# Swapping cheaper goods for more secure supply chains

By Angelo Katsoras

The world entered 2023 with supply chain security as a critical issue in key industries ranging from semiconductors to green energy. This has spurred businesses and governments to take measures to produce strategic goods locally or obtain them from close allies. While this will in time lead to more resilient supply chains, the greater focus on economic security over efficiency will push structural operating costs higher over the longer term.

These trade policy decisions have not only raised tensions between the world's two leading superpowers, they have also created friction among key allies, in particular the United States and the European Union.

## U.S. industrial policy is increasingly geared towards self-sufficiency

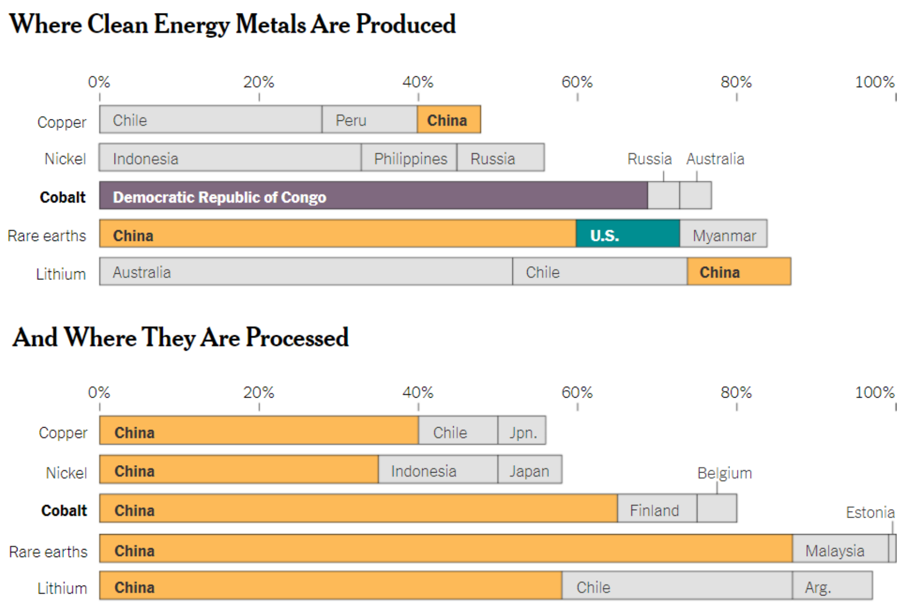
One of the few policies that the Biden presidency has maintained and even reinforced from the previous administration is a more protectionist industrial policy. This is evidenced by recently approved bills covering infrastructure, semiconductors, and green energy. What they all have in common is that they tilt the playing field in favour of domestic companies. Supporters argue these policies are a long overdue response to China's strategy of using a combination of state aid, regulations and tariffs to restrict foreign competition.

### *The Inflation Reduction Act: an example of how domestic production is being incentivized*

Signed into law last August, the Inflation Reduction Act provides for $370 billion in financing for clean energy investments. This includes a $7,500 electric vehicle (EV) tax credit.

For a vehicle to qualify for half the credit, at least 40% of the minerals used to produce the vehicle's battery must be sourced in the United States or in any country with which the United States has a free trade agreement. This required percentage is set to rise to 80% by 2026. For a vehicle to qualify for the other half of the credit, at least 50% of the battery's components must be made in North America. This level is set to rise to 100% by 2028.[1]

While the majority of the minerals that go into the production of EV batteries are mined elsewhere, most need to be refined in China. This is one of the main reasons why China is the largest producer of EV batteries today (70% global market share).[2]

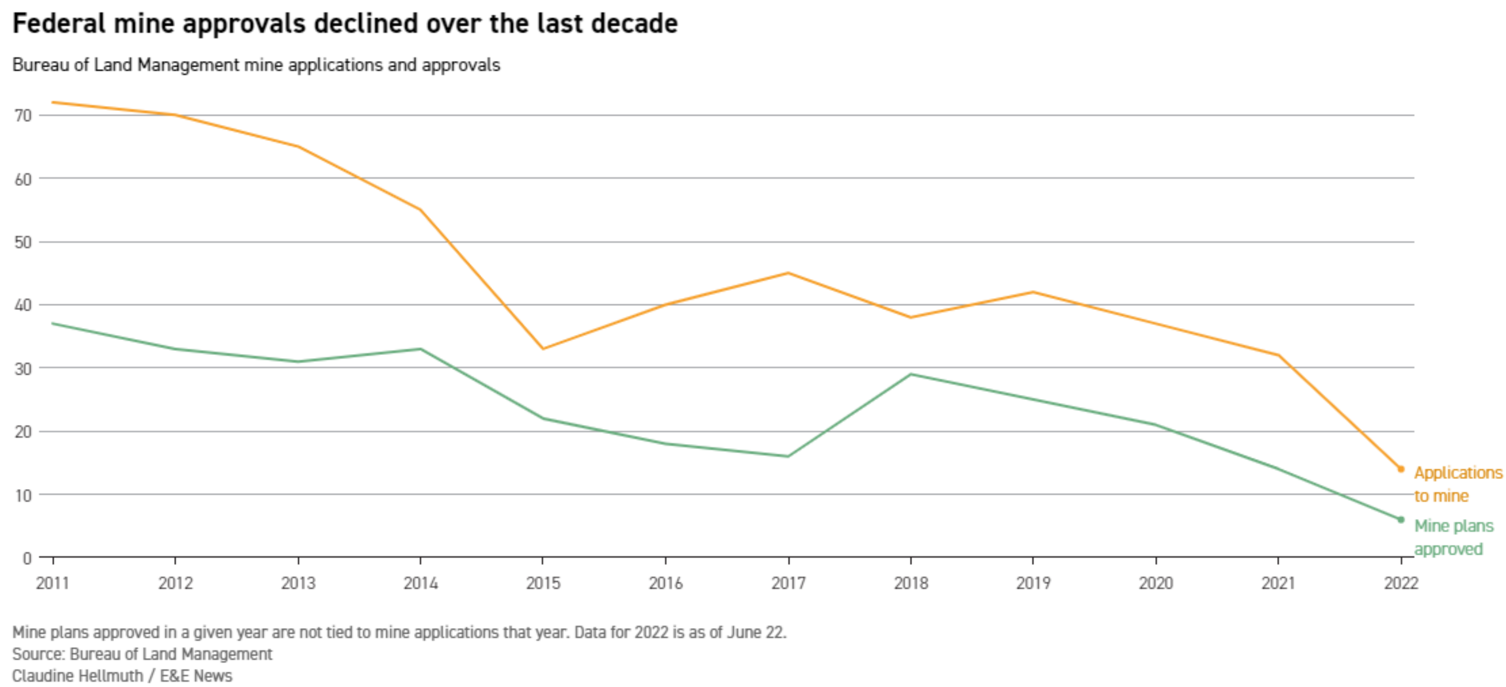



Source: "Clean Energy Metals," New York Times & International Energy Agency, February 2022

[1] "U.S. Delays Key Step for EV Subsidy Program After Foreign Pushback," Wall Street Journal, December 19, 2022
[2] "Benchmark Mineral Intelligence," October 2022

These local content requirements pose a huge challenge in that the United States holds very little of the world's capacity for mining and refining the minerals needed to produce EV batteries. In 2020, its share of refining was 4% for lithium, 1% for nickel, 0% for cobalt, and 0% for graphite.[3]

Despite the lack of mining capacity, obtaining approval to open mines and build related infrastructure has become increasingly difficult in the United States. The Bureau of Land Management, which is responsible for handing out mining permits on federal lands, has seen a decline in the number of projects approved in the past decade.[4] What's more, mines that are approved take 10 years on average to bring online.[5] This significantly increases the risk of supply bottlenecks and higher operating costs over the longer term.

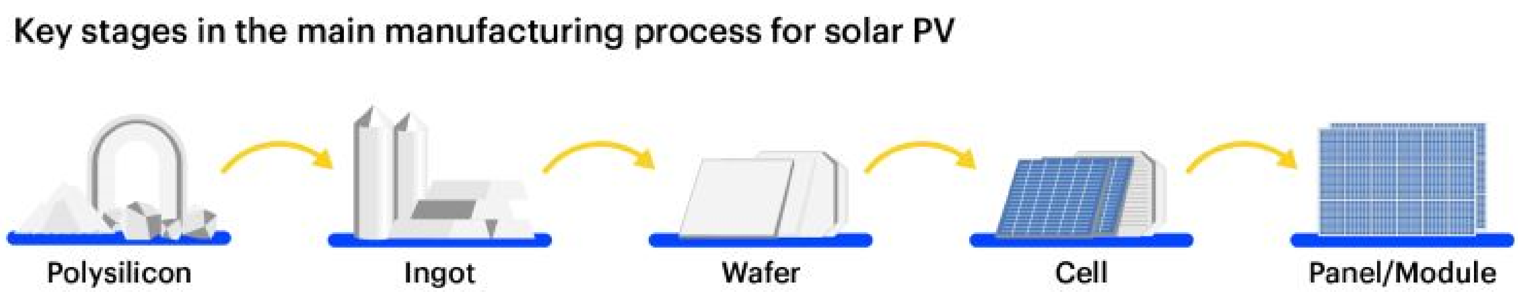



Source: "Biden wants minerals, but mine permitting lags," E&E News, August 9, 2022

Just as the United States imposed restrictions on China's access to American semiconductor technology, China could choose to weaponize the United States' dependence on minerals refined in China.

## China dominates global solar power sector

China also produces the vast majority of the materials and parts required to manufacture solar panels. The International Energy Agency estimated that China's share in the manufacturing of solar panels was over 80% at every stage of the process.[6]




Source: "Special Report on Solar PV Global Supply Chains," International Energy Agency, July 2022

[3] "China's stranglehold on electric car battery supply chain," Mining.com, April 16, 2020, and Benchmark Mineral Intelligence
[4] "Biden wants minerals, but mine permitting lags," E&E News, August 9, 2022
[5] The U.S. National Mining Association, 2022
[6] "Special Report on Solar PV Global Supply Chains," International Energy Agency, July 2022

This stands in stark contrast with the United States' deep lack of productive capacity in this sector. According to the Solar Energy Industries Association in the United States, "America currently has no domestic solar ingot, wafer, or cell manufacturing capacity and only modest capacity to produce solar modules, inverters and trackers."[7]

Building up solar energy capacity in the United States was further complicated by the approval of legislation in December 2021 that prohibits imports from the Xinjiang region of China unless companies can prove that forced labour was not involved in their production. Nearly half of the world's polysilicon, a raw material that most solar panels require to absorb sunlight, comes from that region.[8] As a result of this law, which came into effect last June, over 1,000 shipments of solar energy components have been held up at U.S. ports.

The environmental targets adopted by the United States and other countries have placed them in a bind. On the one hand, the long lead times associated with building up energy and mining infrastructure means that the greater the effort to meet environmental targets in the near term, the higher the likelihood that these countries will become even more reliant on China's green energy supply chains. This includes the risk of America trading its oil and gas independence for dependence on imports of components from its main geopolitical rival.

On the other hand, if the United States and Europe decide to transition more slowly in order to give their domestic supply chains time to reach a critical mass, they will likely miss their environmental targets by a very wide margin.

## Trade tensions mounting between allies as well

In addition to raising tensions with China, U.S. local content requirement rules have also generated friction with the EU, America's most important geopolitical ally. The Europeans argue that these regulations place their companies at a disadvantage. While certain rules could be delayed or loosened in a bid to placate them, the United States will by and large stick to its primary goal of creating domestic supply chains to reduce China's dominance in the EV battery and alternative energy sectors.

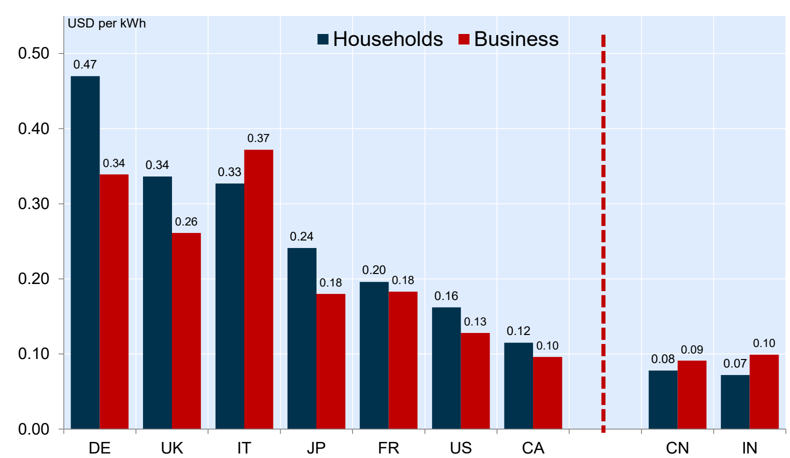
### *Energy prices*

Yet another point of tension is the much higher electricity and natural gas prices that Europe is paying compared with the United States. Some European leaders have publicly decried the fact that the United States produces natural gas at very low cost and then sells it to them with a very high markup. French President Emmanuel Macron recently stated that high U.S. gas prices were not "friendly" and Germany's economy minister has called on Washington to show more "solidarity" by helping reduce energy costs.[9]

The Americans will no doubt counter that Europe's higher energy costs are primarily due to two factors: its heavy reliance on Russian natural gas until recently and its own restrictions on lower-cost domestic gas production.

The fact that energy prices in Europe are among the highest in the world and that generous financial incentives are being offered to firms by some countries (including the United States) will likely compel more European companies to transfer some of their production to lower-cost regions. (For more on this, see our October 2022 report "The perfect storm facing Europe".)

**World electricity prices in G7+**
Electricity prices in March 2022 for households and businesses (at market exchange rate)




NBF Economics and Strategy (data via GlobalPetrolPrices.com)

[7] "Catalyzing American Solar Manufacturing," Solar Energy Industries Association, 2022
[8] "China's Solar Dominance Presents Biden With an Ugly Dilemma," New York Times, June 24, 2021
[9] "Europe accuses US of profiting from war," Politico, November 24, 2022

***Despite criticizing the United States for its protectionist industrial policies, Europeans are providing significant financial assistance to their own economies.***

- The Bruegel think tank has estimated that EU governments have so far announced a total of 600 billion euros in payments to consumers and businesses to cushion the impact of higher energy prices. This is more than the actual spending on green energy in the U.S. Inflation Reduction Act ($370 billion). If support to utilities is added in, the amount climbs to 710 billion euros.[10]
- Many governments have also implemented loan-guarantee programs to support companies hurt by the fallout of the war in Ukraine. In Italy, one-third of all outstanding business loans (by value) are backed by the government.[11]

With interest rates rising and economies slowing down, this type of financial support will become increasingly difficult to maintain, however.

### *Further steps the EU will take to help its companies*

In an effort to pre-empt the flight of further European companies to regions with lower energy costs and generous subsidies, the EU will likely take the following two measures.

1. *Subsidies favouring domestic producers in key sectors*

   French President Macron gave a good idea of the form this aid will likely take when he stated last fall: "We need a 'Buy European Act' like the Americans, we need to reserve [state subsidies] for our European manufacturers," adding, "You have China that is protecting its industry, the US that is protecting its industry, and Europe that is an open house."[12] In this regard, U.S. Trade Envoy Katherine Tai recently suggested that the EU should simply respond to the Inflation Reduction Act with its own massive subsidies program.

2. *Introduction of a carbon border tax*

   In an effort to protect companies from the cost of complying with ever more stringent climate regulations, EU members reached an agreement to impose the world's first tax on imports from countries with higher carbon emissions.

   The tax will apply first to energy-intensive industries such as aluminum, steel, fertilizers, and chemicals. The scheme goes into effect in October 2023 but, initially, importers will be required only to report their carbon footprints. The actual tax is slated to be levied in a few years. However, implementing the tax entails various risks:

   - It could increase trade tensions with developing countries, which could respond by imposing counter-tariffs.
   - There would likely be disputes over how various countries measure pollution.
   - While the tax might level the playing for domestic industries competing against imports from regions with weaker climate regulations, it would also add to operating costs.

   While this tax could also raise tensions between the EU and the United States, we believe that it will be much easier for the two to eventually arrive at a compromise than for the EU to reach an agreement with major developing countries. America's recent proposal to the EU to promote trade in metals produced with less carbon emissions highlights the potential for arriving at a common ground.[13]

## Semiconductors at heart of China-U.S. economic cold war

Over the past few years, the United States has become increasingly concerned that China could: 1) invade Taiwan, which manufactures over 90% of the world's most advanced chips; and/or 2) eventually acquire the ability to manufacture advanced semiconductors, which would allow it to build more sophisticated IT products and defence systems without relying on foreign components.

### *The United States has sought to address these risks with two pieces of legislation*

[10] "Spending Big and Badly Shows Energy Crisis Risks for Europe," Bloomberg, November 19, 2022
[11] "Europe Doubles Down on Big Government," Wall Street Journal, November 7, 2022
[12] "Trade rift between EU and US grows over green industry and jobs," Financial Times, October 30, 2022
[13] "U.S. Proposes Green Steel Club That Would Levy Tariffs On Outliers," New York Times, December 7, 2022

The first is the $280-billion CHIPS and Science Act passed in August, which provides $52 billion for domestic semiconductor production. It also imposes a restriction: Companies that receive funding cannot make new investments in advanced semiconductor manufacturing plants in China or other countries of concern for 10 years.

The United States argues that this in response to the massive support provided to Chinese chip companies. OECD data shows that government support from 2014 to 2018 was equal to 30% or more of the annual revenue for China's two major semiconductor companies: Semiconductor Manufacturing International Corporation and Tsinghua Unigroup.

The second piece of legislation was enacted in October and also targets China's chip sector. It bans exports to China of advanced chip-making equipment and chips without a hard-to-obtain export licence. Foreign companies, also, are subject to these restrictions if they use U.S.-made inputs. The new regulations also include first-ever restrictions on U.S. nationals working in China's chip sector. These measures are much stricter than any taken by the Trump administration, which largely focused on individual corporations.

While America has seen its share of global semiconductor production fall from 37% to just 12% over the past 30 years,[14] it still holds a dominant share of the related software (85%) and equipment (52%) sectors. This means that most of the world's semiconductors are designed with U.S.-made software and produced with U.S.-made equipment. This dominance explains in part why TSMC, the world's largest manufacturer of semiconductors, is building its more advanced foundries in the United States, not China.[15]

China imports 85% of the microchips it needs to build electronic goods. Because the chips are mostly produced using U.S. technology,[16] China is significantly vulnerable to American sanctions. Most of China's manufacturing capacity is in lower-end chip technology.

In the latest example of how China-U.S. tensions are roiling semiconductor supply chains, it was reported that Intel plans to stop using China-made chips by 2024 and that it has told suppliers to significantly reduce the amount of other made-in-China components in its products, such as print circuit boards.[17]

From America's perspective, these trade restrictions are a fair response to decades of China pursuing self-sufficiency in key areas via intellectual property theft and protectionism. China, for its part, feels that the United States is seeking not only to gain greater access to its market but also to restrain China's rise as a global power. Both views contain elements of truth. One indication that these tensions have begun to impact their trade ties is that, from 2018 to 2022, China's share of American imports fell from 21% to 17%.[18]

### *Europe enters semiconductor subsidies war*

In an effort to keep up with other countries providing financial incentives, the EU has agreed to invest 45 billion euros to fund chip production within its borders. The EU Chips Act is expected to be approved by the EU parliament in 2023.

However, given Europe's higher operating costs, the subsidies will have to be extremely generous to attract investments. A case in point is Intel's recent decision to delay plans to build a chip plant in Germany. Construction was set to begin by mid-2023 with the help of 6.8 billion Euros in aid from Germany. However, because the cost of construction has since risen from 17 billion euros to 20 billion euros, Intel is now demanding further state aid to go ahead with the project.[19]

## The difficulty of decoupling trade from China even partially

While decoupling from China in certain sectors is slowly occurring, it is important to note just how deeply integrated China's manufacturing sector is in the global economy. China accounts for three-quarters of the world's manufacturing in categories such as pharmaceuticals, chemicals, computers, electrical equipment, and industrial equipment.[20]

Ironically, this means China has gone from being a source of lower costs just after it joined WTO in 2001 to being a driver of higher operating costs as more and more companies undertake the expensive and time-consuming process of partially relocating their operations elsewhere.

[14] "Biden-Harris Administration Bringing Semiconductor Manufacturing Back to America," White House, January 21, 2022
[15] "China's push to forge a chip coalition in Asia falters as Washington expected to tighten the screws in 2023," South China Morning Post, December 31, 2022
[16] "How the U.S.-Chinese Technology War Is Changing the World," Foreign Policy, November 19, 2022
[17] "Dell looks to phase out 'made in China' chips by 2024," Nikkei Asian Review, January 5, 2023
[18] "Who wins from the unravelling of Sino-American trade?" The Economist, November 6, 2022
[19] "Intel Delays German Chip Plant and Wants More Funds," Bloomberg, December 18, 2022
[20] "Companies will find it hard to diversify away from China Covid shock," Financial Times, November 29, 2022

*Apple a case in point*

Apple is fast-forwarding plans to shift some of its production outside China, which currently produces over 90% of its products. India and Vietnam have emerged as the two leading alternative sites.[21]

However, recreating China's ecosystem elsewhere even only partially, which entails providing skills training and setting up complex regional supply chains, will not be easy and it will not be cheap. This new global economic landscape will be especially challenging for companies that do not have Apple's deep pockets to finance the costs of relocating operations.

## Can India finally seize the moment?

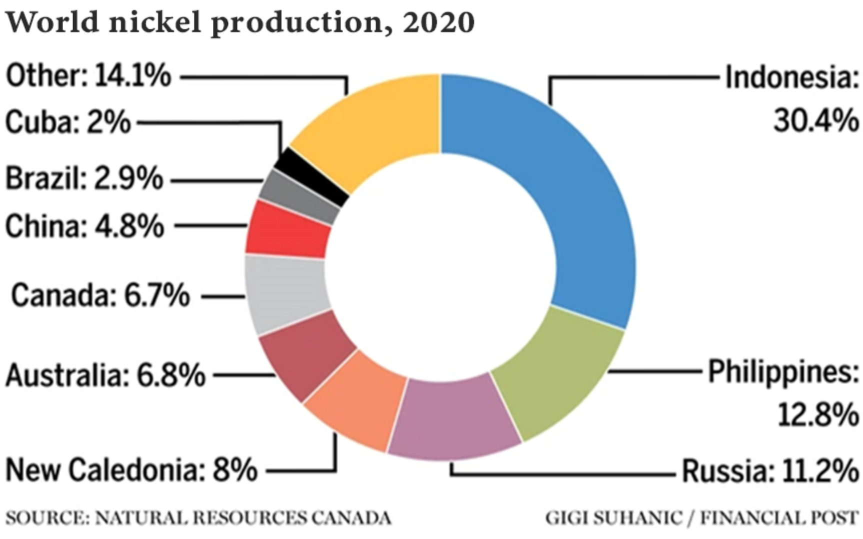
India has many strengths ranging from a huge domestic market to an educated workforce that speaks English. But doing business in India is far from easy. There are many hurdles, including a lack of infrastructure, red tape, and protectionism. These challenges largely explain why manufacturing has seen its share of GDP stagnate at about 15% for the past decade or so.[22]

Despite these challenges and the high costs associated with rebuilding supply chains elsewhere, some analysts feel India's time has finally come. They cite a combination of China's economic missteps (i.e., government interference and zero-Covid) and geopolitical tensions as driving forces. Indeed, the United States is placing India at the center of its plans to detach global supply chains from China. Morgan Stanley recently predicted that the share of India's GDP accounted for by manufacturing will increase from its current 15.6% to 21% by 2031.

## Are mineral-rich countries also jumping on the protectionist bandwagon?

Indonesia, which accounts for 30% of the world's nickel supply, has banned exports of raw commodities in order to attract downstream investments. So far, over $20 billion in investments have been secured via this policy.[23] Other countries could be tempted to follow suit.

Indonesia is also studying the possibility of setting up an OPEC-like cartel for nickel production. Three countries accounted for 60% of nickel production in 2021 (see below). By comparison, OPEC produced no more than 54% of the global oil supply at its market peak in 1973.[24]




"'It makes no sense for Canada': Industry rebuffs idea of joining an OPEC-like alliance for nickel," Financial Post, November 21, 2022

Similarly, there are reports that Argentina, Chile and Bolivia, which together account for just over half the world's known lithium reserves, are considering ways to collaborate on the production and pricing of lithium.[25]

[21] "The end of Apple's affair with China," The Economist, October 24, 2022
[22] "Can India Capitalize on China's Manufacturing Woes?" Wall Street Journal, December 8, 2022
[23] "Why Indonesia matters," The Economist, November 17, 2022
[24] "'It makes no sense for Canada': Industry rebuffs idea of joining an OPEC-like alliance for nickel," Financial Post, November 21, 2022
[25] "Lithium ABC countries" working on common pricing policies," MercoPress, October 21, 2022

## Conclusion: Rewiring of supply chains will take time and money

Geopolitical tensions and growing protectionist sentiments are forcing companies to establish additional supply chains in less strategically vulnerable locations. This entails producing more domestically and importing more goods from allied countries. While this will lower risk levels, it will come at a higher cost.

This includes the long-term costs associated with building up domestic mining and refining capacity and reconfiguring green-energy and semiconductor supply chains. The chip industry, for example, depends on a complex integrated global supply chain: design in the United States, equipment from the Netherlands, manufacturing in Taiwan, and packaging in China. The comparative advantages of each region were built over decades.

Boston Consulting estimated in 2001 that between $900 billion and $1.2 trillion would be needed to create multiple self-sufficient semiconductor supply chains around the world. Annual operational costs would rise by between $45 billion and $125 billion.[26] **This demonstrates that even partially unwinding these supply chains will be very time consuming and expensive.**

Companies relocating to the developed world will also have to manage the additional costs associated with such things as more stringent environmental regulations and higher wages. The EU's forthcoming carbon border tax will have a considerable impact in this regard. China is particularly at risk of being targeted by the tax because of tensions with the West and the heavier carbon footprint that its exports carry owing to the country's significant reliance on coal-generated electricity.

Great power tensions, meanwhile, will increasingly entail building supply chains in China without certain cutting-edge U.S. technology. Last fall, commenting on this growing technological divide, U.S. National Security Adviser Jake Sullivan remarked: "We previously maintained a 'sliding scale' approach that said we need to stay only a couple of generations ahead. That is not the strategic environment we are in today. Given the foundational nature of certain technologies, such as advanced logic and memory chips, we must maintain as large of a lead as possible."[27]

To complicate matters further, trade tensions will also grow between close allies such as the United States and Europe as each side tries to attract and/or retain investments within their borders. This has led to growing accusations by Europeans that the United States is attracting investment from its shores while Europe is grappling with the risk of partial deindustrialization. The greater the friction between the two sides, the harder it could be to sustain cooperation on the war in Ukraine.

Finally, the more that countries try to channel investments inwards, the more companies will play countries off against each other in the quest for greater government financial aid. This will increasingly force countries into a costly subsidy arms race.

**Bottomline: Even if inflation comes down in the following months because of a slowing economy, the reprieve may be temporary in several key sectors due to the high costs involved in redesigning their global supply chains.**

[26] "What America's protectionist turn means for the world," The Economist, January 9, 2023
[27] "Remarks by National Security Advisor Jake Sullivan," The White House (Briefing), September 16, 2022

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