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Prospects for Strategic Re-Shoring in the Post-COVID Age

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Nothing reveals weakness in a system like crisis. Of the many aspects of modern life laid low by the COVID-19 coronavirus, one of the most remarkable was to see globe-spanning supply chains grind to a halt. Factories were idled by lack of intermediate goods. Governments scrambled to track down sufficient supplies of N95 and surgical masks, swabs, and testing kits. In Canada, sales of hand sanitizer grew 640% year-over-year, as consumers responded by panic buying essential goods. Factories in China, where 70-80% of the world's medical-grade masks are produced, were completely overwhelmed by demand. India, a top exporter of medication, temporarily banned exports for fear of shortages.

The aftermath of this disruption has seen calls to 're-shore' critical manufacturing. In Japan, Prime Minister Yoshihide Suga argues his country "must avoid depending excessively on particular countries for products or materials and bring home production facilities for goods needed for daily life." This pledge includes $2.2 B to help the country's firms re-shore.[1] In France, a former director of the Prime Minister's national security office declared that in "times of crisis, we can no longer switch from one production zone to another to get our essential products...the issue of strategic stocks and secure supplies has to be reconsidered. A new model has to be invented." Closer to home, politicians like Premier Jason Kenney in Canada and Senator Tom Cotton in the United States have made similar calls, demanding the return of manufacturing capacity for medical supplies like face masks, respirators and ventilators. A raft of legislation supporting "strategic autonomy" is sure to follow.

When struck with fevered demand, the desire for safe and predictable supply is obvious. But just how practical is this, given the current global architecture of production? To what extent *can* global supply chains bend to fit the reinvigorated economic nationalist mood?

Bringing PPE Home

Consider the N95 respirator mask, a personal protective equipment (PPE) staple. It is a simple product, relatively easy to make. A reasonable estimate for an epidemic of moderate intensity is national Canadian demand for between 170 M and 350 M masks. The problem for Canada is that when the pandemic hit, there were no factories here to make them.[2] This left Ottawa scrambling to secure supplies for itself and its provincial partners, competing in bidding wars as diplomatic officials scoured Asian markets for exportable product. The sense of panic was made all the more acute when the Trump

administration announced a ban on respirator exports—including to Canada. Only an overture from the supplier itself led the White House to back down.

What would it take, then, to establish a steady, secure domestic supply? We can use the latest financial statements of 3M, one of North America's top three N95 mask producers, to come up with some rough calculations. Assuming a constant sales return from each of the company's $26 B US dollars invented in plant, property, and equipment (PPE), it takes $1 in PPE to generate $1.23 in sales.[3] Assuming the moderate Canadian mask estimate, a sales cost of 58 cents per mask, and constant returns to scale,[4] meeting Canadian demand would require at least $80 M to $175 M USD of capital investment.[5] On top of this would come the expense of *operating* and maintaining these machines for current and future years.[6]

These are not inconsequential sums—particularly since the N95 is just one product in a complex web of essential medical supplies. Add to this the capital cost for gloves, gowns, face shields, and the like and the price of re-shoring PPE alone becomes massive—to say nothing of building domestic capacity for far more complicated and costly products such as diagnostic equipment and pharmaceuticals.[7] Constructing a fully nationalized medical supply chain is simply out of financial reach.

Gains From Global Supply

If the cost of bringing these factories back is prohibitive, why did they leave in the first place? The answer lies with the economic and technological geography of the last half century. A relatively open global market, managed by instantaneous telecommunications and serviced by cheap transportation, enables production on an unprecedented scale. Today, single factories in low-cost jurisdictions serve not just one nation but dozens.[8] Agglomeration of suppliers in particular regions (such as that of electronics suppliers in the Pearl River basin) only reinforce the trend.[9] The obvious cost advantage of such scale lured entire supply chains overseas. Today almost $20 *trillion* USD worth of goods are exported each year.

This migration of manufacturing from West to East has been unambiguously good for global welfare. Chinese workers once confined to grinding poverty on rural farms now enjoy solidly middle class lifestyles, strolling through suburban shopping malls with discretionary budgets growing at 10% per year. Meanwhile, North American school children live today amid consumer abundance on a scale previously unimaginable. In this sense the Ricardian trade-off has paid massive dividends. But these gains have not, as we see with today's global pandemic, come without serious risk. So how best then to manage it?

Supply Strategy: Stockpile and Surge

Off-shored supply chains are not coming back, at least so long as energy remains cheap[10], trade remains possible, and labour remains an essential[11] component of manufacturing.[12] Not even the advance of distributed production technologies like 3-D printing nor the supercharged economic rivalry spawned during the Trump administration have succeeded in re-shoring much production.[13] We should therefore expect the virus to fail as well, as it is still is economically impractical to fragment

current supply chains and reconstitute them on a national basis. Of course, this reality offers no salvation from those dark days in April, when fears were high and masks were nowhere to be found.[14] Better safeguards are needed.

Two simple mechanisms exist. First is the long-established—but oft-neglected—tactic of stockpiling of strategic reserves. These supplies must be well-maintained and not allowed to dwindle.[15] PPE and ventilators are the most obvious need, but testing machines and vaccine[16] stocks are important as well. To give a sense of perspective, a $100 M capital investment could buy 5,000 stripped-down ventilators, at a warehousing cost of less than $30,000 per year.[17] In the middle of a pandemic the return on such investment would far outweigh the opportunity cost. In the United States, for example, we have seen in some cases the cost of surgical gowns increase from 40 cents before the pandemic to a stunning $9 a pair. A modest medical stockpile program of $100 M in investment per year would rapidly build significant resiliency.

Second is to do a better job of planning to 'surge' existing capacity, whether by squeezing out more production from existing plant, or by pivoting idle or non-essential capital stock into into essential goods. Small factories can provide niche PPE products, such as transitioning from sporting goods to face shields for first responders.[18] Larger firms with more complicated manufacturing experience are able to handle more complicated products, such as the auto parts giant Linamar and former plane-and-train manufacturer Bombardier. Transition can be difficult—particularly if the firm has no experience with such products[19] or relies on input goods from abroad. Overcoming these handicaps requires government to maintain close links with the associations that represent manufacturers. More importantly, it requires streamlined testing and approval processes, mechanisms that allow products to enter certified production on a higher risk basis than in non-emergency circumstances. Last, a national registry of essential good designs should be at the ready, free to access for any manufacturer looking to surge their capacity.

Reassuring Allies, Making New Friends

In a pandemic, the world needs more supply not less. Cutting off trade is counterproductive, given the lost economies of scale, reduced capital available for investment, and greater exposure to catastrophic risks. But not only do export restrictions make shortages more acute, they reallocate the shortages, shifting them onto countries with the least capacity and thereby magnifying the pain. We would therefore be better off, in both absolute and relative terms, with a third recommendation: ensuring the flow of trade in times of international emergency. Of course, it is reasonable to expect that local manufacturers will meet (whether of their own volition or by political force) local needs first—and for this reason alone the stockpile and surge strategies mentioned above are vital. But once the initial crisis passes it is necessary to keep tit-for-tat export restraints to a minimum. So how best to do that?

The answer is two-fold. First is to bind trade and our existing security community more tightly together.[20] Commitment to keep the flow of essential goods running, no matter the circumstance, must be enshrined into the very heart of the western alliance

architecture. This can be achieved through formal declarations and establishing management structures designed to spring into action in times of emergency.[21] Doing so will build trust and improve cooperation in a pandemic's darkest days. This will save lives.

The second is to recognize the *national security* imperative of supporting manufacturing in developing countries. The need for continued economic rise in Vietnam, India, and Ethiopia is not just founded on moral interest, but the reality that the more capacity these countries have, the more they can contribute to the battle against COVID-19 and whatever nasty virus comes next. Viewed through this lens, there is a much stronger case for engaging with these countries in terms of favourable trade deals. Our own health and well-being serve as yet another reason to reach a hand out to the poor.

Endnotes

[1] At least 87 companies have taken advantage of this funding, though 30 of them have used it to increase production in Vietnam, Myanmar, Thailand, and other Southeast Asian countries. Eligible firms include emergency goods suppliers, such as those that make masks, as well as industries where supplies can be disrupted by an economic shock—including auto and aviation parts, hygiene products such as alcohol-based sanitizers, fertilizer, medicines, and paper products.

[2] AMD Medicom, a Quebec-based mask supplier with factories in China, Taiwan, France, and the United States, opened its first mask factory in Canada this summer. It will supply 24 M surgical (production starting in July) and 20 M fine-particle blocking N95 (first output in August) masks to Ottawa each year under a proposed long-term agreement, guaranteeing $10 M to $20 M in annual sales. The 10-year, $382 M, sole-sourced contract was signed in April. Notably, the automaker GM also produces surgical masks in an Oshawa assembly plant at the rate of about one million per month.

[3] To be specific, 3M's $32 B US in total global sales relied on $26 B US in unamortized capital investment. Taking the 35 M N95 masks made at the company's plant in South Dakota and multiplying it by 58 cents per mask, the ratio is $16.5 M worth of plant to generate $20.3 M in sales. Extrapolated to the Canadian mask requirement estimate, this equals between $98.6 M and $214.6 M USD in essential mask sales.

[4] This is a reasonable assumption for any new production getting off the ground. Even among experienced manufacturers, a common complaint during the COVID supply shift was that basic manufactures like masks and face shields have been outsourced for so long few in North America remember how to produce them.

[5] This estimate appear reasonable, given the federal and Ontario governments recently signed a deal with 3M to upgrade an *existing* facility in Brockville for the production of N95 masks. The deal specifies the three parties will split "at least" $70 M CAD in capital investment costs, in addition to a long-term commitment to buy masks from the company. Note, however, that production will not likely begin until 2021.

[6] Long before the COVID pandemic, France issued a five-year contract to a domestic firm for 180 M masks a year, but when the contract ended the factory could no longer remain viable and soon closed.

[7] COMTRADE reports that prior to the pandemic Canada imported roughly $900 M in medical equipment, $3 B worth of medical instruments, and almost $6 B in pharmaceuticals.

[8] The Longhua Science and Technology Park, owned by the electronics manufacturing firm Foxconn and located in Shenzen, employs perhaps as many as 300,000 employees, making it by far the largest factory in human history. Joshua B. Freeman, *Behemoth*, (New York: W.W. Norton, 2018), p272. Today, all the world's iPads are assembled in a single factory and the latest iPhones at no more than two. By comparison, in Ford's heyday it set up branch plants all over the world, well away from its main factories, subject as it was to more tariffs, higher shipping costs, and slower shipping speeds (p290, 294). Lastly, note that agglomeration is not restricted to the construction of gigantic factories. In other cases it means industrial districts or centres where many small plants and ancillary services cluster together, such as is the case with socks in Datang, China and Christmas decorations in Yiwu (p295).

[9] It is important to recognize the dependence of modern supply chains on network effects, a dynamic considered by Alfred Marshall a hundred years ago. Vertical integration has given way to "virtual integration," where retailers, distributors, manufacturers, and transportation companies "now focus on their core competencies and partner with others companies to create supply chains for fast-moving markets." Michael Hugos, *Essentials of Supply Chain Management*, (Hoboken: Wiley, 2018). Compared to this, stand-alone enterprises are isolated, capacity- and information-bereft dinosaurs. Factories like Ford's River Rouge Plan, where iron ore went in one end and cars came out the other, are no more.

[10] Transportation costs can be as much as a third of the operating cost of a supply chain, thus when the cost of energy—say, aircraft fuel for a product relying on tight delivery times—goes up, the effect on profitability is substantial.

[11] We have already seen that rising trade tensions between US-China are pushing production in the direction of a "China plus one" or "non-red supply chain" manufacturing strategy, with Vietnam the clear beneficiary. Note that this pressure so far *not* led to a wave of re-shoring. Even China's manufacturing resiliency itself has disappointed the re-shoring crowd. In mid-May Young Liu, chairman of Hon Hai Precision Industry, whose Foxconn unit makes iPhones in Chinese plants, noted that it is difficult to move assembly of mobile devices to the U.S. due to the sheer number of workers needed.

[12] Even bullish automation proponents admit the transition away from labour in factories will take decades, at a minimum. See McKinsey, for example (p2).

[13] It is true there has been movement towards more *regionalized* supply chains. As noted above, Foxconn is quietly moving production away from China, including to India. But this is very different from re-shoring. According to Kearney, the US manufacturing import ratio (a useful measure of re-shoring, calculated as total US manufactured goods imports from 14 countries as a percentage of domestic manufacturing gross output) was still higher in 2019 than it was in 2014. COIVD can be expected to bring some manufacturing home, as producers develop local alternatives to increase supply chain resiliency. But we should expect the total value to be modest.

[14] In supply chain terminology, this is the drive for responsiveness (through excess capacity, flexible manufacturing, high inventory levels, and locations close to the customer) rather than efficiency.

[15] Crucially, these stocks must be maintained. France, for example, prepared a store of one billion surgical and 700 million N95-like FFP2 masks following the 2003 SARS pandemic. Yet this total fell to 150 million by the time of COVID, since expired masks were disposed of and not replaced. France had—erroneously—decided "that it was no longer necessary to keep massive stocks in the country, considering that production plants were able to be operational very quickly, especially in China." A supplementary lesson here is that sticking strictly to best-before dates for PPE is utterly ridiculous when the short-term alternative is reliance on homemade cloth masks—or nothing at all.

[16] 383 M Euros for 44 M H1N1 vaccinations in France.

[17] This estimate uses a pre-pandemic cost of $20,000 for a basic ventilator, and $2-3 per square foot in warehouse operation (utilities, insurance, etc) costs and $4-7 per square foot in warehouse leasing costs each year. Assuming a dozen ventilators on a standard 48" by 40" pallet (equal to 13.333 square feet), stacked three high, 2,000 square feet of warehouse space and a non-labour annual O&M cost of $20,000 would be more than reasonable. For reference, Canada had an estimated 5,000 ventilators at the start of the pandemic (4,982 mechanical ventilators and 3,170 ICU beds in 286 hospitals were identified in 2015).

[18] Within weeks of the pandemic's arrival, Irwin Toy, a Canadian doll and toy truck manufacturer, was producing between 250,000 and 500,000 medical-grade masks per day. These were, however, produced in the company's factory located in China, not in Canada.

[19] One way to deal with this is to work with experienced manufacturers and existing health and safety standards. It also helps to seek out feedback directly from hospitals and frontline health care workers.

[20] This is in line with the vision of Japan's trade ministry, METI, which sees the idea of returning all overseas production home as highly unlikely. By contrast, U.S. Trade Representative Robert E. Lightizer's—certainly incorrect—view is that the era of offshoring is over.

[21] Think of this like a NATO deployment plan, but for PPE production and vaccine approvals.