The Stretch of Supply Chains

The pandemic has reignited debate over global assembly lines that stretch around the world

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HAVE YOU EVER visited a store only to find empty shelves rather than the product you wanted to buy? This might have been because of disrupted supply chains. Usually, these chains operate seamlessly in the background to bring you the goods you need. However, when supply chains break down we all notice. So what are these vital parts of the global economy?

Supply chains are the assembly lines that deliver goods for final consumption. Think about the laptop, desktop, tablet, or phone on which you are reading this article. These products came to be thanks to a multitude of different inputs that traveled through a complicated supply chain before arriving in your hands as a finished good. This journey involved product development, sourcing the raw materials, assembling the parts, testing the end product, and shipping it to you. That way, you can think of the supply chain as an assembly line that makes possible the product that you, the consumer, want to buy.

Worldwide inputs

Historically, supply chains were simple and operated within confined geographic areas. National producers would make simple products such as wine, cloth, or bread. By and large, all the components to put together such products could be found near where the end product was consumed. However, in our modern economy, supply chains are highly complex and involve numerous producers around the globe. Think again about your phone. It could include aluminum mined in Africa, silicon produced in South America, and microchips made in Asia. The design may have been developed in North America, and it could all have been put together at a factory in Asia before it was delivered via a European shipping company.

Today firms source their inputs from all over the world to tap the most suitable components to put together their products. Several factors contributed to this development. First, technological leaps have

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allowed firms to communicate seamlessly with other firms on the other side of the globe and have reduced transport costs. Second, international agreements have made trade more predictable by making it easier to enforce contracts and cheaper by reducing trade costs through lower tariffs and nontariff barriers. Third, structural reforms have allowed businesses to invest more easily in foreign factories.

These technological, institutional, and policy advances have allowed to fragment their production processes, causing a boom in the international trade of inputs for production (so-called intermediate goods). These profound changes have affected virtually every country, with both advanced and emerging market economies becoming more integrated into global supply chains as a result. The change was dramatic in the 1990s and 2000s before integration leveled off somewhat in the 2010s.

Pressure from the pandemic

In its acute phase, the pandemic caused widespread factory closures that reverberated through supply chains as intermediate inputs from closed factories became scarce elsewhere on these global assembly lines. While supply was being constrained, demand for goods rose above pre-pandemic trends as consumers stuck at home shifted their spending away from contact-intensive services (such as eating out and traveling) and toward goods allowing them to work, learn, and play at home. In other words, the pandemic caused an extraordinarily high demand for goods at a time when the world's ability to supply these goods was facing unprecedented challenges. Few links in the global supply chain were spared, and some became a regular fixture in media reports, such as widespread scarcity of semiconductors. Even ports emerged as choke points for global trade, with lines of container ships waiting outside major harbors.

For countries, participation in global supply chains during the pandemic thus came with costs and benefits. On the one hand, participation exposed countries to lockdowns and factory closures in other countries. On the other hand, participation allowed for supply of foreign goods at times when the domestic economy was hit hard by the pandemic. On balance, the evidence suggests that global supply chains adapted well during the pandemic, with countries relatively less affected filling in for countries hit harder.

What is the future of supply chains?

The supply chain disruptions in the wake of the pandemic have brought to light the importance of resilience—that is, the ability of supply chains to continue to operate even when hit by shocks. More recently, the surge of the Omicron variant and the war in Ukraine have added to uncertainty surrounding supply chains. In the wake of all this, policymakers and firms are discussing several options that could reshape supply chains:

- First, some have called for "reshoring"—that is, disintegration from global supply chains by moving foreign production back home.
- Second, some have argued for greater diversification—in other words, increasing the number of foreign suppliers for any given input, even if it entails higher costs. Unless all supplying countries are hit at the same time, this would allow producers to better withstand supply shocks.
- Third, companies could decide to hold excess inventory. A higher level of inventory would allow firms to better weather temporary supply shocks.

The shock waves from the pandemic on global supply chains have yet to settle, but the economic evidence available so far does not favor the reshoring approach. The pursuit of self-reliance would yield less efficient production, and available evidence does not suggest that it will improve resilience. The strategy is akin to putting all your supply-chain eggs in the same domestic basket. Diversification and overstocking are essentially insurance strategies. Countries and companies have to decide how high an insurance premium they are willing to pay. Indeed, having spare suppliers or carrying excess inventory is not free.

Policymakers and firms therefore face the difficult task of weighing their need for resilience against their willingness to pay for insurance. The optimal choice depends on country-specific circumstances and risk tolerance. All the same, the debate over how much or how little to integrate into global supply chains looks set to persist. Ultimately it could determine whether you are met with products or empty shelves the next time you go to the store. FD

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New Energy Imperative

Russia's invasion of Ukraine highlights the crisis and opportunity of the energy transition

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PHOTO: KATHARINA ROSSBOTH/DIE PRESSE

IT IS HARD TO LOOK AT A CRISIS like Russia's invasion of Ukraine and see a moment of opportunity. We—to say nothing of Ukrainians—are still very much in a crisis, and a compounding one at that, with potential long-lasting economic and political consequences.

It is similarly clear that talk of "opportunity" cuts both ways. Vested interests are often the ones that benefit the most from swift political action, further cementing the status quo. Witness many lawmakers' tendency to respond to high energy prices with misguided attempts to lower them directly, dampening any incentives to cut fossil fuel use that high prices might provide.

Affordable energy

One big difference between the present energy price surge and previous such episodes is the availability of cheap and accessible alternatives to the current, largely fossil-fueled, infrastructure. The International Energy Agency was right to declare in 2020 that "for projects with low-cost financing that tap high-quality resources, solar [photovoltaic (PV)] is now the cheapest source of electricity in history." That is still the case.

Solar PV prices have risen in the past two years, leading to "greenflation" entering the financial lexicon. Yet "fossilflation" dominates the picture. Prices for fossil-based power sources have risen by more than the relatively small price increases in solar PV, in turn further lowering relative solar prices per kilowatt of capacity and actual electricity produced. Overall, systems prices have come down dramatically over the years, declining by a factor of two within a decade, three within four. And solar PV, of course, is not alone.

Crucially, batteries and electric vehicle (EV) prices have similarly declined fast, leading to rapid increases in adoption. In 2016, the BP *Energy Outlook* projected that the world would surpass 70 million plug-in vehicles globally by 2035. That number now looks achievable for 2025, 10 years earlier than expected on a 20-year time horizon. Of course, any such numbers show how far there is still to go. Global PV market share stands at about 3 percent; for EVs it's not yet 2 percent. Even 70 million EVs would be less than 6 percent of today's global vehicle fleet of some 1.2 billion cars.

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Neither PV nor EVs will make much of a difference in addressing the challenges posed by the current fossil-fueled war. Short-term measures to disentangle EU dependence on Russian oil and gas ought to focus on decreasing demand and finding alternatives to Russian supplies. That implies increasing the production of both oil and gas elsewhere. It also means short-term measures, such as avoiding the German nuclear exit scheduled for December 2022, and some other hard trade-offs—a short-term increase in European coal power production, for example. (Ironically, a good portion of coal used in the European Union also comes from Russia, compounding the challenge.)

Assessing risk

Russia's unprovoked war, and the world's reaction to it, also lays bare another, much more fundamental, issue: economic and broader energy policy analyses' inherent limited ability to inform policymakers' decisions in tackling crises such as those we now face, especially crises that overlap.

To begin with, no serious analysis published before Russian President Vladimir Putin's invasion of Ukraine even imagined that Russia would cut off gas deliveries to the European Union altogether. A deliberate EU break from Russian gas imports was considered all but impossible. For example, the European Network of Transmission System Operators for Gas (ENTSOG), charged with stress-testing the European gas network, never even considered the possibility. ENTSOG's latest stress test imagines what might happen if no Russian gas flowed through Belarus or none through Ukraine. No Russian gas at all was not part of the set of modeled scenarios. The very idea was apparently unimaginable, or so radical that it belied any stress test. The stress on the system would simply be too large.

Economic models at the time were similarly limited. A widely cited analysis by European Central Bank economists has the promising title "Natural Gas Dependence and Risks to Euro Area Activity." Its headline conclusion: a 10 percent gas supply shock would cut euro area GDP by 0.7 percent. The hardest-hit sector? Electricity, gas, steam, and air-conditioning supply, the sector most dependent on gas as a direct input. The sector's output, thus, would fall by almost 10 percent due to a 10 percent gas supply shock. That conclusion seems reasonable at first blush. The methodology, relying on standard input-output methods, is well-established. The problem is the static nature of the analysis and the resulting status quo bias.

Benefits and costs

Heat pumps represent one of the most promising low-carbon energy technologies. They replace oil and gas furnaces and do so much more efficiently. In fact, heat pumps are so efficient that even if all electricity comes from natural gas, the resulting emissions are still lower than if natural gas were burned directly in a home's gas furnace. Heat pumps are also essentially air-conditioners run in reverse. Why then would the air-conditioning sector suffer in a scenario with less gas? Demand for heat pumps would skyrocket, something apparent all over Europe right now, with a clogged supply chain adding to inflation pressure.

That does not mean that cutting off Russian gas somehow portends an economic boom. To the contrary, there are real costs. Change is hard. But costs also imply opportunity. McKinsey's report on the net-zero transition has the promising subtitle "What It Would Cost, What It Could Bring." In short, its analysis shows costs of about

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$25 trillion over 30 years to convert the world economy from its current path to one that achieves net-zero carbon emissions by midcentury.

Establishing who should pay for these $25 trillion investments will engender some difficult political fights. But there will indeed be plenty of winners from these additional investments, including in purely economic terms. Measured from a societal perspective, these investments pay for themselves many times over, given that fossil energy use costs more in external damages than it adds value to GDP.

Policy, thus, is key. The most important aspect: a true net-zero transition implies both the rapid deployment of new low-carbon technologies and more significant systemic changes. The war in Ukraine has already revealed lots of missed opportunities on the policy front. Politicians are often more interested in cementing the status quo than in bringing about necessary changes, for the same reason that Niccolò Machiavelli wrote five centuries ago: "The innovator has for enemies all those who have done well under the old conditions, and lukewarm defenders in those who may do well under the new." FD

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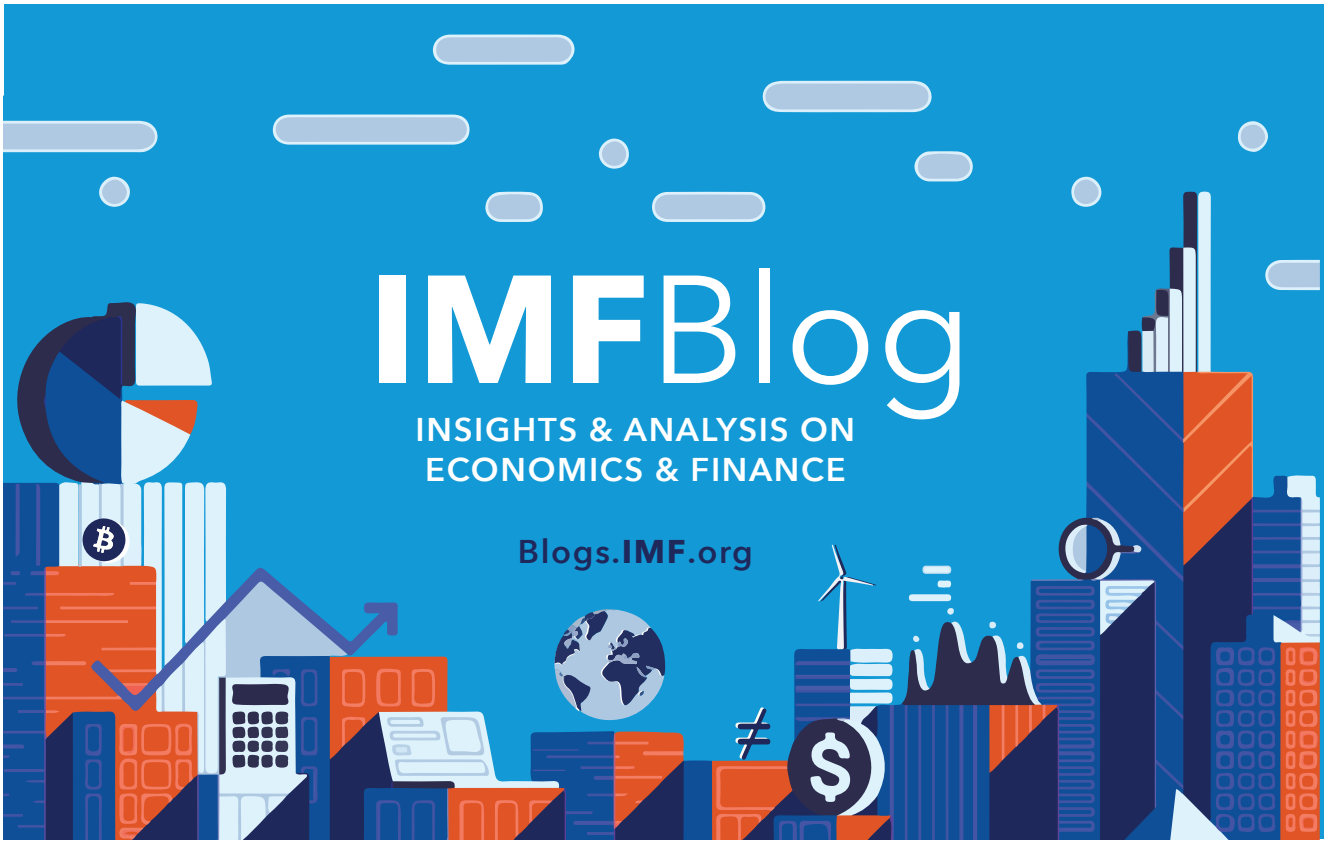

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