which can be further processed in CAFTA-DR region. On the whole, this dynamic can increase demand for American yarns, which might otherwise be sourced from countries like the People's Republic of China.").

[359] Build America, Buy America Act—Federal Financial Assistance, https://www.whitehouse.gov/omb/management/made-in-america/build-america-buy-america-act-federal-financial-assistance/ (last visited July 16, 2023).

[360] James M. Inhofe National Defense Authorization Act for Fiscal Year 2023, Pub. L. No. 117-263.

[361] Heidi M. Peters and Luke A. Nicastro, Cong. Rsch. Serv., IF11311, Defense Primer: The National Technology and Industrial Base (2023).

of the [NTIB]."[362] The NTIB was last expanded in 2016 to include the UK and Australia. Some analysts have raised concerns about the mixed effectiveness of the NTIB, because other regulations, such as the complexity of defense export controls, might hamper NTIB integration.[363] But the addition of the UK, Australia, and New Zealand over the past few years could represent an opportunity to build better defence supply chain resilience by expanding procurement opportunities in ways that promote manufacturing among allies while ensuring enough of a competitive market for defence articles to guarantee value for money spent.

Like the United States, Australia is also exploring procurement as a resilience-building tool. While governments have often used grants and subsidies to achieve this aim, the Australian Parliament's "Inquiry into the implications of the COVID-19 pandemic for Australia's foreign affairs, defence, and trade" notes that procurement stands to be a more effective tool, because of the long-term certainty it can provide business.[364] Relatedly, spurring demand for domestically made products can help create supply. As the Advanced Manufacturing Growth Centre explains:

> "Without that demand, there will be no ongoing supply…if we have something that will be viable to have in the future, the demand needs to be declared. The best thing for a country to have is a vibrant manufacturing capability, because … We don't know whether the next crisis is the virus, a bacteria, a fire, a storm or a flood. The best thing is to have a manufacturing industry that is larger and to scale. That is better for any crisis there will be."[365]

This thinking cuts across sectors. In the case of critical minerals, in one instance, a company was not able to open a mine because—as a resultof low prices globally for rare earths—it could not sell any minerals it mined and still be profitable. Had there been a purchase guarantee for those minerals, however, the industry would have had the certainty needed to start production.[366]

However, public procurement as a supply chain resilience tool can be risky because procurement also involves stewardship of taxpayer dollars. Australia's Productivity Commission acknowledges this reality but suggests a broader framing around value for money. It argues that while it was good value for money to procure PPE from low-cost countries prior

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[362] S. Rept. 114-255—National Defense Authorization Act for Fiscal Year 2017 (2016).

[363] Brendan Thomas-Noone, *Ebbing Opportunity: Australia and the U.S. National Technology Industrial Base*, United States Studies Centre (Nov. 2019) ("While the NTIB is aimed at expanding the number of actors, resources and competitiveness of the US defence industrial base, other reforms focused on providing the Pentagon new tools in contracting and procurement for it to remain adaptive and innovative. Significant in themselves, these other reform efforts — specifically new defence contracting tools like Other Transaction (OT) agreements and Middle-Tier Acquisition authorities — have proven relatively more successful than the NTIB.").

[364] JOINT STANDING COMMITTEE ON FOREIGN AFFAIRS, DEFENCE AND TRADE, INQUIRY INTO THE IMPLICATIONS OF THE COVID-19 PANDEMIC FOR AUSTRALIA'S FOREIGN AFFAIRS, DEFENCE AND TRADE (2020) 48, available at https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Foreign_Affairs_Defence_and_Trade/FADTandglobalpandemic/Report. [Hereinafter Inquiry]

[365] *Id.*, at 49

[366] *Id.*, at 50

to the pandemic, a longer-term view which acknowledges the realities of shocks, such as pandemics, would have reoriented the calculus. Such a view, which would also have incorporated the risks borne unnecessarily by front-line workers who lacked PPE, drove the Commission to conclude that public procurement authorities should be amended to incorporate this broader conception of value.

Australian procurement rules already permit this more comprehensive analysis but are rarely used. Its Commonwealth Procurement Rules note that "price is not the sole factor when assessing value for money." For procurements over $4 million "officials are required to consider the economic benefit of the procurement to the Australian economy." There are also exceptions to the overall rules for national security. Ultimately, the Committee argues that these exceptions are still too narrow to be effective at promoting the sovereign capabilities needed to ensure supply chain resilience. It recommends reforming the Commonwealth Procurement Rules to state that "officials must give a priority weighting to the extent to which a proposed project or individual procurement contributes to the generation or sustainment of a sovereign Australian industry capability which is providing nominated supplies to a critical national system." It further suggests that procurement authorities "aggregate" demand from across government and "phase" procurements to give regular timelines and certainty to industry.

8.D. Learning from Current Industrial Interventions

Governments have no shortage of choices from among the myriad industrial interventions open societies have recently decided to deploy. But just because the menu is long does not mean the items on it are tasty. Like the suite of diversification policies, many of these industrial policy interventions are too new or there is too little public information about their short lives to properly assess their effectiveness. But there are general lessons—or fundamental ingredients—we can extract for future policymakers looking to cook up the next set of industrial interventions for supply chain resilience.

First, investments in resilience should aim to build resilience. This seems like a no-brainer, but it needs to be said. Consider semiconductors. As a matter of strategic competitiveness, industry-specific investments, like those in the semiconductor sector are valuable. Since chips are foundational to practically all economic and national security activity, lack of access to chips is existential. Increasing the amount of chips produced both globally, and domestically, will reduce the impacts of semiconductor supply chain shocks. Had these new chip investments been online prior to 2021, the new capacity might have reduced the impacts of the recent semiconductor shortage. But heavy focus on the end stages of chip manufacturing as the current incentive programs emphasize, offers only incomplete resilience. The supply chain for semiconductors is fabulously complex, and so building resilience at the final stage—fabrication—while necessary, leaves components at earlier stages vulnerable to concentration and overreliance on single sources. To wit:

> "Follow the supply chain upstream, and further chokepoints emerge with regard to the fluoropolymers from which these components are made. One such material, known as PFA, is only supplied by Chemours of the US and Daikin Industries of

> Japan. It requires extensive knowhow to process, and no competitors are on the horizon. And further upstream still? Fluoropolymers are processed from fluorspar, also known as fluorite, a mineral of which China controls nearly 60 per cent of the global production output, according to data from market research company IndexBox. China has long identified fluorspar as a strategic resource and back in the late 1990s limited exports due to its importance to industries from agriculture, electronics and pharmaceuticals to aviation, space and defence. The mineral is often labelled as a "semi-rare earth"."[367]

To that end, countries which have prioritized semiconductor reshoring should explore what further interventions are needed to build more fulsome supply chain resilience. Expanding the mining and processing of fluorspar would be a good place to start.

Yet in other subsidy programs, governments are doing exactly the opposite and permitting investments to strengthen the less vulnerable end of the supply chain. Awardees for Australia's SCRI/SMCP grants can use money for "services and sales."[368] While these investments add value to domestic manufacturing, as the SCRI notes, they do little to increase resilience. No supply chain resilience interest is served by water treatment chemical producers getting public money to better market their products. In this way, the SCRI is overly generous and not fit for purpose. It should instead be limited to investments which are recognized as effective in building resilience.

Interestingly, the SCRI implicitly recognizes this dynamic in its selection of eligible sectors. The SMCP acknowledged PPE and telecommunications products as vulnerable sectors but neglected to open them to SCRI awards. The Government had already invested mightily in PPE during the pandemic, and, despite plenty of imports of telecommunications products, the private market had already taken steps to adopt "built-in redundancies, sufficient inventory and safety-stocks" to effectively mitigate supply chain shocks.[369] To its credit, Australia has shown restraint by not opening these sectors to SCRI awards; in this way it has been able to direct more available funds to sectors which have seen less investment in recent years. By not overinvesting in certain sectors, Australia's SCRI builds resilience while maximizing well-being.

On the other hand, Australia's MMI may be more likely to promote holistic supply chain investments with its focus on co-location. The MMI emphasizes the value of situating industrial processes in the same geographic area, and the need for more demonstration sites to test new ideas.[370] Often referred to as the industrial commons, the geographic proximity of different firms, factories, and industrial processes can distribute infrastructure costs and promote innovation—ideas are bettered generated in face-to-face interactions between engineers,

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[367] Ting-Fang and Li, *supra* note 308.

[368] Tranche 1, *supra* note 99.

[369] *Id. See also* Tranche 2, *supra* note 315.

[370] AUSTRALIAN GOVERNMENT, MEDICAL PRODUCTS: NATIONAL MANUFACTURING PRIORITY ROADMAP (2021) 5.

scientists, and laborers—which ultimately might facilitate deeper supply chain resilience.[371] Drawing on this logic, the MMI argues persuasively for clusters "to optimise [the] collective use of infrastructure such as manufacturing equipment and machine, transport, and other inputs."[372] Whether in the context of critical minerals processing or food and beverage manufacturing, "pooling resources"—while being mindful of competition rules—is core to Australia's self-conception of its manufacturing resurgence. However, there could be downsides to prioritizing co-location; for example, the centralization of risks in one geographic area.[373] Australia's MMI does not discuss this risk, but if co-location sites are in areas prone to natural disasters or other disruptions some of these resilience-building investments might be for naught. For example, the existence of domestic slaughter capacity in the United States did not inoculate against meat shortages when 13 slaughterhouses handling 25 percent of U.S. hog-slaughtering briefly closed during the pandemic in 2020.[374]

One other element of the MMI is worth mentioning because it is rare in much industrial policy. For each sector, the MMI sets sector-specific benchmarks to measure success over two-, five-, and ten-year time horizons. These include quantitative measures like the number of new jobs in a sector or increases in a sector's export revenue.[375] But they also include qualitative measures, such as "new technologies and products are technically and commercial proven" (success at two years for Clean Energy and Recycling) or "scaled companies are making more

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[371] Gary P. Pisano and Willy C. Shih, *Restoring American Competitiveness, Harvard Business Review* (July-Aug. 2009), https://hbr.org/2009/07/restoring-american-competitiveness ("Detailed empirical work on knowledge flows among inventors by our HBS colleague Lee Fleming shows that proximity is crucial. An engineer in Silicon Valley, for instance, is more likely to exchange ideas with other engineers in Silicon Valley than with engineers in Boston. When you think about it, this is not surprising, given that much technical knowledge, even in hard sciences, is highly tacit and therefore far more effectively transmitted face-to-face. Other studies show that the main way knowledge spreads from company to company is when people switch jobs. And even in America's relatively mobile society, it turns out that the vast majority of job hopping is local.").

[372] AUSTRALIAN GOVERNMENT, FOOD AND BEVERAGE: NATIONAL MANUFACTURING PRIORITY ROAD MAP (2021) 10.

[373] *See* Todo, *supra* note 300 ("However, large-scale onshoring/reshoring runs counter to the internationalization of supply chains and heightens the risk of supply chain disruption. In particular, Japan is prone to natural disaster risks, and supply chain disruptions caused by a natural disaster in the country are likely to have a huge impact. Onshoring/reshoring also significantly undermines economic efficiency."). See also Kathryn E. Stecke and Sanjay Kumar, *Sources of Supply Chain Disruptions, Factors That Breed Vulnerability, and Mitigating Strategies*, 16 Journal of Marketing Channels 207 (2009) ("The frequency and type of catastrophes vary across geographical regions. Asia is more prone to earthquakes than Europe. Most hurricanes occur between the latitudes of 30 degrees North and South... Risks of disruption can be considerably reduced by choosing locations that are less susceptible to catastrophes.").

[374] Daniel F. Runde and Sundar R. Ramanujam, *Recovery with Resilience Diversifying Supply Chains to Reduce Risk in the Global Economy*, Center for Strategic and International Studies (2020), https://www.jstor.org/stable/resrep26011 ("Moreover, onshoring does not change the reality that a supply chain system overreliant on a singular economy is overexposed in risk."). *See also* Barthelemy Bonadio, Zhen Huo, Andrei A. Levchenko, and Nitya Pandalai-Nayar, *Global Supply Chains in the Pandemic*, National Bureau of Economic Research Working Paper 27224 (May 2020), https://www.nber.org/system/files/working_papers/w27224/w27224.pdf ("However, "renationalization" of global supply chains does not in general make countries more resilient to pandemic-induced contractions in labor supply. This is because eliminating reliance on foreign inputs increases reliance on the domestic inputs, which are also disrupted due to nationwide lockdowns. In fact, trade can insulate a country imposing a stringent lockdown from the pandemic-shock, as its foreign inputs are less disrupted than its domestic ones.")

[375] For a good example of some quantitative benchmarks, see AUSTRALIAN GOVERNMENT, SPACE: NATIONAL MANUFACTURING PRIORITY ROAD MAP (2021).

globally competitive products and providing them to the international market" (success at five years for Critical Minerals Processing).[376] These factors are exceedingly difficult to measure, and the Australian Government has not released two-year assessments, so it is not clear if the goals of the MMI are on track. However, the desire to evaluate progress is healthy—more countries should consider setting benchmarks up front to measure the success of resilience interventions.

Second subsidies for diversification and reshoring can work but they must be well designed.[377] In 2013, South Korea offered subsidies to reshore manufacturing. Yet, through 2018, only 68 firms moved production because of the subsidies. And only 38 are still in business today.[378] The intervention failed because the subsidies were not targeted at specific industries, and insufficient to reduce the costs of production in South Korea relative to that in China. A similar criticism has been levied at South Korea's new subsidies to reduce reliance on China for manufacturing.[379]

Additionally industrial interventions benefit from strong relationships among the various stakeholders. It is one thing for policymakers to dream up some subsidy scheme in a lab. It is quite another to have talked to the array of stakeholders in and out of industry to know if those planned subsidies will achieve the primary policy aim. Policymakers must design policies with an understanding of where the relevant firms and their workers are situated, as well as an ability to respond to stakeholders who raise well-meaning objections to the effectiveness of the policy.[380] In this regard, policymakers would do well to heed the lessons of Trinidad and

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[376] AUSTRALIAN GOVERNMENT, RECYCLING AND CLEAN ENERGY: NATIONAL MANUFACTURING PRIORITY ROAD MAP (2021) 20. AUSTRALIAN GOVERNMENT, RESOURCES TECHNOLOGY AND CRITICAL MINERALS PROCESSING: NATIONAL MANUFACTURING PRIORITY ROADMAP (2021) 16.

[377] *See* Ting Wang, Rujun Wang, and Hua Zhang, *Does Industrial Policy Reduce Corporate Investment Efficiency? Evidence from China*, 15 Sustainability 1, 18 (2022) ("However, the "visible hand" of the government intervene is a double-edged sword. Improper design or invalid implementation of industrial policies may distort the behavior of corporate investment, resulting in over-investment and investment inefficiency… The investment efficiency of non-SOEs decreases with the increase in the amount of government subsidy and the degree of inter-industry competition.").

[378] *Pandemic Prompts Companies to Weigh Reshoring*, Korean Joongang Daily (May 10, 2020), https://koreajoongangdaily.joins.com/2020/05/10/finance/company-korean-companies-korea-companies/20200510203500109.html (explaining the failures of the earlier subsidy program and analogizing to the present program).

[379] Kim Kyung-ho, *Korea's Reshoring Policy Far from Effective*, The Korea Herald (Oct. 23, 2017), https://www.koreaherald.com/view.php?ud=20171023000618 ("Few Korean companies have brought home overseas production in recent years in contrast to a sharp rise in the number of the country's firms operating abroad."). *See also* Minkyung Lim and Jina Yeo, *Reshoring Pattern-Analysis of China Based Korean Firms and Its Policy Implications*, Korean Institute For International Economic Policy (Feb. 6, 2015), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2770207 ("Some companies do not have much knowledge in reshoring policies and some do not even understand whether their company is fit for the reshoring and whether they can obtain benefits under the FTA. Therefore, there is a need to select appropriate company types and business types and encourage them to take a reshoring." *See also* Jai S. Mah, *Industrial Policy and Economic Development: Korea's Experience*, 41 Journal of Economic Issues (2007) 89 (noting that in the mid-1980s Korea adopted successful industrial policies which were not industry specific but did support broad-based industrial public goods like R&D which levelled the playing field, which is different from firm specific subsidies but not targeted at industries).

[380] *See* Amir Qamar, Simon Collinson, and Anne Green, *Covid-19 Disruption, Resilience, and Industrial Policy*, Regional Studies (2022) 12 ("This requires a sophisticated understanding of the relative differences between firms and their related local networks, in terms of their size and direct and indirect contributions to regional employment, productivity and GDP

Tobago, which despite a push by the government to subsidize the creation of a domestic aluminium smelting industry (thanks to the country's plentiful energy resources), failed in its industrial policy goals because of poor consultation with stakeholders.[381] In one instance, policymakers did not even provide a cost-benefit analysis of the project.[382]

It is also important to ensure that industrial policies foster some degree of market competition rather than merely protecting uncompetitive firms. Will the firm or industry eventually be able to stand on its own two feet absent public financing? How long will that take? Anti-competitive industrial policy decreases innovation, productivity, and ultimately well-being.[383] When designing subsidy policies for firms "analysis suggests that proper selection criteria together with good guidelines for governing sectoral support can make a significant difference in terms of growth and innovation performance…In other words, political economy considerations should reinforce the interaction between competition and the efficiency of sectoral state aid."[384]

While it is hard to say without the benefit of hindsight if countries current resilience-building subsidies will be effective or fall into the trap of South Korea's subsidies from the previous decade, there are some signs of promise. The uptake of the diversification subsidies offered by Japan suggests that the government is attuned to the dynamics of specific industries and has targeted the subsidies in a helpful way. Certainly, expanding beneficiary locations to Southeast Asia, rather than just Japan, helps ensure each subsidy dollar can be used most competitively and ensures greater competition than permitting reshoring alone would.[385] Japan's Economic Security Act even explicitly recognizes the need to respect the usefulness of market forces when it comes to successful industrial policy.[386] And the focus by nearly every country pursuing resilience-building industrial policy on R&D, infrastructure, and job skills training

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amongst other aggregate outcome measures. Embeddedness, as a measure of local value-chain (or sup plier–buyer) connectedness, but also as an indicator of where a firm's employees work, live and spend, is an important framing for evaluating the targets, scope and scale of interventions.").

[381] Lou Anne Barclay, *The Anatomy of a Failed Industrial Policy: Developing an Aluminium Industry in Trinidad and Tobago*, 21 Transnational Corporations (2012) ("But this bifurcated bureaucracy was not designed to effectively deal with the issues of accountability and transparency…Indeed, policymakers remained publicly silent on crucial issues such as preferential gas pricing and subsidies to be enjoyed by the TNCs operating in this new industry. In consequence, civil society organizations were instrumental in influencing the decision of the Government to discontinue the two aluminium projects.").

[382] *Id.*, at 62.

[383] Philippe Aghion, Mathias Dewatripont, Luosha Du, Ann Harrison, and Patrick Legros, *Industrial Policy and Competition*, National Bureau of Economic Research Working Paper 18048 (May 2012), https://www.nber.org/system/files/working_papers/w18048/w18048.pdf ("…industrial policies that encourage firms to be active in the same sector, such as through tax holidays or other tax-subsidy schemes, will decrease concentration in the targeted sector and enhance incentives for firms to innovate. Therefore, there can be complementarity between competition and suitably designed industrial policies in inducing innovation and productivity growth.").

[384] *Id.*, at 38.

[385] *See* Todo, *supra* note 300 ("Therefore, policies should not focus exclusively on onshoring/reshoring of supply chain operations to Japan. They should focus more on the geographical diversification of supply chain partners across national borders while reducing dependence on China. However, this effort should aim for "friend shoring," that is, expanding supply chain operations to countries that do not pose national security concerns.").

[386] *See* Koyu, *supra* note 342 (noting that it is explicitly trying to balance resilience with efficiency. The Act recognizes the potential for distortions and tries to explicitly balance against efficiency.)

also stands to improve the effectiveness of these interventions by investing broadly in public industrial goods.[387]

Third, not all industrial policies are equally distortive. A well-designed subsidy program will be less wasteful than a poorly designed one. Such is the lesson of the failure of South Korea's original subsidies and the apparent success of Japan's new economic security subsidies. One benefit of Japan's current subsidies is their nimbleness, whereby government can work iteratively with industry to tailor subsidies in ways designed to maximize their effectiveness. [388] Instead of being boxed in by overly prescriptive rules, this collaboration aims to use public money more effectively to reduce overdependence and build resilience.

And so, in the interest of reducing distortions, procurement policies might be preferable to the extent they reduce the need to depend on grants-based assistance to firms. For that reason, in seeking to find the well-being-maximizing point between resilience and efficiency, Australia aims to soften the effects of its subsidies and grants with procurement rules: the lesser of two evils in its opinion.[389] In that vein, the *Make PPE in America Act* breaks new ground for procurement policy by leveraging the powers of both public procurement and regional value chains. In this way, the law builds resilience comprehensively while also empowering firms. The expansion of the NTIB is similar. It is rooted in notions of diversification and enhanced competition.

[387] Kalchschmidt, *Post-Pandemic Reconfiguration from Global to Domestic and Regional Value Chains: The Role of Industrial Policies*, 28 Transnational Corporations 88 (2021) ("Therefore…policymakers aiming to develop pro-reshoring initiatives should carefully evaluate how to improve the success rates of their initiatives by matching reshoring policies with others aimed at re-establishing manufacturing skills and infrastructure.").

[388] David Adler, *Why 'Economic Security' Became Magic Words in Japan*, Foreign Policy (Jan. 20, 2023), https://www2.itif.org/2023-Adler-economic-security-article.pdf ("The private sector is incentivized to participate in economic security initiatives through subsidies. While these do exist in the United States and most other industrialized countries as well, what is singular about Japan is the flexibility in what can garner a government subsidy—namely, the presence of "specific critical materials." These are ambiguously defined by the government, if at all. Igata explained that as part of the ESPA, "the private sector can submit a plan to the government about diversifying supply chains of 'critical materials,' however defined." If the government decides it is important for economic security reasons, Igata said, it results in a subsidy.").

[389] Inquiry, *supra* note 364 at 119.

8.E. Conclusion

When it comes to building resilience, it is important to remember that firms are the most agile actors.[390] They know their markets and suppliers better than the government will ever be able to. But that does not mean that firms are perfect or proactive when it comes to addressing an economy's vulnerabilities. The question for policymakers is whether firms' incentives to achieve supply chain resilience either exceed or fail relative to the overall economy's desired—or in other words, the socially optimal—level of resilience.[391] Determining the well-being-maximizing level of resilience desired by an economy is the goal of this project's conceptual framework and checklist. The purpose of a resilience building intervention isn't random. The aim is for a government to complement the unique knowledge and capabilities that firms possess. Just as a referee can place safety cones around a ditch in a park before players take the field for soccer, a government can set contours for the economic playing field to shape behavior in favor of greater resilience.[392]

Thus far in Part II we have looked at how policymakers have attempted to place safety cones around ditches, or even to fill those ditches, with the application of resilience-building interventions. Although a myriad of policies have been introduced, not all policies have been tried. Stockpiling critical goods appears to be an uncommon tactic, perhaps because it is costly and, in the case of the U.S. Strategic National Stockpile, does not guarantee success at mitigating responses to shocks, especially during times of unprecedented demand. Some stockpiling can also violate WTO rules.[393] Similarly, stress testing firms' supply chains is a proposal which enjoys respect in the policy literature, but does not seem to have much uptake among policymakers themselves.[394] Further policy experimentation with respect to these interventions would be warranted.

Moreover, there is no reason that governments should only deploy interventions as standalone policies. Most governments surveyed have not, but they also have not necessarily demonstrated a coherence to the multiple interventions deployed to suggest that these interventions intentionally complement each other in building resilience. Given that evidence indicates that economies need a mix of diversification and reshoring to build resilience comprehensively,

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[390] COVID-19 and Global Value Chains, *supra* note 184 ("…firms mitigate the impact through what is described in the business literature as agility…Since the nature of the next risk or disruption is often unknowable, developing agility is an important part of resilience strategies.").

[391] Gene Grossman, Elhanan Helpman, Hugo Lhuillier, *Supply Chain Resilience: Should Policy Promote Diversification or Reshoring?*, National Bureau of Economic Research Working Paper 29330 (Oct. 2021), https://www.nber.org/system/files/working_papers/w29330/w29330.pdf ("Firms may have inadequate incentives to invest in supply chain resilience, because they do not capture all of the surplus from offering their products to the market.").

[392] COVID-19 and Global Value Chains, *supra* note 184 at 8 ("Most efforts will be at the firm level, as previously highlighted, but governments have an important role to give incentives to firms to integrate risk awareness and develop risk management and resilience strategies.").

[393] A Short Note On Public Stockholding, https://unacademy.com/content/railway-exam/study-material/general-awareness/a-short-note-on-public-stockholding/#:~:text=Public%20stockholding%20(PSH)%20is%20a,are%20constantly%20facing%20food%20shortages (last visited July 16, 2023).

[394] *See* COVID-19 and Global Value Chains, *supra* note 184 at 9. *See also* Levi and Levi, *supra* note 132.

governments should ensure that they combine policies in ways which are strategic and coordinated.[395]

In summary, when it comes to deploying interventions to build resilience, preparation is key. In few, if any, of these examples is it clear that countries are undertaking the rigorous analysis of vulnerabilities and risks proposed in the beginning of this report. This is not to say that the policies being implemented throughout open societies are worthless. Quite the contrary. We need more capacity and diversification in the semiconductor industry, and overreliance on China for critical minerals creates obvious vulnerabilities. But in many ways these sectors are the low-hanging fruit of resilience. They are elements of the economy where gut-based interventions by policymakers will actually pay off. Going forward, and to learn by contemporary example, policies should better integrate the thinking of the checklist into the design of interventions. This will ensure that forthcoming interventions most effectively build the resilience we need to maximize well-being.

[395] *See* Grossman, *supra* note 391 (Noting in its analysis of reshoring and diversification policies that government's need a mix of the two to build resilience).

PART III: SETTING A COURSE FOR ACTION

Section 9: A New Resilience Model for Open Societies

9.A. Introduction

We now come to the final component of this report—a chance to unify the theory and practice to articulate a new policy intervention to build supply chain resilience. The purpose of this is not to denigrate the policies already being undertaken by various governments, but rather to think creatively about a new intervention paradigm which draws upon the best the world has to offer, with modifications to make it effective at closing vulnerabilities, building resilience, and maximizing well-being. This new model—named the Security and Trade Agreement for Resilience or STAR—offers an opportunity to demonstrate how policymakers can employ the Supply Chain Resilience Checklist to design an effective intervention.

The theory developed in Part I—locating the well-being-maximizing point between resilience and efficiency, identifying risks, and asking the right questions about critical vulnerabilities—is only useful if it can be put into practice. The policies described in Part II—IPEF, Singapore's Supply Chain Control Tower, Japan's relocation subsidies—offer inspiration, natural experiments, and advice for development of new supply chain resilience policies. By combining what these two sides of the coin have to offer, this section argues for a new vision of what might be possible in terms of for building supply chain resilience.

9.B. Applying the Supply Chain Resilience Checklist

As Part I explained, the Supply Chain Resilience Checklist begins with an identification of vulnerabilities. Some countries have undertaken that analysis and identified which imported goods are highly concentrated from countries which are the top global exporters of those goods. By analyzing their trade data, and consulting with industry experts, policymakers can create the list of imports which fit these criteria. For example, Australia imports 5,862 products of which 518 are vulnerable. These vulnerable products represent about 9 percent of Australia's imports by volume.[396]

But many of these products are sundry and not critical for protecting citizen's life and health, or national security: for example, Christmas decorations, toys, and swimsuits.[397] For this reason, the second part of the checklist asks policymakers to overlay a criticality consideration on this list of vulnerable imports. Applying such a consideration reduces the list to 130.[398]

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[396] Study Report, *supra* note 117 at 58-60. Australia has a slightly different calculation than New Zealand of what constitutes a vulnerable import. Where New Zealand (and this paper's supply chain check list) define a vulnerable import as one which is highly concentrated and for which the imports originate in a country holding the majority share of global exports of that good, Australia defines a vulnerable import as one where Australia was more than 80 percent import reliant and the overall industry had a Herfindahl-Hirschman Index of greater than 3,100. It is possible that using New Zealand's criteria, Australia might have a longer list of vulnerable imports.

[397] *Id.*, at 66.

[398] *Id.*, at 53.

Having winnowed down the products to those which, because of their vulnerability and essentiality, present the greatest risk to well-being from a supply chain shock, the next step is to understand whether firms are already taking steps to address the supply chain risks associated with these products. If so, the need for government intervention is likely unnecessary.

In the case of Australia, research suggests that many firms are already taking such steps. Generally, half the goods "used in production by an essential industry were sourced from within Australia."[399] However, this varies by industry: the telecommunications equipment industry is more import-dependant than the water treatment sector, for example.[400] In this instance, it does not appear that the water treatment industry needs government intervention to secure its resilience. Although chlorine, for example, is a concentrated import for Australia, sufficient alternatives exist in other allied countries to allow firms to shift sourcing in the event of a disruption from the primary producer. There are also alternative ways to treat water, and Australia has sufficient domestic chlorine production that the country is a net exporter of the chemical.[401] However, in the case of goods where (more or less) single source foreign suppliers are so exceedingly dominant that firms have been unable to reduce the associated vulnerabilities on their own, government intervention is more warranted. For Australia, this includes certain fire-retardant chemicals used in fighting forest fires, for which there is only one major global producer.[402]

So what to do about the identified critical vulnerabilities—130 for Australia, plus the semiconductors and critical minerals, and untold other goods in other economies? Unsurprisingly, the intervention will depend on the good in question. Transparency policies will work best for goods where the vulnerability is due to a lack of information about the risks associated with the vulnerability.[403] For example, firms regularly used Huawei and ZTE telecommunications products until national governments began to warn of the risks associated with those products.[404] Although many governments have taken additional steps to restrict or

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[399] *Id.*, at 71.

[400] *Id.*, at 71-72.

[401] *Id.*, at 162-163 ("In 2017 Australia imported around $1.1 million of chlorine products (HS 280110) while exports were valued at about $1.4 million.").

[402] *Id.*, at 163 ("The long-term fire retardant referred to in the Royal Commission report is the PHOS-CHeK range, manufactured by Perimeter Solutions in the United States. Perimeter Solutions supplies PHOS-CHeK globally to fire and forestry services and appears to be the only major supplier of long-term fire retardant.").

[403] Perhaps a mostly semantic matter, it is worth noting that the exercise of identifying critical vulnerabilities is itself a type of transparency intervention because this up-front exercise has policymakers peering into the market to understand and map supply chains.

[404] Sara Salinas, *Six Top U.S. Intelligence Chiefs Caution Against Buying Huawei Phones*, CNBC (Feb. 13, 2018), https://www.cnbc.com/2018/02/13/chinas-hauwei-top-us-intelligence-chiefs-caution-americans-away.html ("We're deeply concerned about the risks of allowing any company or entity that is beholden to foreign governments that don't share our values to gain positions of power inside our telecommunications networks," FBI Director Chris Wray testified. "That provides the capacity to exert pressure or control over our telecommunications infrastructure…It provides the capacity to maliciously modify or steal information. And it provides the capacity to conduct undetected espionage."").

ban such products, firms have also heeded those warnings on their own, and generally not pushed back against government-led restrictions based upon those warnings.[405]

For other goods diversification policies will be more appropriate. Australia primarily imports chlorine from China. But its next biggest trading partners for chlorine imports are Canada, the United States, and France. By liberalizing trade in chlorine with those countries, Australia can make it easier to acquire chlorine in the event of import disruption from China. Fortunately, Australia already has trade agreements with the United States and Canada and is negotiating one with the EU.[406] However, the existence of these agreements has not prevented Australia's excessive import reliance on China for water treatment chemicals. For that reason, Australia should consider how those agreements could be modified to promote resilience, possibly by diversifying trade in the inputs away from China.

For some goods industrial policy might offer the right mix of resilience and efficiency necessary to maximize well-being. The semiconductor industry, which has long been awash in government intervention, is hardly a free market. As a result, it has ended up so concentrated as to present real vulnerabilities for the global economy. In response, many governments have undertaken their own subsidies, incentive programs, and industrial policies to build resilience by reducing import reliance with new domestic production and alleviating the impact of global supply chain shocks with new world-wide capacity. Relatedly, industrial policy interventions are more appropriate where there is little recourse to substitutes (as in the case of semiconductors and critical minerals) and therefore a likely limit to the benefits of diversification. For these goods, ensuring the desired level of resilience will likely mean bending market behaviors in the direction of resilience more forcefully.

9.C. The Security and Trade Agreement for Resilience

Since the hundreds of vulnerable products are all vulnerable for different reasons, it is sensible to bundle different interventions together as a comprehensive policy agenda rather than leaving resilience to be built silo by silo. Like the hawser, the strength of which comes from multiple strands of fiber woven together, resilience policies which complement each other and act in concert can be more effective than a collection of individual policies.[407] The Security and Trade Agreement for Resilience (STAR) offers a model for international collaboration between open societies to facilitate comprehensive supply chain resilience. Not a traditional FTA, but still trade liberalizing, and not carte blanche for industrial policy, but still supportive of reshoring, the STAR builds upon the recent momentum of alternative resilience-building paradigms, such as IPEF and the New Zealand-Singapore bespoke agreement.

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[405] Isobel Asher Hamilton, *Here Are All the Big Companies That Have Cut Ties With Huawei, Dealing the Chinese Tech Giant a Crushing Blow*, Business Insider (Jun. 19, 2019), https://www.businessinsider.com/all-the-companies-that-have-cut-ties-with-huawei-2019-5

[406] Australia-European Union Free Trade Agreement, https://www.dfat.gov.au/trade/agreements/negotiations/aeufta#:~:text=Australia%20and%20the%20European%20Union,GDP%20of%20US%2416.6%20trillion (last visited July 16, 2023).

[407] Grossman, *supra* note 391.

At its core, the STAR would diversify the supply chains among countries party to the agreement. To achieve this, the STAR would liberalize trade between parties in the tariff lines for vulnerable and critical goods by reducing tariffs and non-tariff barriers to the trade in those goods. The STAR between New Zealand and the United States, for example, would, at minimum, reduce tariffs and non-tariff barriers on the imported products that are most critically vulnerable for New Zealand, and related imported products for the United States. Moreover, the STAR can be done on a bilateral or plurilateral basis. On a plurilateral basis the number and types of products involved would be larger and more varied because of the multitude of different economies involved. Whether the plurilateral or bilateral STAR would be better for building resilience will depend on the nature of the resilience being sought and the economies which might be involved.

Alongside the liberalization for key products, the STAR would also include trade facilitation provisions to expedite the movement of goods through customs and reduce administrative impediments to trade.[408] Trade facilitation may seem a minor matter, but it offers high impact for building resilience. During the pandemic, disruptions at the border were among the biggest challenges faced by importer and exporters.[409] And sound trade facilitation policies can have significant beneficial impacts. For example, the WTO's Agreement on Trade Facilitation is projected to reduce trade costs by an average of 14.3 percent.[410]Trade facilitation is also useful during a supply chain shock.[411]

Smart trade facilitation rules keep goods moving during, and after, the shock, so that economies can access the goods and inputs they need to keep humming.[412] The expansion of trusted trader programs, which certify that participants have a minimum level of supply chain integrity and security can expedite the ability to import critical goods during a crisis. In this way, the STAR also serves as a trade recovery framework for parties to get goods and services flowing swiftly after a shock. The development of trade recovery protocols between parties could include

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[408] Niels Graham, *Trade Facilitation and the Indo-Pacific Economic Framework*, Atlantic Council (May 16, 2022), https://www.atlanticcouncil.org/blogs/econographics/trade-facilitation-in-the-indo-pacific-economic-framework/. *See also* Runde and Ramanujam, *supra* note 374 ("Beyond creating an enabling environment for the manufacturing process, official development assistance (ODA) should be leveraged to make targeted investments for trade facilitation in developing countries that are vying to become alternative players to China in a de-risked global supply chain system.30 Once the goods are produced, they need to be delivered in a timely and efficient manner.").

[409] Trade Facilitation, https://www.oecd.org/trade/resilient-supply-chains/trade-facilitation/ (last visited July 16, 2023).

[410] WORLD TRADE ORGANIZATION, ESTIMATING THE BENEFITS OF THE TRADE FACILITATION AGREEMENT 73 (2015), available at https://www.wto.org/english/res_e/booksp_e/wtr15-2d_e.pdf.

[411] Sarah Bianchi, *Building Resilient and Secure Supply Chains Through Trade*, Office of the U.S. Trade Representative (Apr. 2022), https://ustr.gov/about-us/policy-offices/press-office/blogs-and-op-eds/2022/april/building-resilient-and-secure-supply-chains-through-trade (Noting trade facilitation as a component of the US supply chain resilience strategy).

[412] ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, COVID-19 AND INTERNATIONAL TRADE: ISSUES AND ACTIONS 3-5 (2020), available at https://read.oecd-ilibrary.org/view/?ref=128_128542-3ijq8kfswh&title=COVID-19-and-international-trade-issues-and-actions ("An important priority is keeping the key supply chains for essential goods for the crisis –including medical supplies, food products and ICT goods and services–open and functioning...[Such as by] speeding up border checks for medical products and food and minimising the need for physical interaction between Customs and other border officials and traders at borders, by digitising processes to the extent possible. Also important will be efforts to expedite standard formalities to leave room for any necessary additional COVID-19 controls.").

investments in communications infrastructure to allow coordination during a trade recovery scenario, and exercises between parties to prepare for trade recovery events.[413] In this vein, IPEF includes trade facilitation as part of its supply chain resilience work. It calls for simplifying customs procedures, emphasizes the use of digital technology to smooth customs procedures, and seeks full implementation of the Agreement on Trade Facilitation.[414] And the Ottawa Group—13 WTO members—recently proposed a "Trade and Health" initiative to promote recovery from the pandemic, in part by increasing trade facilitation cooperation.[415]

The STAR would also promote diversified reliance by requiring short supply cooperation for critical goods (such as pharmaceuticals and medical goods, energy, critical minerals, and food). When there is short supply of a critical good, parties producing excess of that good would be required to give priority to purchases by STAR partners. This would reduce vulnerabilities by helping to guarantee parties' access to critical goods. And by establishing prioritization for sharing of critical goods, such cooperation may also reduce the rush by national governments to institute short supply restrictions, the likes of which proliferated during the pandemic.[416] In the face of uneven global distribution of the production of critical products, STAR parties could still position themselves to import critical goods rather than resort to hoarding.[417]

However, diversification alone is insufficient to address vulnerabilities in sectors with limited substitutability and extreme reliance on foreign sources; especially those countries which are strategic competitors or adversaries. To that end, the STAR would empower states to utilize industrial policy to reorient supply chains to new countries and regions or even reshore production domestically. This could be done by requiring STAR parties to spend a certain amount annually to build resilience domestically against critical vulnerabilities which threaten the supply chain integrity of the STAR parties. These mandatory investments could take the form of subsidies for new semiconductors, or, even better, investments in expanding the production of PFA, the key fluoropolymer for chip production of which there are only two suppliers in the world.[418] But it could also involve R&D funding; infrastructure improvements,

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[413] Louritha Green, *Trade Recovery: Laying the Groundwork for the Establishment of a New Zealand-United States Action Plan for Application in the Event of a Serious Trade Disruption*, Ian Axford Fellowship Report 47 (2010), https://www.fulbright.org.nz/publications/2010-green/ (Proposing a trade recovery framework for NZ and US to navigate supply chain shocks).

[414] Ministerial Text for Trade Pillar of the Indo-Pacific Economic Framework for Prosperity, https://ustr.gov/sites/default/files/2022-09/IPEF%20Pillar%201%20Ministerial%20Text%20(Trade%20Pillar)_FOR%20PUBLIC%20RELEASE%20(1).pdf (last visited June 16, 2023)

[415] The Ottawa Group consists of Canada, the European Union, Australia, Brazil, Chile, Japan, Kenya, Mexico, New Zealand, Norway, Singapore, South Korea, and Switzerland. Meredith Broadbent paper on covid medical supply chains. Meredith Broadbent, *Covid-19 Demand Shock and Preparedness Response Securing Medical Supply Chains: The Trusted Trade Partner Network*, Center for Strategic and International Studies (2020), https://www.jstor.org/stable/resrep27598.

[416] Evenett, *supra* note 6 at 51.

[417] Alan O. Sykes, *Short Supply Conditions and the Law of International Trade: Economic Lessons from the Pandemic*, 114 AM. J. INT'L. L. 652 (2020) ("Moreover, because production of essential supplies is not uniformly distributed around the world, the harmful effects of restrictions are asymmetrical and major producers of essential supplies may find restrictions desirable even if they anticipate retaliation.").

[418] *See* Ting-Fang and Li, *supra* note 308. (Discussing fluoropolymers as a chokepoint in the semiconductor supply chain).

especially those at ports of entry; test beds to commercialize innovations developed as a result of basic research; and other publicly financed projects, albeit narrowly targeted to build resilience in the areas where the market has failed to do so. Whatever form it takes, the STAR should set rules to ensure these investments build resilience beyond just final assembly and make effective use of the public's dollars. In this way, STAR subsidies should set firms and industries on a path to competitiveness, rather than keeping them indefinitely on state support. Industrial interventions will look different across different STAR members, but the general principles for smart industrial policy should still apply to all.

An analogous model is the MSP, which promotes international collaboration between governments and industry to secure financing and investment on critical minerals. However, given the scope of vulnerabilities—critical minerals are hardly the only set of goods wanting for resilience—it seems unnecessarily stove-piped to create MSP-style arrangements for a myriad of sectors when one agreement which comprehensively covers vulnerabilities could be an option. That said, the MSP already exists. Policymakers looking to operationalize the STAR model would do well to follow the MSP closely to replicate its successes and improve upon its shortcomings.

The economy is not static, and supply chain vulnerabilities aren't either. Therefore, the STAR requires a vigilance mode (to borrow a term from the EU's SMEI) to make its resilience-building efforts a living initiative rather than a snapshot in time. The vigilance mode would allow STAR parties to respond to the recognition, raised by South Korea and Singapore, that economies should endeavour to be one step ahead of looming supply chain shocks.[419] The idea of an early warning system is also something that has been suggested as an additional component to IPEF.[420]

The vigilance mode would also serve as the overall governance function for the STAR. A forum for consultation and coordination on supply chain resilience and security writ large, it would also be a space for the STAR parties to assess whether products should be added, or even removed, from the scope of the agreement's liberalization requirements. As the nature of global supply chains change, vulnerabilities are addressed, and new vulnerabilities arise, the vigilance mode would allow the STAR parties to ensure that the agreement covered the products for which countries seek resilience. As discussed in Part II—if you're going to build resilience, the intervention needs to actually build resilience. Similarly, the vigilance mode would be a forum to coordinate those industrial policy investments required by the agreement so that investments are targeted at the right vulnerabilities and not unnecessarily duplicative.

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[419] Sam Kim, *Korean Calls for Global Network to Cushion Supply Chain Hit*, Bloomberg (Mar. 10, 2022) ("We need to explore new ways in which we could establish some sort of early warning system if there's any risk factor along the supply chain, or also a network of bilateral and multilateral cooperation for supply chains," he added.").

[420] Yeo and Cutler, *supra* note 283 at 6 ("To prevent or at least better prepare for possible supply chain disruptions, IPEF members need to develop a system in which countries closely monitor what is happening in the supply chain, share information in real time, and catch potential disruptions as early as possible. Information sharing among the countries and between the public and private sectors is critical for such a mechanism to be effective.").

As the STAR's governance forum, the vigilance mode would also play host to supply chain stress tests and wargaming exercises designed to uncover vulnerabilities and foster cooperation during a supply chain crisis. Stress tests are an underutilized tool of official policy but have been deployed informally with success.[421] Stress tests and wargames also bring new perspectives to bear, ones which policymakers often do not have. The supply chain expertise and experience of those outside of government, and especially in industry, is an advantage that STAR members should not squander.

The STAR would also have strong labor and environmental standards to effectively promote resilience. When production chases locales with lower labor and environmental standards in search of cost savings the supply chain can become harmfully concentrated.[422] The world's exceptional overreliance on China for critical minerals and many medical countermeasures is a case in point. Ensuring a level playing field for STAR-liberalized trade promotes diversification and guards against the race to the bottom where supply chain vulnerabilities can be found.

Similarly, the STAR would need strong rules of origin. This ensures the resilience benefits of trade are not eroded by the concentration of non-originating content in places outside the agreement. As part of these strong rules, the STAR would include limits on the amount of non-market content which can be considered originating, and thus benefit from tariff cuts. Consider a scenario in which trading partners liberalize the flow of fertilizer to reduce overreliance on a non-market autocracy which is a leading producer of the product. Without a rule of origin for non-market content, the fundamental resilience-building effort is for naught, because trading partners would be incentivized to rely on non-market autocracies for the basic building blocks of the product.[423]

To further guard against resilience erosion by non-market autocracies, the STAR should also ensure subsidies and incentives provided pursuant to the agreement do not benefit persons and entities affiliated with non-market autocracies, give parties permission to account for third-country, upstream subsidies in national trade remedy proceedings, and require joint coordination in the face of major subsidies by non-market economies. Just like with the need for strong rules of origin, the benefits of the subsidies for reshoring should flow to STAR parties and not to entities affiliated with non-parties, let alone non-market autocracies. To do otherwise undermines the resilience-building investment, which ill stewards the public money at stake. As for the need to combat third-country subsidies, the EU and the United States have

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[421] *See* Bradley Martin, Laura H. Baldwin, Paul DeLuca, et al., *Supply Chain Interdependence and Geopolitical Vulnerability: The Case of Taiwan and High-End Semiconductors*, RAND Corporation (2023), https://www.rand.org/content/dam/rand/pubs/research_reports/RRA2300/RRA2354-1/RAND_RRA2354-1.pdf ("To explore the geopolitical implications of Taiwan's semiconductor dominance, the RAND National Security Supply Chain Institute conducted a tabletop exercise with representatives from across the executive and legislative branches of the U.S. government and from a variety of industries that rely on semiconductors.").

[422] Baltzan, *supra* note 189 at 5.

[423] Letter from Robert Casey, *supra* note 148 ("That is, half the content of goods entering into the United States under a trade agreement could come from China…Rather than integrating our supply chains with democratic and like-minded countries, these trade rules may further enmesh our dependency on supply chains from foreign adversaries, and Nations which do not adhere to high standards on labor or environment.").

already begun to experiment with trade remedy rules to challenge this pernicious tactic.[424] And creating a new requirement for coordinated action by parties against non-market subsidies further recognizes the collective nature of building resilience, and the ways in which non-market autocracies will gladly spend resources to disrupt that. For example, China's intervention in its rare earth mineral sector—including state ownership of key rare earth firms—has contributed to its monopolistic dominance today.[425] The more open societies that can work collaboratively and offensively against non-market economic practices, the more everyone benefits from genuine supply chain resilience. The STAR offers a forum for countries to share such experimentation with allies in the interest of reducing global market distortions in the same of both resilience and efficiency.

Given that the most notable non-market autocracies are China and Russia, it would be sensible for the STAR to acknowledge the linkages between supply chain resilience and national security. One the one hand, the reason for that is functional—critical minerals are just as vital for the civilian economy as they are for warfighting capabilities. But it is also political—open societies the world over explicitly present their supply chain resilience initiatives against a backdrop of geopolitical tension with those countries. To that end, a comprehensive STAR model might include policies aimed at coordinating parties' collective response to the national security and strategic competition issues so tightly adjacent to the supply chain resilience question. Because it is beyond the scope of this paper, these policies get brief mention here. But future efforts are welcome to explore further what these elements, and others, of the STAR model would look like. Some examples of relevant security-centric policies might include alignment and information sharing on export controls, sanctions, and investment screening measures, and streamlined processes for arms sales amongst the parties.

By combining transparency, industrial, and diversification interventions into a single entity, the STAR would smooth out market distortions from an overreliance on any one type of intervention and build resilience more deeply and sustainably. It would also engender coordination between open societies in a way which does not currently exist. Beggar-thy-neighbor races to the bottom on subsidies can give way to a win-win which pairs serious investments in domestic manufacturing with the benefits of comparative advantage.

9.D. Conclusion

Just as the risks of putting all the eggs in the same basket are obvious, so are the risks of building resilience alone. Siloed interventions may be the norm, but open societies have demonstrated an interest in alternative models for building resilience. New paradigms in diversification, like IPEF and the New Zealand-Singapore bespoke agreement, and cutting-edge proposals like Japan's economic security law, should inspire policymakers to think big.

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[424] William Reinsch and Kaycee Ikeonu, *Transatlantic Treatment of Transnational Subsidies, Center for Strategic and International Subsidies* (July 22, 2022), https://www.csis.org/analysis/transatlantic-treatment-transnational-subsidies.

[425] Joanne Abel Goldman, *The U.S. Rare Earth Industry: Its Growth and Decline*, 26 Journal of Policy History 152-153 (2014) ("First, the cost savings realized by China in mining and refinement operations, due to government ownership of the largest producers, low labor costs, and only nominal regulation of working conditions and environmental safety, allowed them to sell their products inexpensively.").

Building supply chain resilience in a way which maximizes well-being requires a balance, which the STAR aims to provide. It pumps the gas, taps the brakes, and puts to good use several policies, new and old, in ways which strengthen supply chains to good effect.

Section 10: Conclusion

It is difficult to accurately predict the likelihood of supply chain shocks. It is even more difficult to stop those shocks from happening. Instead, open societies should close vulnerabilities in supply chains to protect their economies from the effects of various shocks. To close a vulnerability is to build resilience. But because policymakers have finite resources, interventions in the economy to build resilience should be strategic and well-planned. This ensures resources are used most effectively and in ways which maximize societal well-being.

This report aims to be an instruction manual for those objectives. It sets out an intellectual framework for supply chain resilience by articulating the theory behind term and the tools available to policymakers to build it. Upon that theory is built a new guide for policymakers—the Supply Chain Resilience Checklist—which channels appetite for action through a simple process designed to maximize success by focusing efforts on the most significant vulnerabilities using the most effective interventions.

The report gives policymakers a survey of current supply chain resilience interventions and draws out lessons from those policies. What makes for a good transparency intervention? What things should policymakers keep in mind when devising an industrial intervention? What is the value of alternative trade agreements? It is hoped that in discussing current interventions, policymakers can draw inspiration from these experiments and, ideally, bring the best these policies have to offer to the drawing boards of their respect systems.

To catalyze those efforts, the report proposes a new model for supply chain resilience, the Security and Trade Agreement for Resilience. The STAR intentionally builds on some of the most useful interventions being currently deployed to respond to the specific vulnerabilities identified by the Checklist in a way which is comprehensive, collaborative, and effective. But the STAR is merely one idea in a constellation of new supply chain resilience policies. Going forward, policymakers can use this manual to chart their own course away from the shoals of vulnerability and towards the smooth seas of supply chain resilience.

APPENDIX I: ARE RESILIENCE AND EFFICIENCY REALLY MUTUALLY EXCLUSIVE?

In the interest of simplicity, this report has argued for tension between supply chain resilience and efficiency. For every marginal investment in, or intervention for, resilience, there is a corresponding decrease in supply chain efficiency and vice versa. Prior to the pandemic, the existence of a supply chain which had concentrated nearly the entire world's production of certain medical gloves in China was rarely questioned. Such a supply chain provided serious cost savings. It was efficient. But as the shock of COVID-19 revealed, such a concentrated supply chain for gloves (and other PPE) was vulnerable to disruption. To make this supply chain more resilient by diversification or reshoring would be to make it less efficient: the advantages of concentrated production plus the cost savings (including from unfair labor and environmental arbitrage) would be lost.

Policymakers looking to build resilience into a vulnerable supply chain should recognize that trade-off. Overkill in favor of resilience can reduce societal well-being through lost efficiency. And overkill in favor of efficiency reduces societal well-being through lost resilience; it preserves vulnerability in the supply chain. But this trade-off is most stark in the short-term. This is because, in the short-term, building resilience inherently alters the current direction of the market, which is, by its nature, oriented towards efficiency—the very act of intervening in favor of resilience pulls the market in a direction it has not chosen to go. And while policymakers generally inhabit the short-term when balancing trade-offs, it is important to recognize that when taking a longer-term view, resilience and efficiency do not need to be mutually exclusive. In fact, there are policies which can promote both efficiency and resilience.

Consider this theoretical scenario. Country A is the most efficient producer of good X. A firm in Country B uses X to produce a final product, Y. Also assume that Country A is unable to produce Y (because it lacks the technology, or it is too costly) and has a non-concentrated market of firms producing X. In that scenario, because there are many firms in Country A producing X (call them A1, A2, A3, etc), the firm in Country B can easily switch between them when it becomes advantageous to switch suppliers. If the firm in Country B has a contract to buy X from A1, it can easily switch to sourcing from A3 when A3 offers better terms. In this way, the firm in Country B can be said to be resilient—it has a multitude of suppliers for its key input—and efficient—competition between those multiple suppliers lowers costs for the firm in Country B. In the immediate term, a policymaker in Country B may worry about the vulnerability posed by reliance on Country A for X, but over the longer term—and so long as Country A is an ally with a competitive market—policymakers in Country B can be safe knowing that their choice to let efficiency reign has ensured a resilient outcome.

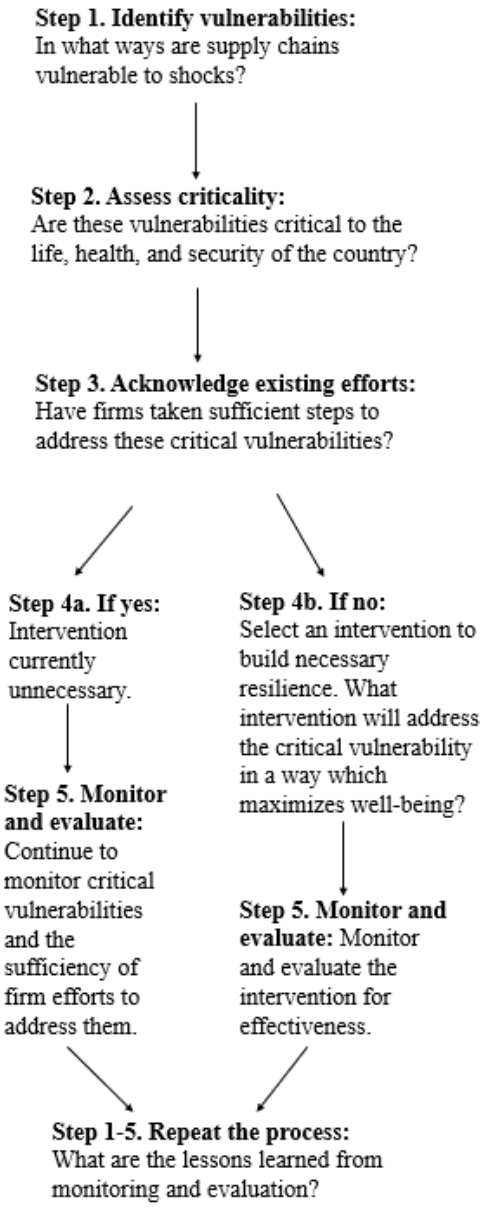
There are practical examples as well. Efficiency gains from trade can improve resilience through diversification over time. Similarly, the efficient allocation of capital can also promote resilience by helping to move resources to where they're needed in a crisis. The Singapore Trade Data Exchange is a policy designed to build resilience, but it also will likely yield efficiency gains by giving member firms timely information about the movement of markets and goods. Technology, too, can help resolve the tension between resilience and efficiency. Additive manufacturing is efficient because it negates the advantages some foreign locales have in terms of labor costs (to 3D print costs the same in China as it does in the United States) and shortens delivery times to the consumers benefit. Yet it also promotes resilience because it can reduce overreliance on foreign sources through manufacturing reshoring. By 2060,

additive manufacturing could reduce global trade by 25 percent as firms use its efficiency gains to localize production.[426]

Just as there can be efficiency gains from building resilience and vice versa, there are also efficiency *losses* from failure to make supply chains resilient. Supply chain shocks are a fact of life. By disrupting supply chains, shocks impose their own costs and inefficiencies. The trade-off between efficiency and resilience is most stark in the short-term when there are no disruptions, but when a shock does occur the lack of resilience is costly. In that sense, it is nearly always desirable to make some base-line investment in resilience to protect the efficient operation of the market during a period of crisis.

[426] Alexsandra Gadzala, *3D Printing: Shaping Africa's Future*, Atlantic Council (2018), https://www.jstor.org/stable/resrep17104.

APPENDIX II: THE SUPPLY CHAIN RESILIENCE CHECKLIST



Step 1: Identify Vulnerabilities

- Which imported goods are highly concentrated? Of those goods, which are imported from countries holding the majority share of global exports of that good?
- Which highly concentrated imports are produced in open societies? Which highly concentrated imports are produced in strategic competitors or adversaries?
- Which imported goods are comprised of inputs produced by countries that are the dominant producer of those inputs? Which inputs are produced by strategic competitors or adversaries? What are the sources of inputs of inputs?
- Which goods are most susceptible to supply shortages because of spikes in demand (from the most likely shocks)?

Step 2: Assess Criticality

- Would disruptions in the supply of this good threaten the life and health of citizens, or degrade the general functioning of the economy?
- For which goods would a supply chain disruption undermine national security, including in terms of the ability to successfully defeat military threats, or present an opportunity for interference or coercion by foreign powers?
- For which goods would a supply chain disruption undermine national competitiveness, for example, in terms of the economy's innovativeness or other non-military sources of power?
- Would disruptions greatly reduce the well-being of certain communities or the competitiveness of sectors key to economic growth overall?

Step 3: Acknowledge Existing Efforts

- Have firms identified these critical vulnerabilities on their own? Is the appetite for risk of those firms equal to the appetite for risk by the society at large?
- Have firms taken sufficient steps to address these critical vulnerabilities on their own?
- What are the reasons firms have failed to build supply chain resilience on their own?

Step 4a: Do nothing

- Are you sure?

Step 4b: Select an Intervention

- Is the vulnerability due to firms' inability to coordinate during a crisis?
- Is the vulnerability due to firms' (or government's) lack of knowledge about the extent to which supply chains are exposed to risk, and the location of that risk?
- For the good in question, can the vulnerability be addressed by expanding the sources of imports from countries that are not strategic competitors or adversaries?
- Can the vulnerability be addressed by increasing imports of substitutes for the good in question?
- Can the vulnerability be addressed by expanding the destinations for exports of the good in question?
- Can the vulnerability be addressed by decreasing imports from existing sources (e.g. tariffs or other trade restrictions) so as to relatively make alternative sources of imports more competitive?
- To what extent must the economy produce the good domestically because it cannot rely on foreign sources? How much more resilience would be created for the public cost of such onshoring?

- Can public procurements stimulate sufficient demand to support investments in domestic production in ways that reduce a given vulnerability?
- Are there regulations that make it difficult for firms to pursue resilience on their own, by diversifying sources of expanding production domestically? How should those regulations be changed to make it easier for firms to build resilience in those ways?
- If subsidies are granted, will those subsidies build additional resilience capabilities beyond what the economy currently possesses? Is the project economically viable without subsidies within a reasonable frame of time?

Step 5: Monitor and Evaluate

- Is the good in question still vulnerable?
- Is it still critical?

APPENDIX III: RESILIENCE INTERVENTIONS BY OPEN SOCIETIES

Open Society	Transparency	Diversification	Industrial
Australia	• Supply Chain Resilience Initiative (with the UK)	• Economic Cooperation and Trade Agreement (with the India) • Supply Chain Resilience Initiative (with India and Japan)	• Semiconductor investments • Sovereign Manufacturing Capability Plans • Modern Manufacturing Initiative • Strengthening procurement
EU	• Single Market Emergency Instrument		• Semiconductor investments • Critical minerals strategy
India		• Economic Cooperation and Trade Agreement (with Australia) • Supply Chain Resilience Initiative (with Australia and Japan) • India-Middle East Food Corridor (with Israel)	
Israel		• FTA with United Arab Emirates • India-Middle East Food Corridor (with India)	
Japan	• World's first economic security minister	• Supply Chain Resilience Initiative (with Australia, Japan)	• Semiconductor investments • Program for Promoting Investment in Japan to Strengthen Supply Chains (to return production to Japan)

			• Program for Strengthening Supply Chains (investment can be used to move anywhere out of China not just back to Japan) • Japan's economic security legislation (supply chain resilience subsidies)
New Zealand		• New Zealand-Singapore bespoke agreement	
Singapore	• Trade Data Exchange • Supply Chain 3.0 Initiative/Control Tower	• New Zealand-Singapore bespoke agreement	
South Korea			• Semiconductor investments • Diversification subsidies
UK	• Project Defend • Supply Chain Resilience Initiative (with Australia)	• Post-Brexit FTAs •	• Semiconductor investments • CLIMATES initiative for critical minerals
U.S.	• 100-day Supply Chain Review	• Indo-Pacific Economic Framework • Mineral Security Partnership • Tariff relief on medical products	• Semiconductor investments • Make PPE in America Act • Build America, Buy America Act • National Technology and Industrial Base expansion to New Zealand

APPENDIX IV: THE STAR CHART

The proposed attributes of the new Security and Trade Agreement for Resilience (STAR) are as follows.

Diversification Interventions

- tariff reductions (w/ strong rules of origin) on products which are critically vulnerable for STAR parties
- reduction of non-tariff barriers to trade in critically vulnerable products
- trade facilitation and trade recovery provisions
- short-supply priority for STAR parties

Industrial Interventions

- requirement for STAR parties to invest annual sums in resilience enhancing industrial capabilities

Transparency Interventions

- vigilance mode to review products subject to the STAR's liberalization rules and serve as an early warning system for emerging threats to supply chain resilience
- multi-stakeholder supply chain stress tests

Non-Market Autocracy Provisions

- limits on the amount of non-market economy content which can be considered originating for rules of origin for goods receiving tariff cuts
- rules to ensure subsidies and incentivizes provided pursuant to the agreement do not benefit persons and entities affiliated with non-market economies
- permission to account for third-country, upstream subsidies in national trade remedy proceedings.
- cooperation to challenge subsidies by non-market autocracies
- strong labor and environmental rules

Security Provisions

- alignment and information sharing on export controls, sanctions, and investment screening measures
- streamlined processes for arms sales among the parties

BIBLIOGRAPHY

Akihiro Furusho, Japan, the US, and the Quest for Secure Supply Chains, The Diplomat July 30, 2021).

Alan O. Sykes, Short Supply Conditions and the Law of International Trade: Economic Lessons from the Pandemic, 114 AM. J. INT'L. L. 647-656 (2020).

Alexandra Alper, U.S, E.U will seek to head off subsidy race over chip production, official says, Reuters (May 16, 2022), https://www.reuters.com/technology/us-eu-will-seek-head-off-subsidy-race-over-chip-production-official-says-2022-05-16/.

Alexandra Helfgott and Duncan Wood, Of Swans and Rhinos: Building Resilience in the Semiconductor Supply Chain, Wilson Center for International Studies 15 (2022), https://www.wilsoncenter.org/sites/default/files/media/uploads/documents/Swans%20and%20Rhinos%20WEB.pdf.

Alexsandra Gadzala, 3D Printing: Shaping Africa's Future, Atlantic Council (2018), https://www.jstor.org/stable/resrep17104.

Amir Qamar, Simon Collinson, and Anne Green, Covid-19 Disruption, Resilience, and Industrial Policy, Regional Studies (2022).

Amitendu Palit, The Resilient Supply Chain Initiative: Reshaping Economics Through Geopolitics, The Diplomat (Sept. 10, 2020).

Andrew Coleman, Dave Maré, and Guanyu Zheng, New Jobs, Old Jobs: The Evolution of Work in New Zealand's Cities and Towns, New Zealand Productivity Commission (2019), available at https://www.productivity.govt.nz/assets/Documents/bcea812a17/New-jobs-old-jobs-Working-paper.pdf.

Andrew Dowse and John Blackburn, Improving Supply Chain Resilience Through Preparedness, 16 Security Challenges 90 (2020).

Australian-European Union Free Trade Agreement, https://www.dfat.gov.au/trade/agreements/negotiations/aeufta#:~:text=Australia%20and%20the%20European%20Union,GDP%20of%20US%2416.6%20trillion (last visited July 16, 2023).

AUSTRALIAN GOVERNMENT, FOOD AND BEVERAGE: NATIONAL MANUFACTURING PRIORITY ROAD MAP (2021).

AUSTRALIAN GOVERNMENT, MAKE IT HAPPEN: THE AUSTRALIAN GOVERNMENT'S MODERN MANUFACTURING STRATEGY (2020).

AUSTRALIAN GOVERNMENT, MEDICAL PRODUCTS: NATIONAL MANUFACTURING PRIORITY ROADMAP (2021).

AUSTRALIAN GOVERNMENT, RECYCLING AND CLEAN ENERGY: NATIONAL MANUFACTURING PRIORITY ROAD MAP (2021).

AUSTRALIAN GOVERNMENT, RESOURCES TECHNOLOGY AND CRITICAL MINERALS PROCESSING: NATIONAL MANUFACTURING PRIORITY ROADMAP (2021).

AUSTRALIAN GOVERNMENT, SOVEREIGN MANUFACTURING CAPABILITY PLAN: TRANCHE 1 (2021).

AUSTRALIAN GOVERNMENT, SOVEREIGN MANUFACTURING CAPABILITY PLAN: TRANCHE 2 (2021).

AUSTRALIAN GOVERNMENT, SPACE: NATIONAL MANUFACTURING PRIORITY ROAD MAP (2021).

Australia-India Comprehensive Economic Cooperation Agreement (CECA), https://www.dfat.gov.au/trade/agreements/negotiations/aifta/australia-india-comprehensive-economic-cooperation-agreement (last visited July 16, 2023).

Australian Productivity Commission, Vulnerable Supply Chains Study Report (2021) 175, https://www.pc.gov.au/inquiries/completed/supply-chains/report/supply-chains.pdf.

Ayal Kimhi, Food Security in Israel: Challenges and Policies, Shoresh Institution for Socioeconomic Research (Nov. 2022).

Barbara Allen, Broader Outcomes in Procurement Policy – A Case of New Zealand Pragmatism, 21 Journal of Public Procurement 318-341 (2021).

Barry C. Lynn, Why Economists Can't See the Economy, The American Prospect (Mar. 19, 2007), https://prospect.org/features/economists-see-economy/.

Barthelemy Bonadio, Zhen Huo, Andrei A. Levchenko, and Nitya Pandalai-Nayar, Global Supply Chains in the Pandemic, National Bureau of Economic Research Working Paper 27224 (May 2020), https://www.nber.org/system/files/working_papers/w27224/w27224.pdf.

The Berry Amendment, https://www.trade.gov/berry-amendment#:~:text=The%20Berry%20Amendment%20is%20a,reprocessed%2C%20reused%2C%20or%20produced%20in (last visited July 16, 2023).

Beth Baltzan, COVID-19 and the End of Laissez-Faire Globalization, Open Markets Institute (Aug. 5, 2020), https://www.openmarketsinstitute.org/publications/covid-19-and-the-end-of-laissez-faire-globalization.

Beth Baltzan, The Modern Agreement of Amity and Commerce, Open Society Foundations (2020), available at https://www.opensocietyfoundations.org/publications/the-modern-agreement-of-amity-and-commerce-toward-a-new-model-for-trade-agreements.

Beth Baltzan and Jamila Thompson, From the Heartland of Our Nation's Fabric, Office of the U.S. Trade Representative (Mar. 21, 2023), https://ustr.gov/about-us/policy-offices/press-office/blogs-and-op-eds/2023/heartland-our-nations-fabric.

Bradley Martin, Laura H. Baldwin, Paul DeLuca, et al., Supply Chain Interdependence and Geopolitical Vulnerability: The Case of Taiwan and High-End Semiconductors, RAND Corporation (2023), https://www.rand.org/content/dam/rand/pubs/research_reports/RRA2300/RRA2354-1/RAND_RRA2354-1.pdf.

Branko Milanovic, The Clash of Capitalisms, 99 Foreign Affairs (2020).

Brendan Murray, Brexit Costs, Delays Still Weigh on UK Companies: Supply Lines, Bloomberg Law (Jan. 11, 2023), https://news.bloomberglaw.com/international-trade/brexit-costs-delays-still-weigh-on-uk-companies-supply-lines.

Brendan Thomas-Noone, Ebbing Opportunity: Australia and the U.S. National Technology Industrial Base, United States Studies Centre (Nov. 2019).

Britain Unveils $1.2B Strategy to Boost Computer Chip Industry, Associated Press (May 19, 2023), https://apnews.com/article/computer-chips-semiconductor-strategy-britain-75a38608b059773f0c1b130c482df84e.

Brock Williams, Mark Manyin, and Rachel Fefer, Cong. Rsch. Serv., IN11814, Biden Administration Plans for an Indo-Pacific Economic Framework (2022).

Bryan Crutchfield, How 3D Printing Fits Into A Mind Shift In Manufacturing, Forbes (Aug. 10, 2021), https://www.forbes.com/sites/forbesbusinesscouncil/2021/08/10/how-3d-printing-fits-into-a-mind-shift-in-manufacturing/?sh=3906be2e2446.

Bryant Harris, The US is Heavily Reliant on China and Russia for its Ammo Supply Chain. Congress Wants to Fix That, Defense News (June 9, 2022), https://www.defensenews.com/congress/budget/2022/06/08/the-us-is-heavily-reliant-on-china-and-russia-for-its-ammo-supply-chain-congress-wants-to-fix-that/.

Bryce Baschuk, US Manufacturers 'Pumped Up' About Supply-Chain Reshoring Trend, Bloomberg (Nov. 2, 2022), https://www.bloomberg.com/news/articles/2022-11-02/us-manufacturers-pumped-up-about-supply-chain-reshoring-trend?in_source=embedded-checkout-banner.

Build America, Buy America Act—Federal Financial Assistance, https://www.whitehouse.gov/omb/management/made-in-america/build-america-buy-america-act-federal-financial-assistance/ (last visited July 16, 2023).

Carlo Del Ninno, Paul A. Dorosh, and Lisa C. Smith, Public Policy, Markets and Household Coping Strategies in Bangladesh: Avoiding a Food Security Crisis Following the 1998 Floods, 31 World Development 1221-1238 (2003).

Certain Tissue Paper Prods. from China, Inv. No. 731-TA-1070B, USITC Pub. 3758 (Mar. 25, 2005) (Final).

Chad Brown, Four Years into the Trade War, Are the US and China Decoupling?, Peter Institute for International Economies (Oct. 2022), https://www.piie.com/blogs/realtime-economics/four-years-trade-war-are-us-and-china-decoupling.

Charles Finny, Hedging Against Trade Dependency Post-Covid 19, Small States and the New Security Environment (May 10, 2020), https://www.canterbury.ac.nz/media/documents/oexp-arts/research-centres/ssanse/Hedging-against-trade-dependency-post-COVID-19.pdf.

Charles Michel, Remarks at the Bruegal think tank on Strategic Autonomy for Europe (Sept. 28, 2020), https://www.consilium.europa.eu/en/press/press-releases/2020/09/28/l-autonomie-strategique-europeenne-est-l-objectif-de-notre-generation-discours-du-president-charles-michel-au-groupe-de-reflexion-bruegel/.

Cheng Ting-Fang and Lauly Li, The Resilience Myth: Fatal Flaws in the Push to Secure Chip Supply Chains, Financial Times (Aug. 5, 2022), https://www.ft.com/content/f76534bf-b501-4cbf-9a46-80be9feb670c.

China labels India, Australia, Japan supply chain plan as 'artificial' and 'unfavourable' to global economy, South China Morning Post (Apr. 28, 2021).

Christa Tobler, EU corona emergency law: Restrictions on the export of protective equipment, notably from the EU into third countries like Switzerland, EFTA Studies (Mar. 30, 2020), https://www.efta-studies.org/_files/ugd/15fad1_e21dbdd78034493dbd22857b4f2da0cd.pdf.

Christian Davies and Song Jung-a, South Korea's Trade Minister Says Supply Chain Resilience Must Be Post-Pandemic Focus, Financial Times (Dec. 29, 2021), https://www.ft.com/content/72976edc-beae-4a43-b504-5271fe07b2ca.

Clyde Prestowitz, The Betrayal of American Prosperity (2010).

C. Tang and B. Tomlin, The power of flexibility for mitigating supply chain risks, 116 Intl. J. of Production Econ.12-27 (2008).

Cynthia Kim, South Korea to Create a Fund to Cope with Supply Chain Challenges, Reuters (Feb. 14, 2022).

Daniel F. Runde and Sundar R. Ramanujam, Recovery with Resilience Diversifying Supply Chains to Reduce Risk in the Global Economy, Center for Strategic and International Studies (2020), https://www.jstor.org/stable/resrep26011.

Daniel Thomas, UK manufacturers 'reshore' supply chains after pandemic and Brexit, Financial Times (May 15, 2022).

David Adler, Why ‘Economic Security’ Became Magic Words in Japan, Foreign Policy (Jan. 20, 2023), https://www2.itif.org/2023-Adler-economic-security-article.pdf.

David Dollar, The Future of Asia-Pacific Value Chains in USMCA Forward 2023, Brookings Institution (2023), https://www.brookings.edu/wp-content/uploads/2023/03/USMCA-Forward-2023.pdf.

David Parker, Remarks to the Trade for All Advisory Board on the State of International Trade (July 23, 2020) (transcript available at https://www.beehive.govt.nz/speech/trade-all-and-state-international-trade).

David Shepardson, White House taps Commerce official to run 'Made in America' office, Reuters (Oct. 12, 2022), https://www.reuters.com/world/us/white-house-taps-commerce-official-run-made-america-office-2022-10-12/.

David Simchi-Levi and Edith Simchi-Levi, We Need a Stress Test for Critical Supply Chains, Harvard Business Review (Apr. 2020), https://hbr.org/2020/04/we-need-a-stress-test-for-critical-supply-chains.

David Simchi-Levi and Pierre Haren, How the War in Ukraine Is Further Disrupting Global Supply Chains, Harvard Business Review (Mar. 17, 2022), https://hbr.org/2022/03/how-the-war-in-ukraine-is-further-disrupting-global-supply-chains.

David Skilling, Supply chains to the last bus stop on the planet: An international perspective on strengthening New Zealand’s supply chain resilience, Prepared for the New Zealand Productivity Commission (2022), https://www.productivity.govt.nz/assets/Inquiries/resilience/Supply-chains-to-the-last-bus-stop-on-the-planet.pdf.

Dennis Carey, Brian Dumaine, Michael Useem, and Rodney Zemmel, Why CEOs Should Push Back Against Short-Termism, Harvard Business Review (May 31, 2018), https://hbr.org/2018/05/why-ceos-should-push-back-against-short-termism.

DEPARTMENT FOR BUSINESS, ENERGY, AND INDUSTRIAL STRATEGY, CRITICAL MINERALS REFRESH: DELIVERING RESILIENCE IN A CHANGING GLOBAL ENVIRONMENT (2023), available at https://www.gov.uk/government/publications/uk-critical-mineral-strategy/critical-minerals-refresh-delivering-resilience-in-a-changing-global-environment-published-13-march-2023#contents.

Derek Scissors, The First Step in Improving Supply Chains, American Enterprise Institute (2022), https://www.aei.org/wp-content/uploads/2022/07/The-First-Step-in-Improving-Supply-Chains.pdf?x91208.

Dollar & Sense, Sen. Rob Portman on the Importance of a Fair Global Trading System, (Oct. 28, 2019), https://www.brookings.edu/wp-content/uploads/2019/10/DollarAndSense_SenatorRobPortman_Transcript.pdf.

Douglas A. Irwin, The Welfare Cost of Autarky: Evidence from the Jeffersonian Trade Embargo, 1807-1809, NBER Working Paper No. w8692 (2001).

Duncan Wood, Cordell Hull, and Jasper Jung, Confronting Challenges in Supply Chain Policy, 46 Wilson Quarterly (2022).

E. Brandon-Jones, B. Squire, et al, A Contingent Resource-based Perspective of Supply Chain Resilience and Robustness, 50 Journal of Supply Chain Management 55-73 (2014).

Edward Attwood, Swine flu highlights need for logistics resilience, Logistics Middle East (April 30, 2009), https://www.logisticsmiddleeast.com/supply-chain/article-2123-swine-flu-highlights-need-for-logistics-resilience.

Eileen Yu, Singapore officially launches digital platform to ease supply chain data flow, ZDNet (June 2, 2022), https://www.zdnet.com/article/singapore-officially-launches-digital-platform-to-ease-supply-chain-data-flow/.

Eileen Yu, Singapore to pilot common data platform in bid to plug supply chain gaps, ZDNet (Nov. 17, 2020), https://www.zdnet.com/article/singapore-to-pilot-common-data-platform-in-bid-to-plug-supply-chain-gaps/.

Elizabeth Brotherton-Bunch, Extending Tariff Exclusions on Face Masks and Medical Goods Gives China an Unfair Advantage, Alliance for American Manufacturing (June 1, 2022), https://www.americanmanufacturing.org/blog/biden-administration-gives-china-an-edge-by-extending-tariff-exclusions-on-face-masks-and-medical-goods/.

Emma Gleason, Everything You Need To Know About New Zealand's CO2 Shortage, NZ Herald (Feb. 28, 2023), https://www.nzherald.co.nz/viva/food-drink/everything-you-need-to-know-about-new-zealands-co2-shortage/NVD7HD4UHVFSLEKJEA7UVSQLEI/.

Eric Berger, Why is there a baby formula shortage in the US, and what can parents do?, The Guardian (May 18, 2022), https://www.theguardian.com/us-news/2022/may/18/baby-formula-shortage-why-is-there-none-what-to-do-causes-explained.

Eric Hamilton, The Global Supply Chain Consequences of the Russia-Ukraine War, (Feb 21, 2023), https://news.ufl.edu/2023/02/russia-ukraine-global-supply-chain/.

EU Conflict Minerals Regulation vs. U.S. Dodd-Frank Act Section 1502, Source Intelligence (Aug. 8, 2022), https://blog.sourceintelligence.com/blog/eu-conflict-minerals-vs-us-dodd-frank-act-section-1502.

EUROPEAN COMMISSION, A NEW INDUSTRIAL STRATEGY FOR EUROPE (2020).

EUROPEAN COMMISSION, CRITICAL RAW MATERIALS RESILIENCE: CHARTING A PATH TOWARDS GREATER SECURITY AND SUSTAINABILITY (2020).

Exec. Order No. 14,017, available at https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/24/executive-order-on-americas-supply-chains/.

Farok Contractor, The World Economy Will Need Even More Globalization in the Post-Pandemic 2021 Decade, 53 Journal of International Business Studies 159 (2022).

Fortnightly Economic Update, New Zealand Treasury 2 (Feb 17, 2023), https://www.treasury.govt.nz/sites/default/files/2023-02/feu-17feb2023.pdf.

Free Trade Agreements Concluded but Not in Force, https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-concluded-but-not-in-force/ (last visited July 16, 2023).

Free Trade Agreements Under Negotiation, https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-under-negotiation/ (last visited July 16, 2023).

Gary P. Pisano and Willy C. Shih, Restoring American Competitiveness, Harvard Business Review (July-Aug. 2009), https://hbr.org/2009/07/restoring-american-competitiveness.

Gavin Evans, Taupo Lithium Resource Potentially Economic – GNS, Scoop News (May 29, 2019), https://www.scoop.co.nz/stories/BU1905/S00860/taupo-lithium-resource-potentially-economic-gns.htm.

Gene Grossman, Elhanan Helpman, Hugo Lhuillier, Supply Chain Resilience: Should Policy Promote Diversification or Reshoring?, National Bureau of Economic Research Working Paper 29330 (Oct. 2021), https://www.nber.org/system/files/working_papers/w29330/w29330.pdf.

Georgina Hutton and Andrew Powell, UK Supply Chain Problems, House of Commons Library Research Briefing No. CBP 9350 (Oct. 22, 2021), https://researchbriefings.files.parliament.uk/documents/CBP-9350/CBP-9350.pdf.

Giorgia Giovannetti, Michele Mancini, Enrico Marvasi, and Giulio Vannelli, The Role of Global Value Chains in the Pandemic: Impact on Italian Firms, Confindustria Servizi (2020), available at https://www.confindustria.it/wcm/connect/6140eed7-5828-4733-af7e-69436b9a41e0/English+version_Giovannetti_et_al_RPE_n2_2020_Confindustria.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE-6140eed7-5828-4733-af7e-69436b9a41e0-nyjgcZy.

Han-Koo Yeo and Wendy Cutler, Strengthening Regional Supply Chain Resiliency Through the Indo-Pacific Economic Framework, Asia Society Policy Institute (May 2023), https://asiasociety.org/sites/default/files/2023-05/ASPI_RegSupplyChain_issuepaper_finalize.pdf.

Hannah Northey, The Diplomat Securing Responsibly Sourced Critical Minerals, Politico (Jan. 25, 2023), https://www.politico.com/newsletters/the-long-game/2023/01/25/the-diplomat-securing-responsibly-sourced-critical-minerals-00079397.

Hearing on the Chinese Communist Party's Threat to America, 118th Cong. (2023) (statement of Matthew Pottinger, China Program Chairman, Foundation for the Defense of Democracies), available at

https://docs.house.gov/meetings/ZS/ZS00/20230228/115402/HHRG-118-ZS00-Wstate-PottingerM-20230228.pdf.

Hearing on the Chinese Communist Party's Threat to America, 118th Cong. (2023) statement of Scott. N. Paul, President, Alliance for American Manufacturing), available at https://docs.house.gov/meetings/ZS/ZS00/20230228/115402/HHRG-118-ZS00-Wstate-PaulS-20230228.pdf.

Hearing on COVID-19 Part II: Evaluating the Medical Supply Chain and Pandemic Response Gaps, 117th Cong. (2021) (statement of Kimberly Glas, President, National Council of Textile Organizations), available at https://www.hsgac.senate.gov/wp-content/uploads/imo/media/doc/Testimony-Glas-2021-05-19.pdf.

Hearing on The Promise and Challenge of Strategic Trade Engagement in the Indo-Pacific Region, 117th Cong. (2022) (statement of Kelly Ann Shaw, Partner, Hogan Lovells), available at https://www.finance.senate.gov/imo/media/doc/Shaw.Testimony.SFC.Mar15.2022.fin.pdf.

Heidi M. Peters and Luke A. Nicastro, Cong. Rsch. Serv., IF11311, Defense Primer: The National Technology and Industrial Base (2023).

Helen Davidson and Julian Borger, China could mount full-scale invasion by 2025, Taiwan defence minister says, The Guardian (Oct. 6, 2021), https://www.theguardian.com/world/2021/oct/06/biden-says-he-and-chinas-xi-have-agreed-to-abide-by-taiwan-agreement.

Holly Williams, UK firms overhaul supply chains after Brexit and pandemic cause havoc – ONS, The Independent (Mar. 8, 2022).

India, Australia free trade agreement to come into force from December 29, The Economic Times (Nov. 30, 2022), https://economictimes.indiatimes.com/news/economy/foreign-trade/india-australia-free-trade-agreement-to-come-into-force-from-december-29/articleshow/95879168.cms.

India & FTA: Series of Bilateral Deals to Pump Up Supply Chains, Newswire (April 28, 2022), https://www.newswire.lk/2022/04/28/india-fta-series-of-bilateral-deals-to-pump-up-supply-chains/.

Indo-Pacific Economic Framework for Prosperity, https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-under-negotiation/indo-pacific-economic-framework-for-prosperity/ipef-overview/ (last visited July 16, 2023).

Indo-Pacific Economic Framework holds value, but it's unclear if it will counter China's influence says Senior Economist David Dapice, https://ash.harvard.edu/indo-pacific-economic-framework-holds-value-it%E2%80%99s-unclear-if-it-will-counter-china%E2%80%99s-influence (last visited July 16, 2023).

Infrastructure Investment and Jobs Act, Pub. L. No. 117-58.

INTERATIONAL MONETARY FUND, TRANSPARENCY (2001), available at https://www.imf.org/external/np/exr/ib/2001/042601b.htm.

INTERNATIONAL MONETARY FUND, WORLD ECONOMIC OUTLOOK (APR. 2022).

Ioanna Falagara Sigala, Mikhail Sirenko, Tina Comes, and Gyöngyi Kovács, Mitigating personal protective equipment (PPE) supply chain disruptions in pandemics – a system dynamics approach, 42 Intl. J. of Operations. & Production. Mgmt. 128-154 (2022).

Ismail Golgeci, Harun Emre Yildiz and Ulf Andersson, The Rising Tensions Between Efficiency and Resilience in Global Value Chains in the Post-COVID-19 World, 27 Transnational Corporations (2020).

Isobel Asher Hamilton, Here Are All the Big Companies That Have Cut Ties With Huawei, Dealing the Chinese Tech Giant a Crushing Blow, Business Insider (Jun. 19, 2019), https://www.businessinsider.com/all-the-companies-that-have-cut-ties-with-huawei-2019-5.

Izumi Koyu, Chihara Takahiro, Hirosaki Takuto, et al., Japan's Economic Security Promotion Act: Background and Overview, 29 Asia-Pacific Review 28-55 (2022).

Jagannath Panda, The Structural Limits of the Supply Chain Resilience Initiative, Pacific Forum (July 8, 2021), https://pacforum.org/wp-content/uploads/2021/07/PacNet31.2021.07.08.pdf.

Jai S. Mah, Industrial Policy and Economic Development: Korea's Experience, 41 Journal of Economic Issues (2007).

Jake Sullivan, Remarks at the Brookings Institution on Renewing American Economic Leadership (Apr. 27, 2023) (transcript available at https://www.whitehouse.gov/briefing-room/speeches-remarks/2023/04/27/remarks-by-national-security-advisor-jake-sullivan-on-renewing-american-economic-leadership-at-the-brookings-institution/).

James A. Lewis, Implementing Supply Chain Resiliency, Center for Strategic and International Studies (2021) 1, https://www.jstor.org/stable/resrep37713.

James M. Inhofe National Defense Authorization Act for Fiscal Year 2023, Pub. L. No. 117-263.

Jamie Dimon and Warren Buffett, Short-Termism Is Harming the Economy, Wall Street Journal (June 6, 2018), https://www.wsj.com/articles/short-termism-is-harming-the-economy-1528336801.

János Allenbach-Ammann, LEAK: EU Council legal opinion slams Single Market Emergency Instrument, Euractiv (Apr. 5, 2023), https://www.euractiv.com/section/economy-jobs/news/leak-eu-council-legal-opinion-slams-single-market-emergency-instrument/.

J.G. March and Z. Shapira, Managerial Perspectives on Risk and Risk Taking, 33 Mgmt. Science 1404-1418 (1987).

Jillian Deutsch, EU Will Propose Crisis Tool for Supply Chain Emergencies, Bloomberg (Sept. 1, 2022).

Jillian Deutsch and Jorge Valero, EU Nations Warn Brussels Over Crisis Plan for Supply-Chain Gaps, Bloomberg (June 8, 2022).

Jim Zarroli, China Churns Out Half The World's Steel, And Other Steelmakers Feel Pinched, National Public Radio (Mar. 8, 2018), https://www.npr.org/2018/03/08/591637097/china-churns-out-half-the-worlds-steel-and-other-steelmakers-feel-pinched.

Joanne Abel Goldman, The U.S. Rare Earth Industry: Its Growth and Decline, 26 Journal of

Policy History 139-166 (2014).

Joanna Prendergast and Lucinda Jose, AdBlue supply fears as clock ticks on Australian

production, ABC Midwest & Wheatbelt (Jul 4, 2022), https://www.abc.net.au/news/2022-07-04/adblue-fears-with-australian-manufacturing-to-cease/101197454.

Joe Berti, The Supply Chain Battles Back: Building Resilient, Flexible Supply Chains in the Post-Covid Era, 75 Plant Engineering (2021).

John Jackson, State Trading and Non-Market Economies 23 INT'L LAW 891–93 (1989).

John Reid, Matthew Rout, Jason Paul Mika, Mapping the Māori Marine Economy, Sustainable Seas National Science Challenge (2019), https://www.sustainableseaschallenge.co.nz/assets/dms/Reports/Mapping-the-Maori-marine-economy/MME20JMika20Mapping20the20Maori20Marine20Economy20LR_0.pdf.

Joint Ministerial Statement affirming commitment to ensuring supply chain connectivity amidst the COVID-19 situation – updated, https://www.mfat.govt.nz/en/trade/covid-19-and-trade/joint-ministerial-statement-affirming-commitment-to-ensuring-supply-chain-connectivity-amidst-the-covid-19-situation-updated/ (last visited July 16, 2023).

JOINT STANDING COMMITTEE ON FOREIGN AFFAIRS, DEFENCE AND TRADE, INQUIRY INTO THE IMPLICATIONS OF THE COVID-19 PANDEMIC FOR AUSTRALIA'S FOREIGN AFFAIRS, DEFENCE AND TRADE (2020), available at https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Foreign_Affairs_Defence_and_Trade/FADTandglobalpandemic/Report.

Joseph A. LaNasa III, Rules of Origin and the Uruguay Round's Effectiveness in Harmonizing and Regulating Them, 90 AM. J. INT'L. L. 625-640 (1996).

Jude Chan, Singapore launches trade data sharing platform to cut supply chain inefficiencies, rebuild trust, The Business Times Singapore (June 1, 2022), https://www.businesstimes.com.sg/companies-markets/energy-commodities/singapore-launches-trade-data-sharing-platform-cut-supply.

Julian Adorney, Want peace? Promote free trade, Hinrich Foundation, Sept. 2020, available at https://www.hinrichfoundation.com/research/tradevistas/sustainable/trade-and-peace/

Jung Suk-yee, Korean Government Announces a New Supply Chain Strategy, Business Korea (Nov. 24, 2022), http://www.businesskorea.co.kr/news/articleView.html?idxno=104701.

Justin Badlam, Stephen Clark, Suhrid Gajendragadkar, et al, The CHIPS and Science Act: Here's What's In It, McKinsey & Co. (Oct. 4, 2022), https://www.mckinsey.com/industries/public-sector/our-insights/the-chips-and-science-act-heres-whats-in-it#/.

Karen M. Sutter, Andres B. Schwarzenberg, and Michael D. Sutherland, Cong. Rsch. Serv., R46304, COVID-19: China Medical Supply Chains and Broader Trade Issues (2020).

Karen M. Sutter, John F. Sargent Jr., Manpreet Singh, Cong. Rsch. Serv., R47558, Semiconductors and the CHIPS Act: The Global Context (2023).

Katharina Längle, Ankai Xu, and Ruijie Tian, Assessing the Supply Chain Effect of Natural Disasters: Evidence from Chinese Manufacturers, WTO Staff Working Papers ERSD-2021-13 (2021).

Katherine Tai, Remarks at the National Press Club on Supply Chain Resilience (June 15, 2023) (transcript available at https://ustr.gov/about-us/policy-offices/press-office/speeches-and-remarks/2023/june/ambassador-katherine-tais-remarks-national-press-club-supply-chain-resilience).

Kathrin Hille and Demetri Sevastopulo, US warns Europe a conflict over Taiwan could cause global economic shock, Financial Times (Nov. 11, 2022), https://www.ft.com/content/c0b815f3-fd3e-4807-8de7-6b5f72ea8ae5.

Kathryn E. Stecke and Sanjay Kumar, Sources of Supply Chain Disruptions, Factors That Breed Vulnerability, and Mitigating Strategies, 16 Journal of Marketing Channels 193-226 (2009).

Katie Rogers and Brad Plummer, Biden Administration Moves to Fix Supply Chain Bottlenecks, N.Y. Times (June 8, 2021), https://www.nytimes.com/2021/06/08/us/politics/biden-supply-chain.html.

Keith B. Belton, Michael Mandel, and Thomas J. Duesterberg, Policies to Enhance the Resilience of U.S. Manufacturing, Indiana University Pub. Pol'y Inst.

Keith Bradsher, China Dominates Medical Supplies, in This Outbreak and the Next, N.Y. Times, July 5, 2020, available at https://www.nytimes.com/2020/07/05/business/china-medical-supplies.html

Kelly Buchanan, New Zealand; Singapore: New Declaration on Trade in Essential Goods for Combating the COVID-19 Pandemic, Library of Congress Global Legal Monitor (Apr. 17,

2020), https://www.loc.gov/item/global-legal-monitor/2020-04-17/new-zealand-singapore-new-declaration-on-trade-in-essential-goods-for-combating-the-covid-19-pandemic/.

Kent Mahoney, Leverage Procurement to Build Resilience, 103 Strategic Finance (2021).

Kevin B. Grier and Michael C. Munger, New Zealand's 1973 experience suggests Brexit will be economically harmful for the foreseeable future, and the losses will not be easily made up, London School of Economics Blog (Sept. 13, 2021), https://blogs.lse.ac.uk/politicsandpolicy/new-zealand-brexit/.

Kim Bo-eun, Can Indo-Pacific Help Korea Reduce Reliance on Chinese Market?, Korea Times (May 21, 2022).

Kim Kyung-ho, Korea's Reshoring Policy Far from Effective, The Korea Herald (Oct. 23, 2017), https://www.koreaherald.com/view.php?ud=20171023000618.

Kirtika Suneja, Oz delegation to focus on agri, critical minerals, infra, The Economic Times (Sept. 25, 2022), https://economictimes.indiatimes.com/news/economy/agriculture/oz-delegation-to-focus-on-agri-critical-minerals-infra/articleshow/94440050.cms?from=mdr.

Koki Shigenoi, Economic Zeitenwende? Lessons from Japan's Economic Security Policy, 49 Security, https://fourninesecurity.de/2022/12/07/economic-zeitenwende-lessons-from-japans-economic-security-policy.

Kristalina Georgieva and Ngozi Okonjo-Iweala, World Trade Can Still Drive Prosperity, International Monetary Fund, June 2023, available at https://www.imf.org/en/Publications/fandd/issues/2023/06/world-trade-can-still-drive-prosperity-georgieva-okonjo-iweala.

Laos—Country Commercial Guide, https://www.trade.gov/country-commercial-guides/laos-trade-barriers?navcard=11879 (last visited July 11, 2023).

Letter from Robert Casey, Senator, et al. to Katherine Tai, U.S. Trade Representative (Sept. 10, 2021), available at https://www.casey.senate.gov/imo/media/doc/letter_to_ustr_tai_on_rules_of_origin_for_nmes2.pdf.

Letter from Rob Portman, Senator, et al. to Brian Deese, Director of the National Economic Council (Feb. 2. 2021), available at https://www.brown.senate.gov/imo/media/doc/210128%20-%20SemiconductorLetter.pdf.

Letter from Rob Portman, Senator, et al. to Ellen Lord, Under Secretary of Defense for Acquisition and Sustainment (June 24, 2020), available at https://www.brown.senate.gov/imo/media/doc/200624%20-%20Letter%20to%20JTAF%20PPE.pdf.

Letter from Rob Portman, Senator, et al. to Gina Raimondo, Secretary of Commerce (May 3, 2020), available at https://www.collins.senate.gov/imo/media/doc/russian_market_economy_letter.pdf.

Letter from Rosa DeLauro, Representative, et al. to Katherine Tai, U.S. Trade Representative, et al. (Aug. 1, 2022), available at https://www.warren.senate.gov/imo/media/doc/DeLauro_Warren_IPEF%20Letter%20Final_8.1.22.pdf.

Lim Min Zhang, S'pore, Australia set up working group to strengthen supply chains, The Straits Times (Oct. 19, 2022).

Livia Dewaele and Rebecca Lucas, Policymaking to Support Resilience in Democratic Countries: An Examination of Sweden, Israel, and Australia, 10 European Journal of Futures Research (2022).

Lou Anne Barclay, The Anatomy of a Failed Industrial Policy: Developing an Aluminium Industry in Trinidad and Tobago, 21 Transnational Corporations (2012).

Louritha Green, Trade Recovery: Laying the Groundwork for the Establishment of a New Zealand-United States Action Plan for Application in the Event of a Serious Trade Disruption, Ian Axford Fellowship Report (2010), https://www.fulbright.org.nz/publications/2010-green/.

Marcin Szczepański, Resilience of Global Supply Chains: Challenges and Solutions, European Parliamentary Research Service 5 (Nov. 2021), https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698815/EPRS_BRI(2021)698815_EN.pdf.

Marco Rubio, Remarks at the Heritage Foundation (Mar 29, 2022) (transcript available at https://www.rubio.senate.gov/public/index.cfm/2022/3/icymi-rubio-speaks-on-the-threat-of-communist-china-at-the-heritage-foundation).

Marco Rubio, Remarks for the Henry Clay Lecture in Political Economy at Hillsdale College's Kirby Center (Dec. 8 2021) (transcript available at https://www.rubio.senate.gov/public/index.cfm/2021/12/rubio-delivers-lecture-on-how-the-bipartisan-economic-consensus-is-destroying-american-greatness).

Maria J. Krol-Sinclair and Thomas Hale, The United States Needs to Innovate New Mineral Production Technologies. Here's One., Center for Strategic and International Studies (Mar. 24, 2023), https://www.csis.org/analysis/united-states-needs-innovate-new-mineral-production-technologies-heres-one

Mark Samuels, How free trade agreements could strengthen our resilience, Confederation of British Industry (Apr. 2022), https://www.cbi.org.uk/articles/how-free-trade-agreements-could-strengthen-our-resilience/#:~:text=Specifically%2C%20free%20trade%20agreements%20could,two%20countries%20for%20many%20medicines.

Mark Wu, The China, Inc. Challenge to Global Trade Governance, 57 Harv. Int'l L.J. 270 (2016).

Markus Brunnermeier, The Resilient Society (2021).

Martin Christopher and Helen Peck, Building the Resilient Supply Chain, 15 INT'L. J. LOG MGMT. 1-14 (2004).

Matthew Reynolds and Matthew P. Goodman, Deny, Deflect, Deter: Counting China's Economic Coercion, Center for Strategic and International Studies 51-62 (2023), https://csis-website-prod.s3.amazonaws.com/s3fs-public/2023-03/230321_Goodman_CounteringChina%27s_EconomicCoercion.pdf?VersionId=UnF29IRogQV4vH6dy6ixTpfTnWvftd6v.

Maya Margit, Emirati Investor: UAE-Israel FTA Will Regrow Ailing Global Supply Chain,

Jerusalem Post (June 2, 2023).

Megan Lamberth, Martijn Rasser, Ryan Johnson, and Henry Wu, The Tangled Web We Wove: Rebalancing America's Supply Chains, Center for New American Security (2022).

Meredith Broadbent, Covid-19 Demand Shock and Preparedness Response Securing Medical Supply Chains: The Trusted Trade Partner Network, Center for Strategic and International Studies (2020), https://www.jstor.org/stable/resrep27598.

Michael Anderson, Martin McKee, Elias Mossialos, Covid-19 Exposes Weaknesses in European Response to Outbreaks, BMJ (2020), available at https://www.bmj.com/content/368/bmj.m1075.full.

Michael Tanchum, The India-Middle East Food Corridor: How the AE, Israel, and India are Forging a New Inter-Regional Supply Chain, Middle East Institute (July 2022), https://www.mei.edu/sites/default/files/2022-07/Tanchum%20-%20India-Middle%20East%20Food%20Corridor.pdf.

Ministerial Text for Trade Pillar of the Indo-Pacific Economic Framework for Prosperity, https://ustr.gov/sites/default/files/2022-09/IPEF%20Pillar%201%20Ministerial%20Text%20(Trade%20Pillar)_FOR%20PUBLIC%20RELEASE%20(1).pdf (last visited June 16, 2023)

MINISTRY OF BUSINESS INNOVATION AND EMPLOYMENT, FUEL SUPPLY RESILIENCE WITHOUT A DOMESTIC OIL REFINERY (2021), available at https://www.mbie.govt.nz/dmsdocument/17733-fuel-supply-resilience-without-a-domestic-oil-refinery-proactiverelease-pdf.

Minkyung Lim and Jina Yeo, Reshoring Pattern-Analysis of China Based Korean Firms and Its Policy Implications, Korean Institute For International Economic Policy (Feb. 6, 2015), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2770207.

Morris Cohen, Shiliang Cui, et el., Bespoke supply-chain resilience: The gap between theory and practice, 68 J. Operations Mgmt. 1 (2022).

MOTIE Announces Amended Cash Grant Program to Attract FDI, Contify Energy News (July 19, 2022).

Nasim Taleb, The Black Swan (2008).

National Mining Association, https://mineralsmakelife.org/policy/?utm_campaign=mml2020&utm_source=search&utm_medium=cpc&utm_content=policy (last visited July 16, 2023).

Neil Gow, New Zealand Government's Involvement In Agriculture – The Road To Non-Sustainability, Lincoln University, available at https://researcharchive.lincoln.ac.nz/bitstream/handle/10182/418/07_N_Gow.pdf.

New Zealand's COVID-19 Trade Recovery Strategy, https://www.mfat.govt.nz/assets/Trade-General/Trade-Recovery-Strategy/Trade-Recovery-Strategy-8.6.20.pdf (last visited July 16, 2023).

New Zealand International Trade, https://statisticsnz.shinyapps.io/trade_dashboard/ (last visited July 11, 2023).

New Zealand wool farmers to lose price support, Agra Europe (Feb. 15, 1991), https://link.gale.com/apps/doc/A10661868/AONE?u=per_tre&sid=bookmark-AONE&xid=0e209b32.

Niels Graham, Trade Facilitation and the Indo-Pacific Economic Framework, Atlantic Council (May 16, 2022), https://www.atlanticcouncil.org/blogs/econographics/trade-facilitation-in-the-indo-pacific-economic-framework/.

Nina Pavcnik, Trade Liberalization, Exit, and Productivity Improvements: Evidence from Chilean Plants, National Bureau of Economic Research Working Paper 7852 (Aug. 2000), https://www.nber.org/system/files/working_papers/w7852/w7852.pdf.

The Oak and the Reed https://aestheticrealism.net/poems/the-oak-and-the-reed-by-jean-de-la-fontaine/ (last visited July 11, 2023).

Operating without Borders – Building Global Resilient Supply Chains, Make UK (May 2022).

ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, COVID-19 AND GLOBAL VALUE CHAINS: POLICY OPTIONS TO BUILD MORE RESILIENT PRODUCTION NETWORKS (2020), available at https://www.oecd.org/coronavirus/policy-responses/covid-19-and-global-value-chains-policy-options-to-build-more-resilient-production-networks-04934ef4/.

ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, COVID-19 AND INTERNATIONAL TRADE: ISSUES AND ACTIONS (2020), available at

https://read.oecd-ilibrary.org/view/?ref=128_128542-3ijg8kfswh&title=COVID-19-and-international-trade-issues-and-actions.

ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, ENHANCING THE CONTRIBUTIONS OF SMES IN A GLOBAL AND DIGITALISED ECONOMY (2017), available at https://www.oecd.org/mcm/documents/C-MIN-2017-8-EN.pdf.

ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT,

MEASURING DISTORTIONS IN INTERNATIONAL MARKETS: THE ALUMINIUM

VALUE CHAIN (2019), available at https://www.oecd-ilibrary.org/docserver/c82911ab-en.pdf?expires=1688945570&id=id&accname=guest&checksum=9D0A4CF03C1111677B3F0312853DE375.

ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, REFORMING PUBLIC PROCUREMENT: PROGRESS IN IMPLEMENTATING THE 2015 OECD RECOMMENDATION 84 (2019).

ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, THE SUPPLY OF CRITICAL RAW MATERIALS ENDANGERED BY RUSSIA'S WAR ON UKRAINE (2022), available https://www.oecd.org/ukraine-hub/policy-responses/the-supply-of-critical-raw-materials-endangered-by-russia-s-war-on-ukraine-e01ac7be/.

Pandemic Prompts Companies to Weigh Reshoring, Korean Joongang Daily (May 10, 2020), https://koreajoongangdaily.joins.com/2020/05/10/finance/company-korean-companies-korea-companies/20200510203500109.html

Paola Mariani, The EU Market in Times of a Global State of Emergency: Internal and External Trade Barriers in the Age of Pandemics, 48 Legal Issues of Economic Integration 7 (2021).

Paul Michelman and Yossi Sheffi, Building a Resilient Supply Chain, Harvard Business Review (Aug. 14, 2007), https://hbr.org/2007/08/building-a-resilient-supply-ch%20May%2011.

Petros C. Mavroidis & Merit E. Janow, Free Markets, State Involvement, and the WTO: Chinese State-Owned Enterprises in the Ring, 16 World Trade Rev. 575 (2017).

P.F. Drucker, Management: Tasks, Responsibilities, Practices (1974).

Philip Garnett, Bob Doherty and Tony Heron, Vulnerability of the United Kingdom's food supply chains exposed by COVID-19, 1 Nature Food 315-318 (June 2020).

Philip Inman, UK joins Asia-Pacific CPTPP trade bloc that includes Japan and Australia, The Guardian (Mar. 31, 2023), https://www.theguardian.com/business/2023/mar/31/uk-joins-asia-pacific-cptpp-trade-bloc-that-includes-japan-and-australia#:~:text=UK%20joins%20Asia%2DPacific%20CPTPP%20trade%20bloc%20that%2

0includes%20Japan%20and%20Australia,-This%20article%20is&text=Britain%20has%20joined%20the%2011,nearly%20two%20years%20of%20negotiations.

Philippe Aghion, Mathias Dewatripont, Luosha Du, Ann Harrison, and Patrick Legros, Industrial Policy and Competition, National Bureau of Economic Research Working Paper 18048 (May 2012), https://www.nber.org/system/files/working_papers/w18048/w18048.pdf.

Phoebe Wall Howard, Miracle in Plymouth: UAW worker celebrates Ford making 1M face shields in 13 days, Detroit Free Press (Apl. 6, 2020), https://www.freep.com/story/money/cars/ford/2020/04/06/ford-uaw-make-million-face-shields-nypd-nyfd/2951650001/.

Pippa Stevens, The ship that blocked the Suez Canal may be free, but experts warn the supply chain impact could last months, CNBC (March 29, 2021), https://www.cnbc.com/2021/03/29/suez-canal-is-moving-but-the-supply-chain-impact-could-last-months.html.

Press Release, Department for Business, Energy, and Industrial Strategy, UK's First Large-scale Merchant Lithium Refinery Announced, (Nov. 7, 2022), https://www.gov.uk/government/news/uks-first-large-scale-merchant-lithium-refinery-announced.

Press Release, Department for Business, Energy, and Industrial Strategy, UK's First Magnet Refinery Given Huge Financial Boost as First Ever Strategy for Supply of Critical Minerals Published, (July 22, 2022), https://www.gov.uk/government/news/uks-first-magnet-refinery-given-huge-financial-boost-as-first-ever-strategy-for-supply-of-critical-minerals-published

Press Release, Department of Business and Trade, £15 Million Funding Boost to Strengthen Supply of Critical Minerals, (Feb. 27, 2023), https://www.gov.uk/government/news/15-million-funding-boost-to-strengthen-supply-of-critical-minerals.

Press Release, Department of Foreign Affairs and Trade, Joint Statement on the Supply Chain Resilience Initiative by Australian, Indian and Japanese Trade Ministers, (Mar. 15, 2022), https://www.dfat.gov.au/news/media-release/joint-statement-supply-chain-resilience-initiative-australian-indian-and-japanese-trade-ministers-0.

Press Release, European Commission, Questions and Answers: Single Market Emergency Instrument (Sept 19, 2022), https://ec.europa.eu/commission/presscorner/detail/en/QANDA_22_5444.

Press Release, Homeland Security and Governmental Affairs Committee, Experts Witnesses Agree with Portman that the United States is too dependent on China for Critical Public Health Supplies (May 19, 2021), https://www.hsgac.senate.gov/media/minority-media/expert-witnesses-agree-with-portman-that-the-united-states-is-too-dependent-on-china-for-critical-public-health-supplies/.

Press Release, SAP News, Supply Chain Crisis: Over 85% Of UK Businesses Plan To Move From 'Just In Time' To 'Just In Case' Model And Prioritise UK-Based Solutions To Overcome Challenges (June 8, 2022), https://news.sap.com/uk/2022/06/supply-chain-crisis-over-85-of-uk-businesses-plan-to-move-from-just-in-time-to-just-in-case-model-and-prioritise-uk-based-solutions-to-overcome-challenges/.

Press Release, U.S. Department of State, Minerals Security Partnership, (June 14, 2022), https://www.state.gov/minerals-security-partnership/.

Press Release, U.S. Trade Representative, Joint Declaration Against Trade-Related Economic Coercion and Non-Market Policies and Practices, (June 9, 2023), https://ustr.gov/about-us/policy-offices/press-office/press-releases/2023/june/joint-declaration-against-trade-related-economic-coercion-and-non-market-policies-and-practices.

Press Release, U.S. Trade Representative, United States-Mexico-Canada Trade Fact Sheet: Rebalancing Trade to Support Manufacturing (Oct. 2018), https://ustr.gov/about-us/policy-offices/press-office/fact-sheets/2018/october/united-states%E2%80%93mexico%E2%80%93canada-trade-fa-0

Press Release, U.S. Trade Representative, USTR Extends Certain COVID-Related Exclusions from China Section 301 Tariffs (May 12, 2023), https://ustr.gov/about-us/policy-offices/press-office/press-releases/2023/may/ustr-extends-certain-covid-related-exclusions-china-section-301-tariffs.

Press Release, World Health Organization, Shortage of Personal Protective Equipment Endangering Health Workers Worldwide (Mar 3, 2020) (https://www.who.int/news/item/03-03-2020-shortage-of-personal-protective-equipment-endangering-health-workers-worldwide).

Raj Bhala, Enter the Dragon: An Essay on China's WTO Accession Saga, 15 Am. U. Int'l L. Rev. 1480 (2000).

Reuters Staff, Factbox: U.S. States Woo Automakers with $17 billion in Subsidies Since 1976, Reuters (Aug. 5, 2017), https://www.reuters.com/article/us-toyota-mazda-jobs-factbox-idUSKBN1AK2BI.

Richard McGregor, Chinese Coercion, Australian Resilience, Lowy Institute (Oct. 20., 2022), https://www.lowyinstitute.org/publications/chinese-coercion-australian-resilience.

Richard Partington and Joanna Partridge, UK plunges towards supply chain crisis due to staff and transport disruption, The Guardian (Aug. 24, 2021).

R. Martin, Regional Economic Resilience, Hysteresis and Recessionary Shocks,12 Journal of Economic Geography 1-32 (2012).

Robert Handfield, We Need Supply Chain Immunity, not Resiliency: A Position Paper, North Carolina State University (2022), https://scm.ncsu.edu/scm-articles/article/we-need-supply-chain-immunity-not-resiliency-a-position-paper.

Robert Lighthizer, Just Say No to Rejoining TPP, American Compass (Mar. 30, 2022), https://americancompass.org/just-say-no-to-rejoining-tpp/.

Rob Portman, Fight to Keep JSMC Open Paying Off, Lima News (Dec. 18, 2016), https://web.archive.org/web/20161220115340/http://limaohio.com/news/219782/portman-fight-to-keep-jsmc-open-paying-off.

Rob Portman, Remarks in the Senate on CHIPS Act Funding (July 19, 2022) (transcript available at https://www.c-span.org/video/?521802-8/sens-portman-cornyn-computer-chip-funding).

Sam Howell, Latin and South America Are a Key to the United States' Critical Minerals Puzzle, The Diplomat (May 5, 2023), https://thediplomat.com/2023/05/latin-and-south-america-are-a-key-to-the-united-states-critical-minerals-puzzle/.

Sam Kim, Korean Calls for Global Network to Cushion Supply Chain Hit, Bloomberg (Mar. 10, 2022).

Sam LaGrone, Milley: China Wants Capability to Take Taiwan by 2027, Sees No Near-term Intent to Invade, USNI News (June 23, 2021), https://news.usni.org/2021/06/23/milley-china-wants-capability-to-take-taiwan-by-2027-sees-no-near-term-intent-to-invade.

Sam Roscoe, Building Supply Chain Resilience: a reflection on 'Project Defend' and the reshoring of manufacturing, UK Trade Policy Observatory (May 28, 2020), https://blogs.sussex.ac.uk/uktpo/2020/05/28/building-supply-chain-resilience-a-reflection-on-project-defend-and-the-reshoring-of-manufacturing/.

Sanna Marin, Prime Minister, Finland, Remarks at the Lowy Institute (Dec. 2, 2022) (transcript available at https://www.lowyinstitute.org/event/sold-out-address-sanna-marin-prime-minister-finland).

Sarah Bianchi, Building Resilient and Secure Supply Chains Through Trade, Office of the U.S. Trade Representative (Apr. 2022), https://ustr.gov/about-us/policy-offices/press-office/blogs-and-op-eds/2022/april/building-resilient-and-secure-supply-chains-through-trade.

Sara Salinas, Six Top U.S. Intelligence Chiefs Caution Against Buying Huawei Phones, CNBC (Feb. 13, 2018), https://www.cnbc.com/2018/02/13/chinas-hauwei-top-us-intelligence-chiefs-caution-americans-away.html.

S. Comm. on Homeland Sec. and Gov. Affairs, 117th Cong., Report on the Federal Government's Pandemic Preparedness and Initial COVID-19 Response (Dec. 2022), https://www.hsgac.senate.gov/wp-content/uploads/imo/media/doc/221208_HSGACMajorityReport_Covid-19.pdf.

Scott Lincicome, Gabriella Beaumont-Smith, and Alfredo Carrillo Obregon, Formula for a Crisis: Protectionism and Supply Chain Resiliency—the Infant Formula Case Study, Cato

Institute Briefing Paper No. 146 (Jan. 11, 2023), https://www.cato.org/briefing-paper/formula-crisis.

Sébastien Miroudot and Håkan Nordström, Made in the World Revisited, RSCAS Applied Network Science Working Paper No. 2019/84, European University Institute (2019), https://cadmus.eui.eu/bitstream/handle/1814/64724/RSCAS%202019_84.pdf?sequence=1.

Sebastien Miroudot, Resilience Versus Robustness in Global Value Chains: Some Policy Implications, Centre for Economic Policy Research (2020), https://cepr.org/voxeu/columns/resilience-versus-robustness-global-value-chains-some-policy-implications.

A series of shortages threatens EU supply chains, The Economist (Nov. 10, 2022),

https://www.economist.com/business/2022/11/10/a-series-of-shortages-threatens-eu-supply-chains.

Sharon See, Supply chain resilience strengthens with ITAP 2021 deals, The Business Times Singapore (Nov. 23, 2021).

Sheila A. Smith, Japan Turns Its Attention to Economic Security, Council on Foreign Relations (May 16, 2022), https://www.cfr.org/blog/japan-turns-its-attention-economic-security.

A Short Note On Public Stockholding, https://unacademy.com/content/railway-exam/study-material/general-awareness/a-short-note-on-public-stockholding/#:~:text=Public%20stockholding%20(PSH)%20is%20a,are%20constantly%20facing%20food%20shortages (last visited July 16, 2023).

Simon J. Evenett and Bernard M. Hoekman, Government Procurement: Market Access, Transparency, and Multilateral Trade Rules, 21 European Journal of Political Economy 182 (2005).

Simon J. Evenett, Flawed prescription: Export Curbs on Medical Goods Won't Tackle Shortages, in COVID-19 AND TRADE POLICY: WHY TURNING INWARD WON'T WORK 91 (Richard E. Baldwin and Simon J. Evenett ed., 2020).

Shin Kawashima, Is Japan Pulling Its Companies out of China?, The Diplomat (May 11, 2020).

Shino Watanabe, Japan's Initiatives to Secure Supply Chains and Its Key Challenges, Italian Institute for International Political Studies (Mar. 17, 2022), https://www.ispionline.it/en/publication/japans-initiatives-secure-supply-chains-and-its-key-challenges-34186.

Shinya Matano, The Impact of China's Industrial Subsidies on Companies and the Response of Japan, the United States, and the European Union, Mitsui & Co. Global Strategic Studies Institute (Jan. 2021),

https://www.mitsui.com/mgssi/en/report/detail/__icsFiles/afieldfile/2021/02/19/2101c_matano_e.pdf.

Single Market Emergency Instrument, https://single-market-economy.ec.europa.eu/single-market/single-market-emergency-instrument_en (last visited July 17, 2022).

Situation and Outlook for Primary Industries, Ministry for Primary Industries (June 2021), https://www.mpi.govt.nz/dmsdocument/45451-Situation-and-Outlook-for-Primary-Industries-SOPI-June-2021.

S. Kumar and C. Chandra, Supply chain disruption by avian flu pandemic for US companies: a case study, 49 Transportation J. 61-73 (2010).

South Korea, https://asiasociety.org/policy-institute/supply-chains-shifting-indo-pacific/south-korea (last visited July 16, 2023).

South Korea Looks to Tap ASEAN Supply Chains as Trade Deficit with China Adds to Worries of Overreliance, South China Morning Post (Nov. 25, 2022).

S. Rept. 114-255—National Defense Authorization Act for Fiscal Year 2017 (2016).

S. Rept. 117-227—BuyAmerican.gov Act of 2021 (2022).

S. Rept. 117-269—Make PPE in America Act (2022).

Staff Writers, Japan reveals 87 projects eligible for 'China exit' subsidies, Nikkei Asia (July 17, 2020), https://asia.nikkei.com/Economy/Japan-reveals-87-projects-eligible-for-China-exit-subsidies.

Stefan Brunnhuber, Open Societies versus Autocratic Experiments or Why the Latter are Parasitic, Cannibalizing and Self-Limiting, 4 CADMUS, 216-225 (2021).

Stefano Elia, Luciano Fratocchi, Paolo Barbieri, Albachiara Boffelli, and Matteo Kalchschmidt, Post-Pandemic Reconfiguration from Global to Domestic and Regional Value Chains: The Role of Industrial Policies, 28 Transnational Corporations (2021).

Stephen Orava, J. Michael Taylor, Christine Savage, et al., Client Alert: Biden Administration Issues 100-Day Supply Chain Review Report, King & Spaulding (June 2021), https://www.kslaw.com/attachments/000/008/838/original/Biden_Administration_Issues_100-Day_Supply_Chain_Review_Report.pdf?1623679538.

Steven R. Phillips, Paul Hemmersbaugh, Matthew Larson, and Ted Loud, Inflation Reduction Act Seeks to Jumpstart Electric Vehicle Market, DLA Piper (Aug 18, 2022), https://www.dlapiper.com/en/insights/publications/2022/08/inflation-reduction-act-seeks-to-jumpstart-electric-vehicle-market.

Story: Sheep Farming, https://teara.govt.nz/en/sheep-farming/page-7 (last visited July 11, 2023).

Sunil Chopra, The Coronavirus Has Upended Supply Chains. Here's How Companies Can Prepare for the Next Disruption, Kellogg Insight (Mar 23, 2020), https://insight.kellogg.northwestern.edu/article/coronavirus-upended-supply-chains-how-companies-can-prepare-disruption

Supply Chain 4.0, https://www.a-star.edu.sg/artc/programmes_initiatives/supplychain, (last visited July 16, 2023).

Supply Chain Resilience Framework, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1118092/dit-supply-chains-resilience-framework.pdf (last visited July 17, 2023).

Takako Gakuto, Japan adds India and Bangladesh to 'China exit' subsidy destinations, Nikkei Asia (Sept. 4, 2020), https://asia.nikkei.com/Economy/Japan-adds-India-and-Bangladesh-to-China-exit-subsidy-destinations.

Tess McClure, Cyclone Gabrielle worst storm to hit New Zealand this century, says PM, The Guardian (Feb. 14, 2023), https://www.theguardian.com/world/2023/feb/13/cyclone-gabrielle-new-zealand-declares-national-state-of-emergency.

Timothy Meyer, Trade Law and Supply Chain Regulation in a Post-COVID-19 World, 114 AM. J. INT'L. L. 637–646 (2020).

Ting Wang, Rujun Wang, and Hua Zhang, Does Industrial Policy Reduce Corporate Investment Efficiency? Evidence from China, 15 Sustainability (2022).

Ting-Wei Chiang, Chinese State-Owned Enterprises and WTO's Anti-Subsidy Regime, 49 GEO. J. INT'L L. 846-886 (2018).

Trade Agreements, https://commerce.gov.in/international-trade/trade-agreements/ (last visited July 17, 2023).

Todo Yasuyuki, Toward Developing Resilient and Innovative Supply Chains, Research Institute of Economy, Trade, and Industry (2022), https://www.rieti.go.jp/en/columns/a01_0704.html.

Tom Edgington, Brexit: What trade deals has the UK done so far?, BBC (Sept. 20, 2022), https://www.bbc.com/news/uk-47213842.

Tommaso Aquilante, Mind the Import Gap: UK Supply Chains in Brexit Times, Industrial Analytics Platform (Dec. 2022), https://iap.unido.org/articles/mind-import-gap-uk-supply-chains-brexit-times.

Trade Facilitation, https://www.oecd.org/trade/resilient-supply-chains/trade-facilitation/ (last visited July 16, 2023).

Trade for All Advisory Board, Trade For All Report, Ministry of Foreign Affairs and Trade (2019), https://www.mfat.govt.nz/assets/Trade-General/Trade-policy/Trade-for-All-report.pdf.

Trade Recovery Strategy 2.0, https://www.mfat.govt.nz/en/trade/trade-recovery-strategy/trade-recovery-strategy-2-0/ (last visited July 16, 2023).

Transcript of Hearing at 18, Tapered Roller Bearings from Korea, Inv. No. 731-TA-1380 (June 5, 2018) (Final).

UK-Australia Supply Chain Resilience Initiative: Introduction Module, https://www.gov.uk/government/publications/uk-australia-supply-chain-resilience-initiative/uk-australia-supply-chain-resilience-initiative-introduction-module (last visited July 16, 2022).

UK's plans to end reliance on Chinese imports has been quietly scrapped, TBS News (June 21, 2022), https://www.tbsnews.net/worldbiz/europe/uks-plans-end-reliance-chinese-imports-has-been-quietly-scrapped-444294.

U.S. TRADE REPRESENTATIVE, 2022 REPORT TO CONGRESS ON CHINA'S WTO COMPLIANCE (2023), available at https://ustr.gov/sites/default/files/2023-02/2022%20USTR%20Report%20to%20Congress%20on%20China's%20WTO%20Compliance%20-%20Final.pdf.

U.S. TRADE REPRESENTATIVE, 2022 REPORT ON THE IMPLEMENTATION AND ENFORCEMENT OF RUSSIA'S WTO COMMITMENTS (2023), available at https://ustr.gov/sites/default/files/2022-12/2022%20Report%20on%20Russia's%20WTO%20Compliance.pdf.

U.S. TRADE REPRESENTATIVE, FINDINGS OF THE INVESTIGATION INTO CHINA'S ACTS, POLICIES, AND PRACTICES RELATED TO TECHNOLOGY TRANSFER, INTELLECTUAL PROPERTY, AND INNOVATION UNDER SECTION 301 OF THE TRADE ACT OF 1974 (2018), available at https://ustr.gov/sites/default/files/Section%20301%20FINAL.PDF.

U.S. TRADE REPRESENTATIVE, REPORT ON THE APPELLATE BODY OF THE WORLD TRADE ORGANIZATION (2020), available at https://ustr.gov/sites/default/files/Report_on_the_Appellate_Body_of_the_World_Trade_Organization.pdf.

Vangelis Vitalis, The End of the Golden Weather: New Zealand's Trade Policy During a Time of International Transition, in From Asia-Pacific to Indo-Pacific: Diplomacy in a Contest Region 294-300 (Robert G. Patman, Patrick Kollner, and Balazs Kiglics eds., 2022).

Wassen Mohammad, Adel Elomri, and Laoucine Kerbache, The Global Semiconductor Chip Shortage: Causes, Implications, and Potential Remedies, 55 IFAC-PapersOnLine 476-483 (2022).

Wells King and Dan Vaughn Jr., The American Camry, National Review (Oct. 17, 2022), https://www.nationalreview.com/magazine/2022/10/17/the-american-camry/.

Will Green, Project Defend maps critical supply chains to boost UK resilience, CIPS (May 21, 2021), https://www.cips.org/supply-management/news/2021/may/project-defend-maps-critical-supply-chains-to-boost-uk-resilience/.

William Reinsch and Kaycee Ikeonu, Transatlantic Treatment of Transnational Subsidies, Center for Strategic and International Subsidies (July 22, 2022), https://www.csis.org/analysis/transatlantic-treatment-transnational-subsidies.

Wily Shih, Is It Time to Rethink Globalized Supply Chains?, MIT Sloan Management Review (Mar. 2020), https://sloanreview.mit.edu/article/is-it-time-to-rethink-globalized-supply-chains/.

The World Bank, https://www.worldbank.org/en/topic/trade/overview (last visited June 20, 2023).

WORLD TRADE ORGANIZATION, ESTIMATING THE BENEFITS OF THE TRADE FACILITATION AGREEMENT (2015), available at https://www.wto.org/english/res_e/booksp_e/wtr15-2d_e.pdf.

Yasuyuki Todo and Hiroyasu Inoue, Geographic Diversification of the Supply Chains of Japanese Firms, 16 Asian Economic Policy Review 319 (Feb. 2021).

WORLD TRADE ORGANIZATION, WORLD TRADE REPORT: THE ROLE OF TRADE IN ECONOMIC RESILIENCE (2021), available at https://www.wto.org/english/res_e/booksp_e/wtr21_e/04_wtr21_e.pdf.

Yen Nee Lee, 2 charts show how much the world depends on Taiwan for semiconductors, CNBC (Mar. 15, 2021), https://www.cnbc.com/2021/03/16/2-charts-show-how-much-the-world-depends-on-taiwan-for-semiconductors.html.

Yuzuka Kashiwagi, Yasuyuki Todo, and Petr Matous, Propagation of Economic Shocks Through Global Supply Chains—Evidence from Hurricane Sandy, 29 Review of International Economics (2021).

Ziyang Fan, How TradeTech can build resilience in global value chains, World Economic Forum (Apr. 5, 2021), https://www.weforum.org/agenda/2021/04/how-tradetech-can-build-resilience-in-global-value-chains/.