EUROPEAN TRADE FINANCE

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World trade can still drive prosperity, argue Kristalina Georgieva and Ngozi Okonjo-Iweala

Arjona *et al* find that the EU benefits from its participation in global value chains

Buch *et al* argue that trade fragmentation matters for bank credit supply

A EUROPEAN PERSPECTIVE ON TRADE FINANCE

Foreword

Welcome to the Summer edition of ETF, a *World Commerce Review* supplement. This publication has been prepared in response to readership demand for an overview of trade finance from a European perspective.

In these turbulent and unique times issues such as geopolitical tensions, macroeconomic volatility, trade digitalisation, sustainability and shifting supply chains will be examined in forthcoming editions, with the most respected authors providing the reader with the most comprehensive information available.

Our brief is to provide all the data necessary for the readership to make their own informed decisions. All editorials are independent, and content is unaffected by advertising or other commercial considerations. Authors are not endorsing any commercial or other content within the publication. ■

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World trade can still drive prosperity

New protectionist policies threaten the global economy. Kristalina Georgieva and Ngozi Okonjo-Iweala argue that international trade goes hand in hand with global prosperity and stability

Rising from the ashes of three disastrous decades of deglobalization, extremism, and world war, our two institutions were built on the idea that thriving international trade goes hand in hand with global prosperity and stability. On balance, the post–World War II record has been impressive.

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.

Yet the tide is turning against economic interdependence and international trade. Trade restrictions and subsidies increased after the global financial crisis, and tensions escalated further as governments responded to the pandemic and Russia's war in Ukraine by scrambling to secure strategic supply chains and rushing into trade-distorting policies.

Taken too far, these measures may open the door to alliance-oriented policies that reduce economic efficiency and fragment the global trading system. They could backfire if short supply chains end up more vulnerable to localized shocks. Foreign direct investment is already increasingly concentrated among geopolitically aligned countries.

Should we abandon the idea of trade as a transformative force for good? Our answer is a resounding *"No!"* Despite all the talk, trade has continued to deliver even during recent crises. It has great potential to keep contributing to higher living standards and greater economic opportunities for decades to come.

There are at least three reasons international trade is crucial for global prosperity. First, it increases productivity by expanding the international division of labour. Second, it enables export-led economic growth by providing access

to foreign markets. And third, it bolsters economic security by giving firms and households valuable outside options when negative shocks hit.

During the pandemic, trade and supply chains became vital to ramping up production and distribution of medical supplies, including vaccines. The power of international trade as a source of resilience has become evident again during the war in Ukraine.

We must cooperate tirelessly to strengthen the multilateral trading system and demonstrate that our own institutions can adapt to a fast-changing world

Deep and diversified international markets for grain enabled economies traditionally reliant on imports from Ukraine and Russia to make up shortfalls. Ethiopia, for example, lost all its wheat imports from Ukraine but now sources 20 percent of its wheat shipments from Argentina—a country from which it had not imported any wheat before.

Fragmentation's costs

In this context, fragmentation could be costly for the global economy. A scenario in which the world divides into two separate trading blocs could lead to a 5 percent drop in global GDP, World Trade Organization (WTO) research shows.

The IMF, meanwhile, reckons global losses from trade fragmentation could range from 0.2 to 7 percent of GDP. The costs may be higher when accounting for technological decoupling. Emerging market economies and low-income countries would be most at risk due to the loss of knowledge transfer.

Reinforcing the trading system to safeguard the benefits and prevent losses is important. But there is also an exciting forward-looking trade policy agenda that responds to the future of international trade, which we envision to be inclusive, green, and increasingly digitally and services driven.

Trade has done a lot to reduce poverty and inequality between countries. Yet we must acknowledge that it has left too many people behind—people in rich countries have been hurt by import competition, and people in poor countries have been unable to tap into global value chains and are often on the front line of environmental degradation and conflict over resources.

As we told Group of Twenty officials in a joint paper our institutions wrote with the World Bank, it need not be this way. With the right domestic policies, countries can benefit from free trade's great opportunities and lift those that have been left behind.

Addressing these underlying causes of discontent would solve people's problems more effectively than the trade interventions we see today. Well-designed social safety nets, greater investment in training, and policies in areas like credit, housing, and infrastructure that help, not hinder, workers to move across industries, occupations, and companies could all play a part.

The current push toward more diversified supply chains presents great opportunities for countries and communities that have struggled to integrate into global value chains: bringing more of them into production networks—what we call 're-globalization'—would be good for supply resilience, growth, and development.

Many of today's most pressing global problems will not be solved without international trade. We cannot overcome the climate crisis and get to net zero greenhouse gas emissions without trade. We need trade to get low-carbon technology and services to everywhere they are needed. Open and predictable trade lowers the cost of decarbonization by expanding market size, enabling scale economies, and learning by doing.

To provide one example, the price of solar power has fallen by almost 90 percent since 2010. Forty percent of this decline has come from scale economies made possible partly by trade and crossborder value chains, the WTO has estimated.

Cooperation's possibilities

By updating global trade rules, governments can help trade thrive in new areas that would expand opportunities,

for emerging market economies especially. Even as goods trade stalls, trade in services continues to expand rapidly. Global exports of digital services such as consulting delivered by video calls reached $3.8 trillion in 2022, or 54 percent of total services exports.

Some efforts are already underway. A group of nearly 90 WTO members, including China, the EU, and the US, are currently negotiating basic rules on digital trade. Shared rules would make trade more predictable, reduce duplication, and cut the compliance costs that typically weigh heaviest on the smallest businesses.

Similarly, multilateral cooperation and common standards could speed the green transition while preventing market fragmentation and minimizing negative policy spillovers to other countries. Bringing more small and women-owned businesses into global production networks—digital and otherwise—would spread the gains from trade more broadly across societies.

Despite geopolitical tensions, meaningful cooperation on trade remains possible. We saw this last June when all WTO members came together to deliver agreements on curbing harmful fisheries subsidies, removing barriers to food aid, and enhancing access to the intellectual property behind COVID vaccines.

Governments can build on those successes at the WTO's next ministerial meeting in February 2024. And recent work by our institutions points to a way to defuse tensions in sensitive areas such as subsidies through data, analysis, and common perspectives on policy design.

Navigating trade policies through the current turbulent period is challenging. But keeping trade open and looking for new opportunities for closer cooperation will be essential to build on existing gains and to help deliver solutions to climate change and other global challenges.

The IMF, WTO, and other leading international institutions have a critical role in charting a way forward that is in the collective interest. We must cooperate tirelessly to strengthen the multilateral trading system and demonstrate that our own institutions can adapt to a fast-changing world.

The IMF has a mandate to support the balanced growth of international trade. The WTO remains the only forum that brings all economies together to advance trade reform. We cannot afford to stand still. ■

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Trade fragmentation matters for bank credit supply

Claudia Buch, Linda Goldberg and Björn Imbierowicz discuss new evidence from the International Banking Research Network on how trade uncertainty can be amplified through the supply of credit

Recent geopolitical events have raised concerns that markets for goods and services could become more fragmented. Clearly, trade uncertainty has increased. The consequences for financial intermediation of fragmentation and uncertainty are not well understood though. If banks affected by adverse trade events contract lending, the effects of the initial shock for the real economy could be amplified.

Studies conducted in the International Banking Research Network show that fragmentation shocks reallocate and sometimes reduce overall credit supply through banks. This reallocation can reinforce fragmentation and change the consequences from trade disruptions.

Over the past decade, threats of restrictive trade policy and geopolitical risks have emerged and intensified. There has been a series of adverse shocks to globalisation (Aiyar *et al* 2023): the trade conflict between China and the US, Brexit, the COVID pandemic, and Russia's war of aggression against Ukraine.

These shocks can affect bank credit provision. Banks are important for financing international trade and providing credit to the real economy[1]. Trade policy and uncertainty shocks might even be reinforced by banks, domestically and internationally, by transmitting financial stress through lending and liquidity flows (eg. Peek and Rosengren 2000, Cetorelli and Goldberg 2012, Schnabl 2012, De Haas and Van Horen 2013, Niepmann 2015, Niepmann and Schmidt-Eisenlohr 2017, Amiti and Weinstein 2018, and Federico *et al* 2020).

The International Banking Research Network (IBRN) initiated a project where country teams investigated how trade uncertainty, fragmentation events and deglobalisation shocks are amplified through the supply of credit. Studies use granular confidential regulatory data on banks to show how fragmentation shocks reallocate and sometimes reduce credit supply through banks.

This reallocation both reinforces fragmentation and influences the pattern of consequences from trade disruptions. Studies draw on detailed information about the specific shocks to firms (to capture the demand side) and banks' exposures to those firms, along with bank characteristics (to capture the supply side).

Banks' credit supply responds to trade fragmentation shocks and increased uncertainty. When a fragmentation event occurs, banks decrease their supply of credit

Specific episodes explored include the effects of Russia's invasion of Ukraine in 2014 on Italian banks (Federico *et al* 2023), of the Brexit referendum on German banks (Imbierowicz *et al* 2023), of retaliatory trade restrictions from China on Norwegian banks (Cao *et al* 2022), of the euro area sovereign debt crisis on Portuguese banks (Bonfim and Fèlix 2023, Pedrono 2022), and of the increase in uncertainty since 2016 from intensifying trade tensions between the US and China on US, Chilean, and Mexican banks (Correa *et al* 2023, Margaretic and Moreno 2023, Bush *et al* 2023).

Other work looks at changes in services trade in a broad range of economies from 2014 through 2019 (Lloyd *et al* 2022 for the UK) or at the geographic specialisation of banks from 2006 to 2019 (Pedrono 2022).

Trade fragmentation spills over into bank lending activity

All studies confirm that banks' credit supply responds to trade fragmentation shocks and increased uncertainty. When a fragmentation event occurs, banks decrease their supply of credit. This effect goes beyond the firms immediately affected as banks also restrict credit to firms which are not directly exposed to the event. Hence, the initial shock is amplified across the universe of bank borrowers.

The magnitude of the decline in credit differs across countries. As regards large US banks, those exposed to trade uncertainty reduce credit originations by 0.5 percentage points, which compares to an average growth rate of 4.2% prior to the shock (Correa *et al* 2023).

A standard deviation increase in Italian bank exposure (around 0.45 percentage points) to a trade shock is associated with a 0.8 percentage point decrease in credit supply (Federico *et al* 2023) and high-exposure Norwegian banks decrease their lending in all lending categories by 3-6% following the trade shock (Cao *et al* 2022). Given the

differences in the type of shock and the measures used for analysis, the results overall suggest a generally material effect on bank credit supply.

Trade shocks are transmitted through increased risks of loans on banks' balance sheets. On impact, trade shocks have adverse effects on the financial soundness of firms. Firms experience a decline in revenues, lower liquidity, and a higher propensity of loan default (Federico *et al* 2023)[2].

Banks respond to higher risks and uncertainty arising from international trade shocks by taking precautionary measures. They increase loan loss provisioning and reduce risk taking. This manifests as a contraction of credit to riskier borrowers, and not just to those exposed directly to the initial uncertainty.

This type of mechanism is identified from analyses of banking responses in Chile, Germany, Italy, Norway, and the US. US banks, for example, contract credit supply more for firms that are more informationally remote, that strongly rely on trade finance, are that are internationally integrated into global value chains.

Firms facing larger information asymmetries, such as having shorter banking histories and being foreign firms, are also affected more. US banks which are exposed to higher uncertainty curtail loans specifically designated for investment.

Borrowers relying on financing through banks exposed to trade uncertainty are unable to fully substitute reduced lending with alternative external sources of credit. Accordingly, a contraction of credit supply can have adverse impacts on firms in terms of lower ability to borrow, capital expenditures, and asset growth (Correa *et al* 2022).

In Chile, banks reallocate credit from firms in nontraded sectors to those involved in global value chains, and to a lesser extent, to importers who are exposed to countries exhibiting an increase in trade uncertainty (Margaretic and Moreno 2023).

Portuguese banks more exposed to foreign firms decrease loan supply during crises but increase lending towards domestic firms (Bonfim and Félix 2023). In Germany, banks reduce credit supply to less profitable firms following the Brexit events (Imbierowicz *et al* 2023).

Some subsidiaries of large multinational corporations can access internal crossborder capital markets in response to the credit supply shock, mitigating some of the negative real economic outcomes. Overall, these banking channels add to the broader set of effects of Brexit on UK firms (Bloom *et al* 2019).

Some types of banks are more prone to credit supply adjustments

Beyond their direct balance sheet exposures to the firms impacted by trade events, the characteristics of banks matter for the magnitude of their credit supply response to international trade disturbances.

The resilience of banks matters for their response to shocks. Large US banks with lower levels of capital and a higher dependence on market funding reduce lending by more than their better capitalised peers or those relying more on retail funding.

Similarly, relative to their peers, German banks with lower levels of capitalisation and lower return on assets tend to have larger reductions in their credit supply to firms which are not directly exposed to the event. The adjustment by Chilean banks which are smaller is to extend new loans with shorter maturities and higher interest rates.

The geographic presence of bank affiliates in foreign countries has an impact as well. Generally, the contraction of credit is larger for banks with business models that support global trade as measured by the extent to which banks engage in trade finance and have loan exposures to foreign residents. The UK study looks at differences across banks with and without foreign affiliates (Lloyd *et al* 2022).

Banks without foreign affiliates decrease crossborder lending. Those banks with a foreign affiliate decrease intragroup lending but increase direct crossborder lending. Barriers to competition have the strongest impact especially for banks which have already established a presence in the other country.

The geographic specialisation of banks also determines the relationship between bilateral crossborder lending of banks and bilateral trade of firms: more geographically specialised banks provide more crossborder lending to firms in the same industry in which they specialize, but less so following an adverse trade shock (Pedrono 2022).

Similarly, under increased trade uncertainty surrounding the renegotiation of the North American Free-Trade Agreement (NAFTA), foreign banks operating in Mexico with their parent headquartered in the US and Canada reduced credit supply, while those with foreign parents elsewhere, increased credit supply (Bush *et al* 2022).

Concluding remarks

Trade policy uncertainty and fragmentation events have become major concerns for global production and trade (Fajgelbaum and Khandelwal 2021), with simulations showing that these events could lead to substantial reductions in economic growth (Bolhuis *et al* 2023).

Cross-country studies organised by the International Banking Research Network emphasise additional financial-sector factors that can affect credit supply and output effects of fragmentation events. Adverse trade shocks affect banks' borrowers, and the effects of those shocks are amplified through contractions in credit supply.

Importantly, these effects go beyond the specific firms that are directly affected by the trade-related events. This body of research shows that shocks to banks, which derive from borrowing firms' exposures to trade and trade uncertainty, generate ripple effects.

A decline and reallocation of bank credit supply can reinforce fragmentation and potentially slow the adjustment of firms to trade shocks.

A general conclusion from very detailed studies is that banks that are more resilient – with diversified portfolios, better capitalisation and liquidity buffers –are better placed to absorb adverse shocks and maintain lending, containing some of the adverse spillovers from trade shocks through credit supply. ■

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Endnotes

1. See the discussion and literature review in Buch and Goldberg (2020).

2. See also Baker et al (2016), Born et al (2019), Bloom et al (2019), and Fajgelbaum and Khandelwal (2021).

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The EU's strategic dependencies unveiled

Román Arjona, William Connell Garcia and Cristina Herghelegiu find that the EU benefits greatly from its wide participation in international value chains

The EU benefits greatly from its wide participation in international value chains. However, that integration is not exempt from strategic dependencies on products and inputs that are critical for Europe. This column examines the EU's dependencies in traded goods using data from 5,400 products imported between 2017 and 2020.

Foreign-dependent products span various sectors, including energy-intensive industries, health, renewables, and digital. China emerges as the primary source for these dependent products, followed by the US and Vietnam. Policymakers can use these insights to enhance supply chain resilience and mitigate vulnerabilities.

Over the past decades, the world has experienced unwavering changes in the shape of longer-term complex societal challenges: climate change, population ageing, and a massive digitisation of the economy and society.

While some of those have brought about numerous opportunities, others have exerted pressures on Europe's economy, industry, and society. An open-ended 'permacrisis' or 'age of disorder', anchored in relentless disruptions and high uncertainty, has added an additional layer of intricacy to the efforts in place to curb these challenges.

The cumulative impacts of the COVID-19 pandemic, the Russian invasion of Ukraine, and the energy crisis have not only bolstered geopolitical frictions but also induced a deep redefinition of the architecture and dynamics of global supply chains.

While some of the societal costs associated with the refurbishment of global value chains were conceivably unavoidable, others resulted from well-known market failures. These occur when firms prioritise their individual interests, whether financial or otherwise, over broader societal concerns.

For example, an overreliance on ring-fenced geographical areas for strategic inputs such as critical raw materials can induce a sub-optimal outcome from a societal point of view.

Against this backdrop, policymakers around the globe have crafted new policy strategies to spur competitiveness and growth, while addressing the risks stemming from the poly-crisis. Many of those put a focus on uplifting economic and social resilience.

Over recent years the EU has equipped itself with a set of policy measures to curb its strategic dependencies

In the EU, this materialised in a renewed industrial strategy with open strategic autonomy at its core. This new-fangled agenda marries openness to international trade with the creation of domestic capacity in strategic areas (European Commission 2021).

In this column, we present a methodology to measure the EU's dependencies and vulnerabilities. Our approach tracks areas where such dependencies are prone to creating ex-ante risks of supply chain distress and, in doing so, our work complements recent studies (Attinasi *et al* 2022, Baldwin 2022, Benoit *et al* 2022, Inoue and Todo 2022, Martin *et al* 2022, Lebastard *et al* 2023, Schwellnus *et al* 2023).

We also aim at rounding out other studies that analysed global and national product vulnerabilities (Bonneau and Nakaa 2020, Di Comite and Pasimeni 2023, Jaravel and Mejean 2021, European Commission 2021, Reiter and Stehrer 2021, ECB 2023, Schwellnus *et al* 2023).

The departure point of this column is 2021. In that year, the European Commission proposed a bottom-up, data-driven methodology to assess the EU's product dependencies. In a recent paper (Arjona *et al* 2023), we update this methodology by exploiting the novel FIGARO trade dataset by the European Commission that corrects for re-exports in international trade. Lack of treatment of re-exports is a drawback present in prevalent trade datasets that can lead to artificial shrinkages or upsurges in the number of dependent products.

A bottom-up, data-driven method to detect strategic dependencies

Our analysis sets its target on the universe of around 5,400 products imported by the EU from 2017 to 2020. We review and filter those products to identify a sub-set for which the EU experiences foreign dependencies.

To be classified as foreign dependent with our method, a product must meet three criteria: first, the majority of non-EU imports of that product must come from fewer than three foreign countries; second, non-EU imports of the good in question must account for at least 50% of its total EU imports; and third, non-EU imports must exceed total EU exports.

This is then complemented with an assessment of the relative rank of each of the traded goods on the three economic indicators that underpin each of the three criteria above, grouped in a single metric. We then select the top 10% of that distribution.

In short, our methodology permits us to identify those goods which suffer from an excessive concentration on foreign sources, significant scarcity within the EU, and low possibilities for domestic substitution. We subsequently scan goods in sensitive areas such as security and safety, health, and the twin transitions.

Applying the methodology described above to the EU import data, we isolate 204 products as foreign-dependent, under four main blocks. First, dependent products are identified in energy-intensive industries.

These are mostly raw materials used as inputs across many other industrial sectors. Some examples include manganese, nickel, aluminium, chromium, rare earth metals, molybdenum, borates, uranium, silicon, and permanent magnets. In addition, dependencies are identified for traditional energy inputs such as coal or petroleum coke and gases.

Second, within the health industrial ecosystem, dependencies include heterocyclic compounds, alkaloids, medicines, vitamins, and medical instruments (eg. scintigraphic apparatus, mechano-therapy or orthopaedic

appliances). We also observe COVID-19-related goods where major supply chain distress was experienced at the onset of the pandemic, such as surgical gloves or protective garments.

Third, within the renewables industrial ecosystem, dependencies are recognised in raw materials with heavy demand for the green transition, including photovoltaic cells or LED lamps. Fourth, on the digital front, we detect products such as laptops, mobile phones, monitors, and projectors.

These 204 products where the EU experiences foreign dependencies represent around 9.2% of the total extra-EU import value. When it comes to origins, China represents more than half of this value, followed by the US and Vietnam with 9% and 7%, respectively.

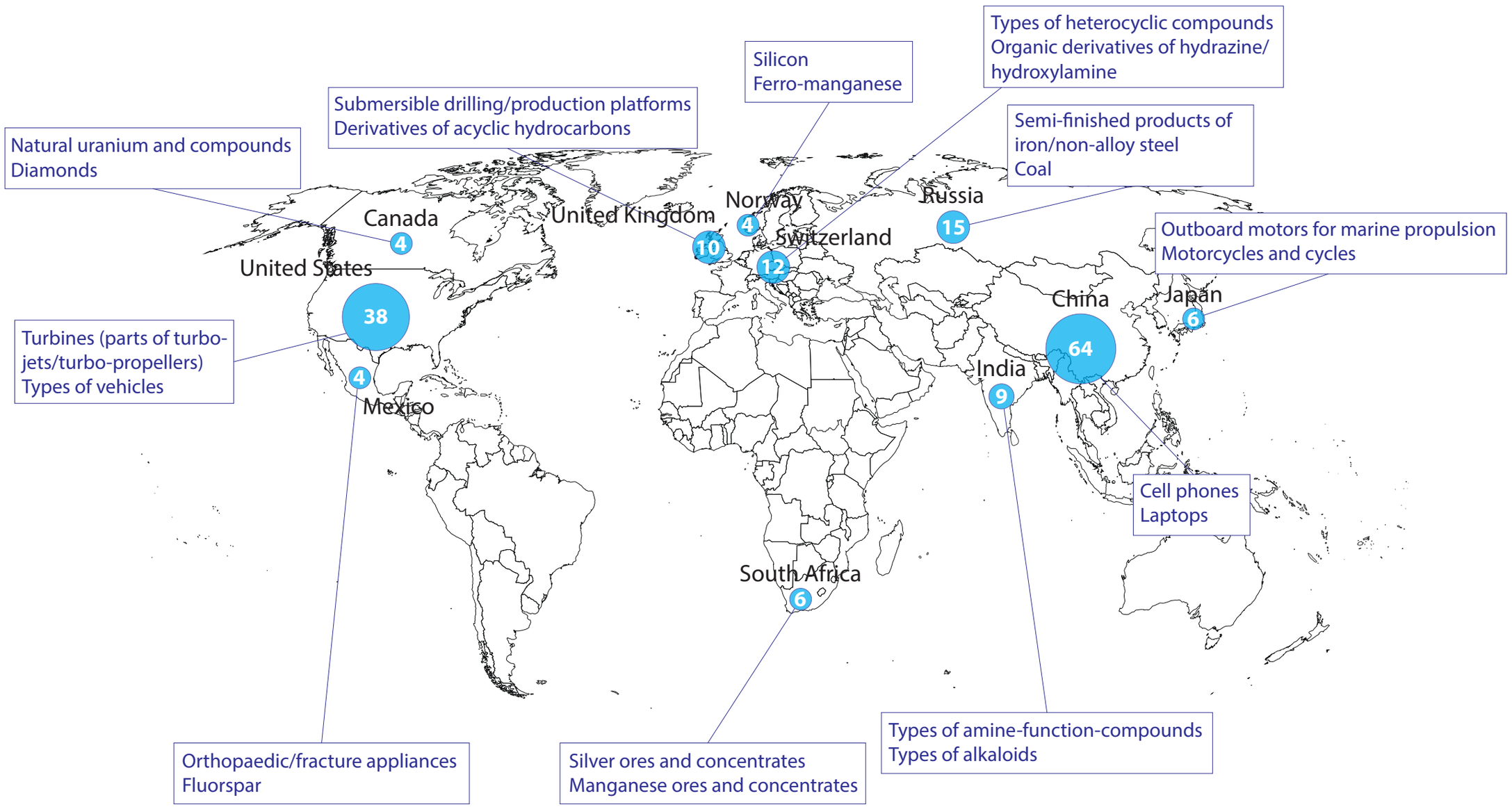
In the number of dependent products, China is the first source for 64 of them, followed by the US with 38 and Russia with 15 (see Figure 1). Examining the number of products rather than the value of imports is crucial since goods, despite facing low import values, may cause significant disruptions to society, as was the case with face masks during the COVID-19 pandemic.

Risks of single points of failure

The list of EU dependencies in strategic ecosystems can be complemented with the main features of the global trade network associated with each of the 204 identified products.

This allows us to detect goods whose production is highly concentrated at the world level and which can be considered highly vulnerable in case of supply chain distress.

Figure 1. Mapping the origins of 204 dependent products, including examples



Source: Authors' computations based on the database - Trade-Figaro-Eurostat.

Our analysis argues that the relative risk of experiencing a global single point of failure (SPOF) for any of the 204 goods is higher when a single exporter is central to a large number of countries within a given trade network, and where world production is likely to be concentrated in a single country.

We calculate the risk of a global SPOF by comparing the relative position of each of the traded goods using the two metrics above. Products with the highest aggregate risk of an SPOF appear in decile 10 of the distribution of all 5,400 HS6 products. Products with the lowest risk of an SPOF locate in the lowest deciles.

Once the relative position of each traded product is identified, we turn back to our identified list of 204 dependencies to inform policymakers when they develop mitigating actions to steer clear of such vulnerabilities.

Out of the 204 EU-dependent products, close to 20% are in the highest decile and thus bear the highest risk of experiencing an SPOF, whereas only 6% are in the lowest risk category.

Those products with the highest risk of an SPOF include goods in the health industrial ecosystem (antibiotics, vitamins, medical apparatus, and COVID-19 goods), digital (laptops and parts, radio-broadcast receivers, and mobile phones), and renewables (LED lights).

Conclusions

Our results imply that the risks associated with EU dependencies cannot be mitigated with a one-size-fits-all policy recipe. Improving our granular understanding of strategic dependencies and global SPOFs would allow, for example, us to differentiate between products where diversification through trade policy instruments is adequate from other products where risk mitigation may instead benefit from EU capacity building.

More precisely, to address EU dependencies on products for which the associated risk of an SPOF is low, EU policies should be able to fully mobilise the power of trade policy instrumentation.

On the other hand, if EU dependencies experience high risks of an SPOF, support for the creation and deployment of novel technologies, stronger R&D, circularity efforts, or stockpiling can appear as more appropriate solutions to support the building of internal EU capacity through industrial and innovation policies.

Against this backdrop, over recent years the EU has equipped itself with a set of policy measures to curb its strategic dependencies. In the case of raw materials, where EU dependencies are prominent, the recently adopted Critical Raw Materials Act (2023) has the goal of fostering the EU's access to a secure, diversified, affordable, and sustainable supply of such materials, supporting a greater EU capacity for extraction, processing, and recycling.

The European Chips Act (2022) and the Net-Zero Industry Act (2023) aim at accelerating the EU's manufacturing capacity in chips and solar panels, respectively. These initiatives secure a central position for accurate and relevant monitoring tools capable of accurately measuring and disentangling strategic dependencies.

Such tools should also be able to identify single points of failure within supply chains and thus provide early warning signals of potential supply chain disruptions. ■

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Climate risks and global value chains

Extreme weather events will become more frequent as global temperatures rise. Rikard Forslid and Mark Sanctuary analyse the impact of the 2011 Thailand flood on Swedish firms

Extreme weather events will become more frequent as global temperatures rise. This is a challenge for companies that depend on complex international supply chains. There is an academic literature that analyses the impact of natural disaster shocks at the firm level (eg. Barrot and Sauvagnat 2016, Boem *et al* 2019, Carvalho *et al* 2021, Todo *et al* 2015, Zhu *et al* 2016, Kashiwagi *et al* 2021).

These studies focus on the Great East Japan Earthquake or on natural disasters in the US and find significant domestic effects as well as spillovers between Japan and the US. For example, Boehm *et al* (2019) find that the Great East Japan Earthquake caused the output of subsidiaries of Japanese firms in the US to fall roughly one-for-one with the decline in imports.

In a recent study (Forslid and Sanctuary 2022), we provide evidence of the impact of extreme weather events on two small countries located far from one another in the impact of the catastrophic 2011 Thai flood on Swedish importing firms. Both Sweden and Thailand are small countries located far from one another.

A priori, it would seem that Thai imports could be easily substituted by imports from countries closer to Sweden. Instead, the evidence points to very large effects. Production falls by an average of 8% among the affected Swedish firms, and the multipliers are very large, with a fall in production almost 30 times larger than the fall in imports.

The Thai flood of 2011 began in July of that year and inundated 9.1% of the total land area of the country, affecting close to 13 million people, with 728 deaths. Damages were estimated at $46.5 billion, dispersed across 69 provinces in every region of the country, and Bangkok and its vicinity were paralysed for two months (Poapongsakorn and Meethom 2013).

The flood hit the manufacturing sector especially hard. METI (2012) report, for instance, production losses of 84% in transport machinery, 77% in office equipment, and 73% in information and communication equipment. The time to recover differed between sectors, but also among individual firms depending on their location.

The fact that Sweden is a small economy far away from Thailand seems to have aggravated the effects of the shock. Multipliers are much higher than in other studies on large countries

In the automotive industry Toyota required 42 days to partly resume operations, while Honda required 174 days. Thailand produced approximately 43% of the world's hard disk drives in 2011, and recovery was somewhat slower than in the automobile sector. Many companies had facilities in Ayutthaya, where industrial parks were heavily inundated (Haraguchi and Lall 2015).

Overall, however, Thai industry recovered within months and had made important progress within six months. Production in March 2012 was 10% lower than that in March 2011, which may be compared to the maximal loss of 77% in November 2011 (METI 2012).

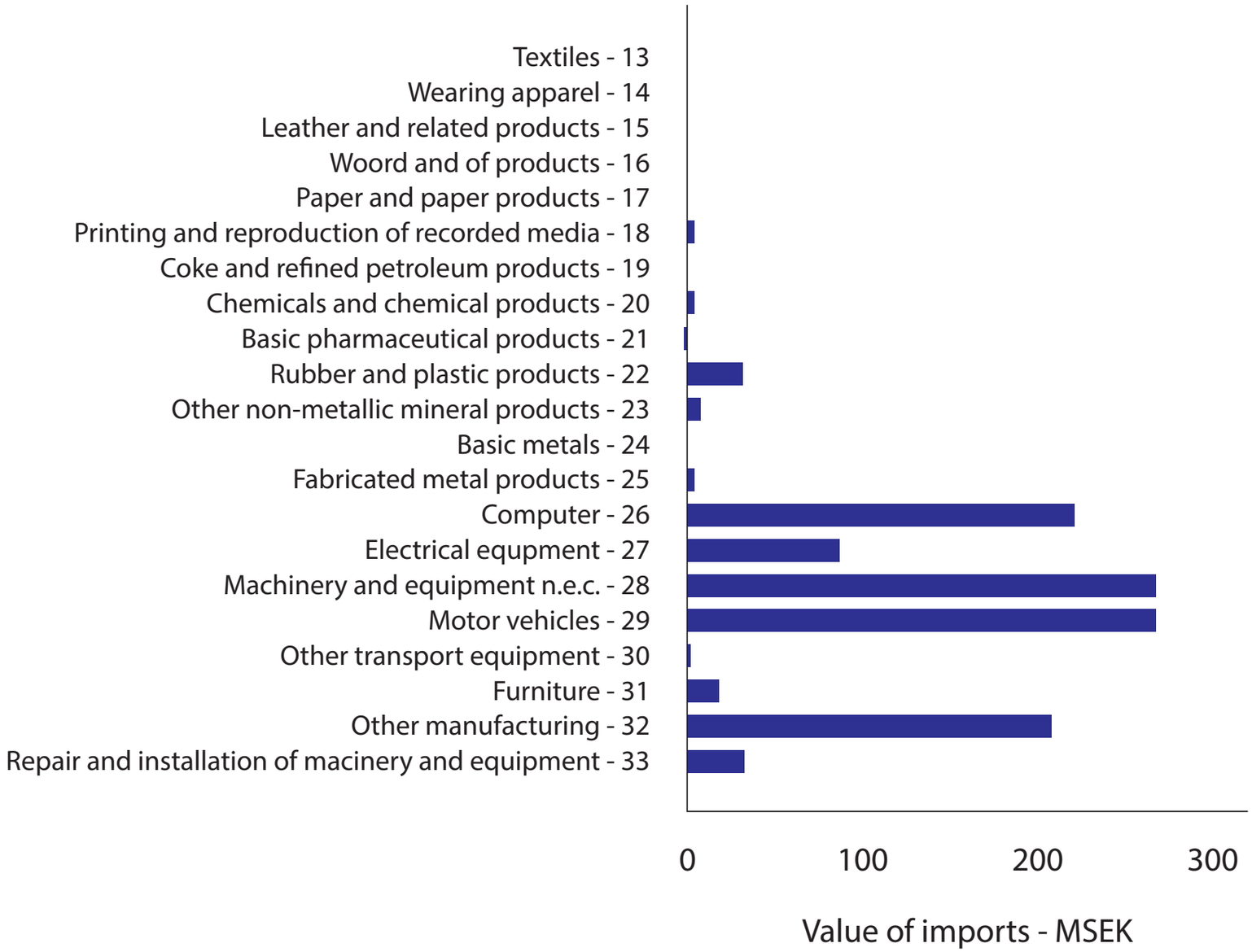
Swedish manufacturing imports from Thailand was concentrated in machinery and equipment (Sector 28) and computer and electronic products (sector 26) both in terms of value and number of importing business, shown in Figure 1.

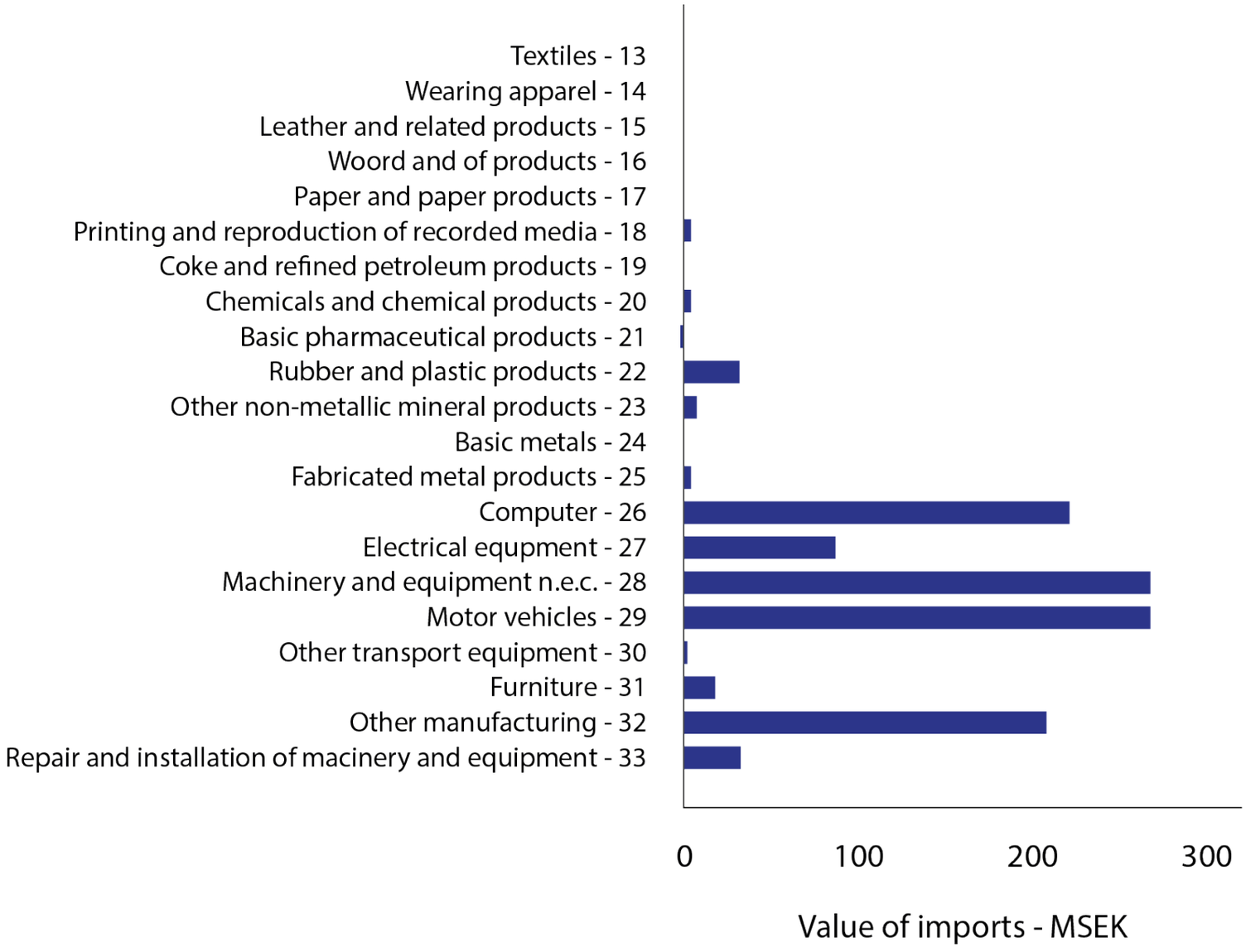
Estimating the impact of the flood on Swedish businesses requires careful study design. For our Thai flood study, we use firm-level data, including the products each business imports, and the countries from which these imports come from, over the period from 2006-2013.

Swedish businesses with an average of at least some (greater than zero) imports from Thailand in the two years prior to the flood (2009 and 2010) are assigned to the treated group, while all other Swedish firms that import during this period are assigned to the control group.

Figure 2 illustrates the divergence in imports between the treated and control groups of firms, the magnitude of the flood's impact is clear. Thai imports by Swedish businesses fell by around 90%: Swedish imports from Thailand were around €100 million lower in 2012, the year following the flood.

Figure 1. The pattern of Swedish imports from Thailand





Source: Statistics Sweden

Moreover, sales by exposed Swedish firms dropped 8% drop in 2012. This suggests the Thai flood caused a drop of about €3 billion in sales by Swedish business, a 30-fold amplification.

Interestingly, the adverse impacts to Swedish businesses persisted for two years through to 2013, even though Thai production had largely recovered within six months of the flood waters receding. This indicates that fixed costs in establishing links in supply networks may be substantial, and once severed, supplier-buyer relationships may be costly to re-establish (eg. Antras and Chor 2021).

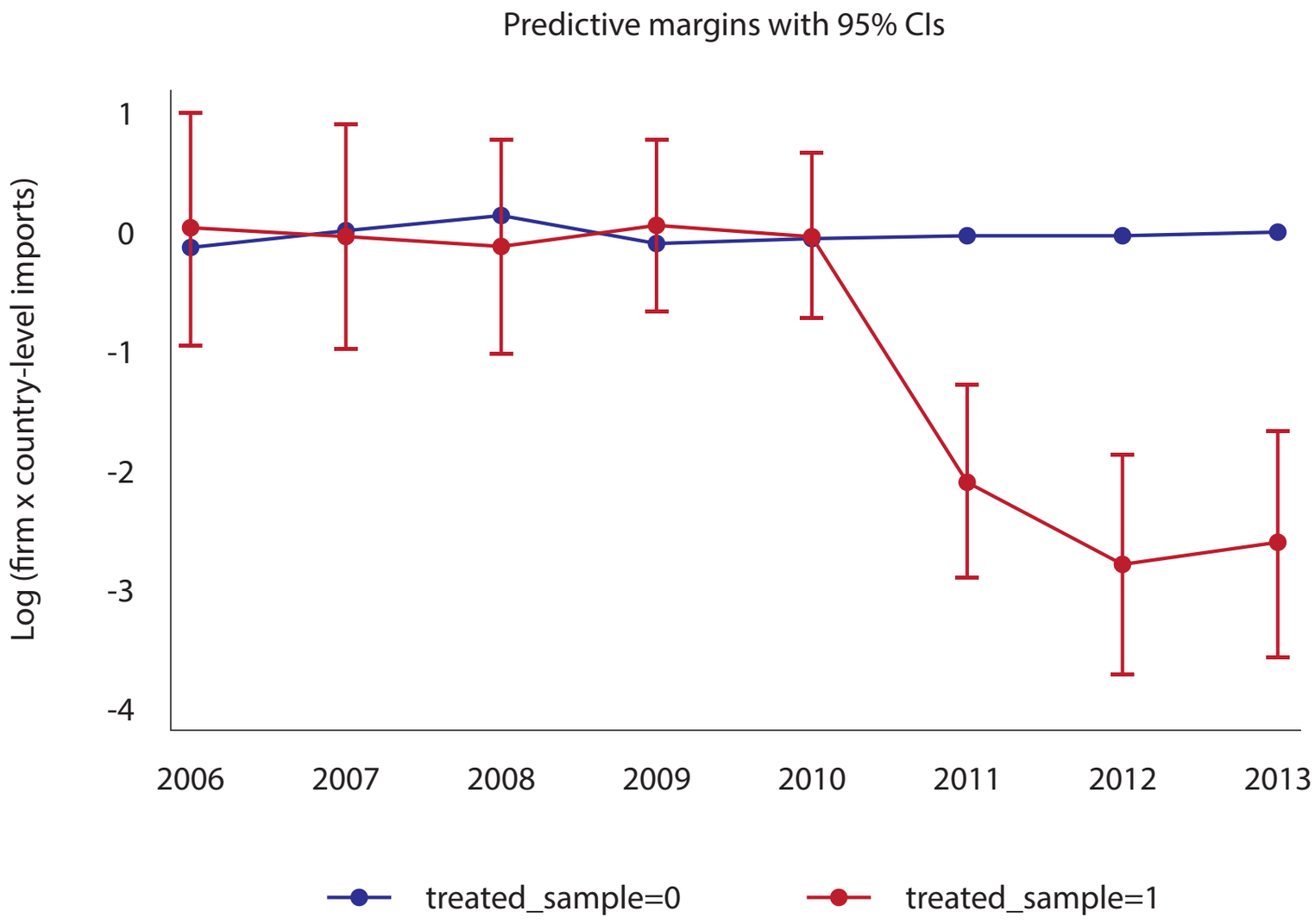
Swedish importers predominantly switched to other Asian suppliers, and there is weak evidence of reshoring (where Swedish businesses sourced alternative inputs from EU countries). Larger businesses were better at handling the shock, facing a smaller drop in the value of imports from Thailand than smaller businesses.

Geographical diversification of suppliers is also important in determining how well Swedish businesses weathered the shock. Exposed businesses that import a product from more than one country are almost completely shielded from the disruptions caused by the flood; it was easier for these firms to substitute to similar inputs from non-Thai countries of origin.

In contrast, businesses that imported a product from Thailand only were unable to source alternative suppliers of the goods affected by the flood. There were also strong negative horizontal effects. Swedish businesses cancelled orders of goods that were complementary to the goods they were unable to obtain from Thailand – imports of other goods from other countries fell by around 80%.

Overall, these new insights suggest that firms were poorly prepared to manage the disruptions arising from the flood, even though some firms hedged their operations with multiple sources of critical inputs.

Figure 2. The impact of the 2011 Thai flood



Source: Forslid and Sanctuary (2022).

Moreover, imports from Thailand were slow to recover as Swedish businesses turned to other countries to meet their needs for critical inputs that Thailand had been unable to supply. The fact that Sweden is a small economy far away from Thailand seems to have aggravated the effects of the shock. Multipliers are much higher than in other studies on large countries.

Similarly, we find that small businesses are worse hit by the shock than large firms, possible due to weaker negotiating power. These microeconomic insights help clarify aggregate effects of foreign extreme weather events on the home economy.

While individual firms may suffer significant losses from events like the Thai flood (Xu and Monteiro 2022), and the aggregate effects were non-negligible, securing alternative sources for critical inputs can help support better economic resilience to extreme weather at home. ■

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Resilient global supply chains and implications for public policy

Supply disruptions during the pandemic raised concerns about supply chains. Cyrille Schwellnus, Antton Haramboure, and Lea Samek consider the resilience of global supply chains

Widespread supply disruptions during the COVID-19 pandemic raised concerns about the risks from globalised value chains. This column studies the resilience of global supply chains using new measures of supply chain dependencies and concentration across the world.

It finds that the impact of mobility restrictions on output are greater in industries with few supplying countries (high geographic concentration) and few supplying firms within the industry (high industry concentration). Public policies can enhance resilience by promoting management and worker skills (ex ante), using targeted fiscal support (ex post), and increasing geographic diversification of supply chains.

The globalisation of supply chains – loosely defined as an increasing share of imported intermediate goods and services in output – has raised productivity and boosted the participation of lower-income countries in international trade (Irwin 2022, OECD 2013). But widespread supply disruptions in the wake of the COVID-19 pandemic have raised concerns that globalised supply chains expose domestic production to shocks from abroad, including by creating strategic dependencies on a small number of key players (Javorcik 2020, OECD 2021).

For instance, widespread shortages of critical medical equipment (eg. respirators) and critical inputs into manufacturing (eg. semiconductors) during the COVID-19 pandemic have triggered a debate about the desirability of onshoring and the geographical diversification of inputs.

Mapping global supply chain dependencies

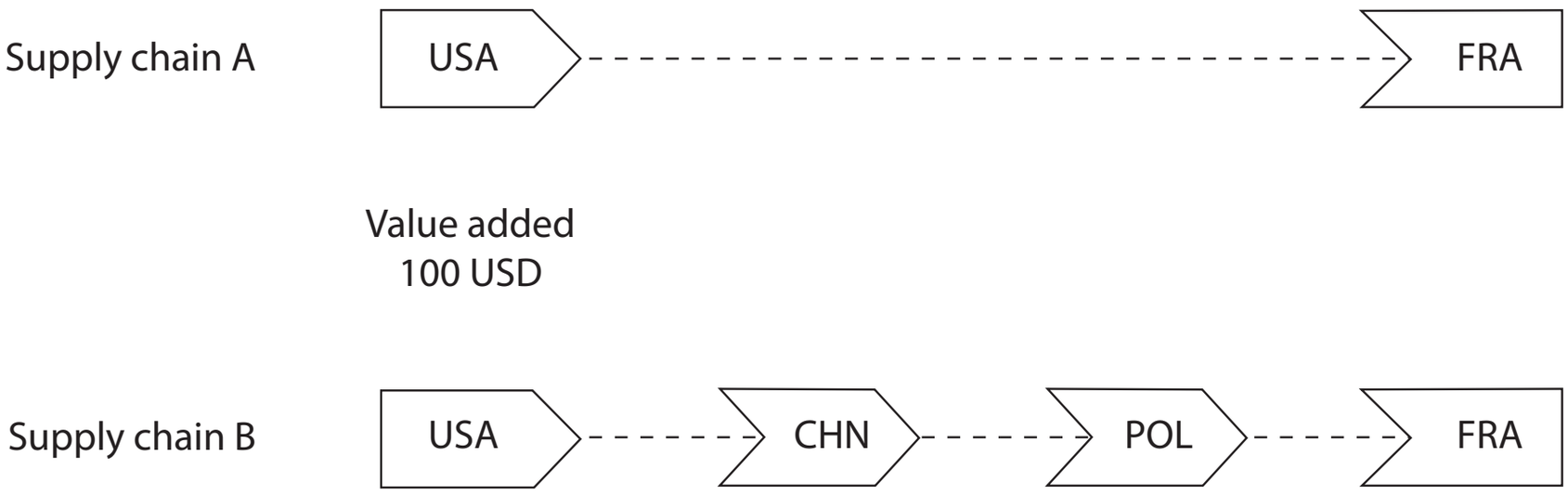
In a recent project, we analyse the resilience of global supply chains in the wake of the COVID-19 pandemic with a view to providing insights for public policies. In our first paper (Schwellnus *et al* 2023b), we draw a detailed map of global supply chain dependencies based on new indicators that account for both the size and the complexity of supply chain exposures[1].

Following a simple but powerful insight of Baldwin and Freeman (2022), our indicators are based on gross trade and gross output rather than value added, thereby implicitly accounting for the fact that longer supply chains may be more vulnerable to disruptions.

The key challenge for public policies will be to preserve the benefits of global sourcing for the overwhelming majority of supply chains while limiting costs when resorting to risk mitigation strategies in strategically important and highly concentrated ones

To see this, consider the stylised supply chains in Figure 1. Suppose the US produces a semiconductor that embodies $100 of US value added. The short (and simple) supply chain A consists of direct exports to France. In the longer (and more complex) supply chain B, the US exports the semiconductor to China, which embodies it in a display and exports it to Poland, which, in turn, embodies it in a car and exports it to France. It is plausible that supply chain B is more vulnerable to disruptions than supply chain B even though the exported value added from the US to France is the same.

Figure 1. Longer supply chains are more vulnerable to disruptions



Our global map of supply chain dependencies based on these indicators emphasises the potential risks related to supply chain concentration. First, some industries are not only highly dependent on foreign inputs but also on geographically highly concentrated suppliers, making them particularly vulnerable to disruptions. This is, for instance, the case of the automotive and information and communications technology (ICT) and electronics industries that were heavily affected by supply disruptions in the wake of COVID-19.

Second, China is a critical choke point in global supply chains, with global supply and demand across a broad range of industries – especially manufacturing and mining – being heavily concentrated in China. Highly concentrated supply chains may be particularly risky by making rapid substitution to alternative suppliers in case of a shock very costly.

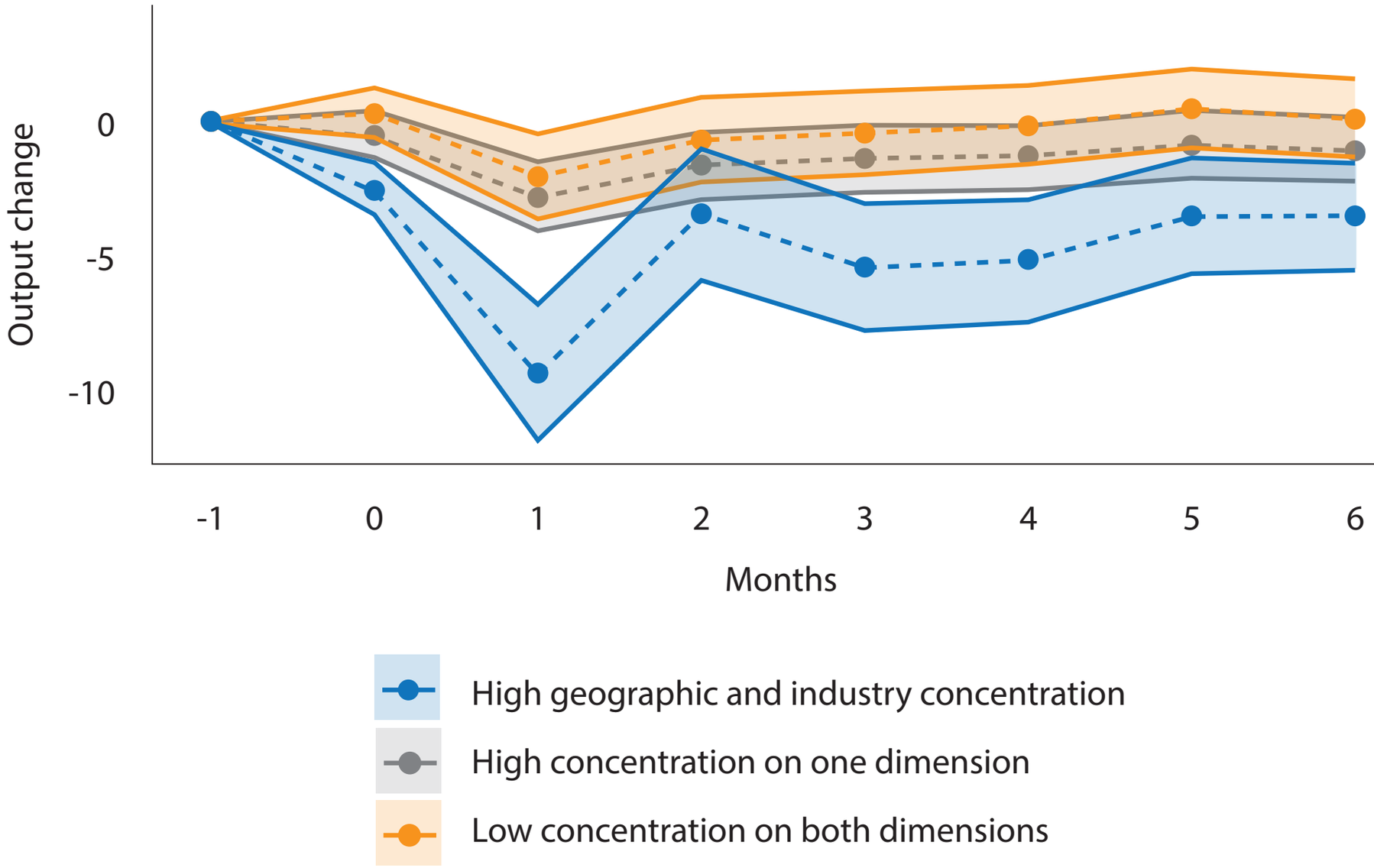
The transmission of foreign shocks through global supply chains

The econometric analysis in our second paper shows that our indicators of global supply chain dependencies are not only plausible but empirically relevant (Schwellnus *et al* 2023a). In this paper, we use exogenous mobility shocks during the COVID-19 pandemic to estimate the transmission of foreign disruptions on domestic output through global supply chains.

We find that our indicators of global supply chain dependencies are economically and statistically significant in transmitting foreign disruptions (Figure 2). The effects are particularly large in industries with few supplying countries (high geographic concentration) and few supplying firms within the industry (high industry concentration), in which the average quarterly output decline in response to a one standard deviation tightening of mobility restrictions abroad is about 5%[2]. To put this into perspective, the tightening of mobility restrictions in the spring of 2020 amounted to two standard deviations.

One way that public policies can enhance global value chain resilience is by facilitating a quick rebound of output, either before a shock occurs (agility policies) or after it materialises (adaptation policies). Our econometric results suggest that promoting management and worker skills is a crucial agility policy by allowing for a rapid restructuring of production. Well-targeted government fiscal support in the form of grants, loan guarantees, and support for workers stands out as a significant adaptation policy.

Figure 2. Supply chain concentration amplifies the output decline in response to a shock



Another way that public policies can enhance global value chain resilience is by mitigating the risk that shocks from abroad are transmitted to the domestic economy in the first place. We find that geographical diversification would reduce the adverse effects on output of a simulated shock to Chinese production in the most exposed downstream industries by up to 25%.

The partial onshoring of production (in addition to diversification) would only have very limited additional benefits in terms of shielding domestic production from shocks. Moreover, onshoring may come at a significant cost in terms of large up-front investments and/or higher production costs.

The shielding effects of technological innovation that reduces dependencies on specific inputs sourced from abroad (eg. fossil fuels) are comparable to diversification but require large technological shifts that may take time to materialise.

Implications for public policies

So what do our results imply for the overall public policy design to strengthen the resilience of global supply chains? Our results suggest that a key factor shaping the appropriate policy response to global supply chain risk is geographical concentration of supply.

Another crucial determinant is the strategic importance of the relevant value chain. From an economic perspective, a strategically important value chain provides an essential input to a wide range of domestic downstream industries (eg. critical raw materials) or provides significant technological spillovers to the wider economy (eg. semiconductors)[3].

Concerns about global supply chain risk are most pronounced in supply chains that are both highly concentrated and strategically important (Figure 3, Panel A, top-right quadrant). For instance, given that semiconductor production is highly concentrated in a small number of key players and semiconductors are a critical input into a broad range of other industries (including national defence), a disruption of the supply chain would have large adverse macroeconomic consequences (Haramboure *et al* forthcoming).

In such supply chains, the benefits of risk mitigation strategies to limit foreign exposures, such as diversification of input suppliers (including through near and partial onshoring of production) and technological innovation to substitute specific inputs may, in some cases, justify high upfront investment costs and increases in operating costs.

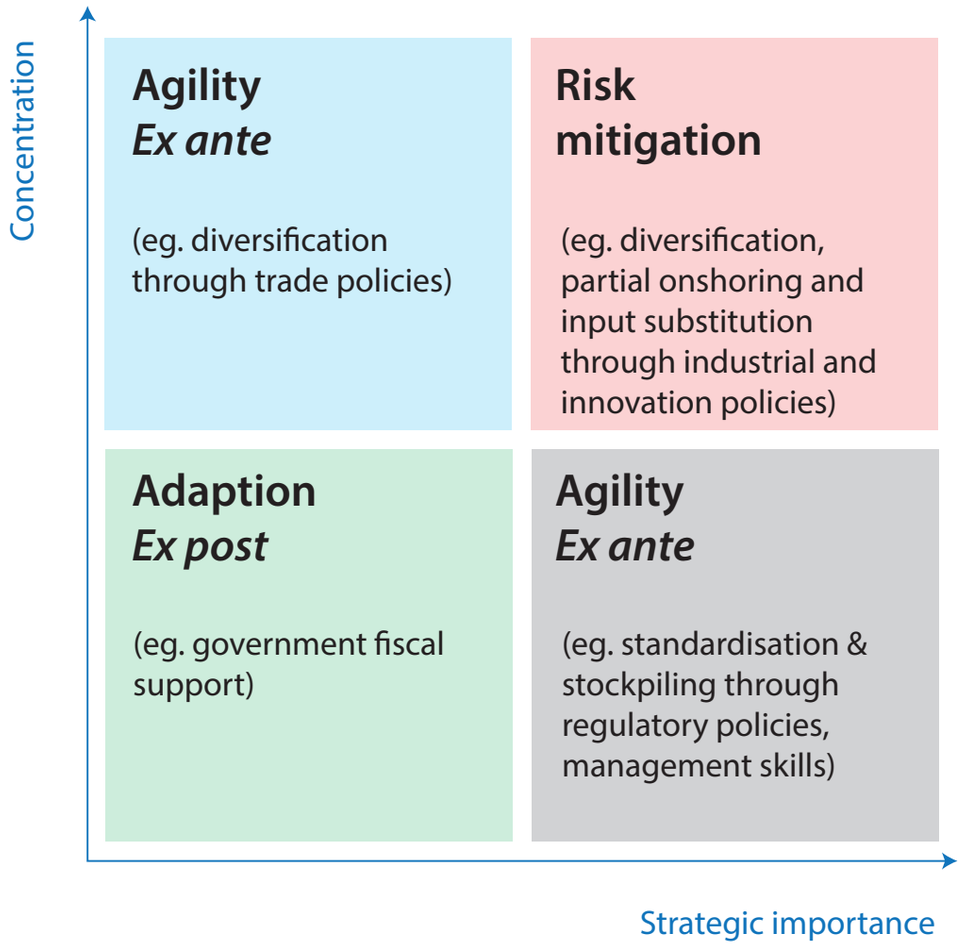
In strategic value chains where suppliers are geographically diversified (eg. a range of medical, pharmaceutical, and ICT products), policies could promote agility, including through the standardisation of inputs and the holding of adequate inventories.

In non-strategic value chains with few suppliers (eg. parts of the textiles and apparel value chain), public policies could promote greater diversification through trade policies that provide better market access to small suppliers. In non-strategic value chains with many suppliers (eg. construction materials), the focus should be on ex-post adaptation measures through fiscal support in case of exceptionally large disruptions.

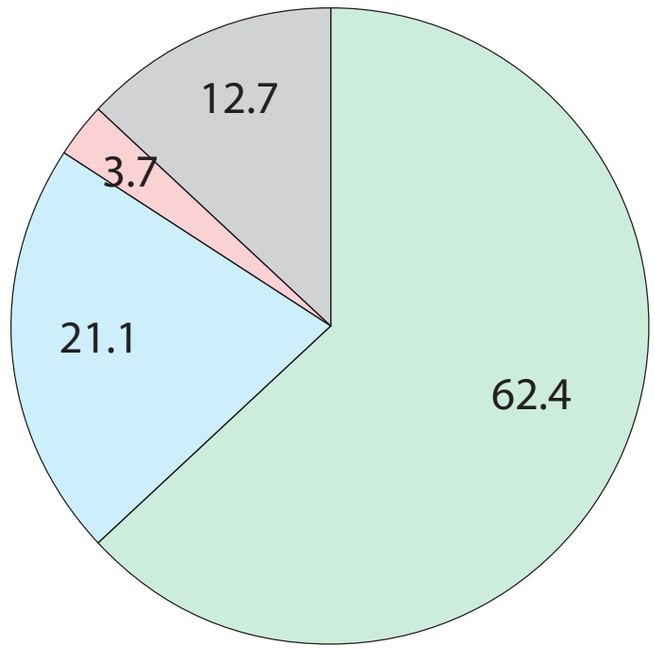
The overwhelming majority of supply chains are non-strategic and non-concentrated, with only a small fraction being strategically important and highly concentrated (Figure 3, Panel B). Based on a common threshold of geographic supplier concentration (Herfindahl-Hirschman Index above 2500) and a list of strategic products maintained at the OECD, about 62% of supply chains are neither dependent on concentrated suppliers nor strategically important.

Figure 3. Policies need to be tailored to the specific supply chain

Panel A. Policy prioritisation



Panel A. Share of products in each quadrant (%)



Only about 4% are both strategically important and highly concentrated. Even though these proportions are only illustrative due to the ad-hoc definitions of geographic concentration and strategic importance, they nonetheless imply that risk mitigation policies are relevant only for a small fraction of supply chains.

In sum, in the overwhelming majority of global supply chains, ex-ante agility and ex-post adaptation policies are likely to be sufficient to deal with disruptions. Moreover, even in highly concentrated and strategically important supply chains, the potential benefits of risk mitigation policies need to be balanced with potential costs.

The key challenge for public policies will be to preserve the benefits of global sourcing for the overwhelming majority of supply chains while limiting costs when resorting to risk mitigation strategies in strategically important and highly concentrated ones. ■

Cyrille Schwellnus, Antton Haramboure, and Lea Samek are all Economists at the Organisation for Economic Co-Operation and Development

Endnotes

1. We have made these indicators publicly available at https://forms.office.com/e/q0ZcVACFax.

2. The estimated output decline is 2.5% in the month of the shock (month 0 in Figure 2), 9% in the month following the shock (month 1), and 3.5% in the second month following the shock (month 2).

3. From a non-economic perspective, strategic importance also encompasses considerations such as the importance of a value chain for national defence, public health, and food security.

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COVID-19 and GVCs

Laura Lebastard, Marco Matani and Roberta Serafini examine the impact of COVID-19 supply disruptions on exporters in global value chains

COVID-19 triggered a debate on whether supply value chain trade is primarily a source of vulnerability or a source of resilience. This column uses data on French firms over the period January 2020 to December 2021 to show that participation in global value chains increased firms' vulnerability to the pandemic shock in terms of both export sales and probability of survival in the export market – especially when supply bottlenecks were more salient.

Firms located relatively more downstream in the value chain were more severely affected by supply disruptions. At the same time, the results suggest that exporting firms benefited from sourcing their core inputs from different countries, supporting the hypothesis that diversification in global value chains fosters supply chain resilience.

The outbreak of the COVID-19 pandemic resulted in a sharp contraction in both demand and supply, driven by lockdown measures adopted in many countries across the globe in response to the severity of the contagion and its geographical spread.

The global nature of the crisis meant that firms engaged in international trade were exposed to international disruptions on top of domestic ones, with weaker foreign demand for exporting firms, and a reduction in supply translating into shortages of intermediate inputs for importing firms.

Firms involved in global value chains (GVCs) – namely, firms that both import intermediate inputs and export goods – faced these two additional challenges to their ability to produce and therefore sell their goods (Baldwin and Tomiura 2020).

In this context, the further upstream the disruption occurs, the greater is the potential for supply bottlenecks to propagate negative shocks. Thus, the COVID-19 pandemic has triggered a debate among academics and

policymakers on whether supply value chain trade is primarily a source of vulnerability or a source of resilience (Mirodout 2020, Baldwin and Freeman 2022).

In our recent paper (Lebastard *et al* 2023), we exploit rich customs data covering all French firms engaged in international trade to estimate the impact of supply chain linkages on exporting activity during the pandemic[1].

Exporters in global value chains suffered relatively more than other exporters during the COVID-19 crisis

The monthly frequency of the data allows us to differentiate between three periods during the unfolding of the COVID-19 crisis. The first phase was between February and April 2020, when lockdowns caused activity to come to an abrupt halt in a number of non-essential manufacturing and services sectors.

The second phase was between May and August 2020, when exports recovered to some extent in response to the gradual lifting of pandemic-related restrictions.

The third phase was from September 2020 to the end of 2021, when disruptions to global supply chains emerged and progressively intensified. We focus on all firms that had exported every month between July and December 2019.

Within this sample, our treatment group comprises all exporting firms that had imported intermediate inputs at least once over the same period. We assess firms' performance during the crisis, in terms of export sales and probability of survival in the export market. The richness of the dataset allows us to then deepen our analysis and look at several sources of heterogeneity.

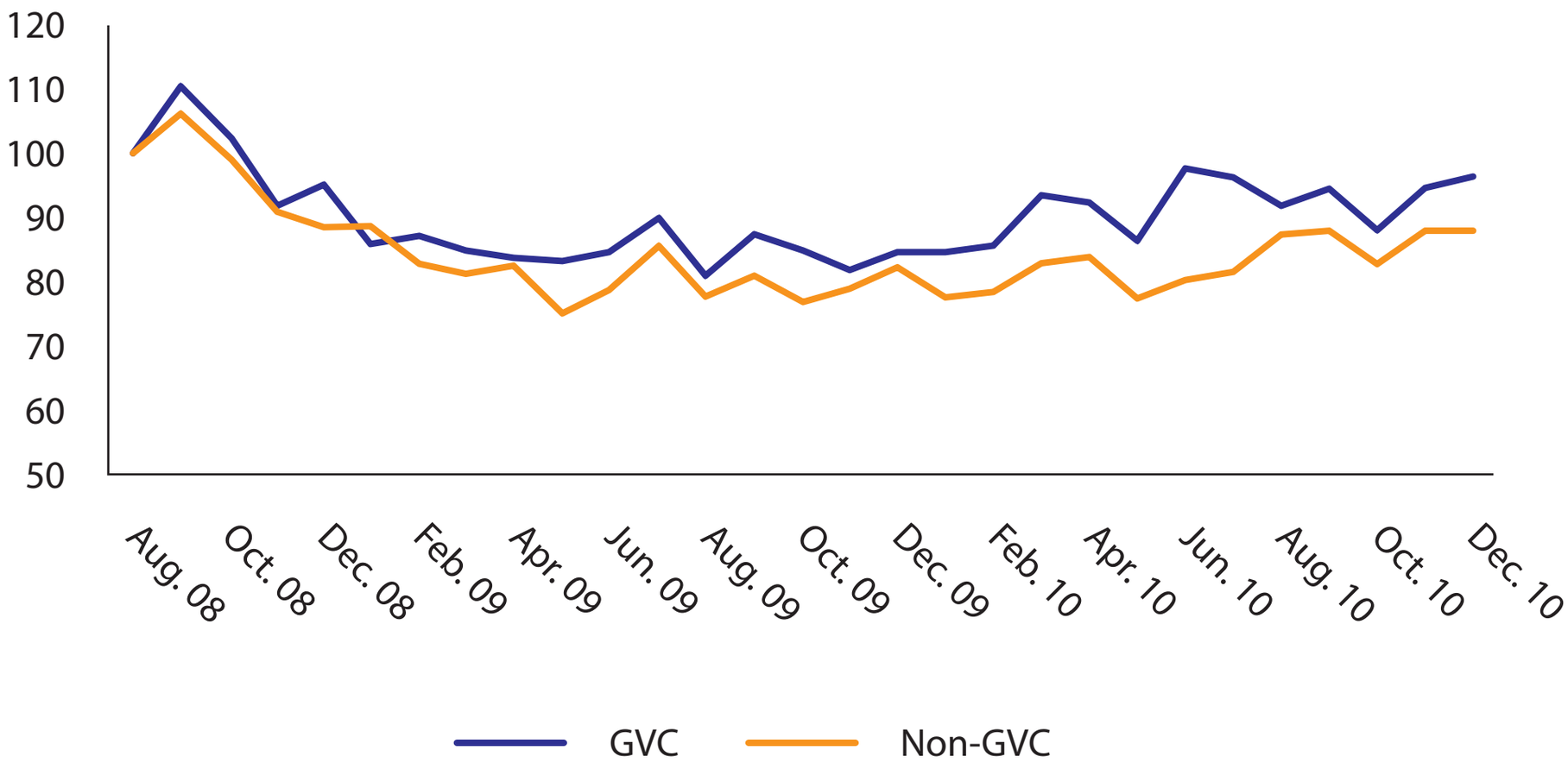
In particular, we investigate the extent to which the pandemic had a differential impact depending on whether firms are located more upstream or downstream along the value chain and on whether they diversify the countries from which they source their inputs.

Firms in global value chains: comparing the COVID-19 crisis and the great financial crisis

Our data show that firms involved in global production networks in the pre-crisis period experienced the sharpest fall in exports at the onset of the COVID-19 crisis, and recovered at a slower pace than non-GVC exporters after the economic reopening (Figure 1, panel a).

Figure 1. Export performance over time of GVC firms and non-GVC firms

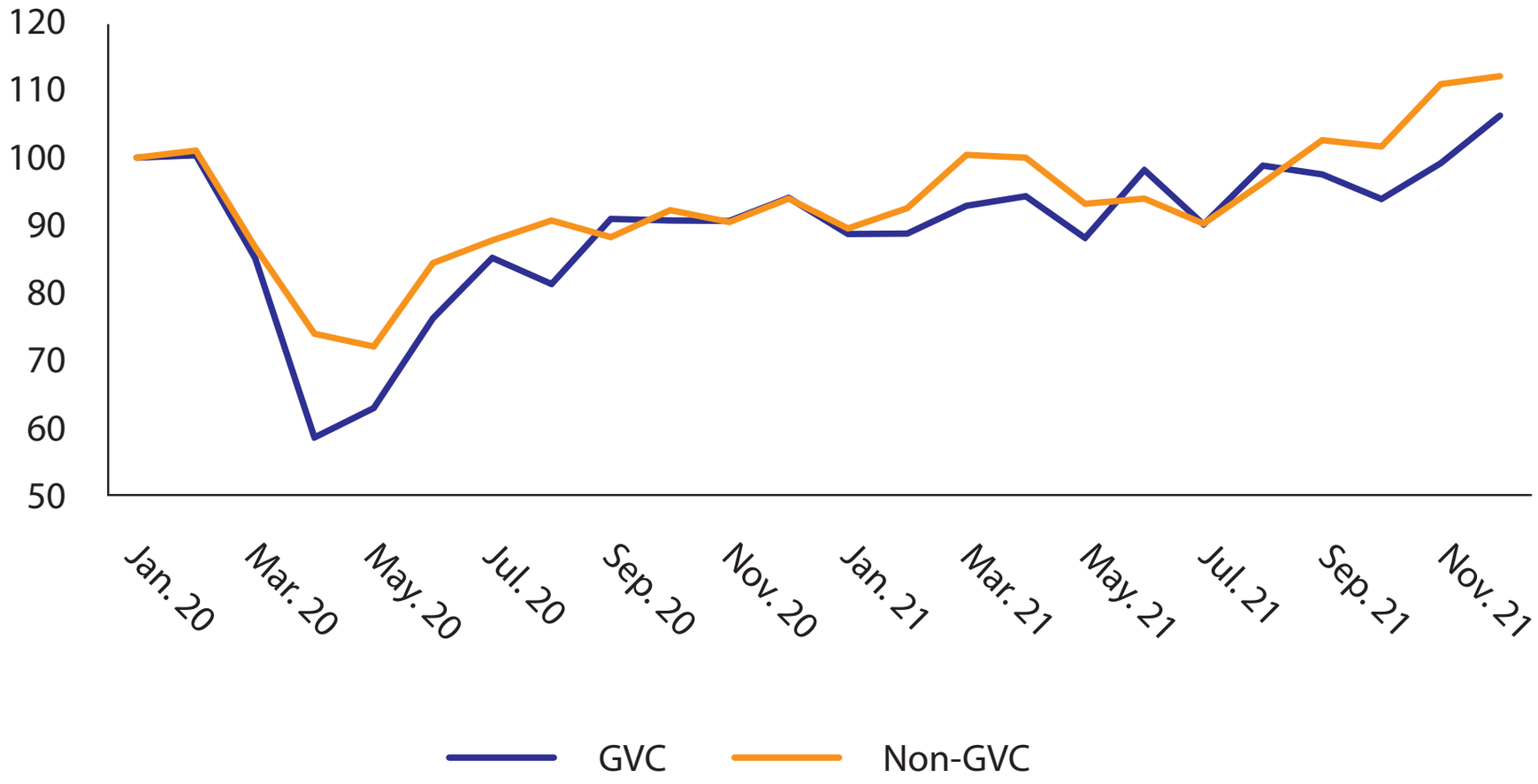
a) COVID-19 crisis (total exports, January 2020 = 100)



Notes: The charts are based on firm-level data for France. We only include firms that exported every month in the pre-crisis period. GVC firms are included if they imported at least once during the six months before the crisis.
Sources: Direction générale des douanes et droits indirects and authors' own calculations.

Figure 1. Export performance over time of GVC firms and non-GVC firms

b) Global financial crisis (total exports, August 2008 = 100)



Notes: The charts are based on firm-level data for France. We only include firms that exported every month in the pre-crisis period. GVC firms are included if they imported at least once during the six months before the crisis.
Sources: Direction générale des douanes et droits indirects and authors' own calculations.

In April 2020 GVC exporters recorded export volumes that were 42% lower than the levels recorded in January 2020. For non-GVC exporters, the cumulative decline was less drastic, reaching a trough in May 2020 at 28% below the level recorded in January 2020.

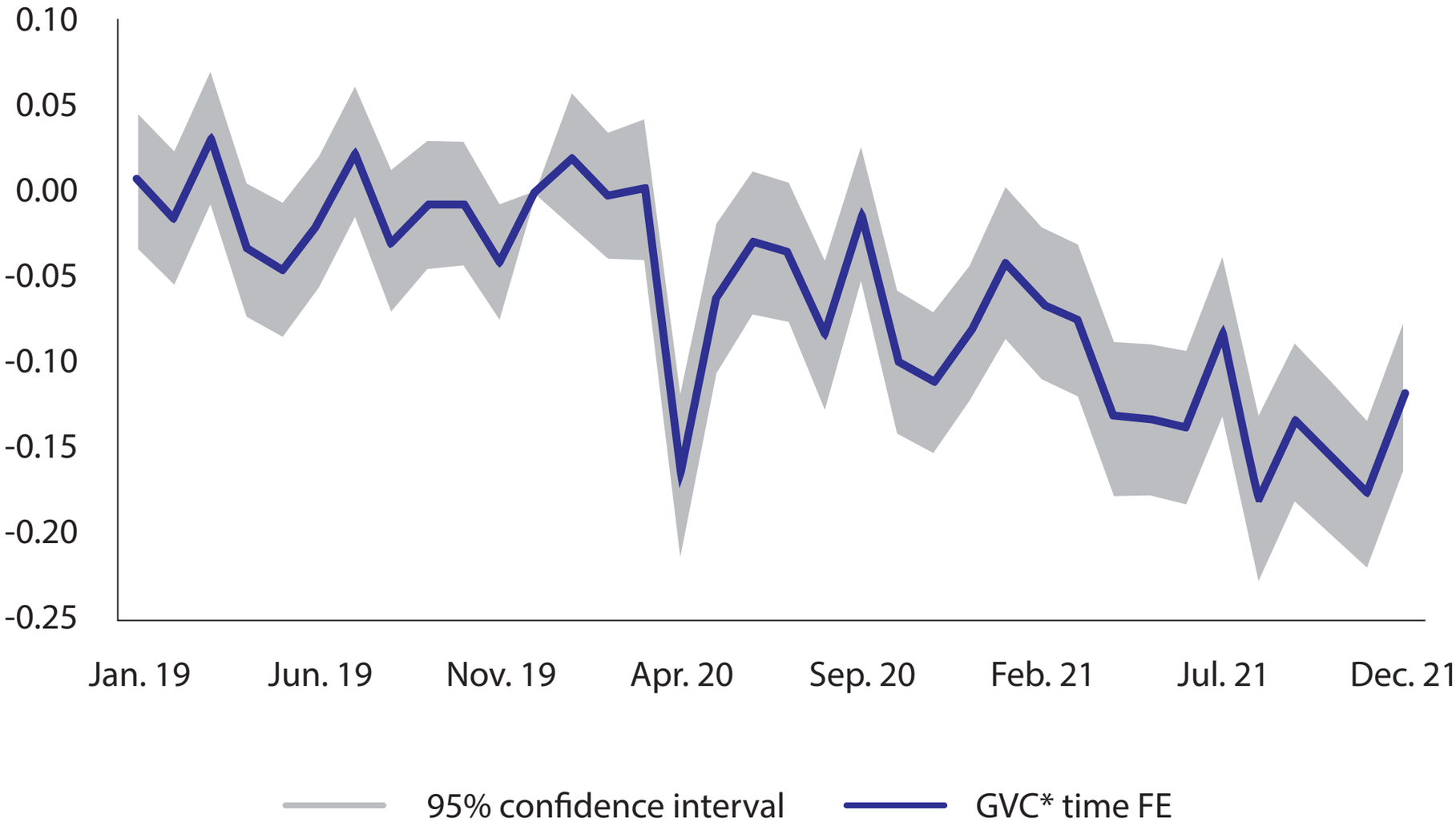
The two groups diverged further when the pandemic-related restrictions were lifted in the summer of 2020 and when the recovery took shape over the following year. By March 2021 nominal exports of firms not involved in global value chains had reached their January 2020 levels and by September 2021 they had recovered well beyond their pre-pandemic levels, while it took until December 2021 for GVC firms to exceed their January 2020 export levels.

Interestingly, during the 2008 global financial crisis the situation was reversed (Figure 1, panel b), with GVC firms recording much smaller reductions in their nominal exports than their non-GVC counterparts. Compared with August 2008, nominal exports of GVC firms had fallen by 19% in August 2009, while exports of similar non-GVC firms had fallen by a quarter at their lowest point in May 2009.

In comparison with the COVID-19 crisis, the collapse in trade in 2008 was less sizeable and less abrupt, although it was more persistent for both types of firm, suggesting that whether supply value chain trade is mainly a source of vulnerability or a source of resilience ultimately depends on the nature of the crisis.

The pandemic had a relatively greater impact on GVC firms' exports, especially when supply disruptions intensified Figure 2 illustrates the estimated effect of participation in global value chains on firm-level exports. Our treatment group includes all continuous exporters that had imported at least once between July and December 2019; the control group is the remaining exporting firms in the dataset, ie. those that did not import over that period.

Figure 2. Event study, effect of the pandemic on GVC firms' exports



Notes: The estimated effect is computed as in Lebastard et al (2023), where the dependent variable is the natural logarithm of exports. The treatment group comprises all exporting firms involved in global value chains (GVCi is equal to 1 if the firm imported at least once in the six months immediately before the crisis) while the control group comprises the other continuous exporters. The econometric model controls for the size of the firms by including firm fixed effects and for time-specific shocks using time fixed effects (FE). The reference month is December 2019.
Sources: Direction générale des douanes et droits indirects and authors' own calculations.

Our results point to the emergence in April and May 2020 of the first negative and significant effect of being part of a global value chain during the pandemic, and a new more sizeable and persistent decline in exports starting in October 2020[2].

Estimates from a difference-in-differences model show that indeed over the latter period exports by non-GVC firms benefited from the pent-up demand and accumulated savings, while those of GVC firms remained constrained owing to protracted unavailability of imported inputs[3].

Additional evidence shows that firm survival followed a similar trend to that observed for exports, pointing to a greater discontinuity of trade flows for GVC firms.

Firms further downstream hit the hardest

We exploit the richness of the dataset to deepen our analysis and assess whether the negative impact of GVC participation on export performance differed depending on firms' position along the value chain.

In particular, based on Antràs *et al* (2012) we use the latest OECD Input-Output Tables to compute an index of upstreamness of production for 45 sectors. We then combine this measure of industry-level upstreamness with product-level information on firm trade flows following Chor *et al* (2021), computing for each firm an average of the respective index of import and export upstreamness.

We find that participation in GVCs increased firm vulnerability during the pandemic, with the negative impact of supply disruptions being greater for firms located relatively more downstream in the value chain. In particular, GVC firms in the lower half of the index distribution saw their exports decrease by about 8% compared with non-GVC

exporters during the lockdown, while the remaining – more upstream – GVC firms did not have significantly worse export performances than non-GVC firms (Figure 3).

Both upstream and downstream GVC firms were strongly negatively affected during the period from September 2020 to December 2021, when disruptions along value chains were at historically high levels, although downstream firms were most affected.

The fact that downstream firms were hit harder would seem to confirm that, although negative shocks occurred in both demand and supply during the pandemic, supply shocks were indeed predominant.

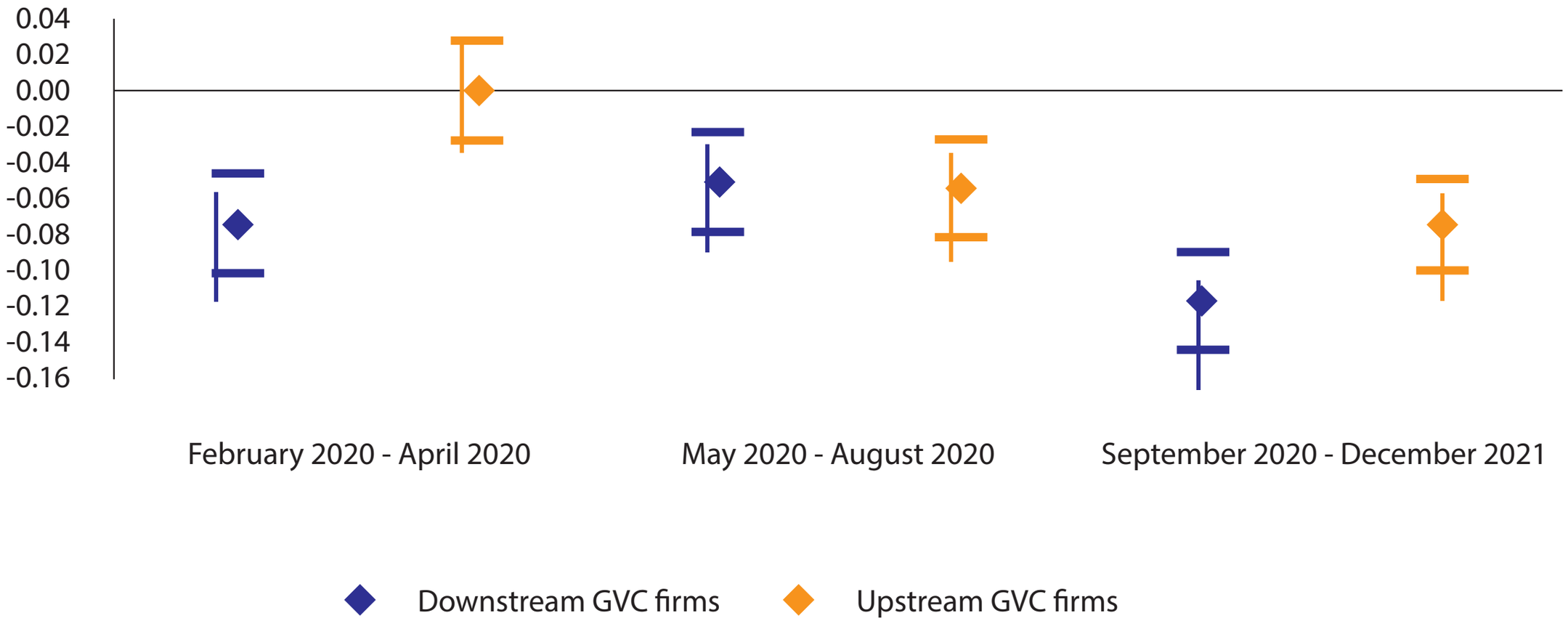
In this respect, the COVID-19 crisis differed from the global financial crisis, which was mainly a result of a demand shock propagating up the value chain via adjustments of firms' inventory holdings (the so-called bullwhip effect, as in Altomonte *et al* 2012).

More diversified sourcing networks for core imported inputs partially shielded firms from shocks

The pandemic has raised the question of whether diversification would foster supply chain resilience and therefore help reduce countries' vulnerability to future external shocks. We try to shed some light on this by estimating the effect of diversification of imports among GVC firms on their export performance.

We follow the approach in Lafrogne-Joussier *et al* (2022), where a firm is considered as diversifying its GVC involvement whenever its 'core' imported products (ie. representing at least 1% of its imports before the pandemic) are sourced from at least two countries.

Figure 3. Difference-in-differences, effect of being downstream or upstream



Notes: For the basis of the the coefficient estimates, see Lebastard et al (2023).
Sources: Direction générale des douanes et droits indirects and authors' own calculations.

In our study, however, we test the effect of diversification by allowing the threshold for a product to be identified as 'core' to vary between 1% and 30% of total imports between July and December 2019.

Our results, as shown in Figure 4 below, suggest that exports of GVC firms suffered from the lack of diversification for products representing more than 15% of total imports.

Conclusions

In this column we investigate the impact of supply chain linkages on exporting firms during the pandemic. Highly granular data for the universe of French exporters allow us to provide one of the first firm-level quantifications of the impact of supply bottlenecks that occurred in 2021, when disruptions along value chains were at historically high levels.

We find that exporters in global value chains suffered relatively more than other exporters during the COVID-19 crisis. This was the case both in terms of export losses and in terms of the greater likelihood of discontinuity in export relations, particularly when supply disruptions were at historically high levels.

This additional negative effect was mostly driven by exporters at downstream production stages, whereas diversifying sourcing networks for core imports helped to buffer the impact. ■

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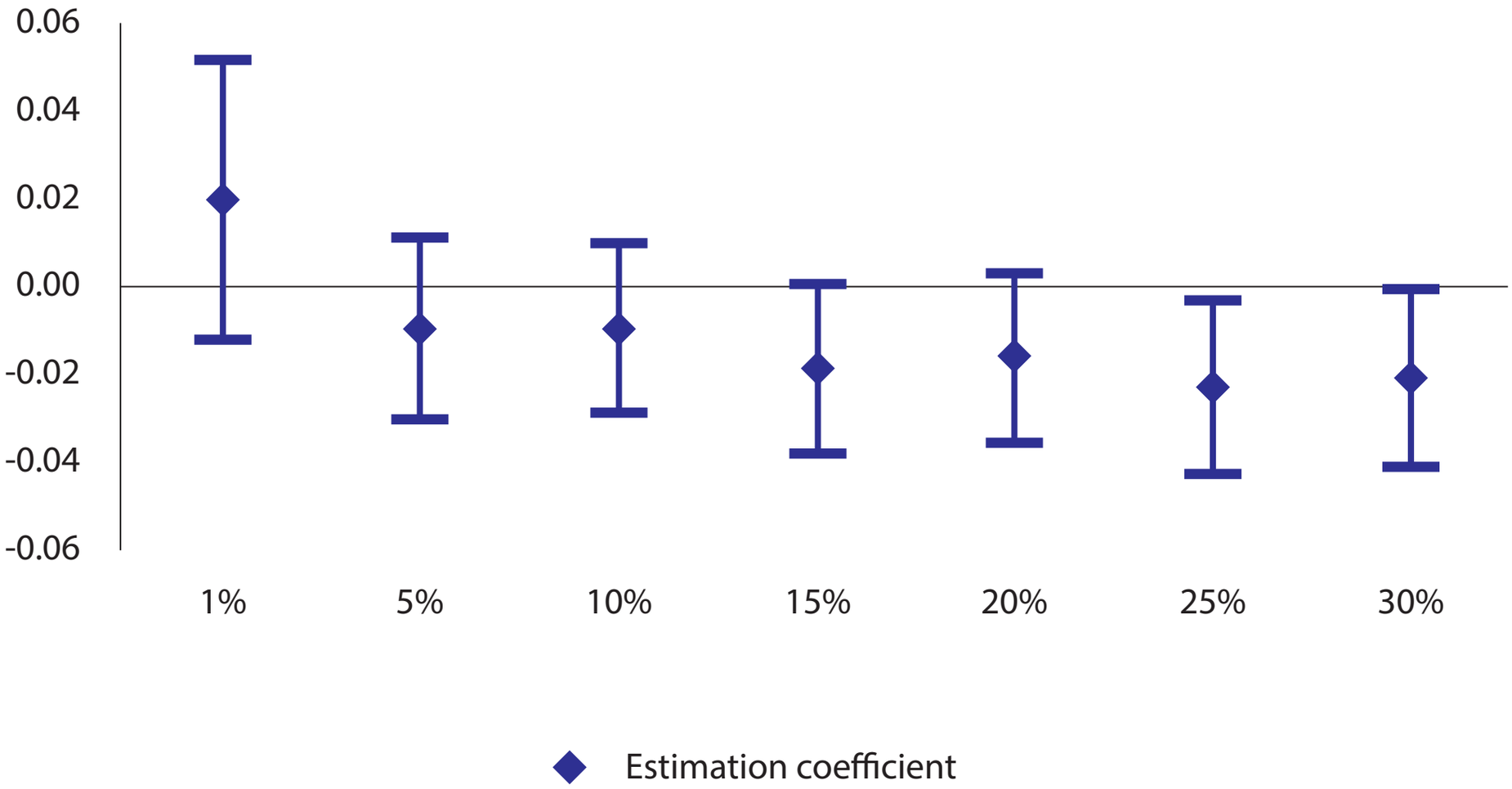
Figure 4. Difference-in-differences, effect of diversification of source countries for core inputs



Notes: For the basis of the coefficient estimates, see Lebastard et al (2023). Core products are defined as products representing a minimum percentage (as indicated on the x-axis) of the total imported products in the six months before the crisis.
Sources: Direction générale des douanes et droits indirects and authors' own calculations.

Endnotes

1. Our analysis is based on French customs data, known as "Statistiques du Commerce Extérieur", provided by Direction générale des douanes et droits indirects; access to firm-level confidential data from France has been made possible within a secure environment offered by CASD – Centre d'accès sécurisé aux données (Ref. 10.34724/CASD).

2. The absence of any pre-trend before the pandemic confirms the comparability of our treatment group and control group.

3. As detailed in Lebastard et al (2023), our results prove robust to a number of robustness checks, including more stringent criteria for GVC involvement.

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