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The Scramble for Critical Raw Materials: Time to Take Stock?

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by Simon J. Evenett and Johannes Fritz

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MAX SCHMIDHEINY FOUNDATION

CEPR Press

Centre for Economic Policy Research
33 Great Sutton Street
London EC1V 0DX

Tel: +44 (0) 20 7183 8801
Fax: +44 (0)20 7183 8820
Email: cepr@cepr.org
Web: www.cepr.org

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EXECUTIVE SUMMARY

Many Western governments frame their strategies towards Critical Raw Materials in terms of security of supply and fret about "dependency" on hostile trading partners. Governments of lower per-capita income nations with lots of material reserves see the matter differently. For them, the sharp predicted increases in demand for these materials in the decades ahead is too good an opportunity to miss to develop processing industries as part of the modernisation of their economies. Both groups frequently talk past each other, a practice made worse by the suspicions created by intensified geopolitical rivalry. The ensuing scramble for critical raw materials is the subject of this report.

Many narratives around geopolitics and critical raw materials are misleading

What differentiates this report from others is that:

- We assess the pros and the numerous cons of creating lists of raw materials deemed "critical." Lists can have the merit of being transparent, but they attract the attention of special interest groups.
- We evaluate whether trading patterns in critical raw materials are more volatile than other materials and metals (they aren't).
- Central to geopolitical scaremongering about trade in critical raw materials are claims made that China "weaponised" Rare Earths exports against Japan in 2010. Using United Nations' trade data, we found no evidence that China singled out any G7 member or the EU for reductions in Rare Earth exports.
- We demonstrate that, with the exception of the United States, Western nations have significantly reduced their sourcing of Rare Earths from China since 2010. That was facilitated by a five-fold increase in the quantity of Rare Earths available from other countries in the years 2015 to 2021.
- Another narrative we challenge with data is that Indonesia's export curbs on nickel ore provided a surefire recipe to develop its downstream processing industry. Increases in Indonesia downstream exports look a lot less impressive when the surge in recent years of Indonesia's other non-agricultural exports is taken into account. Attributing downstream nickel sector gains solely to the upstream export ban fails to take account of the other measures Indonesia took.
- For all the talk of policy support for sourcing and producing critical raw materials we show that, worldwide, policy intervention affecting other materials occurred more often, was more likely to be permanent, and was more likely to favour local firms than the products deemed critical.
- We show that the weight given in trade policy circles to export restrictions on critical raw materials is probably misplaced. In fact, such restrictions account for small percentages of the measures taken by governments that bear upon markets for critical raw materials. Resort to subsidies is far more frequent.
- Given Western governments frequent reference to securing critical raw materials one might have expected that they would have reduced import restrictions on more critical raw material product lines and larger shares of relevant imports. We show that, when compared to those champions of active industrial policy—the BRICS and Indonesia—they didn't.

Time to take stock and to face the realities inhibiting capacity growth

It surprised us that much of the trade policy-related narrative concerning critical raw materials has little basis in fact. Analysts and officials need to take stock of the current scramble for critical raw materials—and, ultimately, revisit assumptions about the factors most likely to prevent long-term supply of critical raw materials from growing to meet growing demand.

Even in the absence of geopolitical rivalry, the challenges associated with scaling up supply of raw and processed critical raw materials to meet higher levels of demand would have been formidable. Complicating factors include fundamental uncertainty as to the pace of the digital and energy transitions, with their knock-on effects for both how much material will be needed and, quite possibly, which materials are needed in greater quantities in the first place.

On top of this are geological considerations including the fact that some critical raw materials are byproducts of other less-wanted materials, that long time frames needed to bring some mining facilities online, and the central roles that uncertainty and difficulties in financing play in scaling up production. Without denying the contribution that greater recycling and the adoption of circular economy

practices can make, on its current trajectory, supply expansion for most critical raw materials is likely to be sporadic.

One consequence is that periodic outbreaks of market disruption are on the cards. Whichever long-term strategies are adopted by governments need to be designed with this disruption in mind. Opportunists should not be allowed to capitalise on any short-term shortages, price hikes, and the like. Anyone expecting or demanding that markets for critical raw materials unfold over time in a predictable manner simply hasn't read enough about the mining industry. This is going to be messy. Yet, we do not counsel despair.

Towards a Thick Markets Approach

In this report we frame the search for solutions in terms of thickening markets precisely because, as the global market for wheat demonstrated last year, an open, transparent and competitive market with a range of suppliers spread across the globe is capable of absorbing unanticipated supply disruptions. The desired end point is, as a practical and conceptual matter, clear. What matters is that policy intervention and corporate strategies induce markets to thicken over time.

This approach starts from the propositions that market structures are not set in stone and that thin markets are the outcome of prevailing private sector incentives (including those caused by coordination failures) as well as law and regulation. Adopting the principles of the thick markets approach offers a practical way to turn the current narrative of de-risking into a meaningful work programme. Moreover, central to a thick market approach is fostering viable long-term suppliers—which ought to appeal to those governments keen on making the most of their nation's material bounty.

Five steps must be taken to properly implement a thick markets approach capable of meeting the rising long-term demand for critical raw materials.

1 Scale the challenge properly using a Rule of Reason approach.

Not every raw or processed industrial material faces security of supply concerns. Nor do the profit margins at the extraction and processing stage of every industrial material support a viable business case. Consequently, governments need logic- and evidence-based approaches to determine which raw materials to single out as "critical," "strategic," etc.

Technocratic assessment of these markets, attendant risks, the track records of suppliers, the potential for substitution, recycling, and other relevant factors is required. Claims that a raw material is special should be subject to scrutiny in processes shielded as much as possible from lobbying and political interference. Following an evidence-based Rule of Reason approach is likely to lead to a relatively small number of potentially very important raw materials being singled out for special treatment by governments.

2 Expect occasional shortages and market disruption and prepare accordingly.

The potential for unanticipated demand surges and occasional supply lapses, combined with the slow and potentially faltering expansion in upstream and downstream production capacity for raw materials, means that market disruption will occur from time to time. Even if a thick markets approach is being pursued faithfully, the history of materials markets points to bouts of market turbulence. Where technically possible and viable, governments should establish incentives for the commercial buyers of raw materials to create stockpiles.

3 Take steps to progressively thicken markets over time.

The goal ultimately is to persuade commercial actors to expand production capacity. In many cases this involves making huge financial outlays with very long payback periods, sometimes reflecting lengthy times-to-market. This is not a new problem. But it is one that needs to be tackled. Policy measures should seek to reduce revenue uncertainty (better accomplished by committing to minimum purchase prices rather than commitments to buy fixed quantities of raw material), taking steps to maximise the total addressable market (ideally by the economies with the largest buying power for raw materials aligning on steps that keep markets open), reducing the amount of capital commercial actors must tie up in a mining or downstream activity, and reducing the risk faced by lenders to commercial actors operating in critical raw material markets (through partial loan guarantees that mean lenders still have enough skin in the game).

4 Eschew public and private sector steps that thin markets.

We show in this report that both private and public sector acts can reduce the amounts of a raw material available for sale on the international market. Thinning upstream markets for raw materials is particularly pernicious as it can also thin the market for downstream processed materials. Eschewing steps to thin markets will affect the conduct of policies towards exports, competition law and its enforcement (in respect of vertical mergers and restraints), and development policy (in relation to offtake agreements associated with specific transactions).

5 Rebuild trust and discourage opportunism by ratcheting up transparency.

The challenges before governments—namely, expanding the supply of raw materials necessary to slow down or halt the rise of global temperatures and to capitalise on the digital transformations of our societies—are long-term in nature. Commercial enterprises need to be induced to make major investments in a sustained fashion for years to come. Expecting that to happen when policy is driven by narrative based on suspicion is naïve. Uncertainty is the enemy of long-term investment. Of course, governments will compete and tensions between states will break out from time to time. But clashes should be reserved for cases when foul play can actually be established. When it comes to critical raw materials, as we describe in the report, this requires a radical revision in the approach taken to transparency *both* of policy intervention and corporate ownership.

CHAPTER 1
INTRODUCTION: TIME TO TAKE STOCK OF THE SCRAMBLE FOR CRITICAL RAW MATERIALS

In recent years governments from every continent have differentiated between raw and processed materials and metals used in industrial production. So special are some materials that they have deemed them "critical" or "strategic." Policy and regulation have been deployed to produce or secure more supplies of these materials. Most often governments act unilaterally, sometimes in concert with other states, and frequently, it appears, in reaction to feared or actual moves by others, including private sector parties.

The upshot is much more, often unanticipated, policy intervention, potentially cutting against the measures taken by other governments, and a further shift away from international deliberation and problem solving in fora such as the Group of Twenty (G20) nations and the World Trade Organization (WTO). Perhaps most importantly of all, policy uncertainty faced by businesses operating in the material extracting and processing sectors—which was already significant to begin with—has reached new heights.

In these circumstances, whether current approaches to policy intervention are credible, likely to affect longer term private sector decisions, or meet government objectives is open to question. It is time to take stock of the ends and means of policymaking towards so-called critical materials informed by evidence and logic and without succumbing to tenuous hypotheticals and scaremongering.

At this time, at least three imperatives appear to drive policymaking towards critical raw materials. With an eye to securing more export revenues, generating extra value-added, and creating additional jobs, governments have long intervened in resource-related sectors, ranging from agricultural commodities through to sources of energy and on to industrial raw materials. In turn, this has led to sector-specific policies that affect upstream extraction and downstream commercial activities, with knock-on effects for the supplies available to foreign buyers.

On top of this, the return of intense geopolitical rivalry over the past decade or so has drawn in raw materials and associated technologies, especially when those materials are required in the production of defence or advanced manufacturing products. Nowadays, such is the loss of trust between governments that not every foreign source of supply is seen as reliable.

To this heady brew is added the third factor: the expectation that demand for certain industrial raw materials will multiply by 2040 if the targets embedded in the Paris Agreement on climate change are to be met (Kowalski and Legendre 2023, Schröder, Bergsen, and Barrie 2023). For example, the International Energy Agency has estimated that demand for lithium will rise 42 times, graphite 25 times, cobalt 25 times, magnesium 21 times, and nickel 19 times (IEA 2021) by the end of the next decade. But, as will become a common refrain in this report, there are significant differences across raw materials with, for example, demand for germanium not expected to change much.

The combination of expected demand expansion as well as concerns about securing sufficient supplies have resulted in nothing less than a scramble for critical raw materials in recent years. While this could have been an opportunity to develop system-wide thicker, open, transparent, and competitive markets for these materials, in fact many steps have been taken that fragment markets, diminishing the range of potential buyers available to sellers and, as is often the focus, vice versa. Worse still, once again discriminatory trade, investment, and sectoral policies beget other bad policy at home and abroad.

Purpose of this report

The purpose of this report is to put the policymaking associated with the scramble for critical raw materials in perspective. This will involve reflecting on the very notion of critical raw materials and the apparent logic and evidence that purports to justify singling out a certain

group of materials, raw and processed. Singling out is important as certain business interests will gain from state largesse while others, not least those called upon to finance state support, may well lose.

This report also outlines what steps governments are taking unilaterally and in unison in pursuit of their objectives with respect to critical raw materials. As far as unilateral action is concerned, much analysis focuses on the role of export curbs with its potential for so-called weaponisation of cross-border delivery of raw materials.[1] Some of those curbs have been salient and in other cases, governments have been accused of seeking to reduce export supplies behind the scenes.[2] But, as we will see, a wider range of policy tools are being used by governments.

We will find it useful to distinguish between policy intervention that *diverts* trade in raw materials from world markets and others to *create* a larger pool of raw and processed materials that are potentially available to trade internationally. In some policy interventions, in particular those seeking to develop downstream processing activity, the state measures deployed can both restrict exports of extracted raw materials and, when successful, create the potential for more trade in processed materials or for the goods made with them.[3] In addition, policies that allow for some export of extracted raw materials yet have been designed so as to offer lower prices to downstream domestic buyers of raw materials than those paid by foreign purchasers attract criticism from trading partners.[4]

Western governments (taken here to be the Group of Seven nations plus allies such as Australia and South Korea) have individually and together engaged with other governments to secure supplies of critical materials and we will explore what form that cooperation is taking and whether it reduces—or inadvertently increases—the risks faced by the private sector. The agreement between the Japan and the United States relating to supply chains for critical minerals, agreed in March 2023, is a case in point. The United States is currently negotiating similar accords with the European Union and the United Kingdom.

Western governments are not alone in taking joint action, however. In its pursuit of critical raw materials, China has developed partnerships with other developing countries which invariably involve making available capital for investments to secure raw materials as well as the deployment of other development policy tools. Moreover, some experts have linked China's pursuit of lithium investments in very risky[5] developing country locations to having planned investments in such mines in blocked by Australia and Canada (WSJ 2023a).[6] Indeed, as Figure 1 shows, if China is unable to source lithium from Western nations then the remaining sourcing options are in nations that have less favourable governance scores (as measured by the World Bank metrics reported on the horizontal axis.)

Further international economic policy initiatives appear to be in the works. American officials are reported to be exploring whether to form a buyers' club of Western governments for certain raw materials (WSJ 2023b). For their part, Argentina, Bolivia, and Chile are giving thought to jointly selling lithium. Overall, there are few grounds for expecting that policy intervention affecting critical raw materials will abate in the near to medium term—with the potential for poorly designed policies to add more fuel to the fire of geopolitical rivalry.

Governments whose economies don't have enough domestic supplies of critical raw materials know they must engage internationally—on this matter, isolationism is not an option. But that engagement can still involve taking steps that come at the expense of others. Ultimately, the question is whether alternative collaborative approaches offer the prospect of greater assurance of raw material supply for more governments, more opportunities for economic modernisation in resource-rich economies, and less tension between them.

To that end, we draw from the economic analysis of developing "thick markets." Current observed levels of supplier concentration are not set in stone. They can be influenced by commercial considerations unrelated to policy—such as economies of scale and first-mover advantages, that trigger learning-by-doing and the development of expertise and firm capabilities unavailable to firms entering these markets for the first time. Furthermore, patterns of ownership of mines and

1 A recent, very informative OECD study is a case in point (Kowalski and Legendre 2023).

2 The claim is often made that China cut off Japan's access to its Rare Earths in response to a diplomatic dispute in the third quarter of 2010. In this report we will examine the evidence concerning Chinese shipments of Rare Earth materials to Western nations, not just Japan, over the years 2010 to 2022.

3 Indonesia's development of a downstream nickel industry is a case in point. For many, China's development of a downstream processing capability for Rare Earth materials is another leading example.

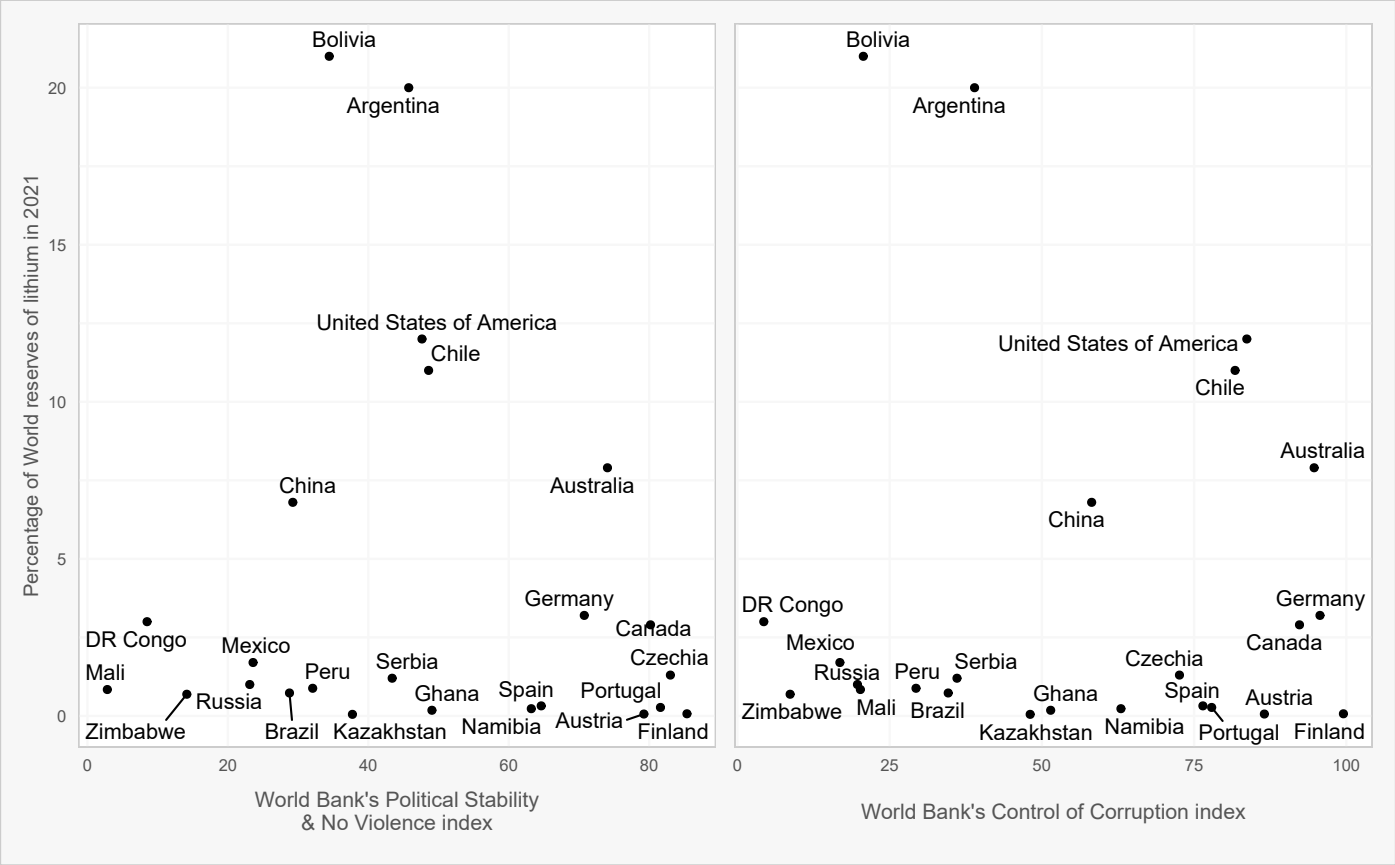
4 This is the case of differential pricing of raw materials extracted upstream.

5 Those risks relate to political instability, civil strife, expropriation of assets and other policy-induced disadvantages inflicted on foreign investors.

6 Chinese firms are reported to have spent over the past two years around $4.5 billion acquiring stakes in 20 lithium mines (WSJ 2023a). The extent to which Chinese firms' overseas investments has been determined by or influenced by the Chinese government is unclear. The same newspaper article quotes a report in Chinese state media where President Xi tells the chairman of CATL ""You should avoid charging ahead on your own, thinking you're invincible, only to be caught out wanting in the end." This begs the question as to whether certain Chinese firms have not taken due account of the risks in investing in certain locations abroad.

FIGURE 1

Extensive lithium reserves exist in higher risk nations with poor governance scores



Source: For lithium reserves: United States Geological Survey (USGS). For governance indices: the World Bank.

processing facilities and resort to long-term contracting can influence the amount of critical raw materials available for sale on world markets and, therefore, policymakers' expectations as to whether sufficient suppliers are likely to be available. Identifying unilateral and joint policy initiatives that move from thin to open, competitive, transparent, and thicker markets ought to be the goal.

Markets can be induced by policy to thicken and this could be a tangible way of taking forward an agenda of revisiting cross-border commercial ties. Governments must play their part in addressing the reasons why the private sector has been unwilling to invest thus far and why buyers are reluctant to place orders with material extractors and processors. As will become evident, we are not advocating zero state involvement, although we are sceptical about the merits and long-term effectiveness of trade diverting measures taken to date.

Organisation of this report

This report is organised into two parts supplemented by a data annex. In the first part of this report we examine the notion of Critical Raw Materials and examine whether international trade in these materials differs from other materials shipped across borders. Then we consider what constitutes a security of supply concern for such materials and how policies, including industrial policies, have created such concerns at home and abroad. Indonesia's apparently successful policies to create a downstream nickel processing sector is evaluated here.

In the third chapter of this report, we revisit the factual record concerning China's alleged manipulation of the market for Rare Earths for geopolitical ends. The extent to which markets for Rare Earths have thickened over the past decade is considered too, along with evidence on "import dependencies." Chapters 2 through 4, therefore, are vehicles through which we can establish our point of departure from some of the existing narratives concerning CRM.

The second part of this report focuses on the policy responses deployed by governments towards CRM. Chapter 5 lays out the unilateral commercial policy responses, drawing upon the Global Trade Alert database. In this chapter we widen the discussion beyond export controls and their alleged deployment in attempts to weaponise CRM trade. In chapter 6 we assemble information from other sources on the cross-border

cooperation between governments on securing CRM, highlighting the differences in approach taken between the major economic powers. We offer some reflections on these efforts taken in concert noting, in particular, whether these measures create or divert CRM trade.

Throughout this report we emphasise the importance of open, competitive, transparent, and thick markets for CRM and highlight the characteristics of thinner and thicker markets. In chapter 7 we describe what it takes to thicken markets and argue that the steps taken here are congruent with strategies to de-risk cross-border commercial ties. Indeed, a thick markets approach may provide an organising logic for de-risking strategies. An Executive Summary describes our principal findings and policy recommendations and relates them to some of the narratives on geopolitics, trade, and the transition to the low carbon economy that have been advanced in recent years.

Our reports contain Annexes on each G20 Member's commercial policies and their exposure to the policy intervention by other governments. This report is no exception. However, we note that the first two parts of the report can be read independently of the Annexes and visa versa.

PART ONE
CRITICAL RAW MATERIALS: CONCEPT, NARRATIVES, AND EVIDENCE

CHAPTER 2
WHICH RAW MATERIALS ARE DEEMED "CRITICAL"?

A common first step taken by governments in devising policy towards critical raw materials (CRM) is to define which materials are "critical." This often takes the form of issuing lists of CRM. As Figure 2 shows, governments on every continent have issued CRM lists. That 13 jurisdictions have issued their latest CRM lists since 1 January 2020 gives a sense of how active this field of policymaking is.

The purpose of this chapter is to summarise the main features of those lists, to explore the practical pros and cons of creating such lists, and to begin to explore whether the trading patterns of CRM justifying grouping them together in the first place. What follows builds on the assessment of Sancho Calvino (2022), undertaken by a colleague of ours. Our discussion focuses on energy related raw and processed materials in industrial use. But first it will be instructive to layout the fundamental economic factors that are likely to disrupt the markets for certain materials over the years to come, which is often the pretext for singling them out for special treatment by the state.

Potential future shortages of some materials and the perils of over-generalisation

If a government takes particular exception to the actions of a foreign counterpart that happens to be a significant material supplier, then it should not come as a surprise if its firms experience difficulties sourcing sufficient materials from that particular source. Demoting economic ties may well result in bilateral shortages.

However, such diplomatic and geopolitical considerations are not the starting point of most analyses of potential future shortages of certain industrial materials. Instead, structural factors underway in the world economy may result in more generalised shortages of certain raw materials, which in turn can lead governments in both producing and buying nations to single out particular materials for special designation and policy treatment.

Like many other analysts, Azevedo et al. (2022) started by observing that:

> *"Raw materials will be at the center of decarbonization efforts and electrification of the economy as we move from fossil fuels to wind and solar power generation, battery- and fuel-cell-based electric vehicles (EVs), and hydrogen production. Just as there are several possible trajectories through which the global economy can achieve its target of limiting warming to 1.5°C, there are corresponding technology mixes involving different raw-materials combinations that bring their own respective implications. No matter which decarbonization pathway we follow, there will be fundamental demand shifts—and these will change the metals and mining sector as we know it, creating new sources of value while shrinking others."*

Under these circumstances, demand and supply imbalances of unknowable size and duration can be expected. Moreover, there is likely to be significant differences across raw materials as forecasted demand growth varies considerably. Ultimately, the question comes down to how quickly the supply side of materials markets can respond to growing demand.

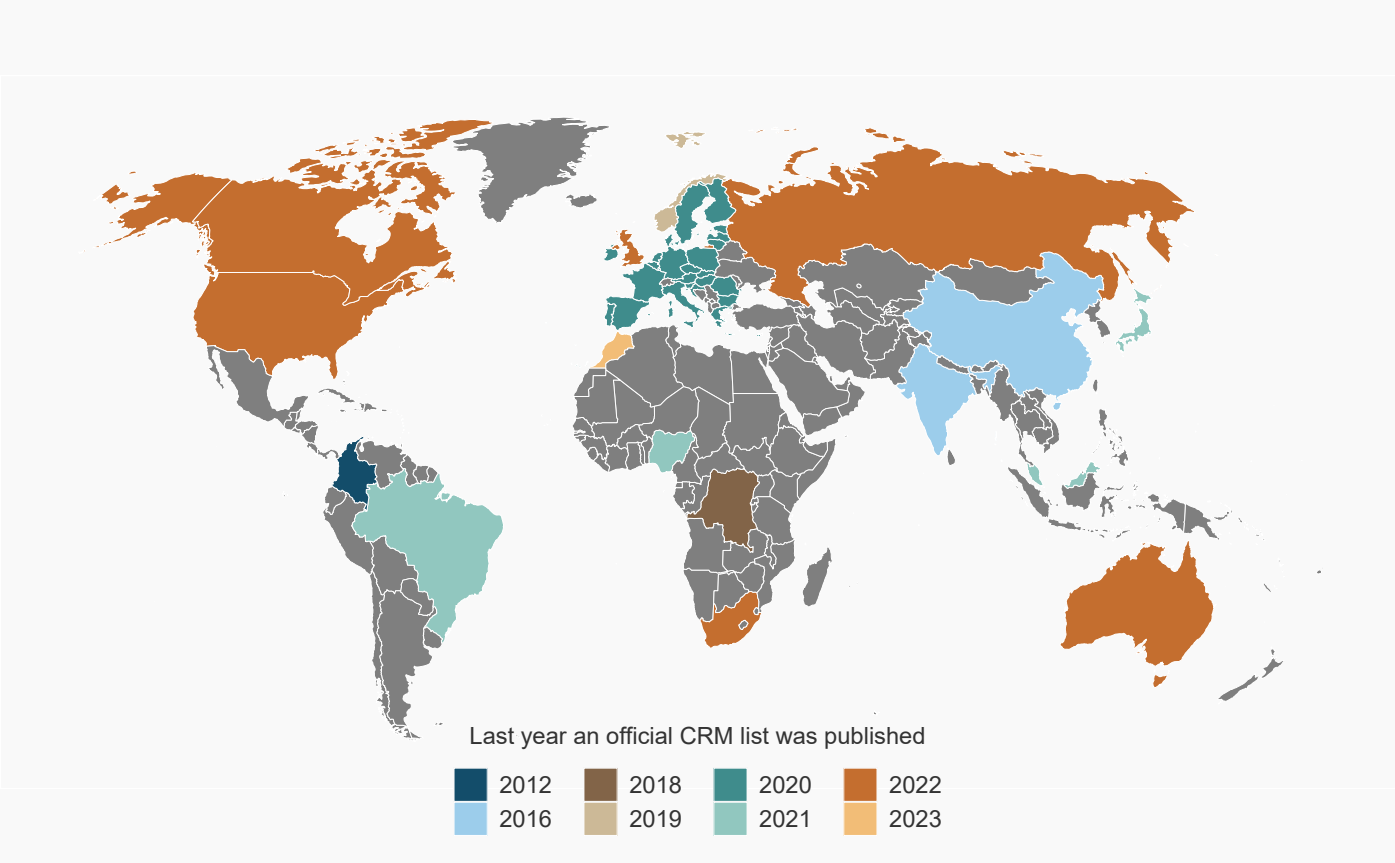
An example may shed light on the challenges before private and public sector actors. Noting the significant increases in the expected demand for copper during the transition to a low carbon economy, Yergin (2022) observed:

> *The choke point is supply. At the current rate of supply growth—which encompasses new mines, mine expansion and greater efficiency, and recycling, as well as substitution—the amount of copper available will be significantly smaller than the copper supply requirements. For instance, the IEA estimates that it takes 16 years from discovery to first production for a new mine. Some mining companies say more than 20 years. Permitting and environmental issues are major constraints around the world.*

Even without the potential disruption brought on by geopolitical disputes, it would be almost miraculous if demand and supply grew in roughly in line with one another for decades. Under these circumstances, bouts

FIGURE 2

The past three years have seen many governments issue lists of critical raw materials



of market disruption are likely. Azevedo et al. (2022) put it well:

> *"…while there may not necessarily be physical resource scarcity for some of these raw materials in the earth's crust, and acknowledging that recycled materials will play an increasingly important role in decarbonization in the future, the trajectory toward materials availability will not be a linear one. We expect materials shortages, price fly-ups, and, given the inability of supply to react quickly, the need for technological innovation and substitution of certain metals (possibly at the expense of performance and cost of the end-use application).*
>
> *"While raw-materials needs will grow exponentially for certain metals, lead times for large-scale new greenfield assets are long (seven to ten years) and will require significant capital investment before actual demand and price incentives are seen. At the same time, with increasingly complex (and largely lower-quality) deposits needed, miners will require significant incentive (for example, consistent copper prices of more than $8,000 to $10,000 per metric ton and nickel prices of more than $18,000 per metric ton) before large capital decisions are made. Without slack in the system (such as strategic stockpiles and overcapacity), the industry will not be able to absorb short-term (less than five to seven years) exponential growth."*

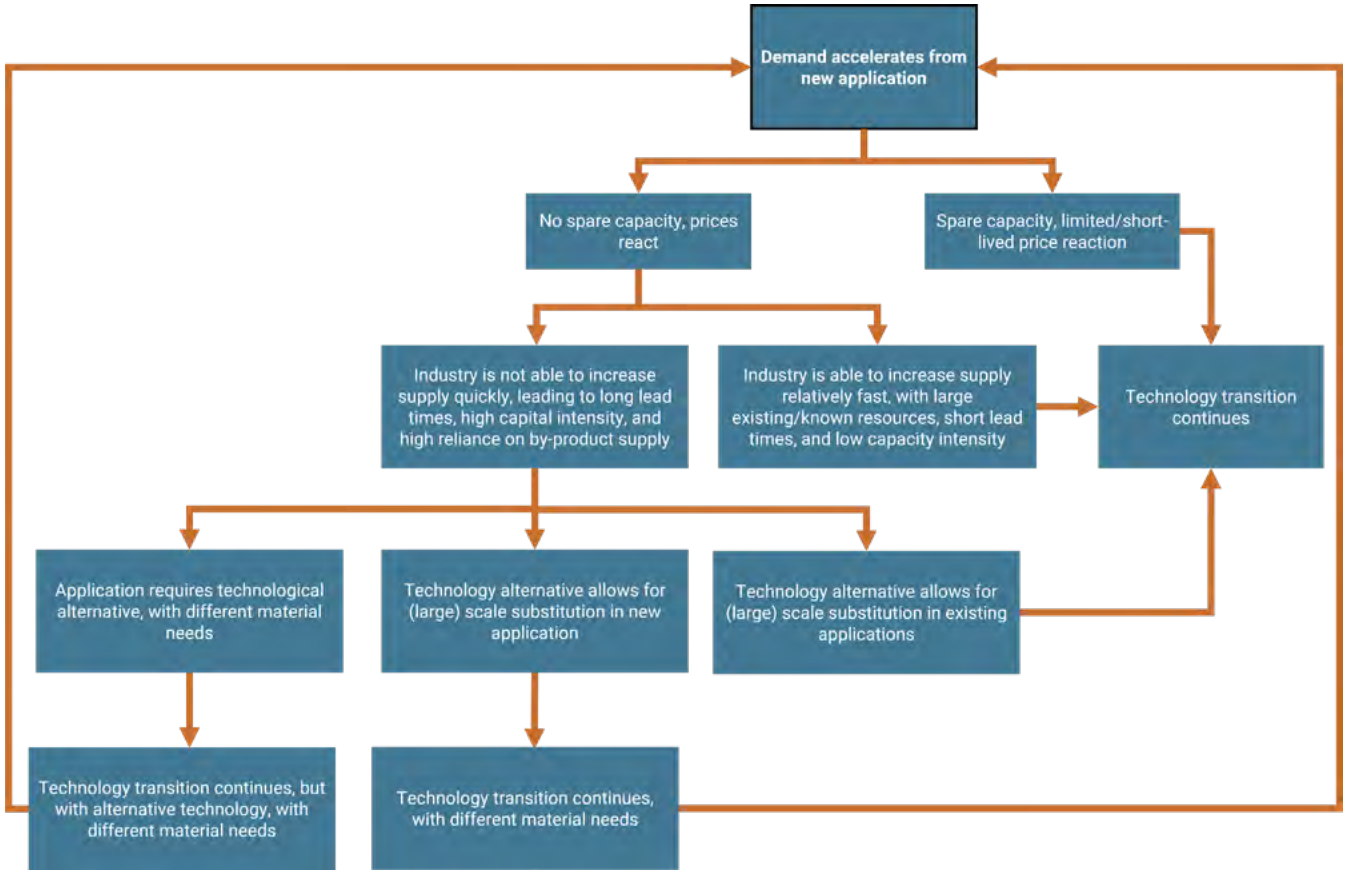
Prices will play a role bringing supply and demand back into balance, but there can be no assumption that this will be a smooth process and that some material buyers will almost certainly be disappointed. Indeed, Azevedo et al. (2022) usefully identified the various direct links between higher demand, short- and longer-term supply response, and other feedback loops that reflect the realities of the operation of materials markets (see Figure 3).

The last paragraph quoted above provide further grounds to caution against generalisation across materials and metals. Not only are forecasted demand increases different across materials along decarbonisation pathways, the potential for substitution away to other materials, for recycling, for stockpiling, and the ramp up time to start extraction and processing materials differ too.

Another important consideration that further cautions against lumping materials together is that a number of those forecast to be in short supply are in fact by-products of extracting or producing other materials. For example, almost all cobalt extracted today arises as a byproduct of mining copper and nickel (Cobalt Institute 2022). Bellois and Ramdoo (2023) highlight the systemic significance of this so-called companionality of metals:

FIGURE 3

How materials markets respond to demand increases



Source: Azevedo et al. (2022)

> *"Among metals that are considered critical for the energy transition and for digital technologies, more than 60% are produced as co-products or by-products… This has significant implications because even if they are deemed strategic or critical from a policy and political perspective, rising demand is likely to result in problematic supply responses, as they may not be directly extracted for themselves."*

One implication of Bellois and Ramdoo's argument is that on current technologies scaling up suppliers of "needed" materials can require extracting and processing lots of "less needed" materials, begging the question as to what will be done with the latter.

Notwithstanding these complications, the narrative around critical materials has emphasised the plural—that is, distinct materials have been given the same label. Without a proper understanding on a case-by-case basis of the fundamental factors at work, lumping together these materials makes little sense. Worse, policymakers are likely to be surprised again and again about the price volatility and other disruptions in the markets for industrial materials central to the digital and energy transitions underway. This is unlikely to be a recipe for formulating and consistently applying effective policy.

The content of CRM lists

We searched for official CRM lists issued over the past decade or so and, where a jurisdiction made more than one list available, we considered the most recently published list. The CRM lists of the following 17 jurisdictions were analysed: Australia, Brazil, Canada, China, Colombia, Democratic Republic of Congo, European Union, India, Japan, Malaysia, Morocco, Nigeria, Norway, Russia, South Africa, UK, and USA.[7]

Issuing CRM lists is not the sole preserve of high-income nations. The 17 CRM lists analysed here were issued by governments with a wide range of per capita incomes—from the Democratic Republic of Congo ($577 per year) to Norway (just under $90,000 a year). Nor is it confined to members of the G7—every BRICS nation has issued a CRM list.

7 We will share a table summarising the contents of these lists upon request.

The number of distinct non-energy related materials found on CRM lists varies a lot: from just four for the Democratic Republic of Congo to a total of 49 for Japan. The median number of items listed on the 17 CRM lists was 37. The 17 Rare Earth elements are found most often on CRM lists: 16 of the Rare Earth elements were found on 14 CRM lists; the remaining Rare Earth element was found on 13 lists. After that, lithium was mentioned on 11 CRM lists and natural graphite can be found on 10 CRM lists. Meanwhile, quartz and silver are mentioned on only two CRM lists and cadmium and olivine are found on Norway's CRM list. These summary statistics highlight the similarities and, importantly the differences, in official lists of CRM.

While there is no common understanding on which goods constitute CRM, there are strong similarities across the lists of certain groups of nations. There are very few differences between the CRM lists of the BRICs and slightly more among the G7 nations. In both cases, the Rare Earth elements are central to their CRM lists. The seven nations not in the G7 or the BRICS, which differ markedly in levels of per-capita income, had far less similar lists of CRM. For instance, no Rare Earth element was found on five or more of those seven latter CRM lists. Still, overall, Rare Earth elements are consistently found in all 17 CRM lists analysed here.

Some CRM lists describe how they were assembled. For example, a Federal Register notice published on 24 February 2022 spelt out the different attributes employed by the United States to determine whether a material was "critical." This was said to follow previously published methodology documents and involved evaluations of:

> *"(1) A quantitative evaluation of supply risk wherever sufficient data were available, (2) a semi-quantitative evaluation of whether the supply chain had a single point of failure, and (3) a qualitative evaluation when other evaluations were not possible. The quantitative evaluation uses (A) a net import reliance indicator of the dependence of the U.S. manufacturing sector on foreign supplies, (B) an enhanced production concentration indicator which focuses on production concentration outside of the United States, and (C) weights for each producing country's production contribution by its ability or willingness to continue to supply the United States" (USFR 2022).*

Evidently, the U.S. evaluation blends quantitative information (including import and production data) as well as qualitative assessments (relating to whether there might exist a single point of failure and the willingness of a foreign nation to permit supplies to be sent to the United States, which presumably involves an assessment of the state of diplomatic relations with the trading partner in question.)

Meanwhile, the Chinese CRM list, issued in 2016, inventories the materials defined as "strategic" but does not explain the criteria used to make that determination. Instead, the focus of the document (and supporting documents issued around the same time) is on the objectives of policy in this regard and the implementation steps that are planned. Likewise, Japan provided a list of "rare metals" that were part of its national stockpiling strategy. No criteria were shared for inclusion of items on the Japanese CRM list.

It would appear, then, that the degree of transparency on the processes used to determine what is included on a national CRM list varies. Even when the criteria are spelt out, the fact that qualitative information is used in making assessments impairs transparency. This matters for firms considering making investments in supplying items on CRM lists. An item may be on a CRM list now but may be removed at a later date on qualitative grounds. In this regard, it is worth noting, for example, that the United States reviews its CRM list on a three-yearly cycle and that copper and helium were dropped from the previous CRM list (Sancho Calvino 2022).

The pros and cons of defining CRM lists

On the face of it, that governments assemble and publish lists of CRM seems unobjectionable. Surely transparency and accountability are facilitated by publication? There is merit to this view, but it overlooks several other considerations.

One potential benefit of publishing CRM lists by governments with larger economies is the signal sent to the private sector that the issuing government wants to secure more supplies. If the government's signal is backed up by credible policy intervention that favours suppliers of the materials in question, or stimulates downstream demand for these items, then this may positively influence decisions to invest in new mines and processing operations.

However, uncertainty over the criteria used to assess inclusion on a list, any doubts about eligibility for state largesse, plus the potential for a future review resulting in removal of an item from a CRM list, will blunt the positive signal received by the private sector. One drawback of existing CRM lists is that their construction and subsequent policy follow-up are not as transparent as they could be.

A second drawback from creating CRM lists arises because state largesse is typically tied to initiatives to increase the supply of or use critical materials. Miners and processors will seek to have their wares included on the list. Downstream buyers of materials have a similar incentive, as do related equipment manufacturers. Given the sums of money some governments want to spend on the transition to a low-carbon economy and

other priorities, lobbying—motivated by rent-seeking behaviour—could displace the technocratic process that a government initially established (if it established one at all). Experts based in the United States have suggested that rent-seeking has influenced the publication of that nation's CRM list.[8]

The third drawback is that CRM lists may create the impression that the security of supply concerns for each item on a CRM list are similarly acute and that the specific reasons for a thin market in each CRM are the same, when they are in fact quite different. Officials and policymakers may be tempted to develop some all-encompassing, but ultimately unsophisticated and misleading, narrative that is stretched across all CRM. Those narratives may include inadvertently giving the impression that certain foreign trading partners have been unreliable suppliers. Moreover, lumping materials together on to a single list encourages the search for one-size-fits-all solutions, which may be inappropriate.

Taking the latter two points together, the risk that a CRM list is hijacked by commercial and bureaucratic interests to serve their ends cannot be discounted. Particular care is needed in formulating, describing, and disseminating CRM lists if these undesirable consequences are to be avoided.

How similar and stable are trading patterns in CRM?

When a global—as opposed to a national or regional—perspective is taken, it is worth asking how similar cross-border trade patterns are for CRM. This speaks to whether it makes sense to group these materials together in the first place. Do they all have few established foreign suppliers?

If CRM are subject to more supply side disruption—maybe on account of transport delays, commercial considerations in mines and processing facilities, or resort to export restrictions —then we might expect that there is more volatility in CRM trade flows when benchmarked sensibly to non-CRM trade flows.[9] Are trade flows in critical materials inherently more volatile and unpredictable? And, when differences are found, do they apply to all CRM or to just a few?

We explore these empirical matters in the remainder of this section. Specifically, we took all of the materials identified on the 17 CRM lists discussed earlier and identified the relevant product codes in the United Nations (UN) Harmonized System using the most fine-grained information available (at the six-digit level of disaggregation.) We also identified the HS chapters associated with each CRM and whether there were any product codes relating to non-CRM in the same HS chapter.[10] For example, some of the inorganic chemicals tracked in Chapter 28 of the Harmonized System are on CRM lists and some are not. In total there are 14 HS Chapters with 236 (six-digit HS) product codes associated with entries on CRM lists.

When contemplating the *potential* to thicken *global* markets, focusing on the exporting nations with the largest shares of the world market for a material is not sufficient. Attention should also be given to established exporters with more modest shares that might be induced to scale up production in the future.[11] Hence, the first comparison we performed relates to the number of significant exporting jurisdictions for each HS code associated with entries on CRM lists.

Specifically, for each of the 14 HS chapters identified in the paragraph before last, and for the three time periods 2010-14, 2015-19, and 2020-21, we calculated for each HS code relating to a CRM the minimum, median, and maximum number of nations whose exports exceed 1% of world trade of the material in question. We repeated the calculation with a higher 5% threshold, so identifying the number of the larger suppliers to world markets. The results can be found in the third through eighth columns of Table 1.

The principal findings on the number of large suppliers and established smaller suppliers of CRM to *world* markets are:

- In every HS chapter, at least half of the CRM have four or more suppliers with 5% global market shares.
- In every HS chapter, at least half of the CRM have 10 or more suppliers with 1% global market shares, implying that in many cases there are at least six other nations that could be groomed to become larger exporters.
- Only in HS chapters 74 and 81 was the median number of suppliers each with global market shares more than 5% lower in recent years than before the COVID-19 pandemic.

8 See, for example, the remarks of Morgan Bazilian in this podcast: https://www.cfr.org/podcasts/critical-minerals-and-china-morgan-bazilian

9 As will become evident, the approach we take tries to compare green and red apples rather than compare apples and oranges.

10 Not every HS chapter has a product designated as a CRM in it. A total of 14 HS chapters were included in our empirical analysis.

11 In principle, attention should also be given to potential exporters as well. These could be identified using production or resource extraction statistics. To be clear, since the analysis in this chapter is based on trade data, we do not take currently non-exporting producers into account. If we had done so, it would have reinforced the conclusions were draw later in this chapter.

TABLE 1

Number of exporters of critical materials (CRM) and predictability of CRM and non-CRM trade

HS Chapters	Years	Number of exporters with global market share above...						R-Squared from regression (details described in main text)			
		1%			5%			CRM		Non-CRM	
		Min.	Median	Max.	Min.	Median	Max.	With lagged bilateral trade flow	Without lagged bilateral flow	With lagged bilateral trade flow	Without lagged bilateral flow
25	2012-2015	6	13	27	2	4	7	0.80	0.03	NA	NA
	2016-2019	6	14	26	3	5	7				
	2020-2021	7	15	27	3	5	6				
26	2012-2015	2	12	20	1	5	8	0.94	0.01	0.82	0.12
	2016-2019	3	11.5	19	1	4	9				
	2020-2021	5	12	19	2	4.5	7				
27	2012-2015	8	16	19	4	6	6	0.90	0.09	NA	NA
	2016-2019	8	11	17	4	4	6				
	2020-2021	8	14	17	5	6	6				
28	2012-2015	2	12	20	2	4	8	0.84	0.02	0.72	0.01
	2016-2019	3	11	21	2	4	8				
	2020-2021	3	11	23	2	5	9				
31	2012-2015	8	13	15	4	5	5	0.93	0.08	NA	NA
	2016-2019	9	13	15	4	5	6				
	2020-2021	8	11	15	5	6	7				
71	2012-2015	6	11.5	22	1	5	9	0.54	0.02	NA	NA
	2016-2019	7	12	23	2	5.5	7				
	2020-2021	6	11.5	22	2	6	8				
72	2012-2015	6	12	19	3	5	6	0.90	0.03	0.90	0.01
	2016-2019	7	12	16	2	6	7				
	2020-2021	9	12	17	3	5	8				
74	2012-2015	8	13	23	3	5	9	0.91	0.02	0.85	0.06
	2016-2019	8	13.5	23	3	6	9				
	2020-2021	8	15	25	3	5	8				
75	2012-2015	9	13	18	4	5	9	0.83	0.02	0.88	0.10
	2016-2019	7	11.5	18	3	5	7				
	2020-2021	5	11.5	20	3	5.5	8				
76	2012-2015	17	23	25	3	4	5	0.84	0.03	NA	NA
	2016-2019	17	23	24	4	4.5	5				
	2020-2021	17	20.5	23	4	5.5	6				
78	2012-2015	13	16.5	27	4	5	7	0.83	0.04	NA	NA
	2016-2019	9	18.5	25	1	4	5				
	2020-2021	8	17.5	26	3	5	6				
79	2012-2015	11	18	21	4	5	10	0.86	0.04	NA	NA
	2016-2019	9	18	24	4	6	8				
	2020-2021	10	17	21	3	6	9				
80	2012-2015	11	16	20	5	6	6	0.80	0.04	NA	NA
	2016-2019	14	19	22	4	6	7				
	2020-2021	12	17	23	5	5	7				
81	2012-2015	5	10.5	21	2	5	8	0.78	0.01	NA	NA
	2016-2019	6	11	21	2	5	8				
	2020-2021	2	10	20	1	4	7				

Note: The products in each HS chapter are summarised in Table 2.

TABLE 2

Titles of HS chapter including at least one CRM HS code

Chapter number	Chapter title
25	Salt, sulphur, earth & stone, plastering materials, lime & cement.
26	Ores, slag and ash.
27	Mineral fuels, mineral oils and products of their distillation, bituminous substances and mineral waxes.
28	Inorganic chemicals, organic and inorganic compounds of precious metals, isotopes.
31	Fertilisers
71	Pearls, stones, precious metals and imitation jewerly.
72	Iron and steel
74	Copper and articles thereof
75	Nickel and articles thereof
76	Aluminium and articles thereof
78	Lead and articles thereof
79	Zinc and articles thereof
80	Tin and articles thereof
81	Base metals nesoi, cermets, articles, etc

- Only in HS chapters 31 and 76 did the median number of suppliers each with global market shares more than 1% fall by two or more in recent years when compared to 2015-19.
- In HS chapters 26, 27, 31, 72, 78, and 80 for every CRM the minimum number of exporters with global market shares of 5% or more was larger in 2020-21 than in 2015-19.
- In HS chapter 79 for every CRM the minimum number of exporters with global market shares of 5% or more was four in 2015-19 and has since fallen to three.
- In HS chapter 81 for every CRM the minimum number of exporters with global market shares of 5% or more was two in 2015-19 and there are now cases where there is a sole exporter with a 5%+ global market share.
- In four HS chapters the minimum number of exporters with global market shares of 1% or more was higher in 2020-21 than in 2015-19, providing evidence of entry and greater potential to thicken markets. In six HS chapters the comparable minimum numbers fell, suggesting some nations have ceased exporting.

Given these findings it is perilous to generalise about the range of foreign sources of supply for CRM. For sure, there are some HS codes associated with CRM where there are one or two exporting nations that supply more than 5% of world markets. But there are entire HS chapters where there are *at least* five exporters with significant global market shares. And there are even HS codes for CRM where there are *seven to nine* exporting nations with global market shares of 5% or more.

Figures 4 and 5 present the findings for each HS code, that is, for each product category that is associated with an entry on a CRM list. Recall, there are 236 product codes of this type. Figure 4 plots the number of customs territories which exported a product where the global market share is in excess of 5% during 2020-21 against the number of exporting territories that have global market shares between 1% and 5% over the same time frame. One sixth of all these HS codes (38 in total) had three or fewer suppliers with global market shares each in excess of 5%, the larger and sometimes "dominant" exporters. In only seven of those HS codes are there fewer than six suppliers with global market shares in excess of 1%. The large numbers of nations recorded on the vertical axis are an indicator of the suppliers that could potentially expand their shipments to the world market, thereby eroding the dominance of larger exporters.

Figure 5 plots the same horizontal axis against the total global market share of the smaller exporters during 2020-21, those exporting nations which each had global market shares between 1% and 5%. The latter nations don't dominate the global market for these CRM but their current market share suggests they have some scale. For 52 HS codes the "fringe" (smaller) suppliers accounted for 10% or less of the global market share during 2020-22; for a further 123 HS codes the fringe suppliers currently account for between 10%-25% of global market share. For these HS codes there is plenty of room for the fringe exporting nations to expand their exports and dilute the market shares of the presently larger exporting nations.

FIGURE 4

In very few cases are there few exporters that dominate world markets and few fringe exporters that might be coaxed to supply more

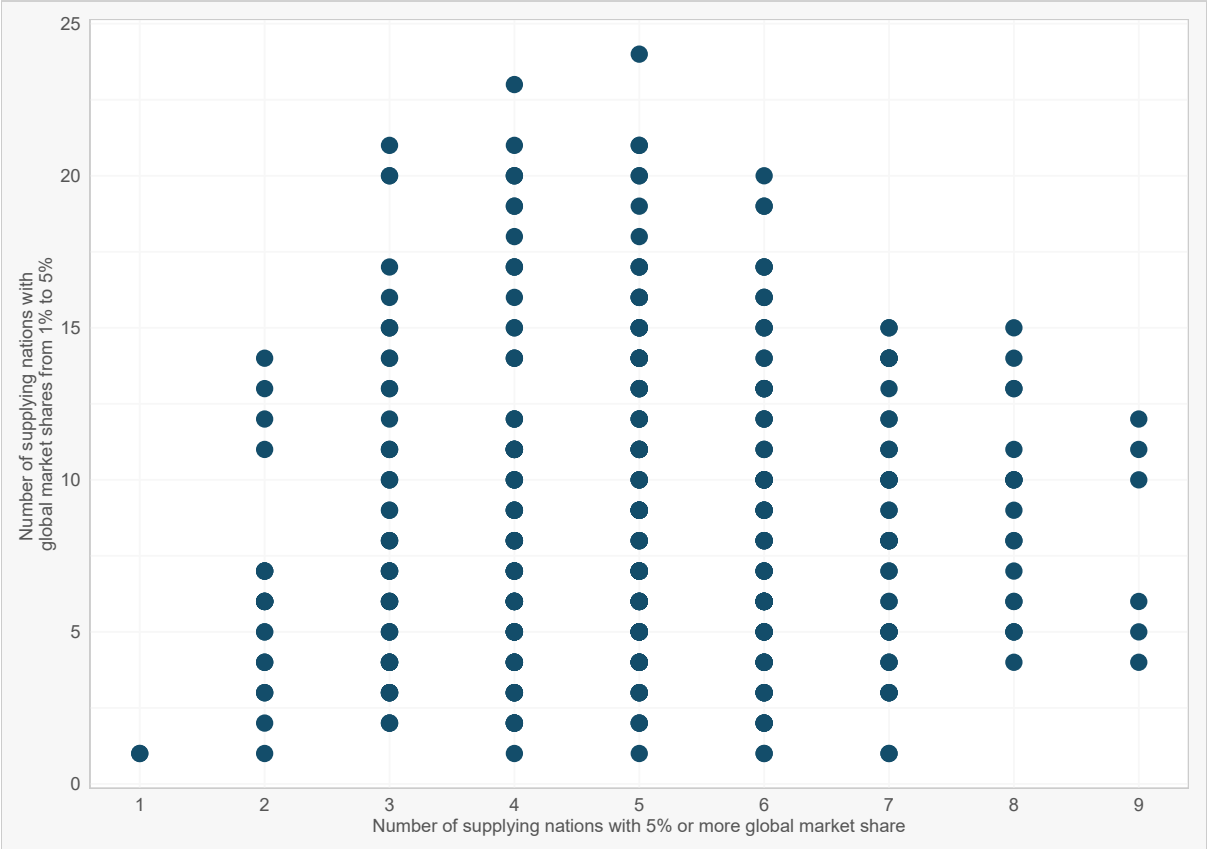
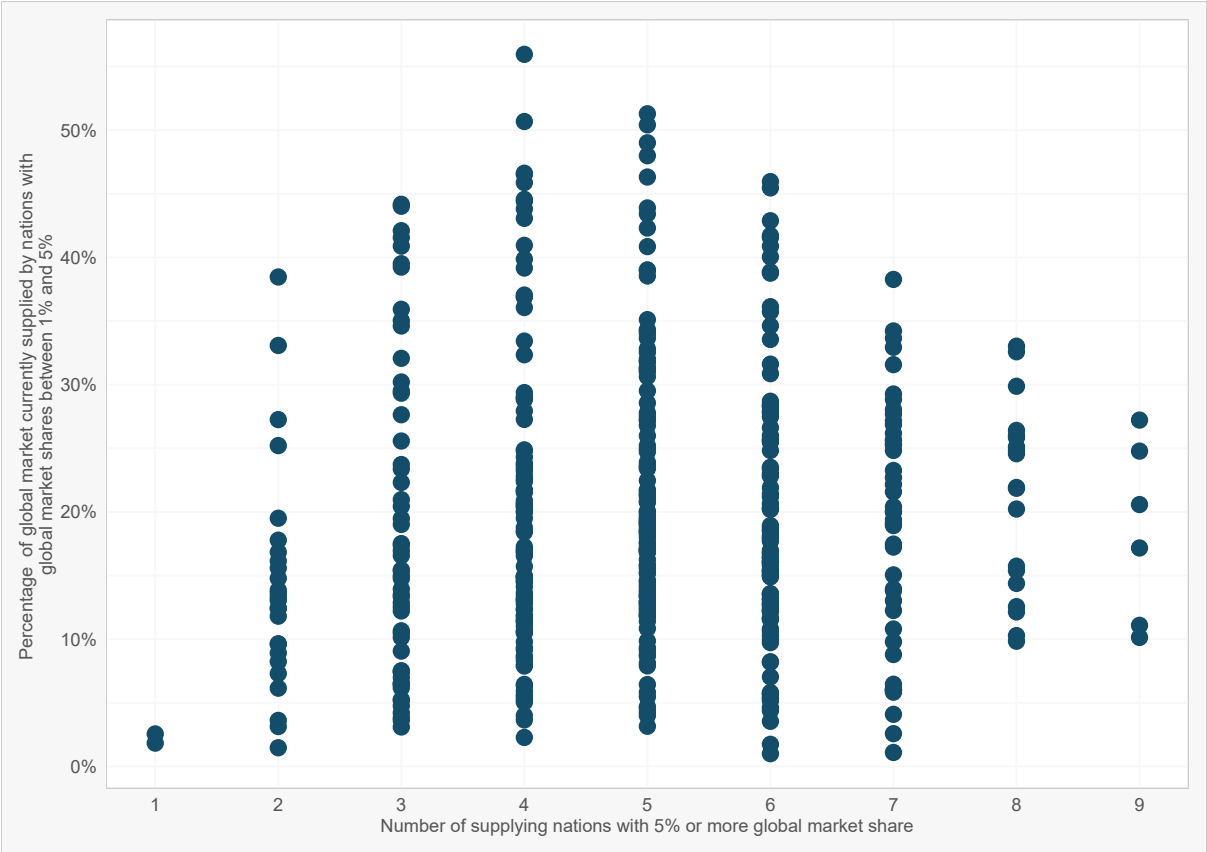


FIGURE 5



Note: Each dot represents a HS code associated with an entry on a CRM list.
Data source: UN COMTRADE data for 2020-21.

This is not to deny that some markets for CRM currently have few sources of supply, which is a pre-requisite for being "thin." But any assumption that every global market for CRM is thin is mistaken. Moreover, the statistics above suggest that in many cases there are established smaller exporters that may be able to expand supplies to world markets.

Some may take exception to these statistics on the number of foreign suppliers for CRM arguing that the actual number of suppliers willing to supply their country is much smaller. Two counterarguments can be made. First, evidence should be provided that a foreign supplier has refused to supply a buyer. Hypotheticals won't do. As the saying goes "in God we trust, everyone else must provide evidence."

Second, if sellers in few foreign nations are willing to supply a buying nation then this may reveal as much about the ineptitude of the latter's diplomacy as it does about the formers' belligerence. We should not forget that it is the job of diplomats and statesmen to find ways to develop harmonious nations with foreign nations. Perhaps the problem is not with the number of suppliers but with the nature and execution of diplomatic strategy pursued by importing nations?

The second assessment we made was to compare estimates of the stability in bilateral trade in CRM and non-CRM. One way to think about this is as follows: Does last year's trade in a material predict this year's trade less accurately for materials deemed critical than for other materials?

To focus on the commercially meaningful trade flows, we excluded any recorded annual bilateral import flow that was worth less than $10 million. To eliminate the effects of longstanding exporter and product characteristics and inter-year volatility in prices, we included so-called fixed effects in our panel data estimation.[12] So as to exclude the instability created by the COVID-19 pandemic, this regression was performed using six-digit international trade data from the UN COMTRADE database for the years 2010-2019.

In each HS chapter, where there was significant trade data available, we ran separate regressions for the CRM products and non-CRM products. We included prior year bilateral trade in our base line regressions and were interested in seeing if those regressions explained less of the variation of CRM product trade as compared to non-CRM products. We also conducted two regressions without the prior year bilateral trade flows, to help us examine whether inclusion of lagged trade flows increased the explanatory power of the regression. The key summary statistics—capturing the amount of variation in bilateral trade explained—are found in the final four columns of the Table 1.

In the five HS chapters where it was possible to estimate regressions for both CRM and non-CRM trade we did not find that, as a general rule, unaccounted for factors (such as arbitrary government export curbs) depressed the explanatory power of the CRM trade below that of non-CRM trade. In fact, in three of the five cases, the results imply that bilateral trade flows in critical materials are better explained by prior year trade flows than for other materials.

In the case of HS chapter 75, the explanatory power of the regression on bilateral trade flows is five percentage points lower for CRM than for for non-CRM; still, 83% of the CRM-related trade was explained. These econometric results do not suggest that there is a marked, broad-based tendency for CRM trade to be more unstable than trade associated with sensibly chosen non-CRM benchmarks. On the basis of this evidence, narratives about the inherent volatility or instability of CRM trade should be treated with scepticism.

Concluding remarks

Since the onset of the COVID-19 pandemic, and in particular following the invasion of Ukraine, a narrative has been advanced that trade flows can be weaponised by unfriendly governments. Nowadays the benefits of sourcing better and cheaper materials from abroad have been rebranded by some as a "dependency." Fears have been fanned that foreign supplies of key materials might be cut off arbitrarily. In turn this had led to the creation of lists of "critical" materials which, upon reflection, may not be as technocratic or shielded from commercial and bureaucratic manipulation as one might hope.

Furthermore, narratives that give the impression that all critical materials have few suppliers worldwide and that trade in critical materials is inherently more volatile are not borne out in the available UN trade data. In fact, there are considerable differences in trade patterns across types of CRM. We note that a detailed study by two OECD officials, released in April 2023, which explored different measures of concentration and of "dependencies" than we did, found similar results (Kowalski and Legendre 2023). When it comes to critical materials, policymakers overgeneralise at their peril.

12 Our regressions were performed separately for each HS chapter and for CRM and non-CRM goods separately. Those regressions included exporter-specific fixed effects, HS code-specific fixed effects, year-specific fixed effects, and the lagged value of bilateral imports by one country from an exporting jurisdiction. Following standard practice, we used bilateral import data recorded in the UN COMTRADE database, not the value of bilateral export data which are thought to be less reliably reported.

Ultimately, the empirical case for treating critical materials differently from other materials is probably weaker than many assume or imply. This is not to deny that there may be certain global markets for CRM that need thickening. But these situations are the exception and not the rule. CRM, associated geopolitical dynamics, and links to the transition to the low carbon economy do not provide a rationale either for tearing up longstanding principles governing cross-border trade or for policy-induced deglobalisation.

Having written this, many of the current lists of CRM have two redeeming features: they specify which materials are included (rather than specifying which ones are not) [13] and they are short. Long may they remain that way.

13 This is a subtle distinction that trade analysts and officials are attuned to in other contexts. Here CRM lists follow a so-called positive list approach.

CHAPTER 3
PUBLIC POLICY, PRIVATE INCENTIVES, AND UNDER-CAPACITY IN MARKETS FOR CRITICAL RAW MATERIALS

Intensifying geopolitical rivalry, in particular the suspicions and fears that its gives rise to, has had a profound effect on trade policy narratives over the past 10 years or so.

Not long ago, Western governments fretted about the consequences of Chinese excess production capacity in aluminum, steel, and other manufactured goods. Having too many goods chasing too few buyers was the concern then.

Now the spotlight is on CRM and the narrative has changed 180 degrees. The concern is about securing enough supplies of raw materials now and in the future. That's tantamount to arguing there is under-capacity—or to be precise, insufficient production capacity being made available to world markets. Now too many buyers are chasing too few materials.

In our 22nd Global Trade Alert report we examined both the economics of "excess capacity" and its empirical relevance in the steel and other sectors. That report found the prevailing narrative, advanced by certain G20 members and business associations, manifestly deficient and largely detached from empirical reality.

In this report we are putting under scrutiny what is tantamount to an "under-capacity" narrative related to government-chosen lists of critical raw materials. In this chapter we will link under-capacity to excess demand and the notion of a thin market. We also focus on the role that public policy and corporate choices can play in thinning markets for CRM. We proceed from the general case to the specific, using the case of Indonesia's export controls on nickel to highlight the different factors that ought to be considered when evaluating such high-profile industrial policy initiatives in CRM markets.

Security of supply considerations and the multifaceted nature of a thin market

It will be useful to start with a definition of the notion of a security of supply concern and then link that definition to the notion of a thin market. A security of supply concern for an industrial material arises when a government determines that the following four conditions are satisfied. Given existing policy and regulation in place and extant corporate practices, the state in question:

1 attaches a sufficiently high probability that, now or at some point in the future, the supplies available for use by buyers from their economy are insufficient;

2 that any shortfall is not expected to be filled quickly enough by private sector suppliers of that material;

3 that any shortfall is not likely to be met readily and affordably by substituting for another material;

4 that, should it occur, any shortfall either compromises a cherished societal objective or results in material harm for those societal stakeholders that the government in question seeks to protect or advance.

Several comments follow from these four conditions, motivated in large part by thinking practically about how to operationalise these conditions:

Condition 1

- Sound public policymaking here ought to require the provision of legitimate, ideally evidenced, grounds that the probability mentioned in condition 1 is high.
    - An economy may have the lions share of world reserves of a given material and a track record of never seeking to adversely affect the supply of the raw material on world markets. Ideally, there needs to be a thorough understanding of what factors underlie that track record. For example,

there could be a constitutional provision banning export restrictions in a society where that national constitution is respected and enforced.

- Fears and assertions that supplies available for use could be cut off or sharply reduced that cannot be substantiated should be discounted. The existence of some posited future scenario is not legitimate grounds for declaring a security of supply concern. Sensible policymakers do not allow for such "trump cards" to be played on them.
- Tacking a different tack, the probability of insufficient supplies available for use should take into account if the assessing government in question has sufficient leverage over relevant suppliers, be they domestic or foreign, to deter withholding supply. In the case of foreign suppliers that leverage may involve the importing government having sway over the behaviour of the government where the foreign suppliers are located.

- Condition 1 implies that there is the expectation that excess demand for the material will arise.
  - Such excess demand could arise from sudden increases in demand or because of longer term increases in demand.
  - Such excess demand could arise from changes in demand domestically or abroad.
  - Evidence should be provided to support the notion that demand is expected to grow and to exceed available supply. That evidence, in particular the associated forecasts, should be revisited from time to time.
- Condition 1 is not confined to any particular stage in a value chain.
  - Security of supply concerns can occur at the extraction and processing stages of value chain.
- The inclusion of "for use" in condition 1 was deliberate as private or public sector actors may stockpile the material in question.
  - This implies that sharp fluctuations in price or quantities available for use are neither necessary nor sufficient to create a security of supply concern. If anticipated, or if there is a track record of such fluctuations, then private and public sector actors may have decided that, on net, it wise to build up stockpiles.
- Nothing in condition 1 confines security of supply concerns to foreign sources of a material. Domestic suppliers can act opportunistically or for other reasons to reduce available supplies to domestic buyers.

Condition 2

- Condition 2 brings in one facet of the supply side of the notion of security of supply.
  - In the immediate or near term the capacity of the private sector, located at home and abroad, to profitably increase production is relevant and the economics of industrial organisation literature has shown us that several factors may influence that.
  - Over longer time horizons the willingness of private sector suppliers, again at home and abroad, to enter a market or to expand existing capacity is relevant. Analysis of these decisions has shown that they may be influenced by a host of policy-related and private sector factors, including expectations about the latter too. Barriers to entry, more generally, and potential coordination failures between private sector buyers and suppliers, in particular, are relevant here.

Condition 3

- Condition 3 requires consideration of the supply, availability, and costs of substitutes for the material, both in the near term and over time.
  - Many of the points made in the last bullet apply here too.
  - The cost, uncertainty, and length of time necessary to develop substitute materials are relevant factors here as well and will in turn be affected by public policy and private expectations and incentives.
- Conditions 2 and 3 serve as a reminder that the supply side of markets for materials are not set in stone.
  - Market structures can evolve over time. Put differently, any assumption that the supply side of a market for a material is fixed needs to be convincingly accounted for.
  - Should situations of excess demand occur then consideration should be given as to how frustrated buyers of that material and suppliers in different geographies will react.
  - Consideration should be given—informed by evidence and precedent—as to how long it takes for those reactions to meaningfully affect market outcomes.

Definition of a thin market for CRM

- A market is thin now, or has the potential to be thin in the future, if conditions 1, 2 and 3 are met.
  - The thinness of a market and its geographical scope—in particular whether current and potential future foreign buyers and sellers are market

participants—are distinct but related attributes of a market.

- A thin market could be a competitive market but need not be. Likewise, a thin market may have varying degrees of transparency about corporate and policy decision-making.

Condition 4

- Not every industrial material falls under this definition, because any scarcity thereof would compromise a sought-after societal goal or cause disruption or sufficient harm to stakeholders privileged by a government (condition 4).
  - Therefore, not every thin market gives rise to a security of supply concern.

Taking account of cross-border trade and investment

When cross-border trade and investment is possible, this complicates the assessment of whether a security of supply concern exists. The existence of foreign buyers may be a reason for excess demand changing. The existence of foreign governments may influence the amount of material available to buyers in other countries—and the stated goals of those governments may influence the probability assessment outlined in condition 1.

The presence of foreign suppliers of the material in question and of substitutes to that material must also be taken into account when assessing whether a security of supply concern is present. The key point here is that adding the international dimension neither automatically eliminates security of supply concerns, nor does it necessarily create those concerns. As British governments learned in the 1970s and 1980s, threats to the security of supply of coal were domestic in origin.

Role of domestic policy objectives

As will be argued in the next section, current and likely domestic policies affecting materials markets and any uncertainty about those policies need to be taken into account, too. In addition to bearing upon domestic buyer and supplier behaviour of the material in question, that several distinct domestic policy regimes can influence market outcomes creates the potential for conflicts between government objectives.

For example, the mining of certain materials with currently available technologies is said to be environmentally damaging and a government may determine that it wishes to limit such damage. Policies associated with the latter may constrain the amounts of domestically available supplies of a material. In principle, a security of supply concern could arise as an unintended consequence of the pursuit of other legitimate public policies. Humphries (2013) contends that environmental regulations and incidents were one factor that led Molycorp to close its Mountain Pass mine in 2002. Such was the significance of this mine to American and global markets for Rare Earths from the 1960s on that Humphries observed "Since then, the United States has lost nearly all of its capacity in the rare earth supply chain, including intellectual capacity" (page 13).[14] Recognising that domestic policies contributed to the creation of a security of supply concern ought to discourage narratives that heap the blame entirely on others.

Role of corporate choices

Private sector choices can also influence the thinness of markets and security of supply assessments. To the extent that a firm or a group of firms[15] have market power over the supply of a material, they may be tempted to curtail production, thereby thinning the market. The upshot is higher prices, increasing profit margins, and less choice for buyers. Private sector firms can respond to shortages of a material by trying to find or create substitutes. Other firms may be tempted by higher world prices to start exporting in the first place, increasing the set of suppliers available and thickening the market.

Potential for market-based coordination failure

Coordination failures may arise between firms in the same value chain. For example, downstream buyers of a material may be reluctant to increase their scale of processing activities if they are unsure of obtaining sufficient reliable supplies of the material for the duration of their commercial plans, which may last many years. Expectations of the likelihood of supply, time to market, and any regulatory consideration could influence future entry into the upstream sector can be important here.

Meanwhile, upstream suppliers may be unwilling to invest in additional mining capacity and the like if they don't see or expect sufficient entry by downstream processors over the time frame of their investment. Furthermore, the expectations of upstream suppliers may be influenced by their assessment of how quickly governments and the private sector embrace the digital and energy transitions.

Failures to align expectations of commercial actors of both sides of each market along the material value chains can result in thin markets.

14 Note Humphries was writing in 2013. Since then the Mountain Pass mine has been reopened with a different business model and, critically to the argument in this paragraph, with previous environmental liabilities removed (Humphries 2013; Tracy 2020).

15 Here firms may operate global cartels. Recall that export cartels are exempt from some nations' competition laws.

Account for long-term contracting and vertical integration

On the face of it, signing long term contracts between material suppliers and buyers may overcome the uncertainty associated with spot markets for materials. However, signing exclusive long-term contracts can reduce the number of suppliers available to other buyers. Downstream firms, of course, have an incentive to secure materials from themselves. They may also view locking rivals out of certain material suppliers a competitive advantage. From the global and possibly the national perspective, such corporate practices are not ideal. Similar remarks apply to attempts by downstream buyers to acquire their upstream suppliers. These matters become particularly acute when the firm seeking to acquire the supplier is foreign. Vertical integration can be at odds with steps to thicken markets.

The impact of commercial policies on the thickness of CRM markets

Commercial policies applied to industrial materials can thin or thicken markets at home and abroad, the latter being a type of cross-border policy spillover that can generate trade tensions between governments and that can, more positively, rationalise collaboration between states. As the options for the private sector to respond to policy widen over time, the degree to which markets are thinned or thickened can vary over time. In this section, we discuss how this plays out with standard trade and industrial policy instruments.

Import tariff reductions

Let us start with an import tariff reduction on an industrial material. By reducing the tax paid at the border on imports, the government in question thickens the market at home where that material is sold. So long as the price paid net of duties falls[16], then the domestic buyers can seek to source on better terms from abroad. Whether they are successful depends on whether a foreign supplier with capacity to expand supply exists.

For domestic suppliers of the material, the tariff reduction will, to the extent that it lowers domestic prices, reduce the profitability of production and induce a cut in supplies to the domestic market. What matters here is whether total available supply expands and, if the nation in question was initially a net importer, then lowering tariffs will, on net, increase available supply to buyers—thereby thickening the domestic market for that material.[17]

A second-round effect is relevant if the import tariff reduction is expected to last.[18] When foreign firms decide whether to expand their production capacity or to enter the market in the first place, they will consider the size of the current and likely future totally accessible market (TAM). The import tariff reduction can influence the TAM foreseen by current and potential future foreign suppliers. The fact that this effect is on foreign suppliers means that the implementing government creates a positive cross-border spillover that it has probably not internalised. The upshot: less import tariff reductions than is optimal from a global perspective.

Export curbs

Now we consider the case of an export curb on the material.[19] The imposition of such an export restriction will increase availability of the material in the implementing jurisdiction, potentially lowering the domestic price to downstream buyers. The export curb will divert trade away from the global market towards the domestic market, creating a negative spillover that raises prices or reduces availability abroad. Foreign buyers are harmed by the export curb. Ultimately, in the short run, the immediate effect is to thin markets abroad and to thicken them at home.

The second-round effects depend critically on how the downstream domestic buying industry involves. If downstream buyers do not ramp up production and material purchases much due to the lower prices of the raw material, then the domestic upstream suppliers may find their profitability impaired. In which case, when it comes to reassessing their ideal extraction or mining capacity, the suppliers of the material may reduce their scale and even exit the sector—decisions that will thin the upstream domestic market over time.

A particularly interesting case arises when an export curb is applied by a government where a large share of regional or global reserves are found inside the implementing jurisdiction. Rather than pay the higher prices on world markets that follow the imposition of the export curb, foreign firms seeking to buy the material may find it cheaper to invest in downstream production

16 We acknowledge the theoretical but unlikely possibility that the import trariff reduction results in such an increase in global demand that the world price rises. Even in this case, the higher new world price may be lower than the old price plus the tariff.

17 In principle, this creates a potential tension between industrial policy goals to support domestic suppliers and the objective of securing sufficient supply of the material. Essentially, the import tariff reduction privileges the interests of buyers of the material and their downstream customers over the domestic suppliers of the material. As is so often the case, trade policy intervention advances one objective at the expense of some other interest or objective.

18 Any uncertainty on this score weakens the second-round effect.

19 Spencer and Jones (1989) analyses from a nationalistic welfare perspective the pros and cons to a nation that can produce an intermediate and downstream goods of imposing an export ban on the upstream good. They terms such a ban "strategic foreclosure."

in the nation that imposed the export curb. In this case, the export curb diverts both trade and investment flows. Note, however, that many factors affect such investment decisions, including other domestic policies and factors that may or may not be favourable to foreign investors. Any uncertainty over those policies may blunt the foreign direct investment inflows as well.

In principle, if enough foreign firms invest in downstream capacity in the implementing jurisdiction, then domestic demand for the upstream material could rise sufficiently that domestic prices of that material increase, and the domestic suppliers of the material may recoup some of their first-round losses (explained above.) In this case, the government that implemented the export curb is temporarily—and possibly permanently—sacrificing the commercial viability of the upstream material suppliers for downstream commercial interests, some of which may be foreign owned. The jobs and exports created by those foreign investors may be a factor influencing the implementing government's decision-making.

Moreover, to the extent that the additional downstream processed material is made available on world markets, this may, all else being equal, thicken the market for the downstream goods. However, should foreign firms shut down production facilities abroad and move them to the nation imposing the export curb, then that will generate another negative cross-border spillover for trading partners. The net supply of the downstream processed material can rise or fall. If it falls, the net effect of the original curb is to thin both the upstream and downstream markets for the material—a double hit from a global perspective. It is an empirical question which of these different downstream effects prevails.

Not surprisingly, then, the resort to export curbs at home that divert trade and investment flows are likely to be controversial abroad, especially if the curb starts causing foreign firms to relocate production to the sourcing nation. Furthermore, when gaps in the price of materials between the home market and world markets become significant, then such differential pricing has been a source of trade tensions in the past.

Entry subsidies to producers

A government may seek to thicken domestic markets by effectively subsidising the entry of firms. This can take the form of tax breaks, outright cash grants, interest subsidies, state loans, and loan guarantees, to name a few of the salient forms of state aid. New entrants can be domestic or foreign-owned.

Whether such entry thickens the market beyond the short term will depend on whether the new entrants have a viable business model given prevailing prices for the material in question. If a new entrant has negative profit margins, then much will turn on whether economies of scale or learning-by-doing effects can induce lower variable costs in the future and whether any losses in the near-term can be financed. It should be possible to discern from the changes over time in the costs of incumbent firms whether claims about the potential for falling costs are fanciful or not.

Of course, this represents another outing for the infant industry argument, with its known pros and cons. Here, perhaps, the only additional pro is that to the extent that the new entry attenuates a coordination failure, then sufficient downstream buyers may enter too—resulting in a thicker market with higher prices for the purchased material that may enable the upstream seller to break even or make profits. Under these circumstances the market for downstream products may thicken too, so long as the entering downstream processors have viable business models over the near- to medium-term.

To the extent that the production plans of the new entrants markedly expand supply to domestic markets then, unless exports commence, domestic prices will likely fall and incumbent suppliers will be worse off. What policymakers may perceive as under-capacity initially could with sufficient entry result in over-capacity, depressed prices, and compromised business models.

Finally, to the extent that subsidies are tied to requirements that are costly to meet—such as local sourcing requirements for staff, purchases of intermediate goods and capital goods, etc—then this is likely to diminish the thickening effect of the entry subsidies.

It should be evident from this discussion how contingent the impact of entry subsidies on the thickness of market are.

State support to acquire production capacity abroad

The governments of countries with few resources may be tempted to intervene to secure supplies from foreign markets. While a bidding war between governments is in principle possible,[20] more common are policies that offer state support to national firms to form joint ventures with firms abroad that extract or process materials. An alternative is for states to financially support the

20 Recall the case of facemasks at the start of the COVID-19 pandemic.

acquisition of stakes in foreign firms, even to help finance acquisitions.[21]

If the state support facilitates a transfer of ownership and results in no change in the number of competitors, then the existence of any implicit or explicit commitment to ship the material to the nation which offered the state support effectively diverts trade, either away from some third country or from the market when the acquired firm is located. Customers of the acquired firm may no longer have their needs met. This thins the market(s) to which the shipments are reduced. To the extent that the acquisition or joint venture results in increased production, or possibly in extra production capacity, then redirecting some shipments to the financing country may not thin other market(s) as much.

That foreign acquisition of a domestic material miner or processor can result in thinner markets at home accounts, in part, for the greater resort in recent years to screening of foreign direct investment (FDI). Such screening can be seen as a means to prevent the thinning of domestic material markets, although it should be noted that, in the absence of export controls, domestic suppliers are free to ship materials abroad. A government minded to maximise supply of materials to domestic buyers may have to restrict both cross-border merger and acquisitions and exports. Doing so would limit the TAM of domestic suppliers, to the detriment of their near-term commercial viability and their willingness to invest in upgrading and capacity expansion.

All of the traditional risks associated undertaking with cross-border mergers and acquisitions apply to the steps to acquire foreign material producers. The relatively low rates of successful post-merger integration should also be taken into account.

In sum, for those governments minded to do so, there are plenty of commercial policy tools that can influence the availability of materials to their economy. Almost all of those tools have beggar-thy-neighbour qualities or other deleterious side effects. It is important to test each proposal for commercial policy intervention against alternatives, including policies that reduce domestic barriers to entry (of which the time, cost, and conditions to acquire a permit to operate is a leading example) and that reduce the elevated levels of regulatory uncertainty witnessed today in the world's largest economies.[22] Both discourage firms from entering CRM markets.

Having laid out these considerations for four policy instruments frequently used to increase production of and to secure supply of CRM, we further move from the general closer to the specific—with a case study of Indonesia's resort to export controls on nickel products.

Indonesia's industrial policies towards nickel

Governments of resource-rich countries are unlikely to view security of supply concerns in the same light as governments whose territories contain few material reserves or that have limited processing capacity. While the latter governments talk in terms of access to supplies and de-risking supply chains, the former see the rising demand for certain commodities—linked either to the ongoing digital transition or the transformation to a low-carbon economy—as an opportunity to jump start the development of their economies and to improve the living standards of their people. These are legitimate ends—the question arises as to how effective are the means to attaining those ends? Furthermore, do the means thicken or thin markets, domestically and globally?

Examining the case of Indonesia's industrial policies towards nickel, in particular the export policies that it adopted since 2014, is instructive for three reasons. First, nickel has a number of salient downstream uses. It has long been used in the manufacture of stainless steel. Furthermore, nickel is expected to play an important role in the production of batteries in electric vehicles. Given the demand for the latter is expected to grow markedly over time, we can examine whether Indonesia's policies have been able to capitalise on this favourable expected demand growth for processed nickel.

Second, notwithstanding that rising demand, some analysts viewed the implementation of Indonesia's industrial policies towards nickel as a gamble that ultimately paid off. Terauds (2017), an UNCTAD staff member, wrote:

> *"The Indonesian government undertook an ambitious gamble: it banned nickel ore exports to compel mining companies and processors to build smelters in Indonesia. In so doing, it wagered its position as the world's leading exporter of nickel ore and, in particular, as the chief ore supplier to China's nickel pig iron (NPI) industry. The gamble paid off, in that the durable benefits of the ban - in value addition and jobs, for example - outweighed their opportunity costs."*

21 These steps are to be differentiated from state support to set up a production facility abroad, which could have the same consequences for the thickening of markets as in the last subsection, except that the risk of an export control being put in place by the government of the nation when the foreign production facility is in operation.

22 For the latest data on measures of economic policy uncertainty, go to https://www.policyuncertainty.com/

More recently, Kim (2023) went further and noted:

> *"So successful have these industrial policies been that the [Indonesian] government is planning to target other minerals in a similar fashion, despite the objections of major trading partners."*

We want to understand what form this apparent success took and how that was linked to policy. Third, we will explore whether there is any evidence that this success came at the expense of thinning markets abroad and reducing the commercial opportunities and livelihoods in other countries.

To some, Indonesia's industrial policies are an example of "resource nationalism." To others, they contravene WTO rules. Indeed, the European Union took Indonesia to dispute settlement at the WTO and successfully challenged "a prohibition on the exportation of nickel ore as well as another measure that requires that all nickel ore be processed domestically" (WTO 2022).

There does not seem to be much disagreement on the measures that Indonesia took. The International Energy Agency did as good as job as any summarising the actions taken by the Government of Indonesia and their apparent rationale:

> *"Through successive policies implemented between 2009 and 2019, the Indonesian government has, as of late April 2022, progressively banned the export of nickel ore, requiring nickel to be processed domestically for export. The export of nickel ore was first outlawed as early as January 2014, and while some ore with concentration below 1.7% could legally be exported between January 2017 and December 2019, any export of nickel ore has been banned as of January 2020.*
>
> *"The aim of this policy is to strengthen domestic processing facilities, bring back the added value of nickel's supply chain to the Indonesian economy and spur job creation and economic development in Indonesia"* (IEA 2022).

By restricting or banning exports of nickel ore Indonesia created strong incentives for those firms seeking to process that ore to set up new smelters in that country. What underlies these incentives is the fact that Indonesia's estimated reserves of nickel stand at 21 million metric tons and account for 20.5% of the world's total. Only Brazil and Australia have sizeable reserves of nickel and neither has more than Indonesia (USGS 2023). Laterite ores are the principal form of nickel ore found in Indonesia. While this ore is found in other nations, some (for example, the Philippines) are known to have laterite ores of inferior quality to those available in Indonesia (Lederer 2016).

In what follows it will be useful to distinguish between nickel ore and concentrates and two downstream goods made of such unprocessed nickel: stainless steel products and other nickel products, such as ferro-nickels and the products covered in Chapter 75 of the UN Harmonized System of products. Citing official sources, Deloitte (2022) noted that in 2020 a total of 260 nickel mining licenses had been granted and 13 nickel smelters were in operation.

In assessing Indonesia's industrial policy towards nickel four time periods are relevant: the years before 2014, 2014-2016, 2017-2019, and 2020 on. The changes in policy over time may well have generated uncertainty among private sector participants about its future course. Indeed, the date of the last export prohibition was unexpectedly brought forward from 11 August 2022 to, effectively, 1 January 2020.

What predictions follow from this information? First, the strictest bans on exporting nickel ore occurred during 2014-2016 and since 2020, so it will be interesting to see if the reported export flows confirm this. Second, if the strategy of encouraging downstream production of stainless steel and other nickel products was successful, then we should see exports of both products rise. The interesting question is how long this took and whether the export increases are unusually large.

Third, given that it might take time for downstream industries to come online, then there may be short term dip in production of nickel ore. It will be interesting, then, to see if Indonesia's share of global nickel ore production fell, then recovered and, if so, over which time frame.

Furthermore, it is of interest whether—if the growth of the downstream sector is so large—the share of Indonesia's nickel ore production eventually increases above the levels seen before the policy was put in place. It may be that this industrial policy is doubly successful—in increasing downstream production and exports first and increasing Indonesia's global share of upstream nickel ore extraction later.

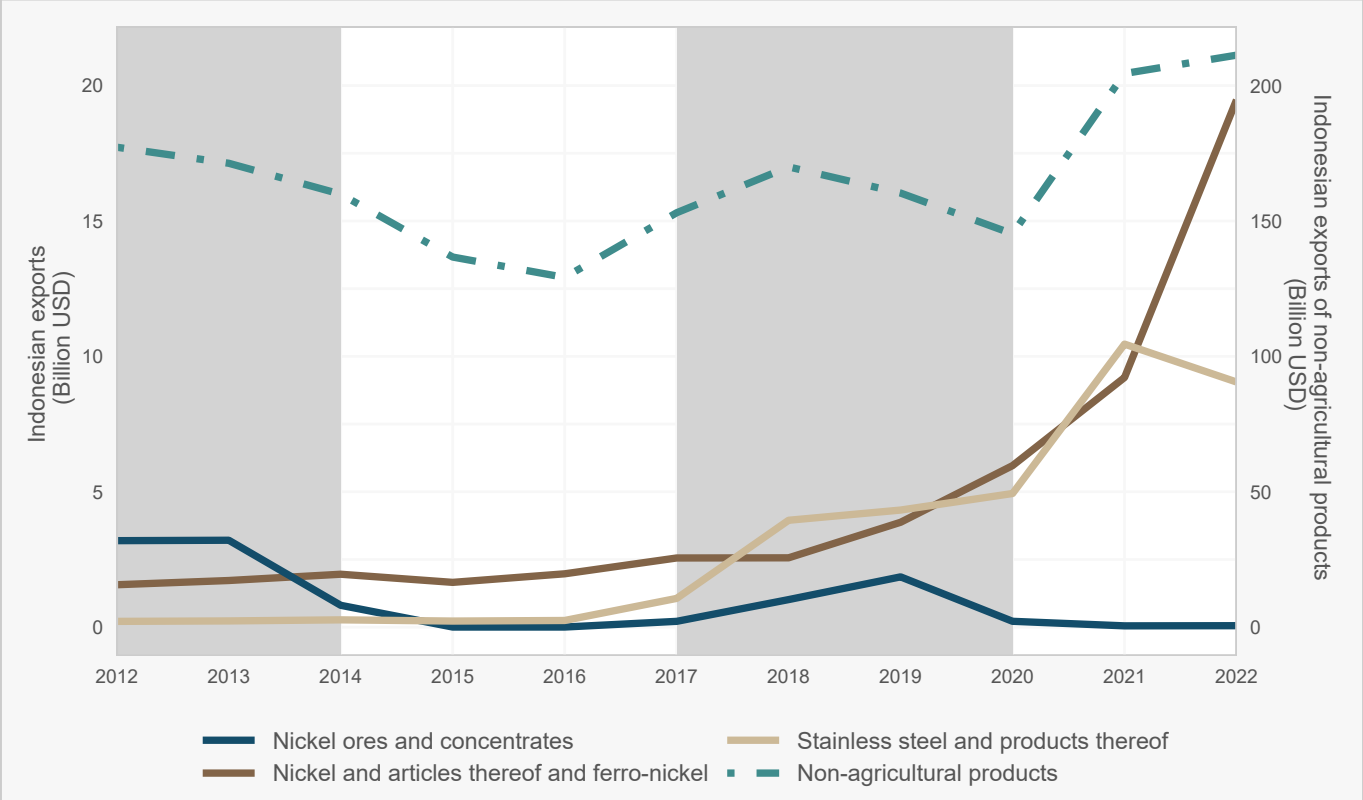
Before looking at the data, there is the question of whether any success(es) can be attributed solely to the export curbs on nickel ore. *The Economist* magazine characterised the policies to attract downstream foreign direct investments in this manner:

> *"Indonesia lured its new nickel smelters by promising a decade-long income tax holiday, a discount on mining royalties and exemption from VAT and export duties. It also compels nickel miners to sell them ore below the market-rate"* (*Economist* 2023).

PWC (2019) provides further details on the tax holidays and tax incentives offered to nickel miners and downstream processing commercial activities. The existence of such incentives begs the following question: would the export ban had as much impact without the award of tax holidays and incentives? If anything, any success cannot automatically be solely attributed to the ban on exporting

FIGURE 6

Indonesia's downstream nickel exports took off from 2020, but so did all of its non-agricultural exports



Data source: UN COMTRADE.

nickel ore. In terms of the language employed earlier in this chapter, the export ban diverted upstream trade, while the fiscal incentives may have created production capacity and potentially created downstream trade.

Debates over industrial policy in trade policy circles are sometimes theological, so it may help to bring some data to bear upon this discussion. For the years 2012-2022 in Figure 6 we plot the annual evolution in the total value of Indonesia's exports of nickel ore and concentrates and the downstream products, stainless steel and ferro-nickel and other nickel products.[23] Exports of nickel ore did indeed collapse in 2014 and 2020, suggesting compliance with the export ban. Exports of stainless steel were minimal until 2016 (two years after the ban came into effect) and then rose sharply in 2018 and 2021 (in particular). Exports of downstream ferro-nickel and other nickel products began to take off from 2019, a full five years after the export ban came into effect.

While these increases in downstream exports appear to be impressive, they beg the question "compared to what?" We also plotted the total value of non-agricultural exports over the same time frame in Figure 6. The 112% increase in Indonesian stainless steel exports in 2021 raises eyebrows, as does the 55% increase in exports of ferro-nickel and other nickel products. But the 40% increase in all non-agricultural exports in 2021 takes some of the shine off these findings. Yes, exports of the downstream products made with nickel ore rose but so did exports of all non-agricultural goods. Still, since 2014 the growth of downstream exports has been significant, and certainly faster than for non-agricultural goods.

Looking carefully at the timing of the measures in force and associated export levels yields other insights. First, the export growth of the downstream products was much less under the first ban than under the second. Perhaps it took the imposition of the second ban for the private sector to take the ban seriously? Or maybe the private sector was better positioned to take advantage of the second ban, possibly on account of building more capacity facilitated by the tax breaks? Both questions highlight the contingent nature of the "success" of the export ban on nickel ore.

Second, downstream exports kept rising even when the export ban was partially relaxed from 2014-16. This begs the question of how important the original ban

23 This particular chart was chosen because one of those claiming Indonesia's industrial policy on nickel was a success (Kim 2023) pointed to this chart as supporting evidence.

was in altering private sector incentives? Or was the partial relaxation in the ban in nickel ores not relevant to downstream production of stainless steel, ferro-nickel, and other nickel products? If so, then why would anyone expect that the subsequent outright ban in 2020 must bolster downstream exports?

Third, supposing the 2014 export ban had bite, it took two years for exports of stainless steel to rise much and five years before exports of the other downstream nickel products to increase. Whatever incentives were received by the private sector took time to work through to recorded trade flows.

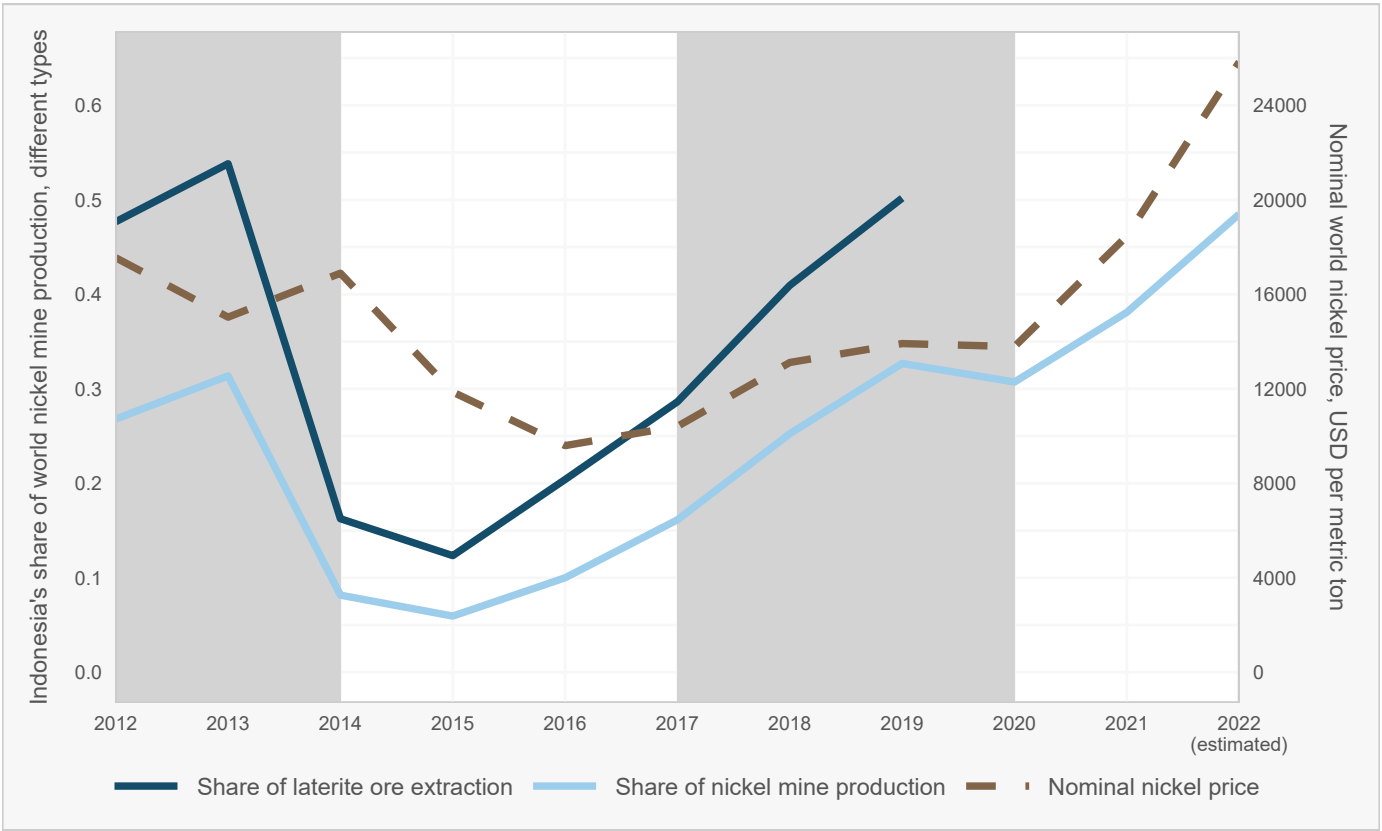
The next step was to examine the implication of these measures on Indonesia's share of the world's mining of nickel ore and concentrates. Fortunately, information on Indonesian and global production of laterite ore are available for many years, allowing the cleanest possible comparison (see Figure 7). As the dark blue line shows, the introduction of the export ban on nickel ore is associated with a collapse in the share of Indonesia's share of global laterite production. That immediate collapse cannot be explained by falling nickel prices, a phenomenon that is only observed from 2015 on.

Figure 7 also reveals that it took five years—until 2019—for Indonesia's share of global laterite production to recover to the levels seen before the 2014 export ban was imposed. This has two implications: first, that the hit to the upstream miners of nickel oil in Indonesia was significant. And, second, that the growth of the downstream industries was sufficiently large after 2019 that Indonesia was able to eventually recover its share of global laterite production.

The last matter we examined is whether there was any evidence that the rest of the world's exports of downstream nickel products suffered after Indonesia's export ban came into effect. To appreciate the scale of the shock created by the 2014 export ban consider the following: had Indonesia's production of laterite ore for the domestic market been the same in 2013 as it was in 2014, then the export ban reduced the total amount of laterite ore available on world markets in 2014 by 42%. A lot of downstream buyers of such ore may have been frustrated by the ban or, at a minimum, had to rely on any

FIGURE 7

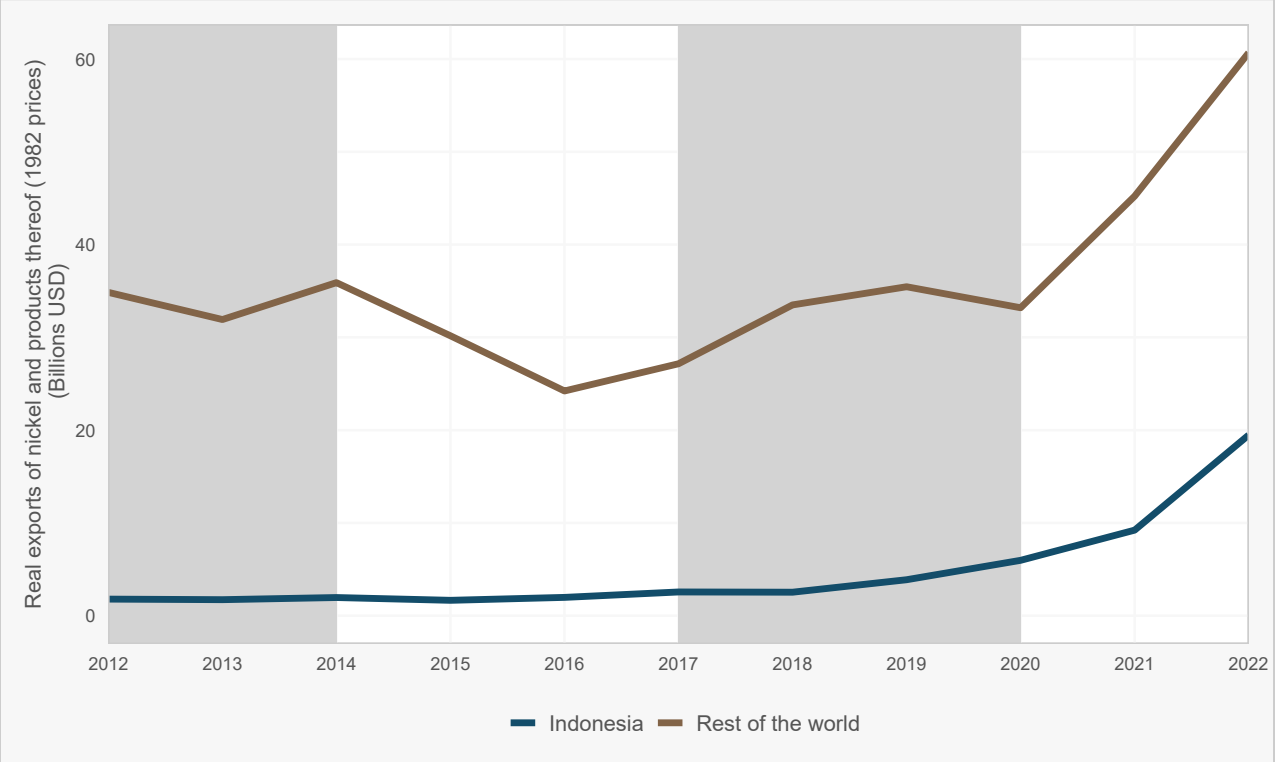
It took five years for Indonesia's share of global laterite ore extraction to recover to levels witnessed before the 2014 export ban came into effect



stockpiles.

FIGURE 8

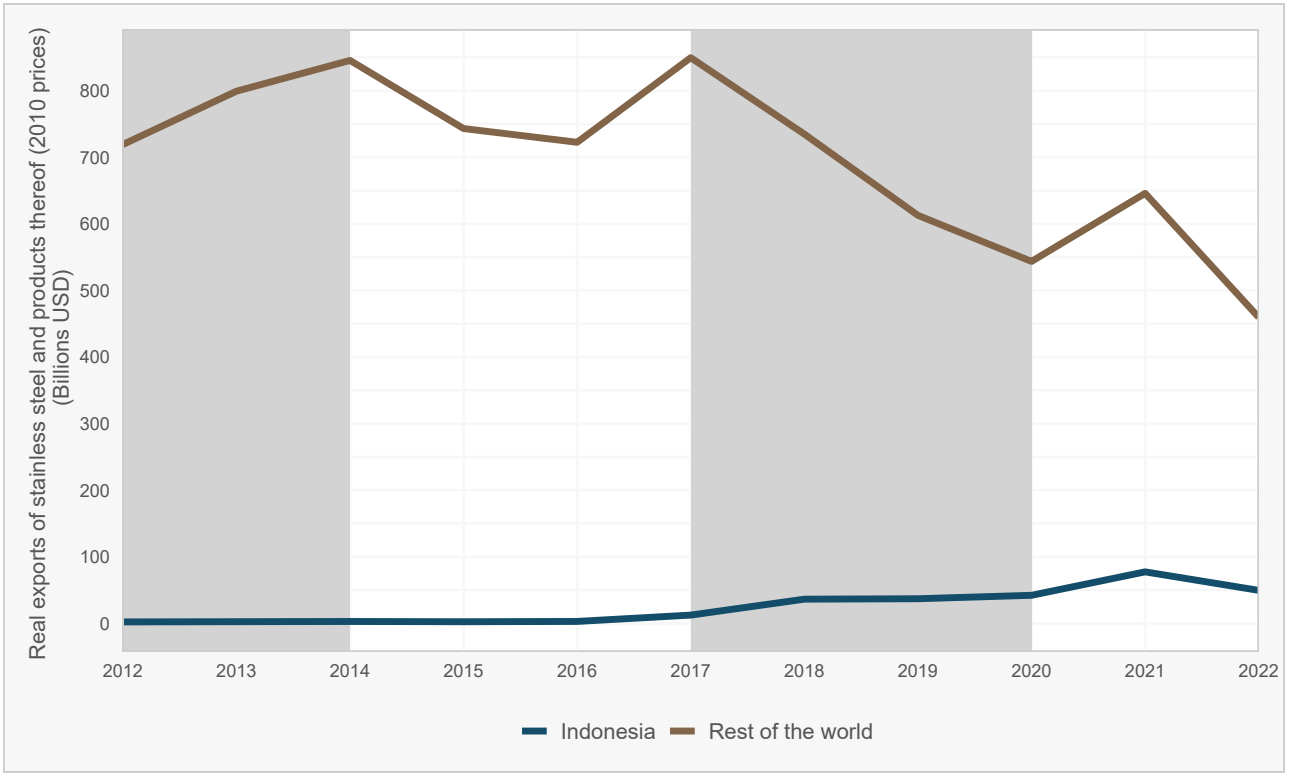
The rest of the world's stainless steel exports fell sharply in the two years after Indonesia's strict export bans came into effect in 2014 and 2020



Data source: UN COMTRADE.
Note: Exports corrected by FRED Producer Price Index for steel wire and stainless steel, which adopts 2010 as base year.

FIGURE 9

Downstream exports of nickel and associated ferro-alloys fell sharply after the first export ban (2014) but not after the second (2020)



Data source: UN COMTRADE.
Note: Exports corrected by FRED Producer Price Index for steel wire and stainless steel, which adopts 2010 as base year.

In Figures 8 and 9 we plot the real value of Indonesia's and the rest of the world's exports of stainless steel and of other nickel products, respectively.[24] Interestingly, the rest of the world's exports of stainless steel fell 24% in the two years after Indonesia banned the export of nickel ore in 2014. Moreover, in the two years following the 2020 Indonesian export ban, the rest of the world's exports of stainless steel fell 15%.

These findings call for a further investigation of the extent to which Indonesia's thinning of the global market for nickel ore also thinned the global market for stainless steel. Ultimately, to what extent has the apparent success Indonesia's industrial policy came at the price of other nations' stainless steel sectors?

With respect to downstream ferro-nickel and other nickel products, as shown in Figure 9, there was a 33% drop in the rest of the world's exports of these products in the two years immediately after the introduction of the 2014 export ban on nickel ore in Indonesia. No similar reduction was observed following the restoration of the complete export ban in 2020. Here, then, there is one red flag.

In sum, is the Indonesian industrial policy to promote its downstream nickel processing industry quite the success it is made out to be? This matters as the Indonesian government is reported to be considering extending the approach taken in nickel to other industrial materials. The evidence presented here, while not definitive, raises some important points.

First, the attribution question must be addressed before victory can be declared: how much of the export growth in downstream nickel products was due to the subsidies awarded or the export ban or in principle to any other factor?

Second, observing rising exports of downstream nickel products is not enough to declare victory either. A benchmark is needed. Once downstream nickel export growth is compared to the growth of non-agricultural goods exports, then much of the shine is taken off the former.

Third, and very much in line with the theme of this report, to what extent did Indonesia's export success in selling more downstream nickel exports abroad result in the global markets for stainless steel becoming thinner? If the latter was significant, it would highlight the zero-sum nature of this particular Indonesian industrial policy.

Our line of argument here should not be misinterpreted. Our concern is with the ends chosen by Indonesia (the export controls) and not the means. If the governments where CRM are located are to be persuaded not to resort to export controls in their drive to modernise their economies and to lift living standards, then alternative, plausibly more successful options—including those that do not involve trade and investment policy at all—need to advanced. The days of merely invoking principles of non-discrimination and extant multilateral trade rules winning the argument are probably over.

Concluding remarks

By going from the general to the specific, the purpose of this chapter has been to show (a) how the concepts of security of supply concerns and thin markets are related, (b) how commercial policies can thin or thicken markets by diverting trade and investment and by creating production that could be exported, and (c) how examining both the timing and the nature of policy intervention casts a different light the efficacy of Indonesia's industrial policy towards developing its downstream nickel processing sector, in particular its resort to an export ban on nickel oil.

That industrial policy may not have been as successful in promoting Indonesian exports as a simplistic examination of subsequent export growth suggests. Furthermore, by denying a large amount of laterite ore to world markets, whatever success Indonesia pulled off for its own downstream industry could well have come at the expense of downstream stainless steel, ferro-nickel producers, and the like in the rest of the world. In turn, this begs the question of whether there are other ways in which Indonesia could develop its downstream nickel processing industry without having to thin the global market for laterite ore.

24 We use the product price indexes for stainless steel and nickel, available from the FRED database, made available by the Federal Reserve Bank of St. Louis, to deflate the nominal values of trade obtained from the UN COMTRADE database.

CHAPTER 4
WEAPONISING RARE EARTHS TRADE: SORTING FACT FROM FICTION

When pressed to provide a telling example of the geopolitical manipulation of critical raw material exports, the case of China allegedly punishing Japan in the third quarter of 2010 is invoked time and again.[25] Twelve years on, this is still the case. For example, on 15 May 2023 the *Wall Street Journal* reported in a reference to the events of 2010 "China curtailed rare-earth exports to Japan after a spat over a boating collision."[26] Moreover, in a 13 January 2023 article on discoveries of Rare Earths in Sweden, the following points were made in a *New York Times* news story: "The worry is that China's dominant position gives Beijing leverage over pricing of the metals as well as the potential to restrict supplies to rivals. In 2010, China halted exports of rare earths to Japan for two months over a fishing dispute."[27]

The purpose of this chapter is to revisit the data on this episode in 2010 to assess not only whether China's exports of Rare Earths to Japan were disrupted but also whether similar patterns of disruption can be identified in China's shipments of Rare Earths to the G7 members and to Australia from 2010 to 2019. The latter nation being included in our analysis because it is often claimed that they are subject to "economic coercion" by China.[28]

There is much at stake here. For if it can be shown that the factual record does not support the claim that China restricted exports of Rare Earths to Japan in 2010, and to other Western countries during the decade 2010 to 2019, then threat of Rare Earths being cut off is hypothetical. On the other hand, if there is a track record of unusual reductions in Chinese Rare Earth exports, then this buttresses the case for thickening the markets for these particular CRM. With the latter in mind, we also examine the changes over the past decade or two in production, reserves, and import sourcing shares for Rare Earths and China's weight in the world market.

One matter is not in dispute as the facts were hashed out in disputes taken to the WTO: China has used export quotas and other export restrictions on Rare Earths.[29] What is at issue here is whether the United Nations' international trade data show that China singled out particular trading partners for sharp reductions in exports of Rare Earths. Even if we find little evidence of selective targeting of trade partners by China, there is still the legitimate concern that the announced, published export restrictions on Rare Earths implemented by China had adverse consequences for foreign buyers of those materials.

A brief summary of the 2010 episode and reaction to it

In a report for the United States Congressional Research Service, Morrison and Tang (2012) provide a standard account of a diplomatic dispute between China and Japan that was said to have implications for the shipments of Rare Earth exports by the former to the latter. Morrison and Tang observed citing, among others, articles in the *New York Times*:

25 We stress that not every analyst makes definitive claims in this regard. For example, Verkasi (2022) repeatedly refers to alleged implementation of an export ban by China on Rare Earth exports to Japan. Campbell (2014) reports the accusation twice but makes no definitive statement of fact. Gholz (2014) takes a cautious line as to Chinese motive. Others, such as Schmid (2019a,b), are less cautious, citing as fact claims made in a 22 September 2010 report in the New York Times. Fan, Omura and Roca (2023) take as face value newspaper reports of the time. Enber (2014), cited later in the main text, does not give the Chinese the benefit of the doubt either. Nor do Dadwal (2011) or Ting and Seaman (2013). Wübbeke (2013) provides an account that is sympathetic to the Chinese position in that he concludes that Chinese export policy towards Rare Earths was not driven by geopolitical considerations.

26 WSJ (2023c).

27 NYT (2023).

28 It may be the case that such coercion has occured but the question here is whether it took the form of curtailing Rare Earths exports.

29 A summary prepared by the WTO Secretariat of these disputes can be found at https://www.wto.org/english/tratop_e/dispu_e/cases_e/1pagesum_e/ds431sum_e.pdf

"Many analysts have raised concerns that China sees its control over rare earths as a potential bargaining chip that can be used to gain political and economic advantages over other countries. For example, on September 8, 2010, a collision occurred between a Chinese fishing boat with two Japanese Coast Guard vessels in disputed waters claimed by both countries. The arrest of the Chinese captain by Japanese authorities resulted in a major diplomatic dispute between the two countries. China cut off high-level exchanges with Japan and reportedly threatened to take 'strong countermeasures.' On September 22, 2010, the New York Times reported that China had begun halting exports of rare earths to Japan. On September 24, Japan agreed to release the Chinese captain. However, on October 19, 2010, the New York Times reported that China's embargo of rare earth exports to Japan appeared to be still in effect and was possibly extended to some rare earth shipments to the United States and the European Union, although China denied such reports. On November 19, 2010, the New York Times reported that China's rare earth exports to Japan had resumed, although with some delays. Chinese trade data show that its rare earth exports to Japan in October and November 2010 were down sharply over previous months in 2010, but rose sharply in December 2010 [and then directs readers to a chart which has been reproduced in this chapter as Figure 10]."

This episode was not lost on U.S. Congressional representatives. For example, Representative Donald A. Manzullo, stated at a hearing on 21 September 2011 of the Subcommittee on Asia and the Pacific, which he chaired:

"In September 2010, the People's Republic of China shocked the world by halting critical rare earth mineral exports in retaliation to a territorial dispute with Japan in the East China Sea. The Chinese action sent a clear and unmistakable message to Japan and the rest of the world: China is willing to use economic tools to achieve diplomatic goals."

Congressman Manzullo drew the following lessons from this episode, observations that are still repeated to this day:

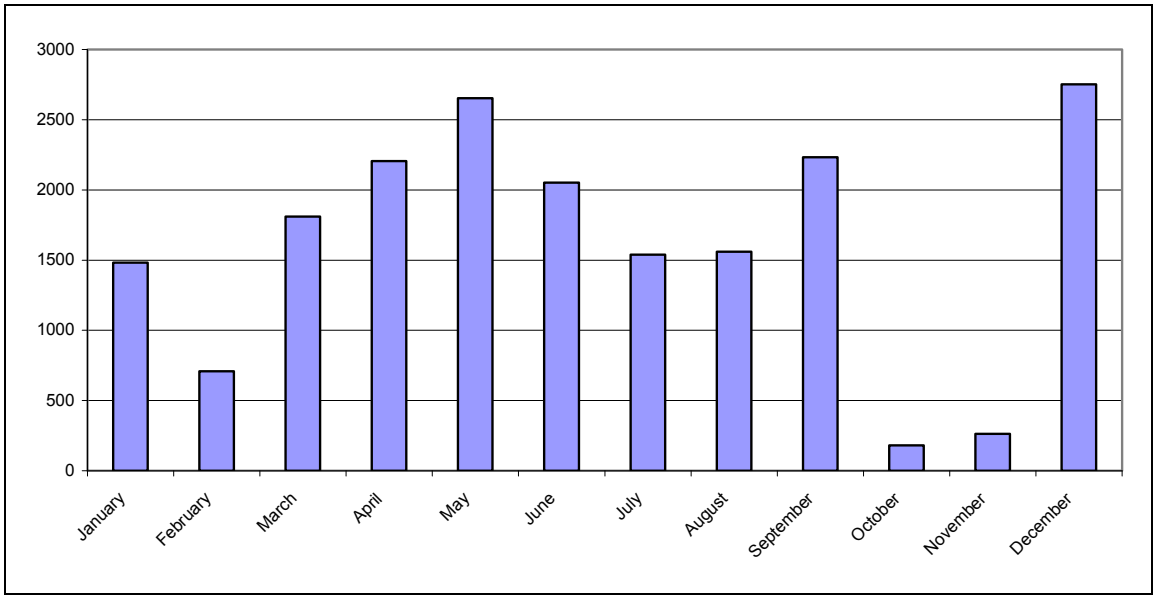
"China's actions against Japan fundamentally transformed the rare earths market for the worse. As a result, manufacturers can no longer expect a steady supply of these elements, and the pricing uncertainty created by this action threatens tens of thousands of American jobs.

FIGURE 10

A chart from a U.S. Congressional Research Service report, published in 2012, purporting to show that Chinese exports of Rare Earths fell sharply during October and November 2010

Chinese Monthly Rare Earth Exports to Japan in 2010

(metric tons)



Source: World Trade Atlas.

Note: Rare earth data in this figure reflect Chinese exports of harmonized tariff code numbers 2846, 280530, and 360690.

Source: Morrison and Tang (2012).

"For America's defense industry, a total reliance on China for rare earths represents a serious weakness for national security. China currently controls 97 percent of the world's rare earth production, including all stages of the supply chain for permanent magnets."

Academic assessments of the impact of China's alleged action and its significance differ. The assessment in Schmid (2019) aligns in part with the Congressman's:

"The supply disruption led to insecurity in the market. Prices exploded more than tenfold. Many companies worldwide who were using rare earths were unsure how long they could sustain production. Japan's overall industry structure, which included leading firms in the fields of electric vehicles, flat panels and consumer electronics as well as future technologies like robots, made the country highly vulnerable to supply disruptions."

Ebner (2014) made the following observations about the geopolitical implications of this dispute:

"China's quasi-monopolistic presence in the rare earth market has equipped the country not only with enormous market power but has also been translated in considerable diplomatic and political power. This was particularly well reflected in the case of rare earth export restrictions targeting Japan after the Senkaku/ Diaoyu conflict escalated with the boat collision incident in September 2010."

As to the adverse effects of any temporary cessation of Rare Earth shipments on Japan, Gholz and Hughes (2019) discount them, arguing:

"Some supply and demand adjustments had rapid effects, while others took longer. In the short term, recycling and substitution dramatically reduced demand, and smuggling, trade deflection, inventory management, and other adjustments ensured residual supply. In the medium term, innovations in magnet design and other rare-earth applications reduced demand and changed its elasticity. Even long term adjustments like opening new mines influenced the 2010 crisis dynamics. Business and government leaders anticipated the vulnerability that concentrated rare earths supply entailed and started adaptation efforts before China imposed its 2010 embargo."

Meanwhile, Gholz (2014) was unpersuaded that China's alleged actions delivered much by way of tangible outcomes:

"And politically, though China seemed to earn a victory in the 2010 confrontation with Japan, it actually achieved very little. The release of the fishing boat captain was a tactical victory, but did not yield any meaningful strategic change; Japan still administers the disputed islands and neither Japan nor any other country changed its legal views on the conflicting territorial claims. Ultimately, concentrated rare earths supply in China had limited economic and political effects."

A pre-requisite for any adverse effects is that exports from China were sharply curtailed during October and November 2010. The purpose of the next section of this chapter is to assess whether unusual import patterns could be detected in the Rare Earth trade flows recorded in a standard database of international trade, the COMTRADE database made available by the United Nations.

Did China substantially reduce Rare Earth exports to Japan in the fourth quarter of 2010?

A critical detail is that, while China may have announced it would take "strong countermeasures" against Japan, it never stated publicly that it had cut exports of Rare Earths to Japan. So, analysts are left to infer whether exports of Rare Earths were reduced, were below typical levels, or were unusually low.

The chart in the U.S. Congressional Research Service study, reprinted in this chapter as Figure 10, purports to show a large reduction in Chinese exports of Rare Earths to Japan in October and November 2010. The data source given for that chart is the "World Trade Atlas." Our first goal was to reproduce this chart. We could find no international trade data source with that name. The same report, however, makes a few references elsewhere to the Global Trade Atlas database, which is a commercial database provided by S&P Global. Perhaps the authors meant this database instead?

Faced with this uncertainty, we turned to United Nations' COMTRADE database, which is widely-recognised as the standard official source of data for international trade. Using the same four HS codes for Rare Earths mentioned in Figure 10 (that is, in the original chart in the U.S. Congressional Research Service study) we downloaded monthly data on Japanese imports of Rare Earths from China. As is best practice, we used data reported by Japan on its imports of Rare Earths from China as opposed to Chinese data on its exports to Japan.[30]

Like the data reported in the Congressional Research Service, the UN COMTRADE data refers to the total value of imports by Japan. As a result, the reported total value of imports can change if the price of a Rare Earth changes significantly or if the quantity shipped changes a lot. One concern, then, is that a sharp increase or decrease in the

30 It is unclear which of these two options the authors of the U.S. Congressional Research Service used.

total value of imports could reflect price fluctuations as opposed to changes in the volume of Rare Earths shipped by China to Japan. Of course, a sharp reduction in imports in any month could be a combination of both price and quantity falls. However, if the fall in the quantity shipped induces a sharp increase in prices on world markets, then the recorded total value of imports could increase or decrease. The upshot of these arguments is that it is hard to discern from the total value of monthly imports if China has restricted the quantity shipped.

In Figure 11 we plot the recorded total value of monthly imports of Rare Earths by Japan from China. Inspection of that figure leads to three observations. First, the total value of imports rose sharply in 2011 and this is widely regarded as being driven by sharp increases in the price of Rare Earths. This reinforces the point that it is difficult to discern from the total value of monthly imports whether the quantity shipped has gone down, which is how a Chinese embargo would manifest itself. Second, the total monthly values of imports for much of the past decade is lower than those recorded in October and November 2010. Yet complaints of Chinese embargos were not heard. Third, the sharp falls in total monthly imports in October and November 2010 were repeated on at least three further occasions until 2013 and we can find no further accusations about Chinese embargos or geopolitically-motivated export reductions of Rare Earths to Japan.

We are not alone in challenging the evidence on this matter. King and Armstrong (2013), both academic analysts, make a number of pertinent factual points in a column on this matter. In addition, having analysed data on imports of specific Rare Earth elements into four Japanese ports, Johnston (2013) concluded "At the very least, the data suggest that the conclusion about an embargo requires considerably more evidence than much of the media and pundit coverage has heretofore provided."

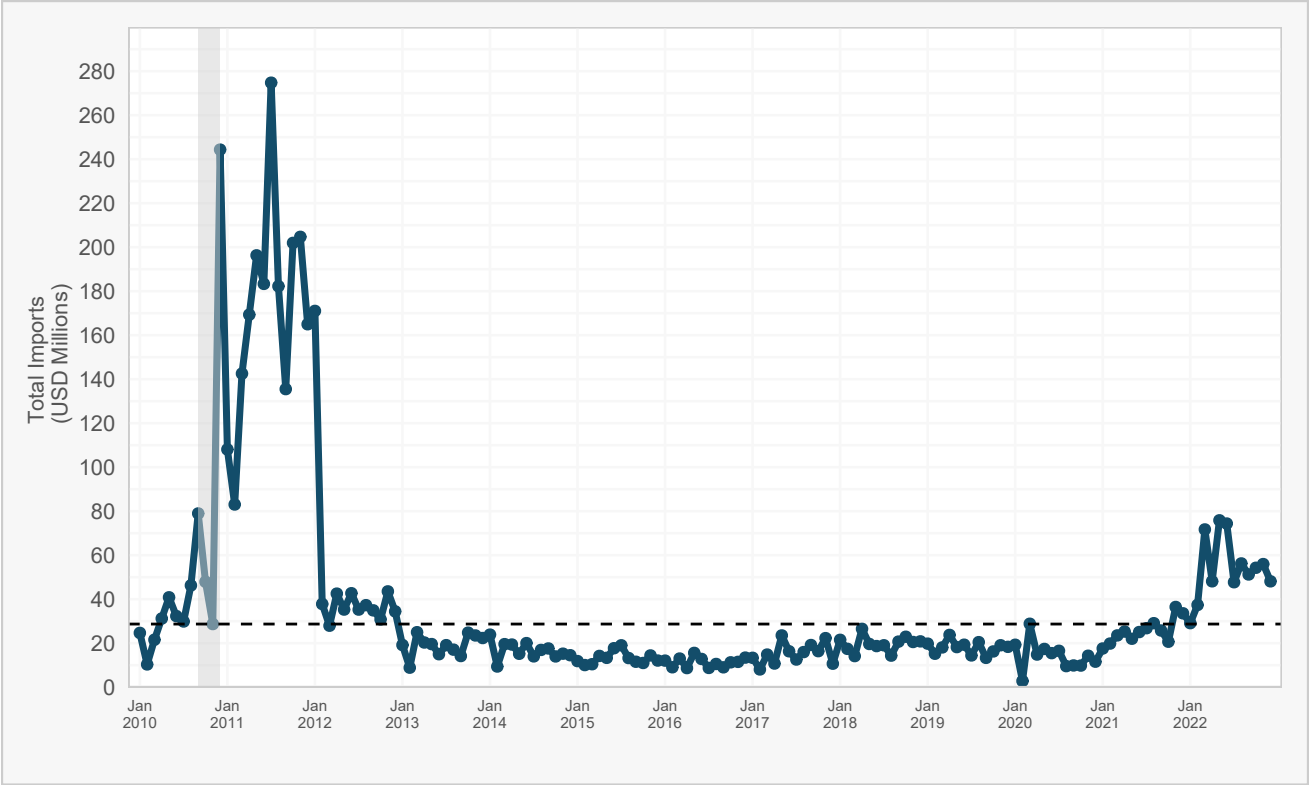
We did not stop here, as the next section reveals.

Can sharp reductions in Rare Earth exports from China to Western importers be detected in UN international trade data?

The U.S. Congressional Research Service study focused on four HS codes they associated with Rare Earths. Those Rare Earths each have prices that, as commodities, are likely to be charged to all importers. This opens the door for another use of the United Nations' monthly import data described above.

FIGURE 11

Total nominal value of Japan's recorded Rare Earth imports from China from 2010 to 2022, millions USD



Data source: UN COMTRADE. Same HS codes used to compute these statistics as in Morrison & Tang (2012).

Recall our goal is to determine if China singled Japan out for a reduction in Rare Earths exports. When we look across a group of Western importers of Rare Earths, if Japan was singled out then, for the months of the embargo, we should observe that the Japanese share of total Western imports in the months in question are below Japan's "average" share over time.

One advantage of looking at the Japanese share of Western imports of Rare Earths in a given month is that all Western importers face the same prices for Rare Earths during that month. This means that if the price of each Rare Earth doubled and the quantities contracted earlier were shipped, then while the total value of recorded Japan monthly imports would double, the shares of Japanese imports in total Western imports would be, by and large, unchanged.[31] Or at a minimum, when faced with big price changes, the share of Japanese imports in total Western imports would change less than the total value of monthly Japanese imports. In short, the signal-to-noise ratio is higher in the shares data than in the data on the total value of monthly imports.

For this purpose of this chapter, we took as Western nations the members of the Group of Seven nations, the European Union (treated as single buyer), and Australia, a country said to suffer from Chinese "economic coercion." For each month from January 2010 to December 2019 for which the total value of monthly import data was available, we calculated for each importer i in month t, the share S_{it} of total Western imports of Rare Earths in that month. Then for each importer i we calculated the median value of S_{it} over our sample period and denoted this by M_i. Next, we calculated the ratio $R_{it} = S_{it}/M_i$. Note that more R_{it} falls below 1 then there is greater likelihood of an unusually low level of Chinese exports of Rare Earths to country i. An unannounced Chinese embargo against a single country i should generate unusually low levels of R_{it}.

On this logic, examining the distribution of the values of R_{it} would reveal the number of months for which the shipments of Rare Earths from China to a destination country were unusually low. Moreover, this approach can be adapted to examine whether imports have been unusually low for consecutive months—thereby preventing rogue data for a single month resulting in erroneous inferences. If few or no months have extremely low levels of R_{it} then it would be difficult to argue that the necessary conditions for a Chinese embargo have been met. On the other hand, if there are many instances when R_{it} then singling out trading partners for "punishment" by China cannot be ruled out.

The median Import shares (M_i) vary significantly across the Western nations studied here. On average, Japan accounts for half of the Rare Earths exported by China to Western nations. The European Union and the United States each account for about a fifth. In contrast, Australia, Canada, and the United Kingdom each account on average for less than 1% of Western imports.

Figure 12 reports the findings from applying this methodology to identifying the number of single months where unusually low levels of imports are recorded. Notice the horizontal axis of this chart covers different ranges of R_{it} that fall below 1. Since, by construction, R_{it}=1 is the median of the distribution of monthly outcomes, half of the distribution is shown in Figure 12. What matters is how much of the distribution is found towards the leftward region of Figure 12, the region that indicates unusually low levels of Rare Earth imports from China.

The most striking finding in Figure 12 is that it is Australia—not Japan—that experienced many one monthly falls in Rare Earths shipments from China during 2010 to 2019. Of the 120 possible months, in 24 months the import shares received by Australia fell 75% below their average level. Interestingly, for all of the G7 members and the European Union large monthly drops of Rare Earths shipments from China are rare.

Figure 13 is constructed in the same way as Figure 12 but for consecutive[32] three-month intervals between 2010 and 2019. Figure 13 therefore eliminates rogue one- or two-month intervals from influencing the findings. "Economic coercion" lasting three or more months, that takes the form of sharp reductions in Rare Earth exports, should be revealed in Figure 13.

Comparing Figures 12 and 13 confirms that sustained three month drops in Rare Earth shipments occur less often than one month drops. Australia witnessed nine three-month periods where its share of Rare Earth shipments from China dropped 75% below its average level—and it should be noted that some of those nine three-month periods might overlap with one another. As there are over 100 such consecutive three-month intervals between January 2010 and December 2019, this suggests that, if manipulation of exports to Australia occurred, it happened less than 10% of the time.[33] Again, if there is a nation that has had to cope with erratic shipments

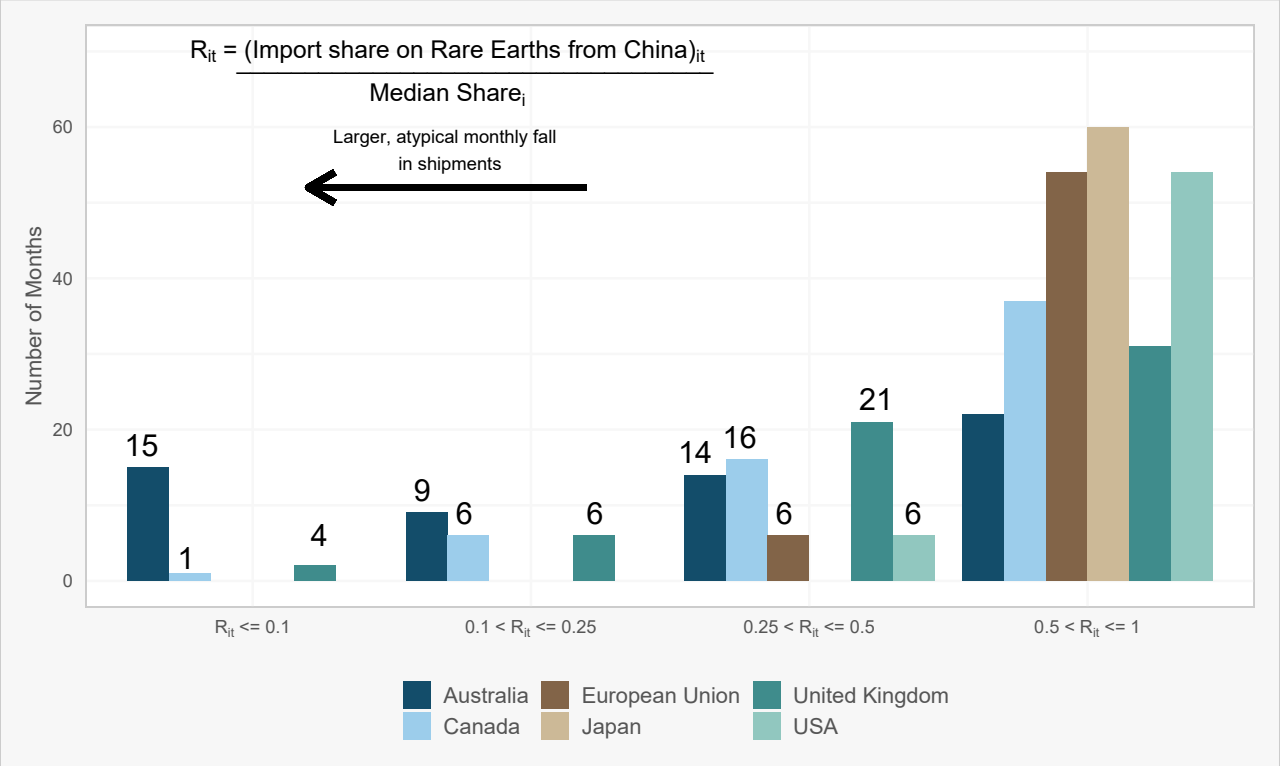
31 The "by and large" remark arises because of two caveats: the import mix across the four Rare Earths may vary across Western imports and it is possible that sharp price changes cause occasional surges or cutbacks in purchases of Rare Earths which are, after all, durable goods. Still, as argued in the main text, the tracking abrupt shifts in import shares has advantages over potentially very noisy data for the total value of a single nation's imports.

32 And overlapping intervals. Therefore, January-March 2010 is one candidate three month interval and so is February-April 2010.

33 Furthermore, as discussed later in this chapter, Table 3 shows that Australia has historically sourced very low percentages of its Rare Earths from China. As a producer of Rare Earths, the latter fact may not be that surprising.

FIGURE 12

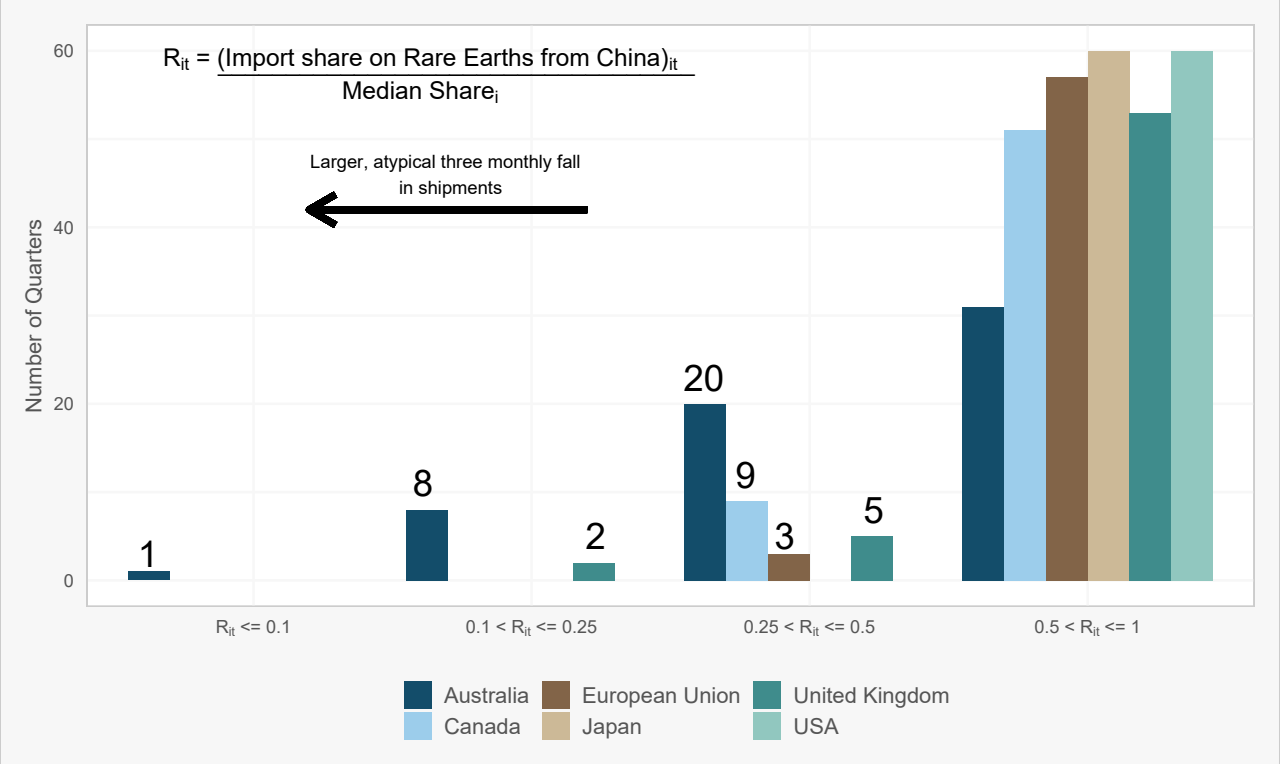
Only Australia experienced frequent drops of monthly Chinese shipments of Rare Earths of 75% or more



Notes: 1. Same HS codes used to compute these statistics as in Morrison & Tang (2012). 2. Total number of months observed: 120.
Source: UN COMTRADE.

FIGURE 13

Prolonged drops (three month long reductions) in Chinese shipments of Rare Earths are few and far between for G7 members and the EU. Less so for Australia



Notes: Same HS codes used to compute these statistics as in Morrison & Tang (2012).
Source: UN COMTRADE.

from China, it is Australia and not Japan. Indeed, of the members of the G7 and the European Union, only the United Kingdom witnessed Rare Earths shipments from China that were 75% or more below normal levels which lasted three months. At that only happened twice.

This evidence casts doubt on the notion that China has routinely weaponised Rare Earth exports against Western nations from 2010 to 2019, arguably an era where geopolitical rivalry intensified. We do not conclude that there were no episodes of disruption to exports but, as Figure 13 shows, with the exception of Australia, very few lasted more than two months.

Notwithstanding these findings and the doubts expressed by others about the evidence, China's alleged curtailment of Rare Earth exports to Japan has become part of folklore. Some importing governments claimed to take action to limit their exposure to Chinese Rare Earths. We turn now to subsequent developments in the production and reserves of the Rare Earths sector around the world. The central question is whether Western "dependency" on Chinese Rare Earths has fallen in the years since the 2010 episode.

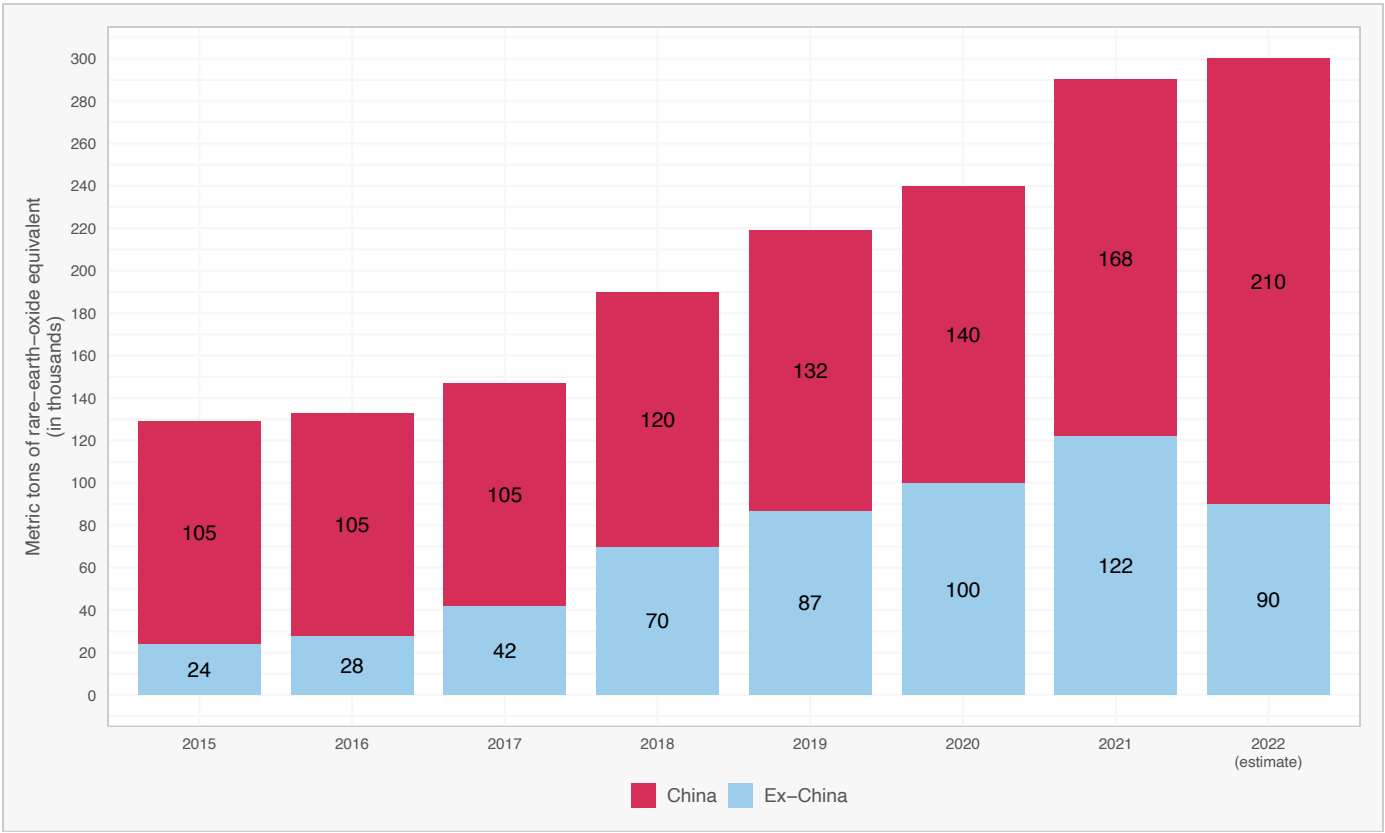
Non-Chinese Rare Earth production has soared since 2015

The United States Geological Survey (USGS) publishes annual statistics on the levels of Rare Earths production and estimated reserves by country (both measured in metric tons of Rare Earth oxide equivalent.) That data source was employed here to examine whether non-Chinese sources of Rare Earths have become available in greater quantities since the 2010 episode. If so, this allows Western governments minded to encourage their companies to source fewer Rare Earths from China to do so. Care is needed here as Rare Earths must both be extracted and then processed. If non-Chinese Rare Earths production is primarily in extracted form, then the number of available sources of processed Rare Earths may not have changed or changed little.

The last year for which actual annual data is available on Rare Earths production from the USGC is 2021. As shown in Figure 14, the total value of Rare Earths production outside of China has increased in volume terms five times over the five years from 2016 to 2021. In 2021 the share of global Rare Earths production outside of China had reached 42%.

FIGURE 14

Rare Earths production outside of China grew five-fold from 2015 to 2021



Source: U.S. Geological Survey Mineral Commodity Summaries, various years.

Figure 15 reports how much production grew outside of China and Russia. For sure, Rare Earths production has increased a lot in China in absolute terms (which, by the way, is not the case in Russia.) However, the percentage increases in other countries are even larger. Certainly, in some cases, those production increases are from a small base. But that is exactly the point about thickening markets. As new sources of CRM are established and scale up production then large percentage increases in production can be expected and the range of suppliers available to buyers expands.

Data on estimated reserves of Rare Earths reinforces these findings. While in absolute terms the total global amount of reserves of Rare Earths has, by and large, been constant this century, China's and Russia's share has now fallen below 50%. Indeed, if the USGC data is accurate, then these two countries' combined share peaked before the Global Financial Crisis. That is not a statistic one hears from the proponents of decoupling and deglobalisation.

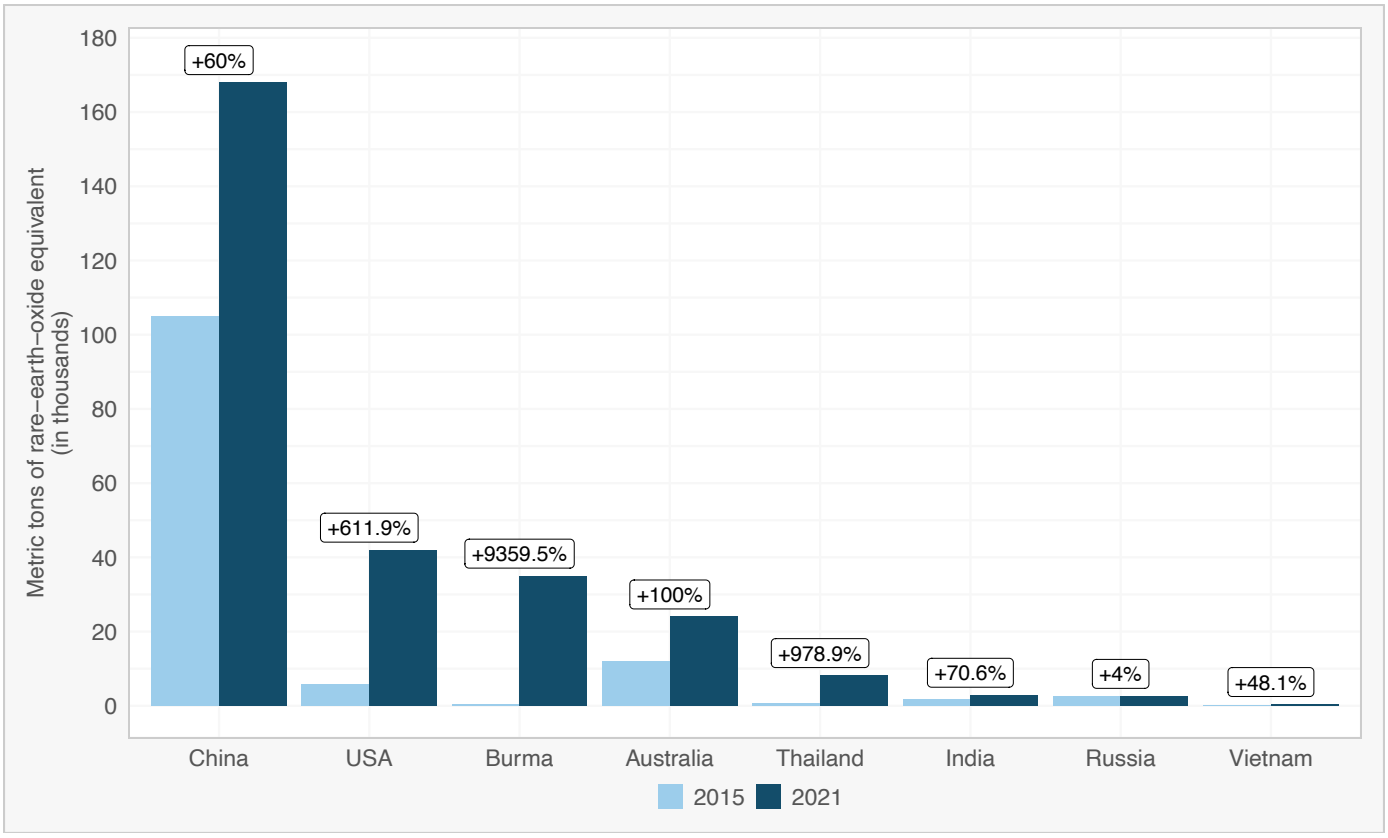
Western sourcing of Rare Earths from China peaked before the pandemic

Ultimately, though, the question is whether the thickening of markets for Rare Earths has led to reductions in Western sourcing from the largest source, namely, China. For the same four HS codes identified in the U.S. Congressional Research Service report, we calculated the share of Rare Earths each Western importer sourced from China in the decade before the 2010 episode and intervals since (2010-2014, 2015-2019, and 2020-21). The results can be found in Table 3.

The European Union, Japan, and the UK now source, as a percentage of total imports, much less from China now (2020-21) than before the 2010 episode. Japan and the United States still source half of their Rare Earths from China; the remaining Western nations source most of their Rare Earths from other locations. With the exception of the United States, whose sourcing share has not changed much despite its increased levels of domestic production, for every other Western importer listed in Table 2 the share sourced in China peaked before the pandemic, often in the first half of the last decade. The progressive thickening of Rare Earth markets has within one decade resulted in significant reductions in "dependency" on China—not that readers would have heard that fact from many of the policymakers and analysts that opine on critical raw materials.

FIGURE 15

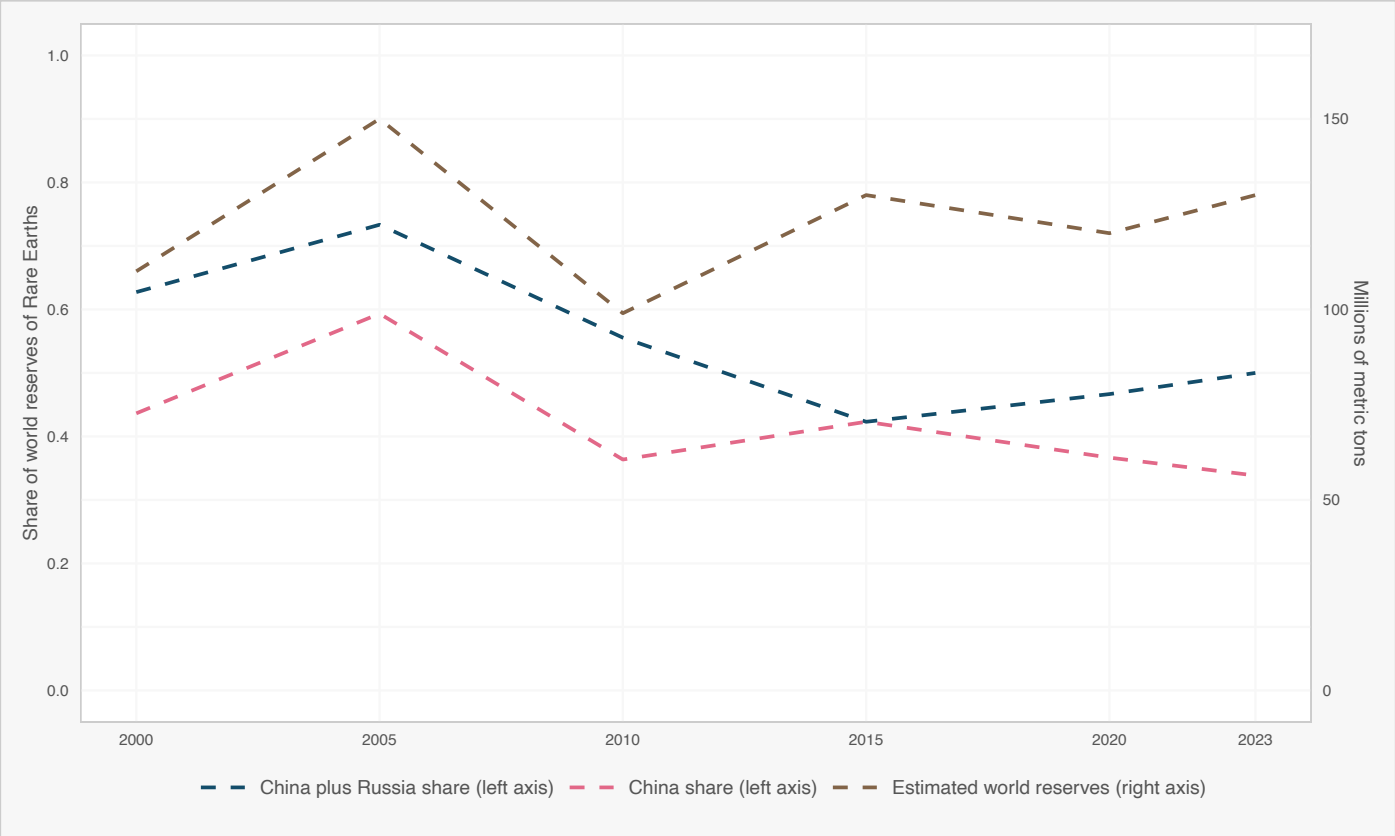
China's Rare Earth production has increased—but it has risen further elsewhere



Source: U.S. Geological Survey Mineral Commodity Summaries, various years.

FIGURE 16

China and Russia's share of world reserves of Rare Earths peaked before the Global Financial Crisis



Source: U.S. Geological Survey Mineral Commodity Summaries, various years.

TABLE 3

Except for the United States, the share of Rare Earths sourced from China peaked well before the COVID-19 pandemic

Importer	Share of Rare Earths imports coming from China			
	2000-2010	2010-2014	2015-2019	2020-2021
Australia	10.2%	19.6%	8.6%	10.5%
Canada	13.2%	52.6%	36.2%	36.5%
European Union	60.0%	63.9%	48.3%	25.9%
Japan	78.3%	62.8%	39.4%	45.7%
United Kingdom	26.7%	16.6%	12.4%	10.2%
USA	48.9%	51.5%	49.9%	49.1%

Note: HS Codes used: 280530 (Scandium and Yttrium) 284610 (Cerium) 284690 (Lanthanum and Yttrium) 360690 (Ferrocerium and Metaldehyde).
Source: UN COMTRADE.

Concluding remarks

If there is a lesson in this chapter for policymakers, analysts, and other observers it is that, from time to time, it pays to check if emergent trade policy narratives can be supported by publicly available data. In this chapter we have cast doubt on several narratives relating to Rare Earths, including:

- claims that China took exceptional measures to punish Japan by restricting Rare Earths exports as part of a diplomatic dispute in 2010;
- claims that, by dint of its vast production at home, China still has a stranglehold on Rare Earths supply, in particular to members of the Group of Seven nations and the European Union; and
- claims that Western nations are locked into Chinese supplies of Rare Earths.

The reality is that—perhaps partly as a consequence of the folklore arising from the 2010 episode—the market for Rare Earths has thickened over the past decade. Rare Earths production and reserves outside of China (and Russia for that matter) have grown so much that Western economies can now avail themselves of a wider range of suppliers of Rare Earths. The market for Rare Earths is not a poster child for those determined to fragment the world trading system on account of their fears about intensifying geopolitical rivalry.

These developments do not mean that China has become a minnow in the market for Rare Earths. But they are a testament to what difference a decade can make. There may be stages in the Rare Earths value chain where China's presence is still felt heavily—such as in the processing stage. But that simply highlights China's own "dependence" on foreign sources of Rare Earth concentrates and begs questions as to how long any Chinese leverage over the processing of Rare Earths can last. The leverage of each supplier tends to decline as markets thicken.

PART TWO
POLICY RESPONSES: PAST, PRESENT, AND FUTURE

CHAPTER 5
UNILATERAL GOVERNMENT MEASURES TOWARDS CRITICAL RAW MATERIALS: EVIDENCE FROM THE GLOBAL TRADE ALERT DATABASE

In Part II of this report, we summarise evidence on and assess the various commercial policy initiatives governments have taken at home and abroad to produce more CRM or to secure better access to CRM for their economies' firms and industries. This chapter focuses on the unilateral commercial policy actions taken by governments and the next chapter emphasises accords between or joint actions by states. In both cases the impact of these public policy interventions can be felt in markets outside of the implementing jurisdiction, a manifestation of the very cross-border spillovers that are at the core of international economic policy questions. Of particular concern are policy initiatives that improve access to CRM for the implementing nation or nations at the expense of other economies.

Unilateral export controls—that is, export bans, export quotas, export licensing requirements, and other policies conditioning the terms upon which a nation's firms can export a particular goods—feature prominently in deliberations on critical raw materials.[34] As we saw in chapter 4, the potential fusion of geopolitical considerations and export controls for CRM can become a major source of tension between governments. It would be wrong to assume there are no restrictions on the use of export controls. The constitutions of some nations, such as the United States, forbid the resort to export duties. As far as international rules are concerned, some nations, notably China, took on commitments to eschew export controls as part of their protocol of accession to the WTO. Resort to export curbs is subject to disciplines in Article XI of the General Agreement on Tariffs and Trade (GATT), although it should be noted that governments can impose such curbs under certain circumstances.

But, for all the attention given to export controls on CRM, what other unilateral policy interventions have governments undertaken that might affect conditions of competition in markets for CRM? Are those interventions more likely to *divert* CRM trade or *expand* the pool of production and therefore potentially *create* CRM trade? Digging deeper, do we observe marked differences in the types of unilateral policies employed across types of CRM and between CRM and other minerals and materials?[35] We will also examine whether the resort to public policy intervention varies across nations. Is such intervention largely the preserve of the world's biggest economies? The purpose of this chapter is to answer these questions, starting from a worldwide perspective and then examining national policy intervention.

Which data source for commercial policy intervention was used?

The principal data source for commercial policy intervention that is employed here is the Global Trade Alert (GTA). This independent commercial monitoring service was set up at the start of the Global Financial Crisis. Since its monitoring began, over 55,000 commercial policy interventions affecting cross-border movement of goods, investment, intellectual property, staff, and data have been documented, almost entirely with official sources.[36]

34 The OECD has kept an inventory of export restrictions affecting raw materials for over a decade.

35 Again, this speaks to the question whether it makes sense to group together these critical raw materials.

36 For accounts of the methodology employed by the GTA team see Evenett (2019) and Evenett and Fritz (2020).

The GTA focuses on unilateral policy interventions that can have cross-border effects on commerce and on the returns to such commerce. Having written that, there are areas of public policy that were deliberately excluded from the GTA, either because another database exists that were thought to accurately inventory them[37] or the trade-related policy intervention has a non-trade rationale that is codified in certain UN treaties.

Not every entry in the GTA database affects CRM. In fact, with a liberal definition of CRM (described below) a total of 4,732 entries in the GTA database involve the implementation of policy interventions that are relevant to the matters discussed in this chapter.

An entry in the GTA database included information on the form of policy intervention (e.g. financial grant to local producer), on the customs territory where the measure was implemented, on the date of implementation and, where relevant, the date a measure was removed or revoked, and on whether the measure's implementation improves the relative treatment of one or more domestic firm at the expense of foreign rivals or vice versa.

Where they can be convincingly identified, the six-digit product code(s) in the UN Harmonised System (HS) and the three-digit sector code(s) from version 2.1 of the UN's Central Product Classification (CPC) relating to the conditions of competition that are directly affected by the implementation of a measure are recorded. In some cases, CPC codes can be credibly identified but HS codes cannot, a distinction we make use of in the paragraphs that follow.

As a first step, we need to identify those unilateral commercial policy interventions that affect conditions of competition in markets involving CRM. We return to the 17 lists of CRM that governments have issued over the past decade or so (see chapter 2). We created a list of HS codes that refer to products on one or more of those CRM lists. We then went into the GTA database and identified the set policy interventions that affect competition in one or more of the HS codes on that list. This set is referred to as the "conservative definition" of relevant unilateral commercial policy intervention. A total of 4,067 implemented unilateral policy measures were identified in this manner.

We then searched the GTA database for other policy interventions in CPC sectors associated with CRM where at least one of a set of keywords was present in the description of the policy intervention on the GTA website.[38] A further 665 GTA database entries were found in this matter. This second set of policy interventions was combined with the first set to form what we refer to as the "liberal definition" of CRM-related unilateral commercial policy intervention. The liberal definition, therefore, includes a set of 4,732 policy measures, the total mentioned earlier.[39]

Checks were also performed on both conservative and liberal sets of relevant unilateral commercial policy intervention to ensure erroneous policy interventions did not slip through the net. It is important to bear in mind that the inclusion of a policy intervention in these sets does not imply that the action taken by the state was motivated, in whole or in part, by the desire to secure CRM. Although the GTA team has in recent years begun tagging policy interventions according to the implementing government's stated motive, those motives play no other part in the coding, classification, or analysis of government measures.[40] Government policy is not always coherent and so it will be interesting to see if there has been resort to unilateral policy interventions that affect the conditions of competition in markets for CRM that could cut against industrial policy or security of supply objectives. For example, raising import taxes on a CRM is likely to discourage local sourcing of foreign CRM from any source.

The unilateral policy mix towards CRM: A global perspective.

First, taking a worldwide perspective, we examined which types of unilateral commercial policy interventions were implemented in CRM markets since the Global Financial Crisis. To check whether the unilateral policy mix changed once geopolitical rivalry became salient, we differentiated between measures implemented before and after the Trump Administration took office.

We also sorted unilateral policy interventions into categories that users familiar with the UN's MAST system for classifying non-tariff measures will recognise. This includes separate categories for import quotas and licensing regimes, for measures against dumped and subsidised imports and import surges (contingent protection), for measures relating to foreign direct investment (FDI), and for measures which encourage local

37 This is the reason why regulations that fall into the categories of Technical Barriers to Trade and Sanitary and Phytosanitary Standards (TBT and SPS, respectively, in WTO terminology) are excluded from the GTA database. In principle, an analyst could find it useful to combine the GTA, TBT, and SPS databases to gain a wider perspective on the regulations affecting CRM to the one presented in this chapter.

38 The keywords used were "critical minerals", "critical materials", "critical raw materials", "rare earth", "rare earths", "essential minerals", "essential raw materials", "essential materials", "strategic minerals", "strategic raw materials", and "strategic materials".

39 The HS codes associated with the conservative and liberal definitions are available upon request.

40 This is because stated motives may or may not be related to the true rationale for state action.

sourcing and hiring (localisation measures and trade-related investment measures). We added categories for import tariff changes, for subsidies to local firms (inward subsidies) and for state support for export transactions or for foreign investments abroad (outward subsidies). As Figure 17 shows, in fact, the latter three categories of unilateral policy were the most used in CRM markets since the Global Financial Crisis. This finding holds whether a conservative or liberal definition is used to define the relevant set of policy intervention.

A shift in the unilateral policy mix towards subsidy awards to local firms can be discerned once geopolitical rivalry intensified after President Trump took office. The number of such subsidies awarded each month rose from 6.7 on average to 10.6.[41]

Bearing in mind that the periods November 2008 to January 2017 and January 2017 to June 2023 differ in length, though the total number of import tariff policy changes was lower in the latter period, the average monthly number of tariff measures affecting CRM per year has changed little.[42]

The same conclusion cannot be drawn for outward subsidy measures—resort to these measures has fallen on average in the years since 2017.[43] A preliminary conclusion is that policy has shifted towards supporting local producers, possibly with an eye to securing CRM from domestic sources or building domestic capacity to process raw CRM, and away from supporting acquisitions of foreign assets and export contracts by local firms.

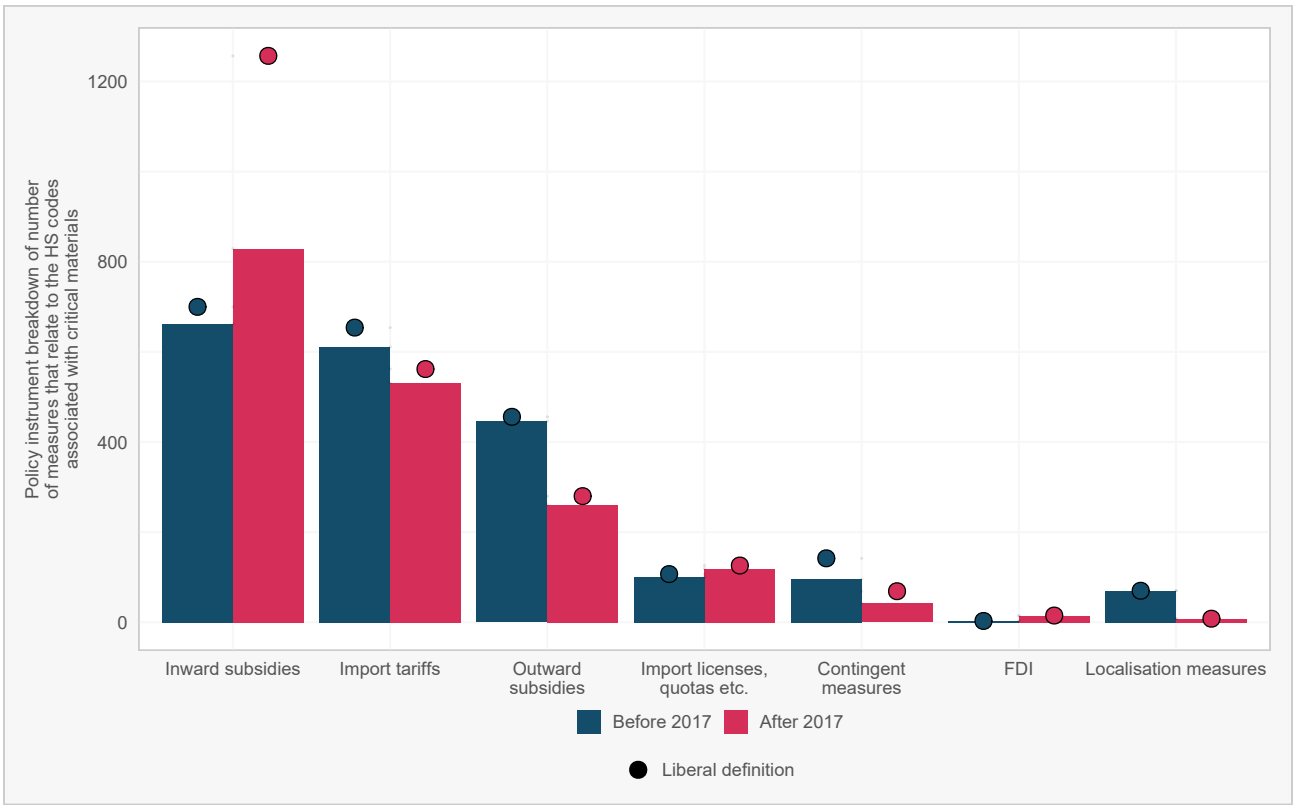
Differential unilateral policy mix across CRM

In this section we explore the extent to which the mix of unilateral commercial policy intervention towards CRM differs from that affecting other materials and whether the mix varies across different types of CRM. This will further contextualise the policy dynamics witnessed in CRM in recent years. The relevant evidence can be found in Tables 4 and 5.

First, we compare the findings in the last row of both tables—for this reveals the extent to which, if at all, unilateral commercial policy affecting CRM markets

FIGURE 17

Three types of commercial policy dominate measures affecting CRM markets



41 Statistics based on the conservative definition.

42 On average, in both periods, six to seven tariff policy changes were witnessed (employing the statistics from the conservative definition).

43 From a monthly average of 1.8 in the pre-Trump period to 1.0 in the years since the Trump Administration took office. Again this calculation was based on the conservative definition.

TABLE 4

Variation in unilateral commercial policy choice between CRM and non-CRM product groups and across CRM

HS Chapter	Total number of unilateral trade policy interventions in the GTA database ever implemented				Percentage of unilateral trade policy interventions implemented since 2017				Percentage of unilateral trade policy interventions that are time limited ever implemented				Percentage of harmful policy interventions ever implemented			
	Conservative	Liberal	Conservative	Liberal	Conservative	Liberal	Conservative	Liberal	Conservative	Liberal	Conservative	Liberal	Conservative	Liberal	Conservative	Liberal
	CRM	CRM	No CRM	No CRM	CRM	CRM	No CRM	No CRM	CRM	CRM	No CRM	No CRM	CRM	CRM	No CRM	No CRM
22	646	654	1310	673	50.8%	51.2%	53.9%	56.0%	52.8%	52.8%	42.4%	31.6%	81.4%	81.3%	76.5%	71.9%
25	620	635	812	372	47.9%	47.6%	41.9%	30.1%	23.1%	23.1%	21.6%	18.5%	70.5%	70.7%	74.5%	82.8%
26	624	626	208	8	51.1%	51.3%	51.9%	25.0%	22.6%	22.6%	18.3%		76.0%	75.7%	67.3%	62.5%
27	793	803	4121	3367	53.5%	53.2%	51.1%	50.3%	21.9%	21.9%	16.1%	14.9%	73.5%	73.3%	86.6%	89.5%
28	1156	1592	1860	556	50.4%	62.4%	63.7%	58.3%	27.3%	27.3%	22.2%	34.0%	74.0%	80.7%	78.5%	71.4%
31	445	455	651	253	53.3%	52.5%	48.2%	41.5%	26.7%	26.7%	28.3%	28.1%	73.3%	73.4%	74.7%	79.8%
40	608	1030	1776	760	52.6%	70.3%	65.7%	59.2%	23.7%	23.7%	20.8%	30.1%	66.0%	79.6%	73.5%	65.4%
71	962	1382	1190	141	52.2%	65.3%	69.4%	64.5%	49.0%	49.0%	31.4%	19.9%	64.0%	74.8%	75.9%	77.3%
72	1210	1805	3400	1633	44.8%	57.0%	53.6%	49.7%	23.2%	23.2%	21.3%	25.5%	77.4%	83.7%	87.7%	91.9%
74	1194	1610	1100	116	45.9%	58.8%	67.9%	57.8%	42.9%	42.9%	13.9%	14.7%	68.6%	76.5%	84.7%	83.6%
75	449	453	258	5	51.2%	51.7%	58.5%	80.0%	18.7%	18.7%	23.3%	20.0%	76.2%	75.9%	68.2%	60.0%
76	899	925	1243	413	51.8%	52.1%	54.1%	58.8%	28.8%	28.8%	26.4%	24.7%	71.2%	71.2%	71.1%	70.2%
78	290	290			56.2%	56.2%			29.3%	29.3%			73.4%	73.4%		
79	388	388			51.8%	51.8%			25.5%	25.5%			76.5%	76.5%		
80	268	268			51.1%	51.1%			36.6%	36.6%			74.3%	74.3%		
81	654	656	224	6	47.2%	47.1%	55.8%	16.7%	24.9%	24.9%	30.4%		73.4%	73.2%	70.1%	66.7%
All	4067	4720	11248	7586	47.0%	51.3%	51.5%	50.4%	36.4%	36.4%	23.8%	21.2%	76.6%	79.0%	83.8%	85.0%

TABLE 5

Resort to different types of commercial policy intervention varies a lot across CRM

HS Chapter	Percentage of implemented liberalising measures that reduce import barriers (excluding subsidies)				Percentage of implmented discriminatory measures took the form of a subsidy to a firm operating in home markets				Percentage of implemented discriminatory measures that involved some form of export control export restrictions ever implemented				Percentage of implemented discrimnatory measures that took the form of state support directed abroad			
	Conservative CRM	Liberal CRM	Conservative No CRM	Liberal No CRM	Conservative CRM	Liberal CRM	Conservative No CRM	Liberal No CRM	Conservative CRM	Liberal CRM	Conservative No CRM	Liberal No CRM	Conservative CRM	Liberal CRM	Conservative No CRM	Liberal No CRM
22	84.6%	84.6%	91.8%	91.8%	83.2%	82.8%	54.6%	54.6%	0.8%	0.8%	4.2%	4.2%	2.4%	2.4%	7.5%	7.5%
25	74.8%	73.1%	76.1%	76.1%	51.4%	50.1%	29.6%	29.7%	11.0%	11.9%	11.9%	11.9%	6.4%	6.1%	24.6%	24.7%
26	62.4%	62.7%	72.1%	72.7%	37.8%	38.2%	29.3%	27.3%	18.6%	18.7%	16.4%	15.9%	22.4%	22.1%	14.3%	15.2%
27	68.6%	68.6%	79.0%	79.0%	57.9%	57.9%	70.8%	70.8%	7.8%	7.8%	4.6%	4.6%	6.9%	6.9%	12.8%	12.8%
28	77.6%	77.8%	87.6%	87.7%	49.0%	49.1%	64.1%	64.5%	10.0%	9.8%	5.6%	5.6%	8.3%	8.7%	5.7%	5.3%
31	78.9%	78.9%	75.3%	75.3%	61.7%	61.7%	39.7%	39.7%	5.7%	5.7%	7.6%	7.6%	5.2%	5.2%	19.5%	19.5%
40	76.5%	76.5%	94.2%	94.2%	41.6%	41.6%	54.1%	54.1%	7.8%	7.8%	6.2%	6.2%	6.5%	6.5%	5.8%	5.8%
71	86.1%	86.0%	86.8%	86.8%	25.0%	24.7%	52.5%	52.5%	12.5%	12.5%	5.8%	5.8%	6.9%	7.0%	6.2%	6.2%
72	83.5%	80.0%	85.0%	85.8%	31.6%	54.2%	41.5%	27.5%	6.8%	5.1%	7.0%	8.8%	8.8%	5.0%	5.2%	6.7%
74	88.9%	88.0%	83.2%	87.1%	40.2%	40.0%	69.3%	70.4%	8.5%	8.6%	4.9%	3.9%	8.7%	8.6%	7.8%	7.6%
75	76.1%	75.0%	78.0%	81.9%	52.8%	51.3%	22.3%	15.7%	9.7%	11.9%	17.1%	18.3%	11.4%	11.6%	20.0%	20.9%
76	79.9%	78.4%	89.0%	91.2%	40.2%	40.6%	39.6%	38.6%	13.0%	12.7%	5.7%	5.5%	7.5%	7.5%	11.7%	11.9%
78	72.7%	72.7%			39.0%	39.0%			16.0%	16.0%			6.1%	6.1%		
79	79.1%	79.1%			48.8%	48.8%			9.8%	9.8%			9.4%	9.4%		
80	61.8%	61.8%			40.7%	40.7%			21.6%	21.6%			6.0%	6.0%		
81	75.7%	75.7%	74.6%	74.6%	47.2%	47.2%	35.9%	35.9%	13.6%	13.6%	18.6%	18.6%	9.8%	9.8%	7.1%	7.1%
All of the above	83.0%	82.9%	85.8%	86.4%	48.5%	52.8%	55.1%	55.3%	7.5%	8.5%	5.2%	5.2%	7.9%	6.8%	11.3%	11.2%

differs from policy affecting other material markets. As in chapter 2, the latter are defined as the HS codes that are not CRM which are found in HS chapters where there is at least one CRM HS product code. Essentially, where possible, we split each HS chapter into CRM and non-CRM six-digit HS product codes and, therefore, make comparisons between relatively similar types of products.

Compared to the unilateral commercial policy mix affecting non-CRM markets, the policy mix affecting CRM markets:

1 Is less frequent (in fact, unilateral measures affecting non-CRM markets occur approximately two-and-a-half times more often.)

2 Is no more concentrated in the years that President Trump took office.

3 Is more likely to be finite (or time-limited) in duration.

4 Is somewhat less likely to discriminate in favour of local commercial interests.

5 Is no more likely to involve import barrier reduction to secure supplies from abroad.

6 Is, when favouring local firms, less likely to take the form of a subsidy.

7 Is slightly more likely to take the form of an export control or restriction.

8 Is less likely to take the form of state support to win foreign export orders and to acquire foreign commercial assets.

These are surprising findings about the intensity and form of unilateral commercial policy intervention affecting CRM markets. Only the finding that export controls are used more often for CRM accords with much contemporary writing. To the extent that the scramble for CRM has translated into unilateral policy initiatives, it has not resulted in CRM receiving more subsidies than other materials. Nor has it resulted in more policy interventions affecting CRM that could become permanent (that is, measures with no phase out dates).

When compared with other materials, lowering import barriers play a smaller role in the unilateral commercial policy mix facing CRM. Such barrier reduction ought to be one way through which governments can secure CRM. And, relatively speaking, in terms of the numbers of measures taken, it has not witnessed an intensification of measures taken since President Trump came to office when compared to other materials.

When looking across HS chapters, as Table 4 shows, there are significant differences in the resort to time-limited unilateral commercial policy intervention and in whether more unilateral action was concentrated in the years when geopolitical rivalry intensified. Variation in unilateral policy mix across HS chapters including CRM can be found in Table 5.

Where liberalising commercial steps have been taken in HS chapter 28 (Rare Earths) the share that take the form of reductions in import barriers is below the average. Resort to export restrictions on Rare Earths is above the average for CRM. Resort to export restrictions is also above the norm in HS chapter 75 (Nickel). Resort to subsidy awards to local producers is above average in HS chapters 27 (Mineral Fuels) and 31 (Fertilizers). The notion that there is a common unilateral mix of commercial policy interventions to CRM should be discounted, again calling into question generalisations as to how "trade dependencies in CRM" are being dealt with.

Unilateral commercial policy initiatives are dominated by the economic behemoths

Our data can also reveal which governments have taken the most unilateral trade, investment, and industrial policy initiatives that bear upon markets for CRM. Whether conservative or liberal methods were used to identify relevant policy intervention, as Figure 18 shows, four customs territories stand out as resorting to unilateral policy interventions towards CRM: China, India, the EU-27, and the United States.

Having written this, such was the frequency of Chinese unilateral policy intervention in CRM markets since the onset of the Global Financial Crisis that the totals presented in Figure 18 exceed that of the EU-27 and the United States combined. This finding holds before as well as after the Trump Administration came to office.

With respect to the other countries reported in Figure 18, Australia and Canada markedly increased their resort to unilateral commercial policy acts towards CRM in the years since President Trump took office. In contrast, the number of recorded policy interventions taken by Kazakhstan and the Republic of Korea fell.

The statistics presented in Figure 18 represent counts of policy intervention, which are a standard metric employed by international organisations, such as the OECD and the WTO. Since a unilateral commercial policy act could affect one or multiple CRM, a better sense of the reach of a nation's unilateral policy intervention can be provided by counting the number of CRM-related HS product codes associated with each intervention that a government has implemented. Those totals are reported in Figure 19.

Correcting for the number of CRM affected alters the ranking of the four largest users of unilateral policy. China remains the largest user, the EU-27 moves into second position, followed by the United States, and India falls

FIGURE 18

Four economic behemoths account for the lions share of policy affecting CRM

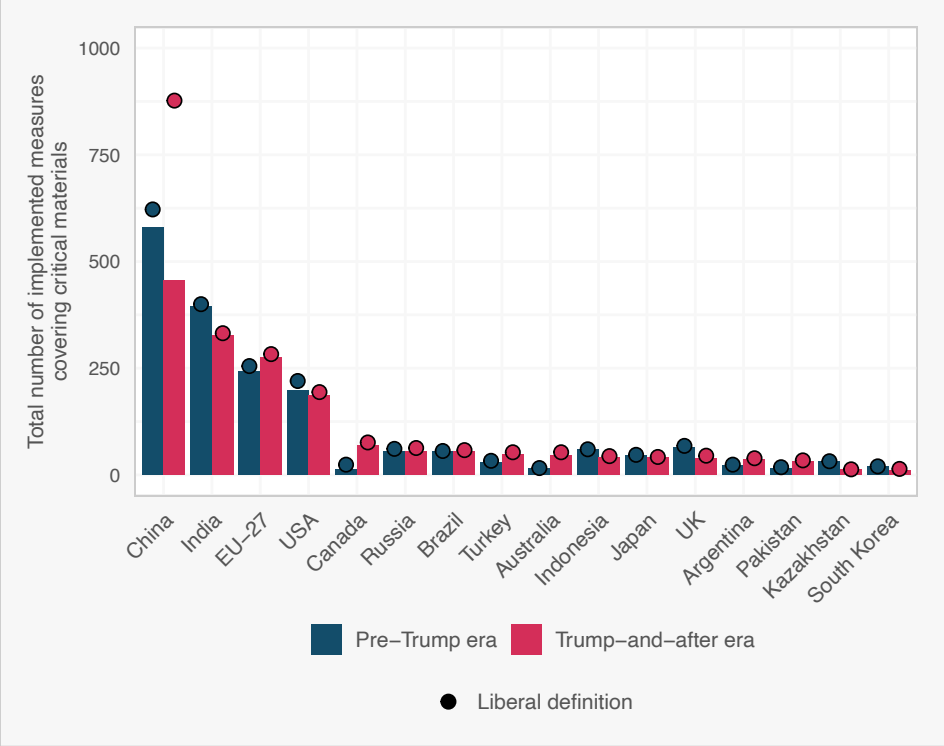


FIGURE 19

Accounting for the number of CRM products affected changes the ranking of most active nations

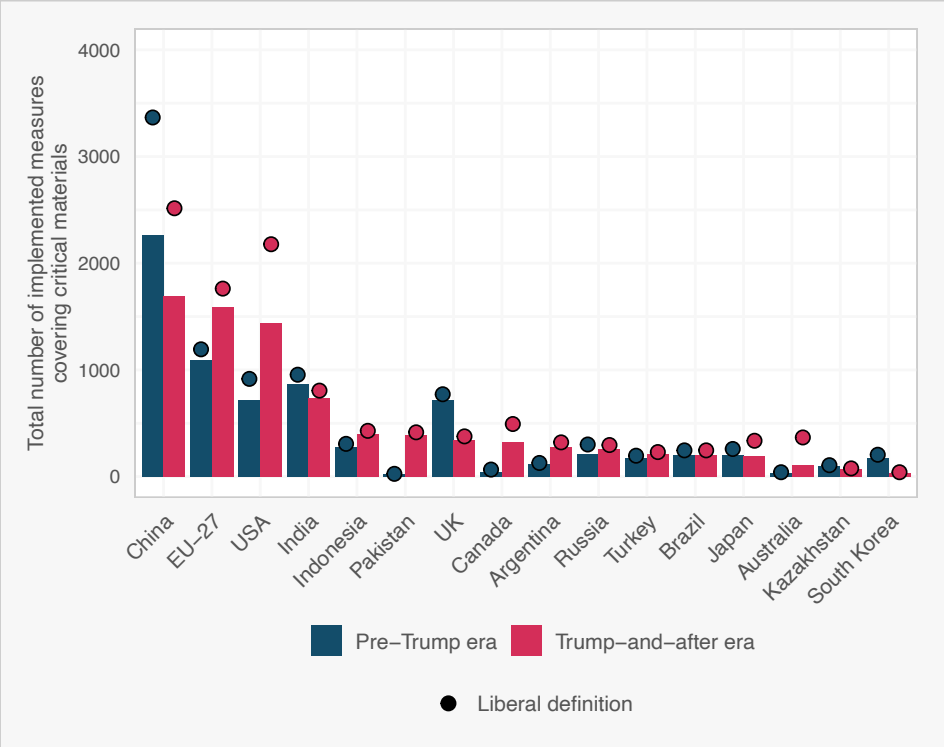


FIGURE 20

Significant variation over time, across implementing jurisdiction, and CRM in unilateral commercial policy choice

to the fourth most frequent user. Indonesia joins the list of nations that have ramped up their unilateral policy interventions that affect CRM in the years since President Trump took office. On this metric, the United Kingdom joins the group of nations that have pared back their unilateral commercial policy interventions covering CRM.

The evidence presented in Figures 18 and 19 points to unilateral policy intervention affecting CRM markets being concentrated in the world's two most populous developing countries and the world's two largest Western economies. Other nations have taken some action, but if CRM markets thicken or thin out over time on account of unilateral commercial policy intervention, it is largely as a result of the behaviour of the behemoths of the world trading system.

As noted in the last section, the policy mix witnessed varies across CRM at the global level. This is true at the national level too. In Figure 20 we report the frequency of unilateral policy intervention (using the conservative definition) for the 16 countries that took the most action affecting markets for cobalt, lithium, and the top eight most affected other CRM. In none of the 16 nations for which evidence on counts of interventions are provided are there even rates of policy intervention across CRM. Diversity in treatment across CRM is the order of the day, it seems, at the national level as well.

But the commercial policy mix towards CRM differs between "Western" nations and the BRICS plus Indonesia

Many Western governments frame the trade-related aspects of CRM in terms of security of supply. Governments of lower per capita incomes that have lots of CRM reserves see the matter differently—for them the sharp predicted increases in demand for CRM is too good an opportunity to miss for industralisation, upgrading, modernisation, and higher levels of employment. One might reasonably expect that these two different framings of the matter translate into different policy mixes towards CRM. The purpose of this section is to explore whether the actual policy mix of these two groups of nations differ and, if so, along what lines.

Given Australia has in recent years been part of a number of CRM-related initiatives, we added them to the Group of Seven nations for form a "Western" group. Similar arguments led us to add Indonesia to the BRICS group of large emerging markets. Table 6 reports summary statistics on the actual unilateral commercial policy choice of those Western and Emerging Market groups, differentiating between measures that favour local firms ("discriminatory" measures) and those that free up trade and investment ("liberalising" measures). We also benchmark policy towards CRM against products in the same HS chapters that are not on CRM lists (referred to the in table as "Non-CRM").

A comparison of statistics presented in Table 6[44] reveals:

- One point of similarity in the commercial policy choices of the Western and large Emerging Markets groups relates to the scope of measures favouring local firms. In both groups every single CRM HS (product) code is the beneficiary of discriminatory unilateral policy intervention at some point since our records began in November 2008. In contrast, 80% of non-CRM HS codes benefit from measures that tilt the commercial playing field in favour of local commercial interests.
- From November 2008 until June 2023 liberalising policy intervention by the Western group covers at least 35% fewer CRM products than the large Emerging Markets group. In fact, every CRM product has benefited from some type of trade, subsidy, or investment reform implemented by the large Emerging Markets group.
- When attention is focused on the unilateral policy intervention in force on 30 June 2023, the policy mix of the Western group towards CRM involves more discrimination and less liberalisation than the large Emerging Markets group. But Western discriminatory measures are more selective—covering 54.8% of CRM imports as compared to 90.2% in the case of the large Emerging Markets group. When it comes to liberalising measures in force on 30 June 2023, they cover over 83% of CRM products imported by the Large Emerging Markets groups and less than 4% of the CRM products imported by the Western group.

44 This table includes statistics on unilateral commercial policy choice for the conservative and liberal definitions of relevant HS codes and policy interventions discussed earlier in this report.

TABLE 6

"Western economies" have a different policy mix towards CRM than the BRICS and Indonesia

	Unilateral commercial policy mix since Trump came to office		Conservative definition				Liberal definition			
			Australia plus G7		BRICS plus Indonesia		Australia plus G7		BRICS plus Indonesia	
	Policy intervention type	Metric	Non-CRM	CRM	Non-CRM	CRM	Non-CRM	CRM	Non-CRM	CRM
Favour national commercial interests	Discriminatory measures implemented ever	% of all measures	92.9	91.8	80.1	73.5	93.0	91.6	79.0	81.2
		% of all relevant HS codes covered	78.1	100.0	82.0	100.0	77.8	100.0	80.9	100.0
Reforms	Liberalising measures implemented ever	% of all relevant HS codes covered	44.5	64.3	61.0	100.0	43.8	66.8	60.6	100.0
Favour national commercial interests	Discriminatory measures implemented and in force on 30 June 2023	% of all measures	93.4	94.6	86.7	83.6	93.5	94.2	85.9	89.5
		% of all relevant HS codes covered	72.4	100.0	78.9	100.0	71.9	100.0	77.3	100.0
		% of all relevant imports covered	73.3	54.8	88.4	90.2	73.4	55.5	88.5	89.7
Reforms	Liberalising measures implemented and in force on 30 June 2023	% of all relevant HS codes covered	28.8	58.5	54.3	100.0	27.8	61.0	53.8	100.0
		% of all relevant imports covered	29.8	3.1	73.1	83.8	29.9	4.3	73.1	82.9

	Unilateral commercial policy mix since Trump came to office		Conservative definition				Liberal definition			
			Australia plus G7		BRICS plus Indonesia		Australia plus G7		BRICS plus Indonesia	
	Policy intervention type	Metric	Non-CRM	CRM	Non-CRM	CRM	Non-CRM	CRM	Non-CRM	CRM
Favour national commercial interests	Resort to subsidies to local firms	% of all harmful measures	60.9	46.9	68.3	61.8	61.0	44.6	66.0	75.5
		% of all relevant HS codes covered	60.8	94.6	66.7	76.8	61.0	94.5	65.7	77.7
	Resort to state support for exports and acquiring commercial assets abroad	% of all harmful measures	20.3	11.6	3.6	2.1	20.3	12.0	3.9	1.3
		% of all relevant HS codes covered	32.4	100.0	43.0	50.6	32.4	100.0	43.3	53.3
	Resort to export controls, including bans, quotas, and licensing requirements	% of all harmful measures	1.3	7.7	5.2	6.7	1.3	7.9	5.6	4.3
		% of all relevant HS codes covered	15.7	32.8	30.4	47.3	14.6	33.6	30.5	48.5
	Resort to import tariff increases	% of all harmful measures	3.1	13.9	5.6	22.6	3.1	14.0	6.1	14.0
		% of all relevant HS codes covered	31.5	91.3	26.3	99.6	30.4	91.6	26.5	99.6
Reforms	Resort to import tariff reductions	% of all liberalising measures	64.1	61.4	41.7	65.7	61.2	67.4	41.7	64.5
		% of all relevant HS codes covered	26.1	63.5	38.7	100.0	25.2	66.1	38.3	100.0

- When it comes to the mix of discriminatory policies used in CRM sectors and when benchmarked against the large Emerging Markets group, the Western policy mix is skewed towards more state support for export deals and acquiring CRM assets abroad.[45] The Western policy mix involves in percentage terms fewer subsidies to local producers and import tariff increases. In both groups subsidies benefiting local producers constituted by far the most common way to tilt the commercial playing field towards domestic commercial interests. Export controls accounted for less than 10% of the policy intervention of both groups.
- When it comes to policies that open up trade and investment, between 60% and 65% of both groups policy interventions were import tariff reductions, by far the most popular form of liberalisation. Where the two groups differ is on the share of CRM imports benefiting from import tariff cuts—all CRM products benefit from tariff cuts by the large Emerging Markets whereas only two-thirds of CRM imports do so in the Western group.

So has differential framing of CRM trade matters translated into differential unilateral policy choice? One might have expected those nations that emphasise security of supply concerns for CRM to have policy mixes skewed more towards reforms and removal of import restrictions and other distortions to domestic markets---but that is not the case. The Western group's unilateral policy mix contains a smaller percentage of liberalising measures and covers fewer CRM products. Moreover, when the Western group has cut import tariffs they cover smaller percentages of CRM imports than in the case of the large Emerging Market group. The latter's discriminatory policy mix is not skewed more towards export restrictions but does involve more frequent resort to subsidisation of local producers than by Western governments.

Furthermore, despite the framing differences, both the G7 group and Australia and the BRICS and Indonesia have made extensive resort to subsidies to national firms and, where they have cut import barriers, this has largely taken the form of cuts in import tariff rates. The notion that only the large Emerging Markets have undertaken selective policy interventions in favour of local firms in CRM sectors—in short, that only these governments have resorted to industrial policy---should be set to one side.

Concluding remarks

The goal of this chapter was to put unilateral commercial policy developments towards CRM in perspective. Most discussions on CRM take as given an uptick in policy intervention affecting CRM in the years since geopolitical rivalry intensified and we confirm that. However, that intensification is no more pronounced than for other materials. As geopolitical rivalry intensified, the unilateral policy mix towards CRM has shifted away from subsidising projects undertaken abroad towards lavishing state largesse on producers at home, with little change in monthly resort to import tariff measures.

Yet the findings in this chapter caution against trying to draw such conclusions at the global level. We found that the unilateral commercial policy mix varies considerably across CRM. Plus, unilateral policy intervention is concentrated in the two largest emerging market economies and the two largest Western economies—suggesting considerable differences across governments in their capacity or willingness to convert their strategies to secure CRM into action.

45 Recall, however, the evidence presented earlier in this chapter on Chinese development projects in mining. Such development projects are not included in the GTA database unless there is explicit evidence that the aid is tied to buying from the donor nation.

CHAPTER 6
ISOLATIONISM IS NOT AN OPTION WHEN SECURING CRM BUT WHERE IS THE MEAT IN CROSS-BORDER COOPERATION?

The scramble for critical materials reaches far beyond national borders. This has been so for centuries as governments and firms try to secure resources not available at home. On this particular commercial policy matter making the case for international engagement is not hard. If the track record is anything to go by, what appears more difficult is making the case for engagement that thickens markets rather than the reverse.

Governments have a number of vehicles to secure critical materials abroad. Our focus is on the non-military means for doing so. First, we examine engagement that explicitly or tacitly involves bilateral engagement, where one government directly acquires the right to resources abroad normally on a transaction-by-transaction basis or finances expansion of pertinent CRM extraction or production capacity. A second, and distinct, form of engagement is when governments sign accords concerning commercial policy and other practices that bear upon the markets for critical raw materials.

Whichever means are chosen by governments, it is worth recalling the distinction between policy intervention that diverts trade in critical raw materials and policy intervention that creates the potential to increase, on net, supplies to the world market, so-called potentially trade-creating state measures. As will become evident, some actions taken by governments have created new lines of production but not necessarily added to available supplies on world markets.

It is worth making a parrallel to competition law, in particular to cases when a downstream firm vertically integrates with—through merger or acquistion—an upstream supplier and in doing so denies supply of the input produced upstream to rivals downstream. Under certain circumstances, competition agencies rightly take action against such vertical foreclosure and against the so-called vertical mergers that create the potential for such foreclosure. Indeed, the screening—and potential banning—of foreign acquistions of upstream commercial assets in critical materials sectors can be seen as a way to prevent denial of supply to other potential buyers of CRM.

Although the focus in this chapter is on actions taken by governments, the concern has arisen that a small number of state-influenced private firms or nominally private firms can exert "ultimate control" over certain critical raw materials around the world. Tracing out ownership structures is difficult and often inferences have to be made, a point that should be borne in mind when assessing the conclusions drawn. Nevertheless, an intriguing paper made public late last year sought to identify the identities of the ultimate owners of materials associated with the ongoing energy transition.

Specifically, Leruth, Mazerai, Régibeau, and Renneboog (2022) analysed supply chains in oil, gas, cobalt, copper, lithium, nickel, and Rare Earths. They found "China's control over the global value chains involving critical materials and REEs extends beyond what is commonly assumed". Moreover, they assess that the United States "dominates the supply chain (upstream, refining, and consumption). In contrast, the United States is only a minor player in the supply chains of clean technologies, in which China is the dominant actor." These authors also note that:

> *"Ownership and control relations and shareholding webs can change frequently and quickly. Therefore, analysis of the type done here needs to be conducted regularly, to shed light on the risks in value chains and to allow policy makers to craft more effective responses. The increased transparency that could come from knowledge of [sources of control] SOCs in the production of critical materials would help reduce the need for broad protectionist and trade-reducing actions by governments in consuming countries."*

Later we will return to the theme of enhanced transparency as a way to reduce suspicion and mutual recriminations in an era of growing geopolitical rivalry. Next, however, we turn to the first of two sections summarising attempts by governments to secure CRM abroad.

Transaction-based approaches

Nations taking steps to secure commodities that enhance their military or economic strengths are not new. Once it became clear before the First World War that warships powered by oil could outperform those run on coal, Germany and the United Kingdom sought "energy independence" by controlling oil fields in other parts of the world. Toprani (2019) outlines the steps British governments took to ensure enough oil in the Middle East was controlled by its nationals and firms. For its part Germany sought secure oil supplies in Romania and the Caucasus. Later, during and after the Second World War, the United States viewed with envy and concern British control of Middle Eastern oil supplies and took steps to secure enough oil of its own (Feis 1946).

History often repeats itself even if it does not rhyme (as Mark Twain wrote.) In the second half of the twentieth century, Japan created government agencies that took steps to secure materials and metals needed to sustain its manufacturing industry. Those efforts continue this day, as outlined in Box 1. Transactions that target specific materials were executed with foreign firm companies, possibly with the assent of the government where those foreign firms were based. In return for different types of state support or foreign direct investment, recipient firms appear to have made commitments to supply Japan with certain metals and materials.

Box 1: The Japan Organization for Metals and Energy Security (JOGMEC)—An approach to securing CRM

Ever since 1963 the Japanese government has taken steps to assure it industries predictable, cheap supplies of metals, then oil, and ultimately, natural gas. Stockpiling began in 1978. In February 2004 JOGMEC was established following the merger of two existing government agencies.

With respect to metals, the JOGMEC website records the following broad objectives for their activities in this area:

"JOGMEC seeks to ensure a stable supply of metal resources which are indispensable for Japanese industry, and contributes to a wide range of fields including surveying, exploration, development, production and stockpiling to recycling and environmental protection."

JOGMEC's 2021 Annual Report paints a stark picture of the difficulties in securing adequate supplies of metals:

"Japan imports most of the metal resources that its manufacturing industries require. However, year after year, the country faces increasing difficulty in securing access to essential metals for the manufacture of cars, IT devices, and other strategic products to maintain its industrial competitiveness. Some metal resources are mined and produced in a limited number of countries. The deepening and remoteness of ore deposits, the reduction of new prospective mining areas, the increase in initial investment for development, and the competition with emerging countries for resources have made it more difficult for Japanese companies to secure the upstream interests."

In pursuit of these objectives JOGMEC offers the following support to private sector firms:

- Subsidies for overseas exploration.
- Exploration loans, up to 15 years in length.
- Exploration investments.
- Equity investments for development and production (acquiring foreign assets).
- Loan guarantees.

According to JOGMEC (2020), since 2004 a total of 54 subsidies for overseas exploration have been granted, three exploration projects have been funded, the acquisition of foreign commercial assets has been supported three times, 17 exploration loans have been awarded, and eight loan or liability guarantees have been given. JOGMEC's 2021 annual report reveals, however, that the number and outstanding value of loans for overseas exploration has been falling in nominal terms since 2014. The same is true for debt guarantees. Only equity stakes have grown over time, and that growth stopped in 2017 (JOGMEC 2021).

A high profile JOGMEC investment in a foreign firm was the equity stake it took in 2023 in Lynas Rare Earths Ltd, a leading Australian company in Rare Earths extraction and processing. In return for this investment, Lynas committed to sell "65% of the HRE (dysprosium and terbium) produced by Lynas from Mt. Weld feedstock to the Japanese market" (JOGMEC 2023a). In June 2023, JOGMEC announced it had taken an equity stake in South African platinum miner, HJ Platinum Metals. This investment is "expected to be a new stable PGM supply source for Japan upon the commencement of production" (JOGMEC 2023b).

China also appears not only to have taken a leaf out of Japan's book but to have done so at scale. In painstaking work, researchers at the College of William and Mary in the United States have assembled granular transactions-level data on Chinese development assistance projects. Fortunately, this data can be sorted by sector. Unfortunately, the sectoral breakdown does not allow users to distinguish between transactions within the minerals sector, so non-CRM projects are combined with CRM transactions. Nevertheless, an analysis of the available transaction-level data is revealing.

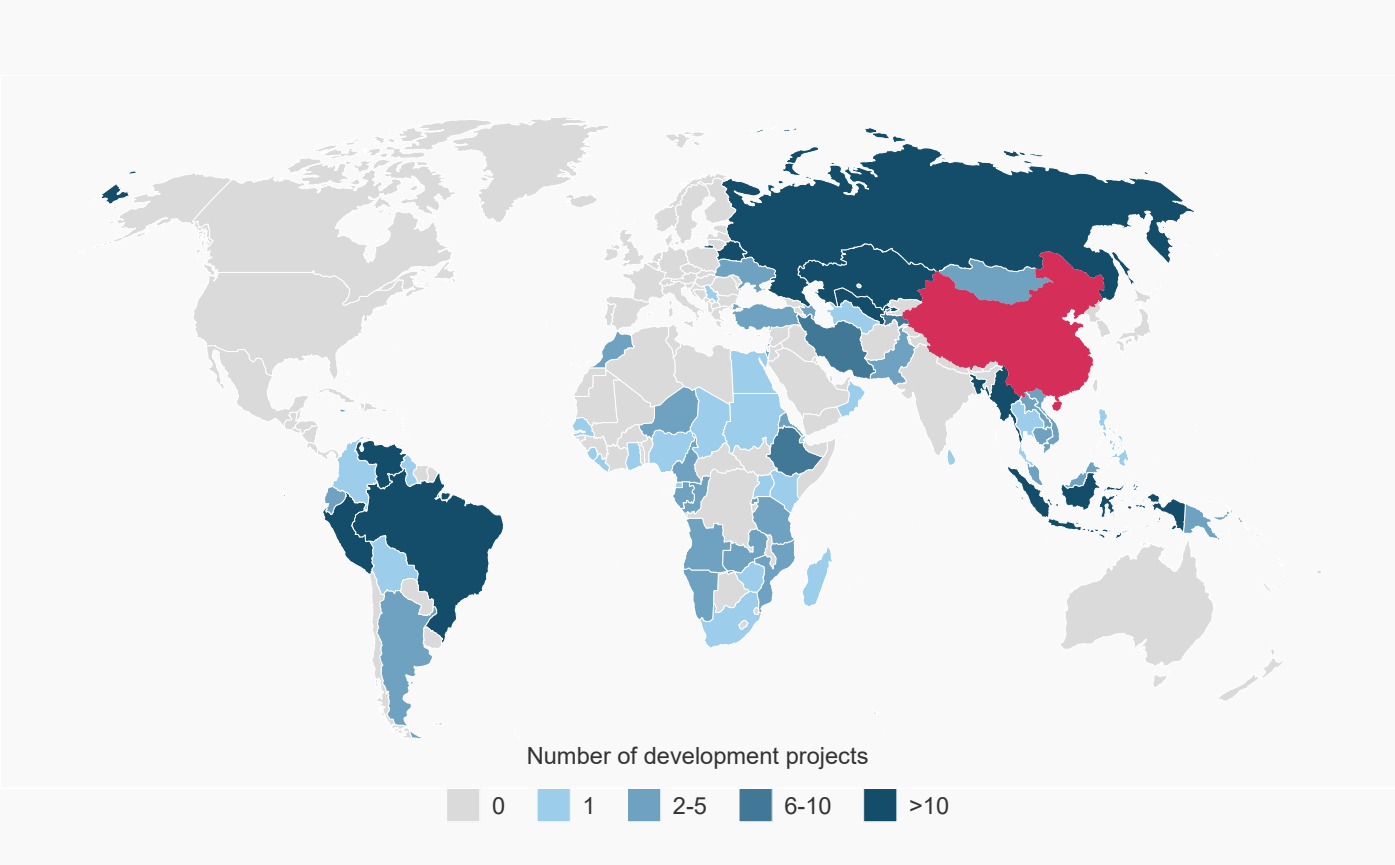
Figure 21 reports how often each foreign nation received development assistance projects from China in the minerals sector since 2010. More than 10 transactions were recorded for each of several nations in Central Asia, including Russia, as well as certain Latin American countries. Despite the attention given to Chinese development policies towards Sub-Saharan Africa, at least as far as development projects were concerned in the minerals sector, fewer transactions were recorded there. Even fewer transactions took place in Middle East and North African nations and, perhaps unsurprisingly, none were found in Western Europe and North America.[46]

The amounts of monies involved in these mineral sector transactions is significant. As Figure 22 shows, dozens of developing countries were the recipients of development projects in the mineral sector since 2010 whose total value exceeded half-a-billion US dollars. In fact, if it is appropriate to classify Russia as a developing country,

46 Recall however that, in addition to the development projects mentioned in the main text, Chinese firms—private, state-linked, or state-owned—may well have sought to invest in companies extracting or processing CRM.

FIGURE 21

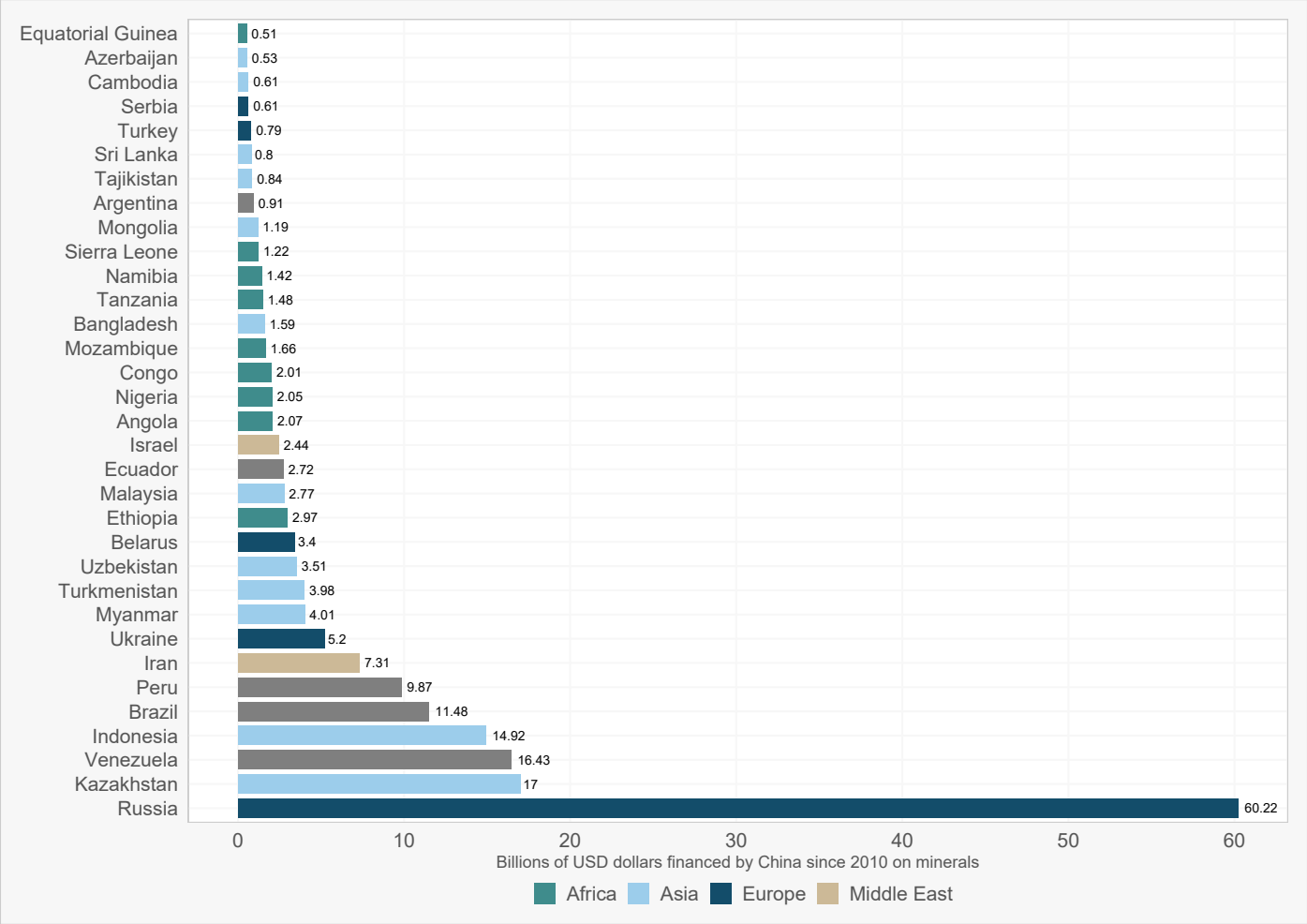
Chinese overseas minerals and mining projects avoid Western economies



Data source: AidData, https://www.aiddata.org/datasets

FIGURE 22

Dozens of developing countries have received significant Chinese development assistance for minerals and mining projects



Data source: AidData, https://www.aiddata.org/datasets

then in eight such countries the total value of development assistance received by each for mineral sector-related projects exceeded $5 billion. It is difficult to conceive of assistance received on this scale without the conscious concurrence of the government of the recipient nation.

Since the Global Financial Crisis, Western governments have deployed state resources to support export transactions involving CRM or to acquire, in whole or in part, commercial assets abroad related to CRM. Using the conservative definition of policy interventions mentioned in earlier chapters, Figure 23 reports the number of such Western policy interventions before and after President Trump came to office (again, the inauguration of the 45th President of the United States is taken as indicating the beginning of a more intense era of geopolitical rivalry.)

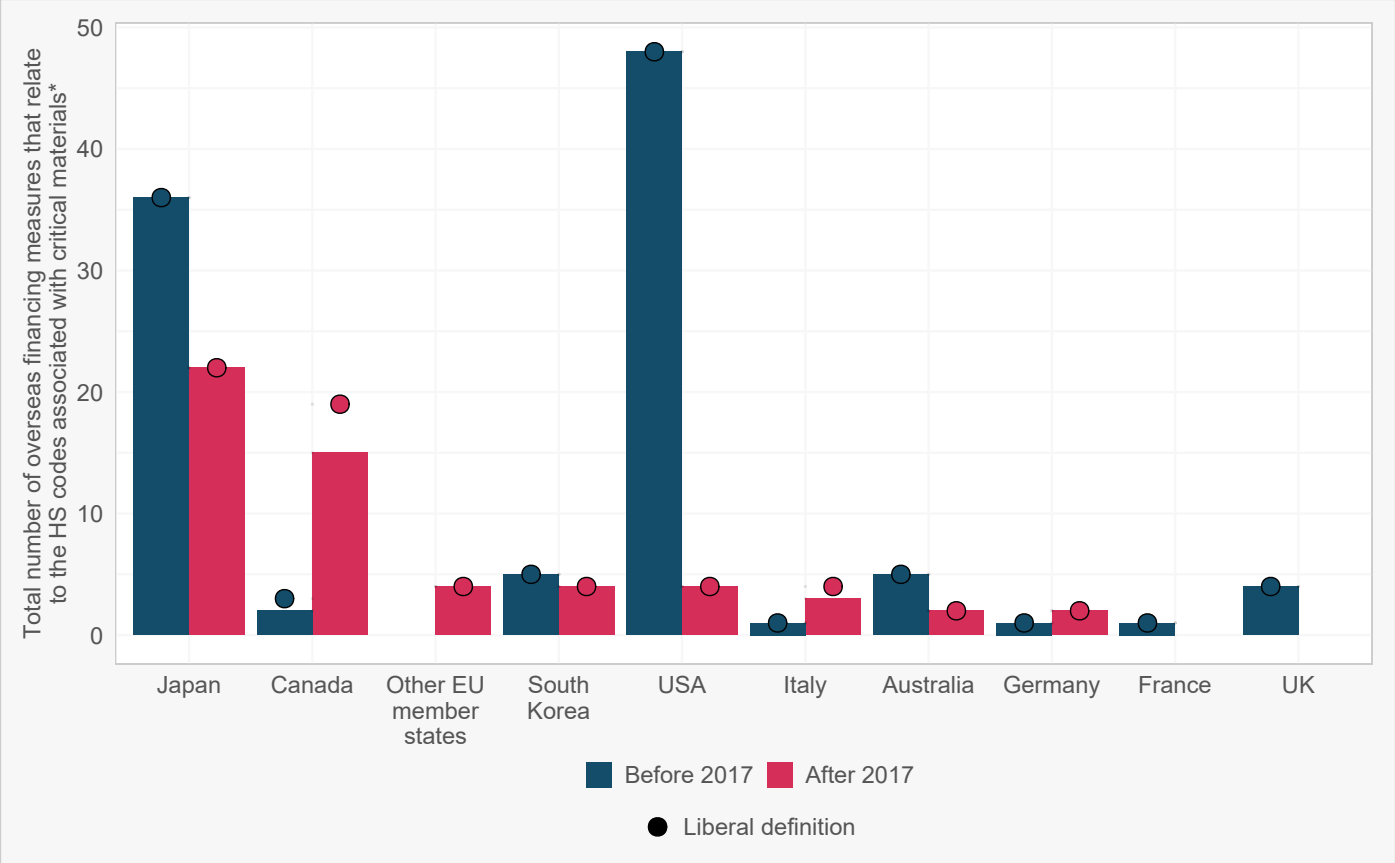
An uneven pattern of Western government efforts to secure CRM abroad can be detected in the Global Trade Alert database, the underlying source used to construct Figure 23. Once geopolitical tensions intensify Canada ramps up the number of transactions involving CRM. Italy and Germany too increase their engagement in such transactions but to a lesser degree. Interestingly, Australia, France, Japan, the United Kingdom, and the United States each witness a fall in the number of such transactions from 2017 on.

There is no particular reason why Western governments should pursue the same strategy in this regard—indeed, some may have concentrated their efforts in a small number of target jurisdictions or focused on projects at home. Still, as a factual matter, it is important to appreciate that since 2010 China was not alone in pursuing CRM in a transactions-based manner, even if the terms and form of that cross-border engagement is likely to have differed from that of Western nations.

Finally, it is worth noting that no international organisation has a mandate to collect information on such transaction-level attempts to secure CRM. Moreover, at best, only fragmentary information on the terms of such transactions are available. This lack of transparency has probably fed mutual suspicion about the strategies pursued by different governments towards securing CRM.

FIGURE 23

Once geopolitical rivalry intensified, few Western governments have ramped up state support for exports and asset acquisition in CRM



Data source: Global Trade Alert

Inter-governmental accords

A stronger case could be made that Western governments departed from Chinese counterparts in the pursuit in recent years of inter-governmental accords relating to critical materials. For example, ten Western governments plus the European Commission signed a Minerals Security Partnership in June 2023. Our attempt to piece together the different inter-governmental accords involving the G7 members can be found in Figure 24. A number of observations follow.

Minerals Security Partnership

Maybe because these inter-governmental accords are so recent or are still being fleshed out, but at the moment they tend to lack specificity. In the case of the Minerals Security Partnership (MSP) the "media note" made available by the U.S. State Department states:

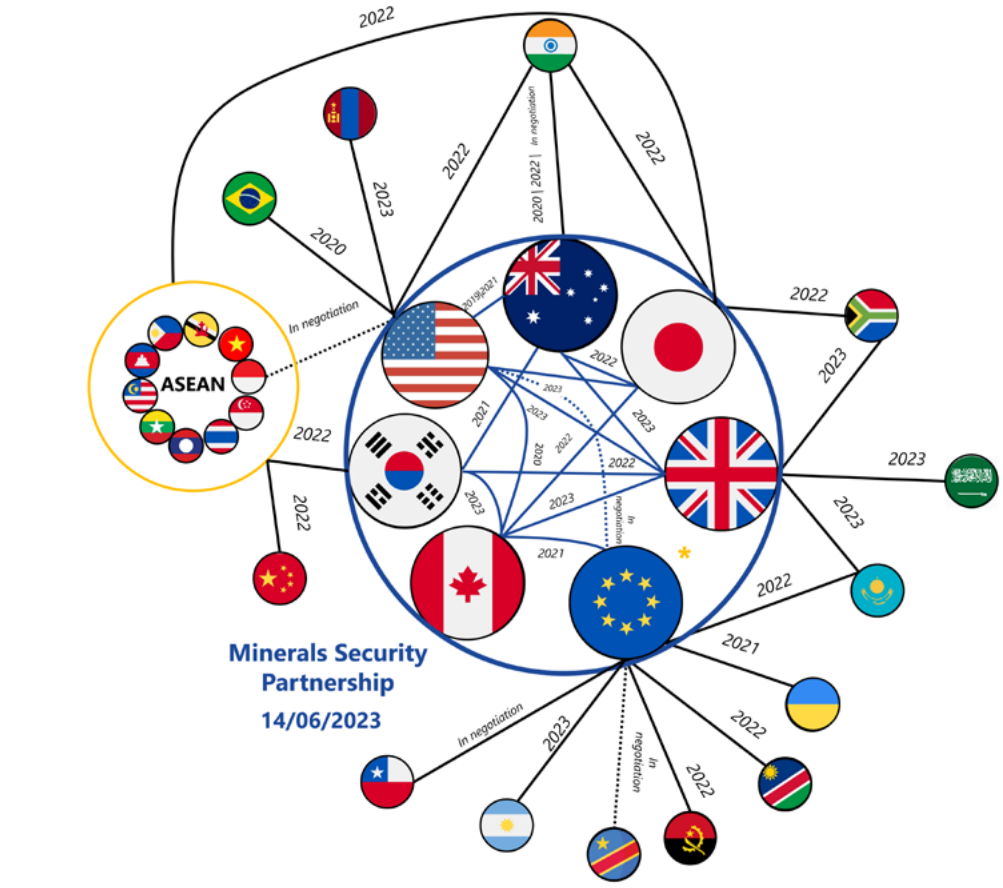
> *"The goal of the MSP is to ensure that critical materials are produced, processed, and recycled in a manner that supports the ability of countries to realize the full economic development benefit of their geological endowments. Demand for critical materials, which are essential for clean energy and other technologies, is projected to expand significantly in the coming decades. The MSP will help catalyze investment from governments and the private sector for strategic opportunities — across the full value chain —that adhere to the highest environmental, social, and governance standards."*

One possibility is that the MSP contains specifics that have not been made public. If so, it is difficult to see how such non-disclosure is going to galvanise private sector investment. Consulting the website of the International Energy Agency and some members of the MSP did not reveal further details. It is not clear that the European Commission even issued a statement about this Partnership.

Notice also that the above statement about the MSP makes no reference to trade and trade policy in CRM. Nor to what constitutes legitimate means to "realize the full economic development benefit" of those nations possessing CRM reserves. Nor to which materials or minerals are deemed "critical" in the first place. Nor it is evident that any emerging market governments have joined this Partnership. At this time of writing, the best that can be said is that the MSP is either a work in progress or it is the umbrella under which many bilateral or plurilateral accords will be signed.

FIGURE 24

A growing network of CRM deals organised by the G7 members



Note: Assembled from government sources

Bilateral initiatives: Japan-US accord

Some inter-governmental accords between Western nations appear to have more content than the MSP. An example is the Agreement Between the Government of Japan and the Government of the United States of America on Strengthening Critical Minerals Supply Chains, signed on 28 March 2023. This Agreement contains 15 articles but covers only the following "critical minerals": cobalt, graphite, lithium, manganese, and nickel. The bulk of the provisions relate to environmental and labour policies that bear upon supply chains for critical raw materials.

Only Article 3, reproduced here as Box 2, contains traditional trade policy provisions. Article 3 contains two provisions that merely affirm Japan and the United States' multilateral trade obligations. Three of the provisions commit the parties to "confer" under different circumstances—and conferral does not commit Japan and the United States to come to an agreed approach or solution.

One provision of Article 3 can be read as eschewing resort to export duties on critical materials. The force of that provision is blunted by the fact that, in the case of the United States, a constitutional amendment would be needed to impose such duties. Overall, the trade policy content of this agreement between the United States and Japan is meagre. Yet, negotiators still insisted on including in the Agreement an article containing a sweeping national security exception (Article 8). The best that can be said for this accord is that the risk of it diverting trade in critical materials is slight, probably nil. This agreement is yet another example of hard looking soft law.

Box 2: The classic trade policy provisions of Agreement Between the Government of Japan and the Government of the United States of America on Strengthening Critical Minerals Supply Chains

Article 3: Facilitating Trade in Critical Minerals

1. Each Party affirms its obligation not to impose prohibitions or restrictions on imports of critical minerals from the territory of the other Party or on exports of critical minerals to the territory of the other Party other than duties, taxes, or other charges, in accordance with Article XI:1 of the GATT 1994.
2. Each Party shall maintain its current practice not to impose export duties on critical minerals exported to the territory of the other Party.
3. Each Party affirms its obligation to accord national treatment to the critical minerals of the other Party in accordance with Article III of the GATT 1994, including its interpretative notes.
4. In order to promote fair competition and market-oriented conditions for trade in critical minerals, the Parties shall confer on potential effective and appropriate domestic measures to address non-market policies and practices of non-Parties affecting trade in critical minerals and on issues relating to global critical minerals supply chains, including extraction and processing capacity and trends, price differences between markets, domestic industry conditions, and trade flows. The Parties may share publicly available data with respect to trade in critical minerals, including from other markets.
5. The Parties shall confer on best practices regarding review of investments within their territories in the critical minerals sector by foreign entities for purposes of assisting a determination by the Party of the effect of such investments on its national security. When appropriate and consistent with their applicable regulatory frameworks, the Parties may notify each other of such investments.
6. In the event of a supply chain disruption, to the extent possible, the Parties shall confer to support each Party's efforts to address the disruption.

Our final comment is that this accord is an executive agreement in the United States and has not be put before the U.S. Congress as a trade agreement. It can be terminated with 90 days written notice. Consequently, no private sector investor in the extraction or processing of critical materials will be afforded much comfort by this Agreement. It is difficult to see how accords like this are going to reduce the significant inherent policy-related risks associated with multi-year investments in CRM sectors.

Regional approaches: the proposed Critical Raw Materials Act

Collective action by governments can be undertaken on a regional basis. The proposal made by the European Commission on 13 March 2023 for a regulation to implement a Critical Raw Materials Act is an attempt to develop a framework to both expand production of CRM within and outside the 27 Member States of the European Union (EC 2023). As of this writing, this proposal has yet to be formally adopted and its contents are likely to be modified during the legislative process. Whether such action ultimately thickens markets for CRM within and outside the region in question will depend on many factors. Still, as will become evident, this proposal goes well beyond the bilateral approaches described earlier.

This proposal identifies 16 "strategic raw materials" and 34 "critical raw materials" in Annexes I and II, respectively (EC 2023). None of these materials are energy- or agricultural-related. With the intention of developing the European supply chains for these raw materials and diversifying international sources, the following specific targets[47] were contained in the proposal:

1 Extracting at least 10% of annual consumption of strategic raw materials within the EU, to the extent that available reserves allow for this.

2 Perform at least 40% of each processing step for each strategic raw material within the EU.

3 Build capacity so that at least 15% of annual consumption of strategic raw materials is recycled within the EU.

4 Sourcing no more than 65% of any strategic raw material from any single trading partner.

While it was stated that these targets are to be met by 2030, it is unclear whether those targets are binding and, if so, on whom. In addition, as a number of commentators

47 Formally, the European Commission referred to these targets as "benchmarks."

have noted[48], it is unclear whether additional funding is being provided to meet these targets. More generally, the proposal is silent on which policy instruments—including potentially trade policy tools—will be used to meet these targets.[49] Consequently, perhaps it is best to think of this proposal as either an attempt to encourage cooperation and coordination among EU Member States or as an initial step towards a more federal approach that could have a direct bearing upon EU commercial policy.

What is clear, however, is that the Commission envisages the creation of "strategic projects" to "contribute to the security of supply of strategic raw materials in the Union"[50] as well as measures to facilitate expeditious permiting, better "enabling conditions" for firms operating in supply chains, as well as distinct measures to promote material exploration. Proposals to monitor, share information on, and coordinate "strategic stocks" of strategic raw materials were advanced as well as those relating to joint purchasing of such materials. Should these measures ultimately alter private sector and government behaviour then they have the potential to reshape conditions of competition in for some CRM regionally and globally.

The proposed regulation also envisages greater cooperation with nations outside of the EU. Chapter IV of the proposal containes "a framework for cooperation on Strategic Partnerships with third countries related to raw materials and to achieve greater synergies between Strategic Partnerships and Member States' cooperation with relevant third countries." In the design and operation of such partnerships one criteria to be taken into account is "for emerging markets and developing economies, whether and how a partnership could contribute to local value addition and would be mutually beneficial for the partner country and the Union." This could open the door for EU contributions (of different types) to the strategies of those developing country governments seeking to develop their CRM extracting and processing capabilities. Mention is made in Chapter IV to the EU's Global Gateway as one means to take that cooperation forward.

EU Partnerships with material supplying nations

High per-capita income nations may well have material extraction and processing technology and expertise of relevance to developing countries seeking to develop their CRM sectors. This opens the door for the creation of collaborative arrangements between the private sector and governments. One such arrangement[51] is the Memorandum of Understanding (MOU) between the European Union and Kazakhstan, signed on 7 December 2022.[52] In principle the scope of this partnership is quite broad and encompasses the supply chains for EU-defined CRM, batteries, and hydrogen. The parties reaffirmed their commitment to transparent, predictable, unimpeded, and non-discriminatory treatment of trade and investment flows in CRM and hydrogen (but a close reading of the text suggests not in batteries).

The main areas of cooperation envisaged include:

1 Integration of CRM and battery supply chains, including the exploration of new CRM deposits in Kazakhstan, modernisation of upstream and downstream processing technology, and possible cooperation in manufacturing components of batteries.

2 Development of open, fair, and competitive markets for renewable energies, in particular hydrogen.

3 Increasing the transparency of policy measures and sources of disruption to CRM, battery, and hydrogen supply chains.

4 Cooperation on research and development, technology transfer, and human capital upgrading in areas related to the scope of this MOU.

In principle, this could be a promising vehicle whereby European and Kazakh firms contribute to the thickening of certain CRM markets and to the capacity of certain supply chains to respond to unanticipated shocks. The level of detail in this MOU is encouraging, suggesting that some thought has gone into how this cooperation might be taken forward. Unfortunately, a statement at the end of the MOU that it should not be read as a commitment of funding detracts, although other financing vehicles may be available (if indeed any significant financing needs arise.)

Other accords

We also reviewed the public statements and other available information in the other CRM-related accords where one Western government was a party. These non-binding initiatives typically contain a number of largely unobjectionable statements (provisions is too strong a word). Stated intentions to enhance the transparency of government policies, to streamline investment

48 Including those quoted in Clifford Chance (2023).

49 For example, import restrictions could in principle be imposed on CRM sourced from a nation which currently exceeds the 65% threshold mentioned in the fourth target.

50 Article VII of the proposed regulation.

51 In this regard it is worth noting that the Chile and EU are negotiating a Memorandum of Understanding on CRM. Furthemore, on 13 June 2023, the EU and Argentina signed an accord relating to "sustainable raw material value chains." That accord is less detailed than the EU-Kazakh accord discussed here in the main text. The text of the accord between the EU and Argentina can be found here https://single-market-economy.ec.europa.eu/system/files/2023-06/MoU%20EU-Argentina%20on%20raw%20materials%20-%20EN.pdf

52 The text of that Memorandum is available here https://single-market-economy.ec.europa.eu/system/files/2022-11/EU-KAZ-MoU-signed_en.pdf

authorisation processes for CRM-related projects, to undertake joint research and development projects and recycling projects, to encourage "modernisation" of pertinent technologies, and to encourage responsible business conduct, among others, are worthwhile but they are hardly going to transform the risk profile from investing in CRM-related projects.

One rationale does appear to motivate the accords being negotiated between the United States and its Western trading partners: access for foreign firms to the tax credits made available in the US Inflation Reduction Act (IRA). It appears that the Biden Administration is prepared to adopt a liberal interpretation of what constitutes a trade agreement with the United States, to include so-called trade-related executive agreements (TEAs) that have not been ratified by the U.S. Congress. In this regard, Claussen (2022) refers to the "constitutional dissonance" which hangs like a cloud over the legality of these TEAs. Still, perhaps the real lesson here, is that once billions of dollars of state largesse was at stake, the negotiation of inter-governmental accords on CRM got a shot in the arm.

Concluding remarks

A stark contrast emerges between current transaction-based and accord-based approaches to securing CRM. The former are more targeted, are often backed up with financial resources, and involve specific commitments to act. At best, the latter are in their infancy, contain few provisions any traditional trade policy analyst would recognise as meaningful, and, in several cases, are motivated by the desire to secure access to time-limited American tax credits associated with the IRA. Having written that, the recognition in nascent EU initiatives of the interests and plans of the material-supplying nations represents a more balanced approach.

Maybe critical raw materials may become so vital that the reluctance in recent years to engage in meaningful trade-, investment-, and technology-related cooperation will be overcome. To date, the scramble for critical materials has been executed more by development ministries and associated agencies, specialist government agencies, and export support agencies than by trade ministries.

CHAPTER 7
THE CASE FOR A THICK MARKETS APPROACH

A Thick Markets Approach grounded in how materials markets actually work

We now draw together the evidence and economic logic presented in previous chapters in order to advance five propositions to guide domestic and international policymaking towards critical raw materials. That evidence provides important context for any attempt to address the likely shortages in critical raw materials in the decades ahead.

Recalling the discussion in chapter 2, we start by observing that, even in the absence of geopolitical rivalry, the challenges associated with scaling up supply of raw and processed critical raw materials to meet higher levels of demand would have been formidable. Complicating factors include fundamental uncertainty as to the pace of the digital and energy transitions, with their knock-on effects for both how much materials will be needed and, quite possibly, which materials are needed in greater quantities in the first place.

On top of this are geological considerations (recall, as noted in chapter 2, that some raw materials are byproducts of other material extraction and processing), the long-time frames needed to bring some mining facilities online, the potential for recycling and circular economy approaches (see Box 3) and the central roles that uncertainty and difficulties in financing play in scaling up production. On its current trajectory, supply expansion is likely to be sporadic at best.

Box 3: Technological innovation and policy measures to broaden and thicken recycling markets

In principle, recycling[53] CRM out of technological waste is another way to thicken supply, though there are several hurdles. First, the technical difficulties associated with extracting certain minerals from end-of-life products are substantial. These products are often complex mixes of many different materials, complicating the separation and recovery of individual elements and increasing the cost of doing so. This is further compounded by the low concentrations of valuable materials in these products. Furthermore, the lack of suitable recycling infrastructure and technologies, particularly for electronics and batteries, can inhibit the growth of "urban mining". Commercial viability is another issue, as the costs associated with recycling can often exceed the market price of the recovered materials, particularly given the price volatility of raw materials.

To thicken CRM supply from recycling, governments could work together to route technological waste and raise recycling rates. Regulatory measures could be implemented to promote the design of products that are easier to recycle, known as Design for End-of-Life (DfE), which could significantly increase recovery rates. Additionally, efforts could be made in the recycling infrastructure to route the collection of technological waste domestically and internationally. Ambitious collection targets for electronic waste are necessary to ensure sufficient volumes are created so that the large-scale recycling plants required to recover CRM can be sustained. Furthermore, governments could work to create domestic and international markets for recycled materials, providing more predictable demand that will incentivise investment in recycling operations. Setting minimum prices for recovered materials and offering partial loan guarantees are part of the toolkit available to governments here.

53 Our focus here on recycling should not be read as demoting the potential contribution that circular economy approaches could play in shaping the demand for CRM.

One consequence of these complications is that periodic outbreaks of market disruption are on the cards. Whichever long-term strategies are adopted by governments need to be designed with this disruption in mind and opportunists should not be allowed to capitalise on any short-term shortages, price hikes, and the like. Anyone who is expecting or demanding that markets for critical raw materials unfold over time in a stable manner simply hasn't read enough about the mining industry. This is going to be messy.

Yet the fact that critical raw material will suffer from bouts of market turbulence does not mean that the fundamental forces of supply and demand are not at work, as outlined in chapter 3. These forces exist and can be influenced by policies, in both constructive and disruptive ways. Another lesson from earlier in this report is that market structures are not immutable. As demonstrated in chapter 4, the global distribution of production of Rare Earths now differs from that in 2015. Production concentration is likely to be even lower in five years time, even if it remains high in certain stages of the supply chain (see Box 4).

Box 4: Major processing bottlenecks can be overcome

Extraction and processing are two critical stages in the supply of critical raw materials (CRM). A closer look at the available data suggests that, of the two, in many cases processing is the bigger bottleneck.

The perceived supply challenges in the critical raw material market, particularly in Europe and the U.S., are not always attributable to limited mineral reserves or existing extraction capacity constraints within the mining sector. According to data from the U.S. Geological Survey, the world's reserves of Rare Earth Elements (REEs) were conservatively estimated at 120 million tons in 2019 (Kalvig & Lucht, 2019).[54] At current consumption levels, these reserves would be adequate for several hundred years. Also, recent technological advances in the extraction of aluminium (see Gronholt-Pedersen, 2021, Knudsen et al., 2012), germanium (Ruiz et al., 2018) and gallium (Macías-Macías et al., 2019) suggest that new and more environmentally-friendly sources are on the horizon.

According to estimates of the International Energy Agency, processing of several materials is highly concentrated in a handful of countries (IEA, 2021, p.13). Almost 90 percent of global Rare Earths processing occurs in China and the remainder essentially filled by Malaysian processers. In lithium, the top three processing countries (China, Chile and Argentina) also account for essentially all of global supply, albeit in slightly more even proportions. Similar patterns exist in the processing of nickel and cobalt where more than half of world processing occurs in three jurisdictions (China, Indonesia, Japan, and China, Chile, Japan, respectively).

China's dominance in the processing market for CRM can be attributed to several factors. The Chinese government has made a long-term commitment to support this industry and attendant supply chains, including implementing favourable regulations, generous financing and dedication of state-owned enterprises to develop supply chains both at home and abroad (see e.g. Ericsson et al, 2020). This has helped to create a more predictable environment for the CRM processing industry which, in turn, has attracted more domestic and foreign investment. China's policies have not only supported the mining and processing of CRM but also developed a comprehensive industrial ecosystem. This includes industries that manufacture end products using these materials (such as electronics, electric vehicles, wind turbines etc.) Thus, domestic demand—not only exports which, it turns out, have been controlled for a long time—played a significant role in China's CRM strategy. That country's cost advantages, primarily lower operational and labour costs coupled with traditionally less stringent environmental regulations (though these have tightened recently), have made CRM processing commercially viable.

Successful technology acquisition and development have further bolstered China's position in Rare Earth markets. The technological advance of Chinese mineral extraction and processing is reflected in international patent data. According to Kennedy (2019), only two of every ten Rare Earths-related patents were filed by non-Chinese entities. In a more recent and general study about trends in mining innovation, Daly et al. (2022) also find that almost 80% of mining-related patents were submitted by Chinese companies. The Chinese share of global patent filings took off in the early 2000s, when Chinese researchers went from several hundred annual filings to more than 30,000 recently. These sustained investments in mining technology are a powerful contributor to the current cost advantage of Chinese critical mineral industries.

54 This estimate excludes sizeable resources discoveries in Greenland, and more recently, in Sweden's Kiruna area

Had geopolitics not intruded then there would still have been a necessary conversation to reconcile the security of supply concerns of net-importing nations with the legitimate development aspirations of those nations seeking to capitalise on their significant reserves of critical raw materials. In this report we have tried to take both perspectives seriously. In chapter 5 we deliberately widened the discussion of unilateral policy responses beyond export restrictions on critical raw materials, which the governments of net-importing countries are rightfully concerned about.

Ultimately, the very fact that export control regimes can be changed over night limits the degree to which any government can meaningfully commit to potential downstream investors that there will be a permanent stream of cheap raw materials available. Whatever success Indonesia has had with its export ban on nickel cannot be attributed solely to its export ban, recalling the discussion of this case study in chapter 3. H.L. Mencken put it well: "for every complex problem there is an answer that is clear, simple and wrong."

But the complex problem of how nations blessed with large reserves of in-demand critical raw materials can make the most of them in the decades ahead still needs an answer. The problem doesn't go away by ridiculing export controls, questioning their impact, or reciting multilateral trade rules. Identifying the combinations of public and private sector actions that stand a good chance of modernising the economies of resource-rich nations is urgently needed. If policymakers in those nations are going to eschew export controls they need to be persuaded that more promising and credible policy alternatives exist. And those alternatives are likely to be highly contingent on local factors and history.

Developments over this decade, compounded by the return to more intense geopolitical rivalry, have further complicated the search for solutions to bring long-term supply into balance with growing demand, not least by giving rise to antagonistic narratives that have a tenuous grounding in fact. Just seven years ago, during the German G20 presidency, numerous Western governments fretted about Chinese excess capacity in certain manufacturing sectors and the damage that export surges could do on world markets. In essence, *excess supply* was the problem.

Now critical raw materials are salient, the narrative has changed 180 degrees. The likely *excess demand* for critical raw materials had led some in the West to worry about so-called dependencies on hostile or potentially hostile trading partners. This has led to volte faces on the part of certain Western producers, keen as ever for state support. In October 2020 European Aluminium, an industry association, was complaining about China's capacity to flood world markets with subsidised aluminium and demanding action to restrict imports. By March 2023, that potential excess supply—which logic dictates is useful in meeting growing demand—was characterised by the same association as "an unacceptable vulnerability in today's precarious geopolitical climate."

As argued in chapter 2, rent-seeking is inevitable when governments compile lists of "critical raw materials." For why create such a list if the state does not plan on acting on it? The evidence presented in chapter 5 showed that extensive resort to unilateral trade, investment, and subsidy measures that cover critical raw materials took place before CRM lists were issued. No doubt we can expect more public policy intervention in the years to come.

Public discourse and policymaker pronouncements since the onset of COVID-19 pandemic and following the Russian invasion of Ukraine have cast a long shadow over deliberations on securing supplies of raw and processed materials now deemed critical. Russia is said to have "weaponised" energy supplies to Western Europe in 2022. The poster child for those for whom the glass is half empty about foreign sourcing is China's apparent export ban on Rare Earths to Japan in 2010. As we showed in chapter 4, it turns out that these allegations cannot be supported with United Nations' international trade data. Indeed, there is precious little evidence that China drastically cut Rare Earth exports to any of the G7 nations or to the European Union. Just because a nation can cut off deliveries to a foreign buyer doesn't mean it will do so. The exporter's track record ought to count for something and that is a matter of public record.

To put some meat on the security of supply concerns, we defined in chapter 3 four conditions that must be met before such concerns can be sustained. These conditions reflect the various ways in which supply can be brought back into line with demand and are grounded in economic logic. We deliberately introduced in chapter 3 the notion of a thin market to capture the idea that supply was constrained over a time frame meaningful for policymakers. It was then possible to identify how common commercial and industrial policy interventions thin a market for a critical raw material—and how they can thicken it.

Ultimately, our view is that the identification of every security of supply concern and every thin market should be grounded in fact. As thin markets can arise for multiple reasons—some related to policy, some not—then it is very unlikely that no one diagnosis and no one solution applies to each critical raw material market where there are legitimate causes for concern. A rule of reason—based on economic logic supported by evidence—should be applied to both scale and understand security of supply concerns. One concern we have is that, by lumping together many materials into a single category, some analysts and policymakers may conclude the root causes are the same, the best responses ought to be similar, and that the "problem" is enormous and unprecedented.

We prefer to frame the search for solutions in terms of thick markets precisely because, as the global market for wheat demonstrated last year, an open, transparent and competitive market with a range of suppliers spread across the globe is capable of absorbing unanticipated supply disruptions. The desired end point is, as a practical and conceptual matter, clear. What matters is that policy and corporate strategy induce a market to thicken over time. That is not to say that surges in demand or unanticipated supply reductions cannot happen, but their effects are likely to attenuate over time.

Policy to address real—as opposed to imagined—security of supply concerns should be based on a thick markets approach. This approach starts from the propositions that market structures are not set in stone and that thin markets are the outcome of prevailing private sector incentives (including those related to coordination failures) as well as law and regulation. Thick markets—that is ones that are open to entry, transparent, competitive and where buyers and sellers have little enduring market power—can be built over time by well-crafted, evidence-based policy intervention by governments acting alone and in concert. As to international cooperation on thickening markets for critical materials, recall our discussion of the deficiencies of current transactions-based and inter-governmental accords presented in chapter 6.

As a general rule, when faced between diverting trade and encouraging greater production and variety, the latter is preferable. The solution to securing critical raw materials is neither sole reliance on states, nor on markets, but the judicious blend of both. Given industrial materials differ markedly, no one should be surprised if the optimal blend is decided on a case-by-case basis.

Adopting the principles of the thick markets approach offers a practical way to turn the current narrative of de-risking into a meaningful work programme. Moreover, central to a thick market approach is fostering viable long-term suppliers—which ought to appeal to those governments keen on making the most of their nation's material bounty. Have introduced the notion of thick and thin markets, we now turn to implementation. Specifically, we identify the five facets of an approach that seeks to thicken markets for critical raw materials over time.

Five elements of a Thick Markets Approach

Proper implementation of a thick markets approach to meeting rising long-term demand for critical raw materials requires taking the following five steps, each of which is explained in turn.

1 Scale the challenge properly using a Rule of Reason approach.

2 Expect occasional shortages and market disruption and prepare accordingly.

3 Take steps to progressively thicken markets over time.

4 Eschew public and private sector steps that thin markets.

5 Rebuild trust and discourage opportunism by ratcheting up transparency.

Scaling the challenge

Not every raw or processed industrial material faces security of supply concerns. Nor do the profit margins at the extraction and processing stage of every industrial material support a viable business case. Consequently, governments need logic-based approaches to determine which raw materials to single out as "critical," "strategic," etc.

Fortunately, materials markets are not new, nor are the businesses that operate in them. Technocratic assessment of these markets, attendant risks, the track records of suppliers, the potential for substitution, recycling, and other relevant factors are called for. Claims that a raw material is special should be subject to careful scrutiny in processes shielded as much as possible from lobbying and political interference. Following an evidence-based Rule of Reason approach is likely to lead to a relatively small number of potentially very important raw materials be singled out for special treatment by states.

Evidence from precedent cases as well as technological and geological considerations can be useful in setting appropriate expectations for policymakers. Whether the goal is thickening a regional or global market or nurturing a downstream processing industry, attaining successful outcomes will take time. Market structures are not immutable but that does not mean that production can be scaled up in months, rather than years. Precedents should be chosen carefully—for example, the fact that global production for face masks scaled up markedly by

the third quarter of 2020 should not set the benchmark by which raw material markets are judged.

Expect disruption and prepare accordingly

The potential for unanticipated demand surges and occasional supply lapses, combined with the slow and potentially faltering expansion in upstream and downstream production capacity for raw materials, means that market disruption should still be expected from time to time. Such disruption is likely to take the form of price hikes, shortages, delays in delivery times etc. Even when a thick markets approach is being pursued faithfully, the history of materials and commodities markets points to bouts of market turbulence. This reality has two important implications.

First, where technically possible and viable, governments should establish incentives for the commercial buyers of raw materials to create their own stockpiles. Should such buyers club together to create joint stockpiles then this could be allowed. Of course, the potential for future disruption may also spur the identification and creation of substitutes for the material in question.

Second, a thick markets approach will likely take years for long-term supply capacity to match trend growth in demand on account of the digital and energy transitions. As this approach expands capacity, unanticipated demand surges should be easier to meet. However, private and public sector decisionmakers must appreciate that generating the incentives and the policy credibility to induce big ticket private sector investments will take time. Opportunists offering alternative short-term fixes and other snake oil will no doubt try to capitalise on any market disruption to advance their own agendas. These overtures should be revisited.

Progressively thicken markets

Here it may be useful to distinguish between thickening markets with the current levels of commercial productive capacity and thickening markets over time. Given the demand for certain raw materials is expected to multiply in the decades to come (assuming the energy transition does not grind to a halt), the importance of the latter cannot be stressed enough.

Nevertheless, there are useful steps that can be taken in the near-term to increase supplies available on international markets. One organising principle is to replace quantity restrictions by private sector and public sector actors with price-based measures. Vertical foreclosure by firms should be strongly discouraged; for states viable alternatives—including supplier and downstream producer development programmes—need to be found as credible alternatives to foreclosure.

The goal ultimately is to persuade commercial actors to expand production capacity. In many cases this involves making huge financial outlays with very long payback periods, sometimes reflecting lengthy times-to-market. This is not a new problem. But it is one that needs to be tackled. Policy measures should seek to reduce revenue uncertainty (better accomplished by committing to minimum purchase prices rather than commitments to buy fixed quantities of raw material), taking steps to maximise the total addressable market (ideally by the economies with the largest buying power for raw materials aligning on steps that keep markets open), reducing the amount of capital commercial actors must tie up in a mining or downstream activity, and reducing the risk faced by lenders to commercial actors operating in critical raw material markets (through partial loan guarantees that mean lenders still have enough skin in the game).

Means need to be found to make decades-long commitments, perhaps through international development agencies and banks. It goes without saying incentivising such commercial investment will require a call on the public purse, just as it did when governments sought to kick-start private sector investment in wind farms, solar panels, and other renewable energy projects.

Other longer-term measures include steps to facilitate entry into raw material markets (streamlined permitting processes being a case in point). In addition, international innovation races should be organised to encourage the development of substitutes for those critical raw materials where supply expansion is frustrated or particularly slow, to enhance the efficiency and viability of recycling critical raw materials, to design products in a way that uses fewer critical raw materials, and to foster sustainable and circular economy practices conducive to narrowing the gap between long-term supply and demand (see Box 5).

Eschew steps that thin markets

As argued in chapter 3, both private and public sector acts can reduce the amounts of a raw material that are available for sale on the international market. Thinning upstream markets for raw materials is particularly pernicious as it can also thin the market for downstream processed materials. Eschewing steps to thin markets has implications for the conduct of policies towards exports, competition law and its enforcement (in respect of vertical mergers and restraints), and development policy (in relation to offtake agreements associated with specific transactions).

Box 5: Developing and deploy next generation technologies—Lessons from the international response to COVID-19

The rapid development and production of COVID-19 vaccines show many traits of the thick markets approach. While the demand for COVID-19 vaccines may have been self-evident, certain dynamics inherent in the market for vaccines necessitated government intervention to quickly ramp up market capacity and efficiency. Previous episodes where governments arbitrarily cancelled orders for what turned out to be unneeded vaccines created uncertainty over revenues.

Vaccine development involved significant upfront costs and risks associated with research, clinical trials, and manufacturing. Without some assurance on returns on investment, private entities might hesitate to bear these alone. The upshot would have been less investment in vaccine research, slower vaccine development, and delayed vaccine rollout. Given the trillions of US dollars of lost output worldwide—not to mention the horrific loss of life—the costs of state action were easily exceeded by the cost of inaction.[55]

In addition, tackling the pandemic required vaccines to be produced and distributed at an unprecedented pace and scale, demanding coordinated efforts along supply chains that went beyond the organisational capacities of individual companies. Governments also needed to ensure the affordability and accessibility of vaccines worldwide, a goal that market forces acting alone might not achieve with certain pricing strategies. Lastly, to counter "vaccine nationalism" and to facilitate a more equitable distribution, global cooperation, facilitated by governments and international organisations, played an important part. Thus, although the demand for COVID-19 vaccines was self-evident, it paid for certain governments to de-risk investments along the value chain from vaccine origination to manufacturing, fill and finish, and distribution.

Government programmes created to support rapid COVID-19 vaccine development offer lessons from thickening markets for critical minerals. The most prominent was the United States' Operation Warp Speed (OWS) but several other governments devised related programmes. The UK government set up a Vaccine Taskforce with the aim of driving the development and manufacturing of a COVID-19 vaccine. The German government's Special COVID-19 Initiative invested heavily in vaccine developers such as BioNTech. Chinese authorities provided support to several Chinese companies developing COVID-19 vaccines, including Sinovac and Sinopharm, as part of a national effort to combat the virus. The European Commission negotiated and funded Advance Purchase Agreements with vaccine manufacturers on behalf of EU Member States. Moreover, while not government-led and predating the COVID pandemic, the Coalition for Epidemic Preparedness Innovations (CEPI) is a global partnership between public, private, philanthropic, and civil society organisations that was set up to develop vaccines to stop future epidemics. CEPI played a crucial role in the global COVID-19 response by co-leading COVAX, the vaccines pillar of the Access to COVID-19 Tools (ACT) Accelerator, alongside Gavi and the World Health Organization.

Lessons from initiatives like Operation Warp Speed (OWS) in the U.S., Germany's Special COVID-19 Initiative, the UK's Vaccine Taskforce, China's Vaccine Development Effort, and the European Union's Joint Procurement Agreement can be applied in the following way as governments encourage the development and deployment next generation of technology that can thicken critical minerals markets.

1. Public-Private Partnerships reinforce the incentive to innovate: As seen in OWS and Germany's support of BioNTech, public-private partnerships can be pivotal in achieving complex solutions. Governments could create similar partnerships with private sector entities in the critical materials market to accelerate R&D, build processing facilities, and tackle other barriers to expansion.
2. Reevaluate Barriers to Entry: Although the time taken and costs expended in securing permits to establish and expand mines and processing facilities receives attention, the general point is that compliance with many regulatory procedures and uncertainty about their implementation influence decisions to enter CRM markets. Delays lengthen financial pay-back periods and other metrics that determine commercial viability and uncertainty curtains investment. With interest rate normalisation, firms in all sectors are going to be held to a higher standard of performance than during the era of Quantitative Easing. Firms operating in the market for CRM will be no exception.

55 It is possible to view the calculus for the transition to a low-carbon economy in a similar light.

Box 5 (contd.)

3. Advance Market Commitments: Just as the U.S. and European Union provided advance market commitments for COVID-19 vaccines, promising to buy a certain number once successfully developed, similar commitments could be used in the critical materials market. This provides a degree of revenue certainty for CRM producers as much as it did for vaccine manufacturers. Governments or consortiums of firms could provide advance commitments to purchase processed critical materials from new market entrants, providing them with a tangible revenue stream to compete for.
4. Regulatory Facilitation: Expedited regulatory review processes, as demonstrated in vaccine development initiatives globally, can also be employed in critical materials markets. Governments could streamline regulatory processes for new entrants in the critical materials processing market, reducing bureaucratic delays while ensuring adherence to environmental and safety standards.
5. Global Collaboration: The Coalition for Epidemic Preparedness Innovations (CEPI) is a testament to the power of global collaboration. Similar international efforts could be pursued for critical materials and could include organising tournaments to overcome technological bottlenecks, promoting transparency that de-risks both new investment and foreign sourcing (which, in many cases, supports market diversification), and identifying better practices that attain environmental and other regulatory goals without jeopardising the viability of business models.

By incorporating these strategies, governments can play a significant role in creating open, competitive and thicker critical materials markets. As with vaccine development, since critical materials differ considerable, strategy needs to be developed to take account of the specificities of each CRM.

The point here is not to encourage blanket bans of each practice that thins a market. Rather it is to call for (a) compelling offsetting evidence of benefits of any such practice, (b) for identification and consideration of alternative actions that attain the same outcome as the practice that thins the market but with less disruption to that market and, in the absence of a viable alternative action, for (c) for design of the practice in such a way as to minimise the reduction of supply to the international market.

International organisations, business associations, and others could develop lists of the pros and cons of alternative corporate and public sector practices that seek to attain the same goal. For example, there may be alternative ways to assure potential investors in downstream processing capacity that there will be affordable, reliable supplies of raw materials than to ban upstream exports. Governments and companies should be presented with menus of alternatives to crude steps that thin markets.

Cross-border acquisitions of mines, other extraction facilities, and downstream processing facilities—past and present—would face scrutiny in so far as they involve excessive commitments to exclusive supply arrangements. Long-term supply contracts would be unwound and replaced by sufficiently generous state-determined minimum price commitments. In this manner transaction-specific steps that thin markets would be replaced by measures that increase the incentive market-wide for entry.

Ratchet up transparency

Governments don't tend to give each other and the private sector the benefit of the doubt in an era of intensifying geopolitical rivalry and after recent bouts of international supply chain disruption. Accusations fly, folklore gets established—well before the facts of the matter come to light, if they come to light ever. Tarnished reputations can take a long time to recover.

The challenge before us—namely, expanding the supply of raw materials necessary to slow down or halt the rise of global temperatures and to capitalise on the digital transformations of our societies—is of a long-term nature. Commercial enterprises need to be induced to major massive investments in a sustained fashion for years to come. Expecting that to happen when policy is made in a factual vacuum and when suspicion is rife is naïve. Uncertainty is the enemy of long-term investment. Of course, governments will compete and tensions between states will break out from time to time. But clashes should be reserved for cases when foul play can actually be established. No one needs unnecessary fights. When it comes to critical raw materials, this requires a radical revision in the approach taken to both policy and corporate transparency.

For those raw materials deemed critical to many of the world's largest economies a centralised registry of policy intervention, long-term (not spot) contracts, offtake agreements, and any other practice that thins or thickens markets needs to be made public. So as to alleviate concerns about indirect sources of control,

ultimate corporate ownership of mining and processing facilities need to be established. Firms, in particular firms headquartered in the poles of the world economy, should be encouraged to supply credible, verifiable evidence of their track record of delivering to customers, in particular foreign buyers. In this way some of the concerns about a firm's "nationality" and its likelihood of being swayed by the government of nation where its headquartered is located may be assuaged.

WHAT'S NEW IN THE GLOBAL TRADE ALERT DATABASE?

The Global Trade Alert (GTA) team continues to be active all along our supply chain. In the first half of 2023 a total of 4,121 reports on commercial policy intervention were published. This takes the total number of published records of trade and industrial policy change in the GTA database to over 55,000. Indeed, we have published over 30,000 records of commercial policy changes since 1 January 2020, which gives a sense as to how active the team has been during the COVID-19 pandemic era and beyond. At this time, our database has information on policy changes by 196 customs territories. For 48 of those territories we have published over 500 reports of their commercial policy changes on each of them.

In terms of measures published this year, they are dominated by subsidies to local firms and to firms engaged in exports or acquisition of foreign commercial assets. A total of 362 import tariff changes have been recorded this year as well. With respect to the customs territories most often affected by measures recorded this year the top 10 are (from most to less often affected) Italy, France, Republic of Korea, Japan, Canada, Chinese Taipei, Spain, Thailand, India, and Vietnam.

While the GTA team produces reports and thought leadership pieces (sometimes in collaboration with others), we supply a huge amount of data each month to users around the world. In fact, since the beginning of 2023 ten thousand excel files of data have been downloaded from the GTA website. At this time between 18000-19000 unique users visit the GTA website over a 28 day period.

In May 2023 we released two new datasets. The first was an update of our inventory of corporate subsidies, first launched with our 28th GTA report. The second version of this inventory contained information on 31,116 subsidy awards or policy changes that were implemented by 57 customs territories since November 2008. Over 99.25% of the entries in this corporate subsidy inventory were based on official documentation or announcements by public bodies or from legally mandated disclosures by publicly listed companies.

In May we also made available a Market Access database that summarises the degree to which a nation's total imports of goods face either policies that liberalise trade or that restrict or distort trade. Given that market access is one of the key negotiating currencies in international trade negotiations and deliberations, we hope that this dataset starts to inform assessments of the openness of national economies to goods trade and of negotiating priorities.

In collaboration with sponsors, we expanded our monitoring initiative on trade policy developments relating to Essential Goods to include recording the stated motive of commercial policy information. The latter may reveal something about how governments are framing the actions they actually take—as opposed to the general rhetoric about trade policy during an era of intensifying geopolitical rivalry. To date, two quarterly summarises of commercial policy developments in the Essential Goods have been prepared and disseminated.

The GTA team engages in a lot of outreach activities and engagement with interested third parties. Significant lengths were taken to disseminate our 30th GTA report, on the contribution of trade and industrial policy to attaining the Sustainable Development Goals articulated in the United Nations' Agenda 2030. The highlight of that outreach was a webinar on the report organised by the WTO Secretariat. We were honoured that the Director-General opened that webinar.

Other welcome developments relating to outreach include an even stronger social media presence and the participation of more experienced GTA members in engagement with interested stakeholders. It is our intention to keep finding and securing opportunities for our team members to showcase their policy expertise.

The Global Trade Alert is one of the initiatives undertaken under the auspices of the St. Gallen Endowment for Prosperity Through Trade. That Endowment is a non-profit spinoff from the University of St. Gallen. Further information about the Endowment and its mission can be found here.

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The Global Trade Alert's Monitoring team is led by Ana Elena Sancho, who is supported by Josse Jakobsen. The team comprises of the following trade policy analysts: Fandi Achmad, Anttoni Asikainen, Fiama Angeles Bonelli, Callum Campbell, Diana Dus, Andrey Eydlin, Halit Harput, Chintan Jadwani, Sangwani Mkandawire, Lucas Miaihles, and Marius Risse. The addition of semi-structured lists of relevant unilateral policy intervention to our database was undertaken by Álvaro Rodríguez Pardo and Varinia González Zúniga.

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Once again our trusted report production partner, Anil Shamdasani, wove together the elements of this report into the professional document that is before you. Lawrence Reddy and Anttoni Asikainen prepared and executed the outreach campaign for this report under the supervision of Josse Jakobsen.

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Simon J. Evenett

Founder, St. Gallen Endowment for Prosperity Through Trade

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HOLDING THEIR FEET TO THE FIRE: THE TRACK RECORD OF EACH G20 MEMBER

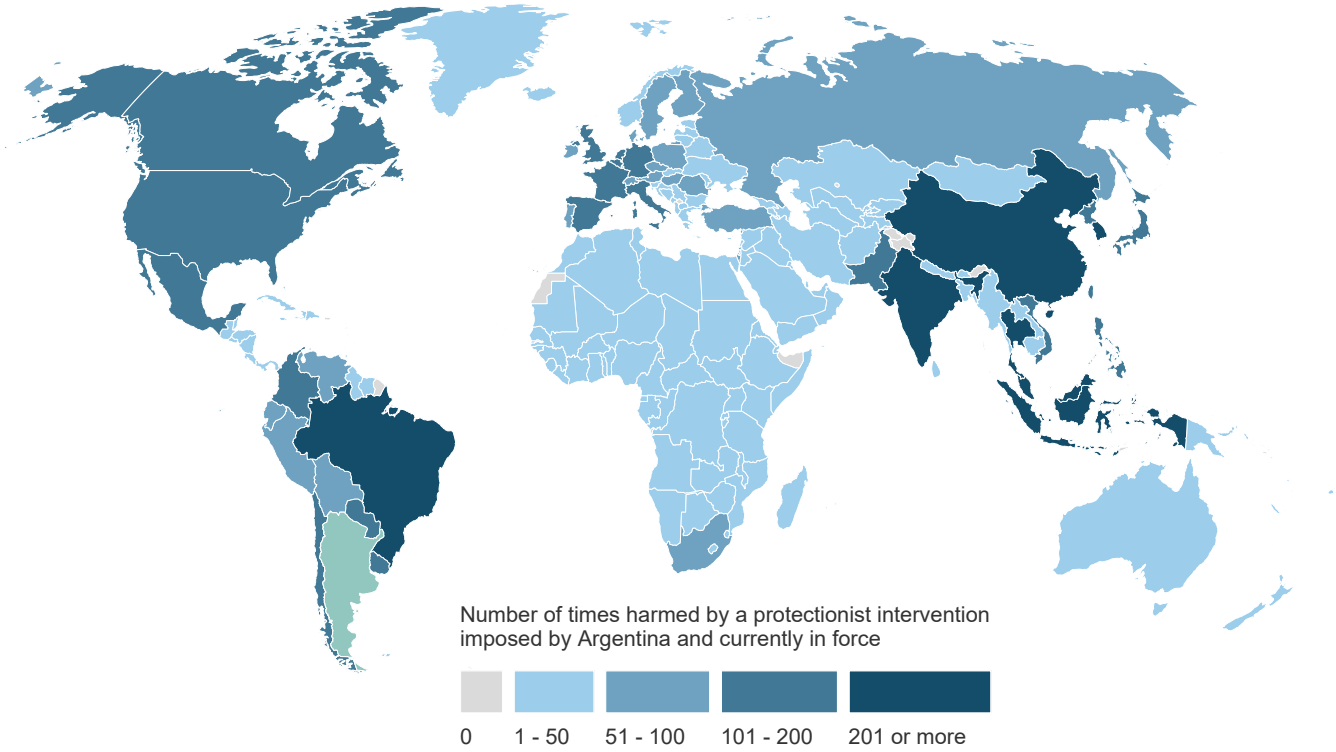
ARGENTINA

What is at stake for Argentina's goods exporters?

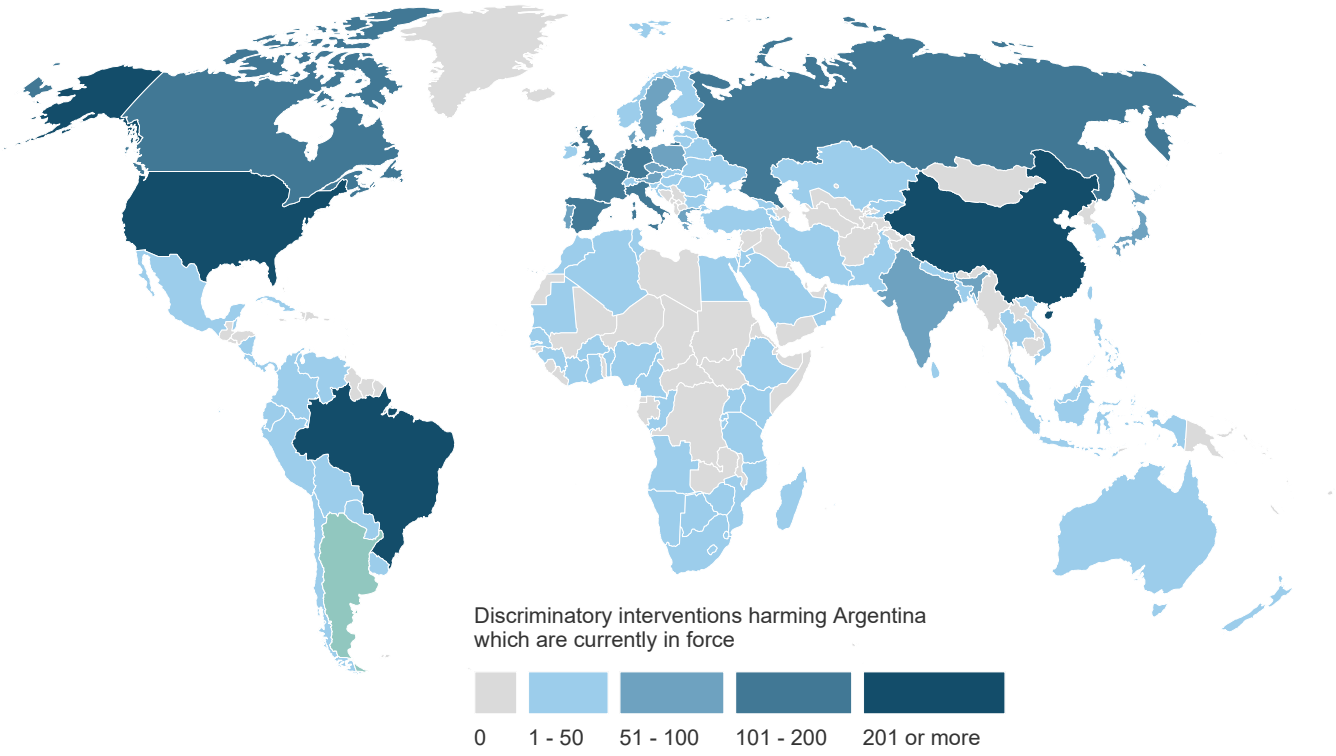
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	21.29	42.25	52.38	61.28	67.21	72.28	72.66	75.60	78.45	77.12	78.24	78.48	76.76	77.02	77.27
D	Contingent trade-protective measures	0.32	0.35	0.36	0.07	0.29	0.42	0.42	0.41	0.40	0.45	0.47	0.53	1.43	1.23	0.97
E	Non-automatic licensing, quotas etc.	4.50	4.89	7.26	12.54	12.35	13.01	13.11	13.30	14.00	14.22	14.32	14.44	14.39	15.26	15.61
F	Price-control measures, including additional taxes and charges	0.17	0.17	1.21	3.56	0.41	3.46	4.97	5.71	5.71	7.11	7.24	7.24	7.24	7.24	7.25
G	Finance measures	0.27	1.32	1.66	1.66	1.66	1.66	1.67	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68
I	Trade-related investment measures	0.26	0.75	1.22	3.32	2.96	4.63	5.54	6.22	5.71	2.76	2.67	3.15	3.87	3.89	3.89
L	Subsidies (excl. export subsidies)	8.98	13.64	14.12	15.74	22.43	32.16	39.23	34.75	41.51	41.78	44.65	44.82	43.41	44.51	45.21
M	Government procurement restrictions	0.26	0.31	0.27	0.79	1.87	2.59	2.83	1.39	1.46	1.59	1.85	1.71	1.84	1.96	2.00
P	Export-related measures (incl. subsidies)	8.65	29.38	43.57	50.95	56.25	62.15	62.38	66.14	67.54	65.75	68.74	68.92	67.88	67.68	68.00
	Tariff measures	1.27	1.40	2.26	5.73	10.70	9.87	10.71	10.79	12.69	12.40	13.35	15.52	16.89	16.93	16.92
	Instrument unclear	0.05	0.09	0.10	0.39	0.33	0.46	1.12	1.29	1.29	1.33	1.36	1.36	1.36	1.36	1.37

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY ARGENTINA'S DISCRIMINATORY INTERVENTIONS

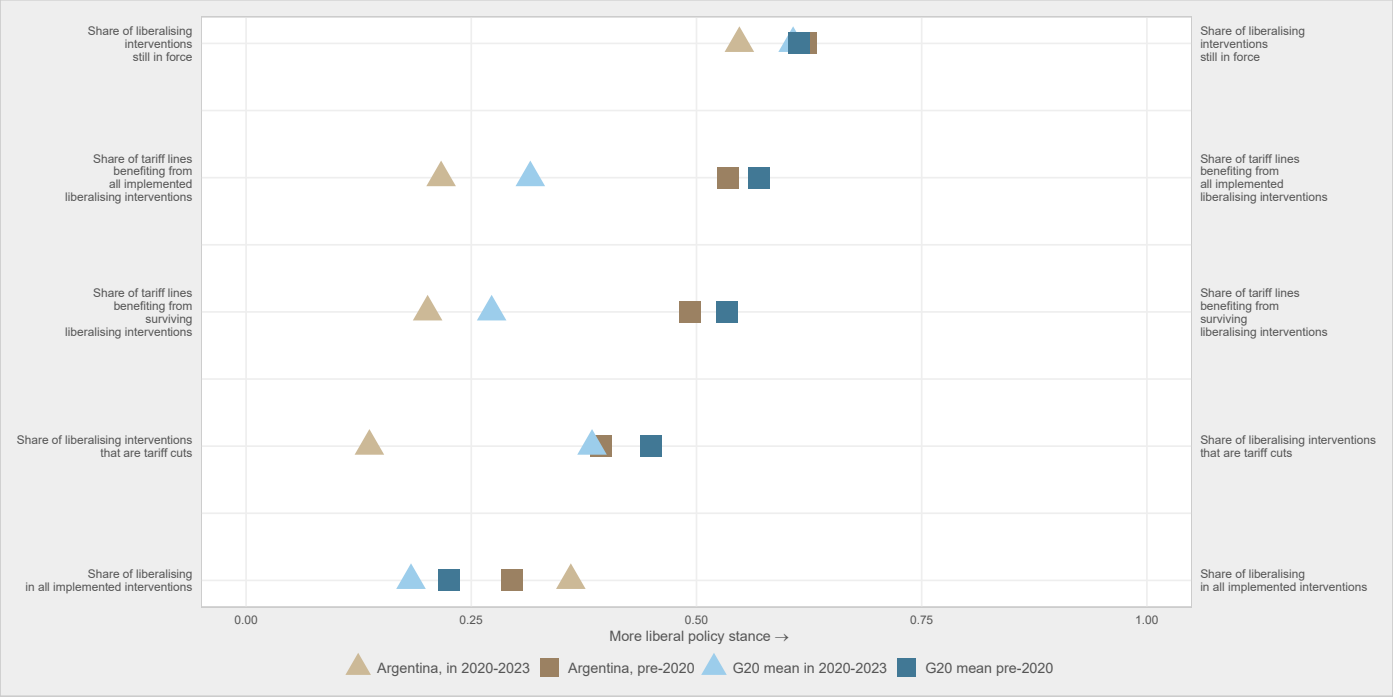


DISCRIMINATORY INTERVENTIONS HARMING ARGENTINA'S INTERESTS



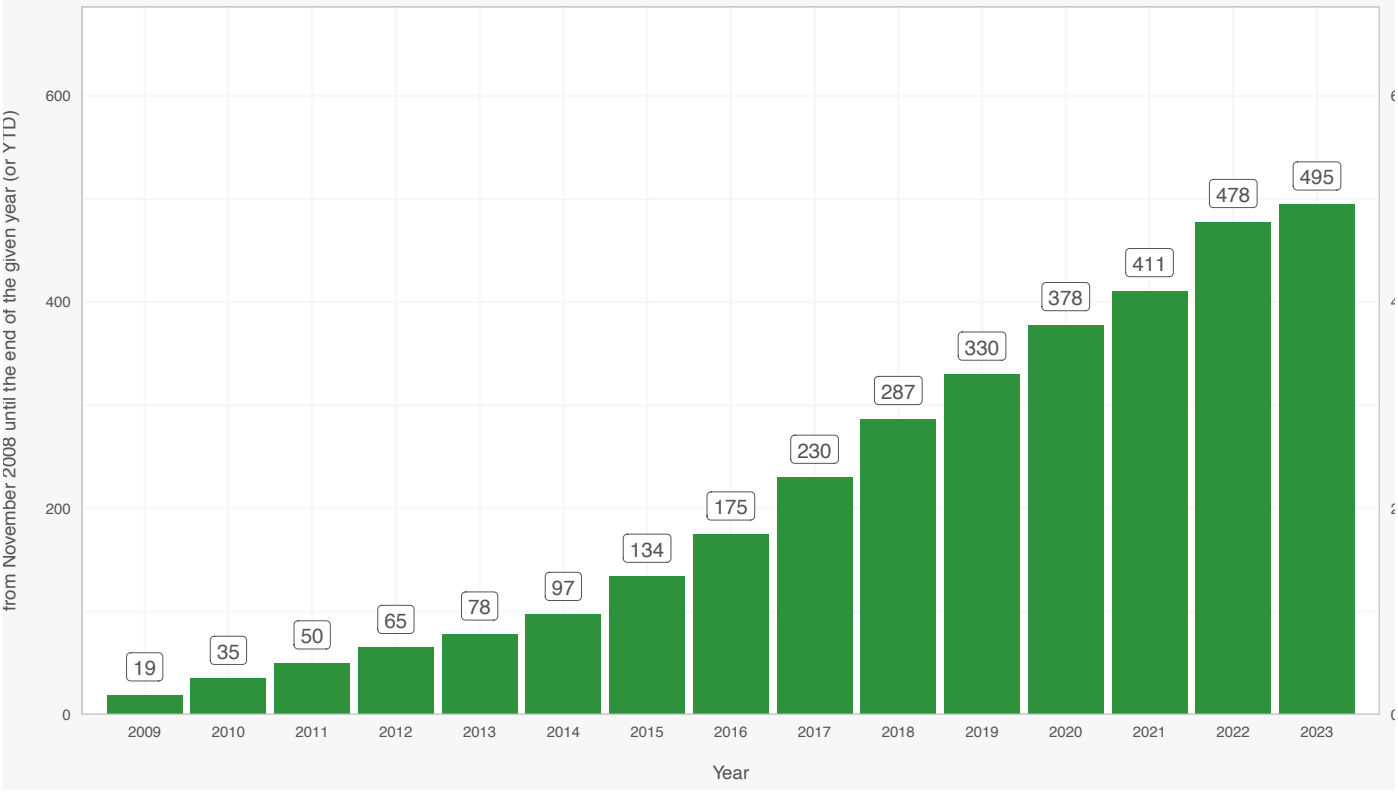
ARGENTINA

Track record of liberalisation



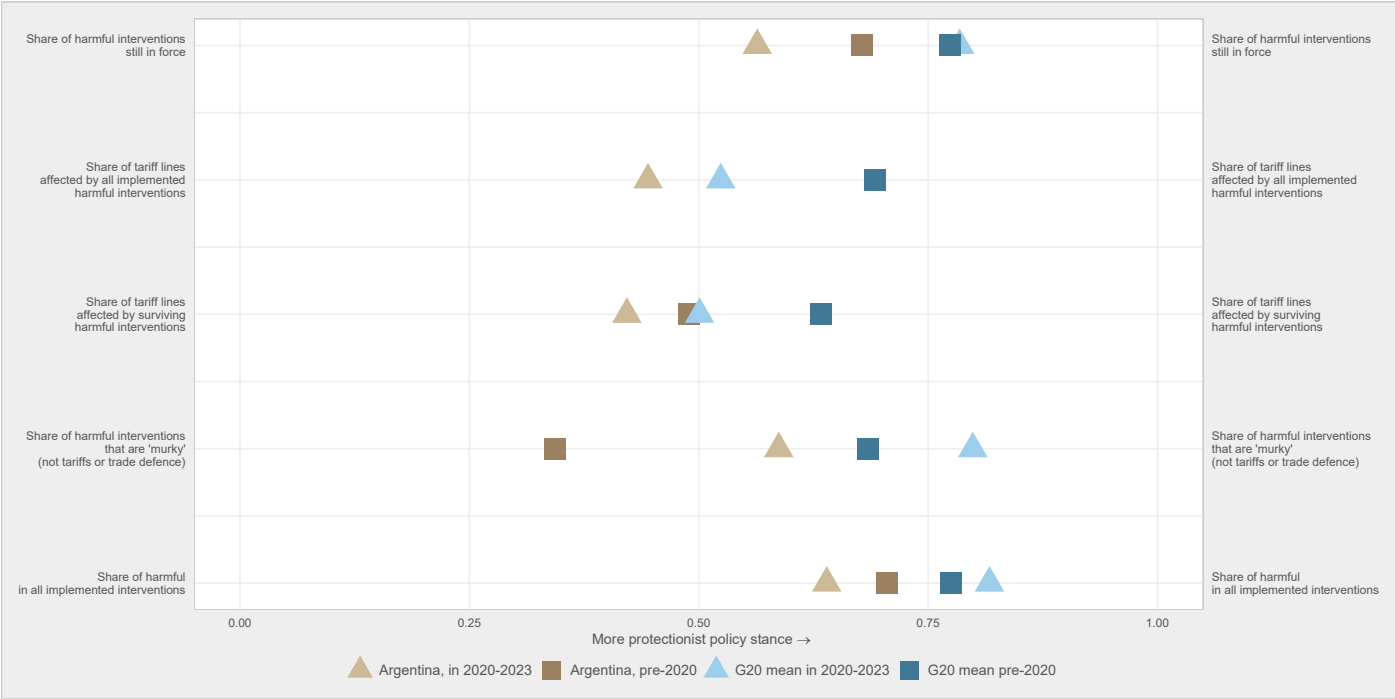
ARGENTINA

Number of liberalising interventions imposed since November 2008



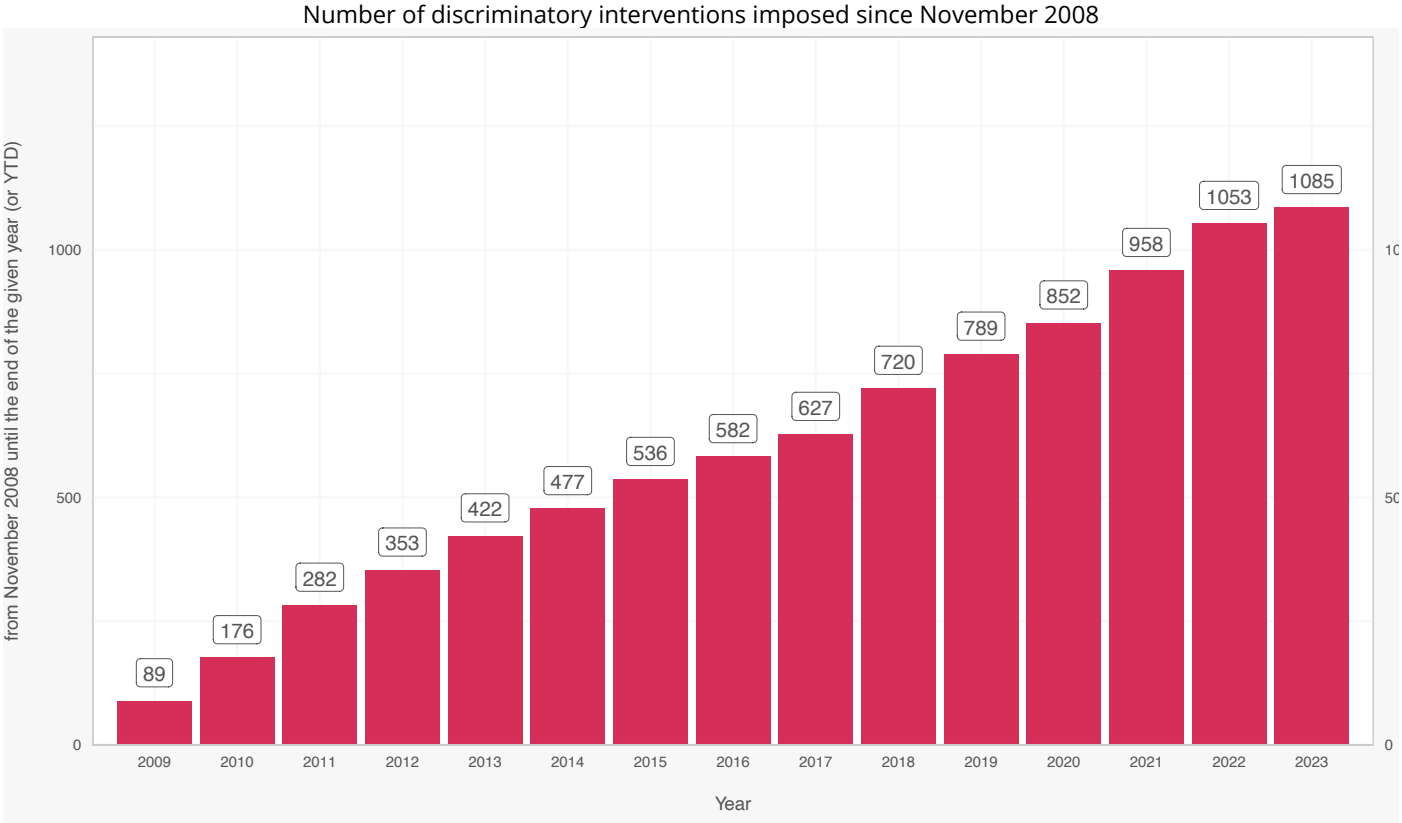
ARGENTINA

Track record of protectionism



ARGENTINA

Number of discriminatory interventions imposed since November 2008



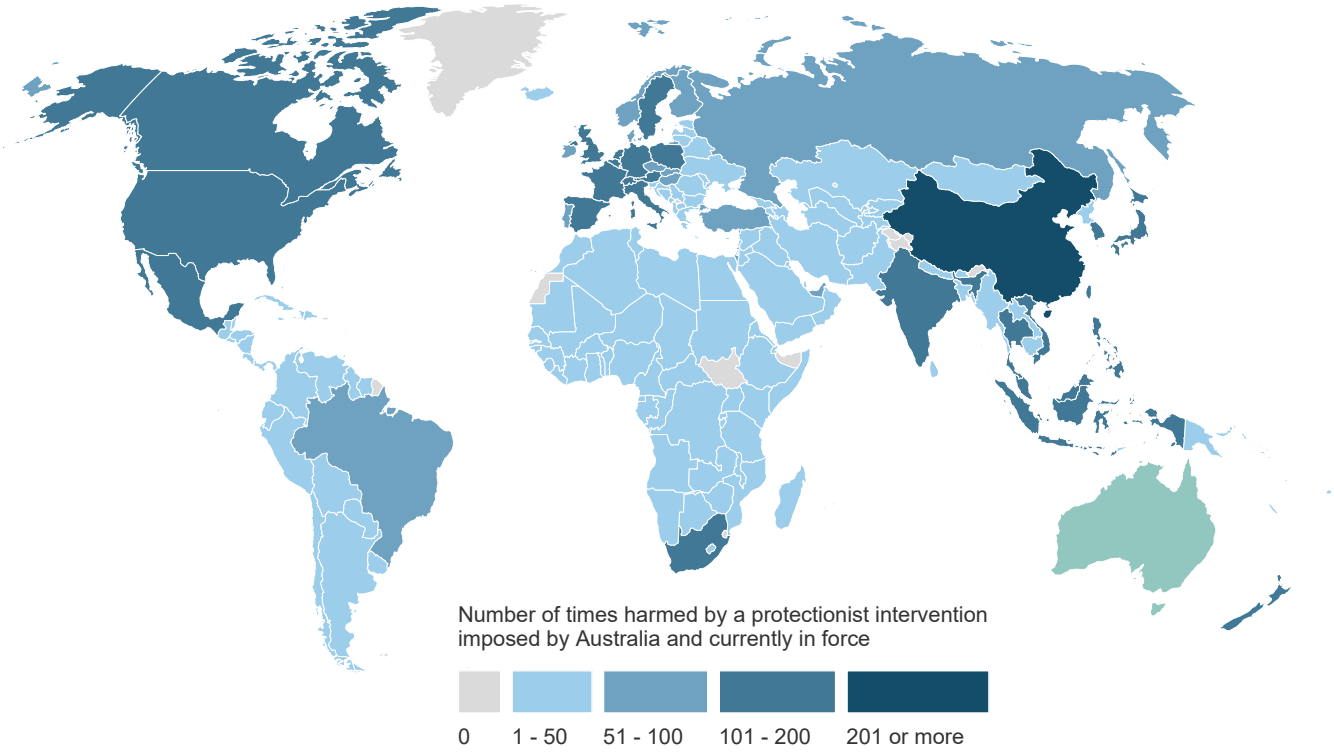
AUSTRALIA

What is at stake for Australia's goods exporters?

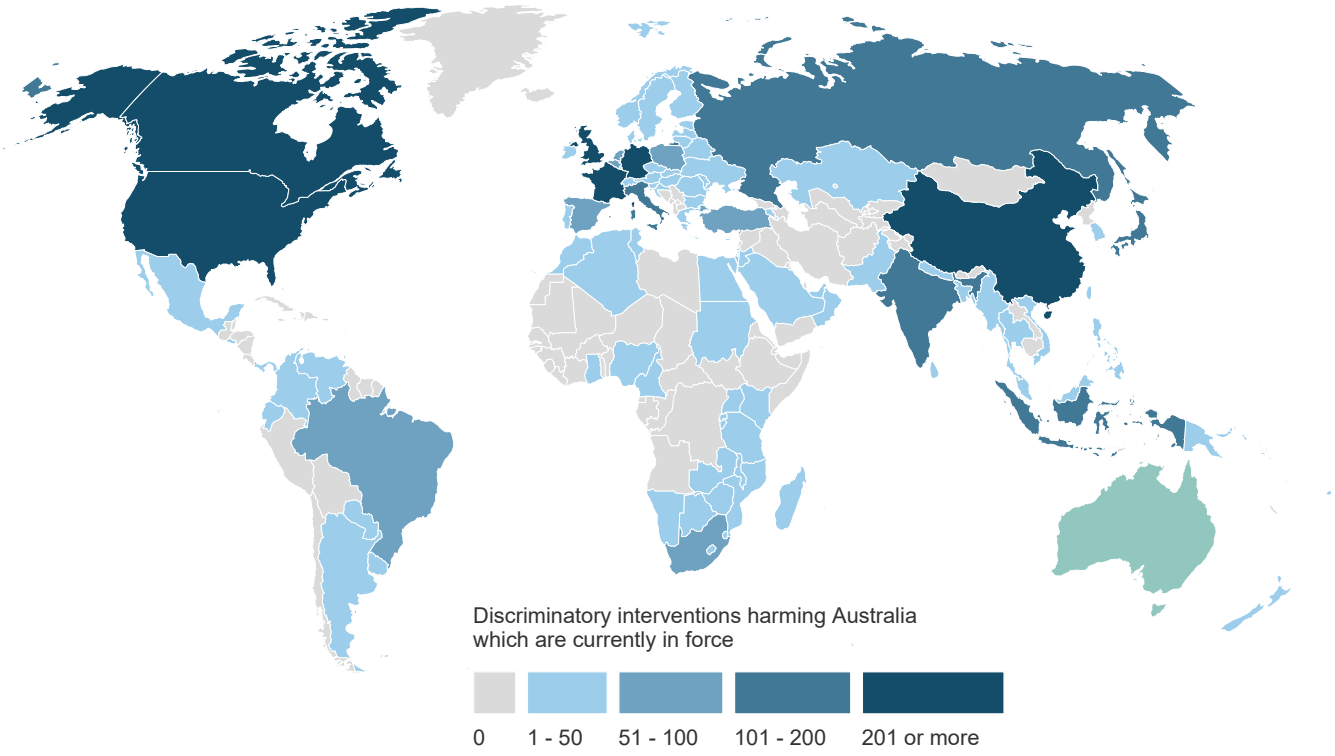
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	22.54	30.61	41.00	45.35	53.98	58.90	59.68	61.09	62.90	66.30	71.65	79.97	78.66	78.83	77.78
D	Contingent trade-protective measures	0.06	0.04	0.04	0.04	0.06	0.09	0.13	0.26	0.35	0.37	0.37	0.42	0.46	0.46	0.46
E	Non-automatic licensing, quotas etc.	11.52	12.22	12.98	14.02	14.85	14.94	15.29	15.36	15.61	15.75	15.81	16.77	16.81	17.73	17.65
F	Price-control measures, including additional taxes and charges	8.63	8.63	8.67	8.70	8.69	9.61	10.52	10.53	10.53	13.90	14.26	14.36	14.48	14.54	16.36
G	Finance measures	0.06	0.28	0.66	0.66	0.66	0.66	1.02	1.14	1.14	1.14	1.15	1.14	1.14	1.16	1.15
I	Trade-related investment measures	0.03	0.39	0.40	0.42	0.42	0.59	0.63	0.64	0.65	0.65	0.55	0.45	0.46	0.47	0.62
L	Subsidies (excl. export subsidies)	3.42	4.83	13.56	14.70	21.96	24.83	25.17	25.51	25.80	27.39	31.59	30.46	29.23	31.06	34.53
M	Government procurement restrictions	0.55	0.60	0.40	0.52	0.61	0.72	0.78	0.80	0.93	1.48	2.37	2.01	2.19	2.58	2.67
P	Export-related measures (incl. subsidies)	11.87	22.76	32.88	36.49	38.55	38.55	38.94	41.45	43.56	45.44	55.07	68.12	67.34	66.75	65.46
	Tariff measures	0.29	1.32	1.42	2.01	4.47	6.12	7.00	7.31	8.08	9.15	9.10	10.16	10.60	10.69	10.75
	Instrument unclear	0.19	0.37	0.38	0.90	2.30	3.01	1.20	1.15	1.51	2.24	2.37	2.40	2.65	2.86	2.87

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY AUSTRALIA'S DISCRIMINATORY INTERVENTIONS

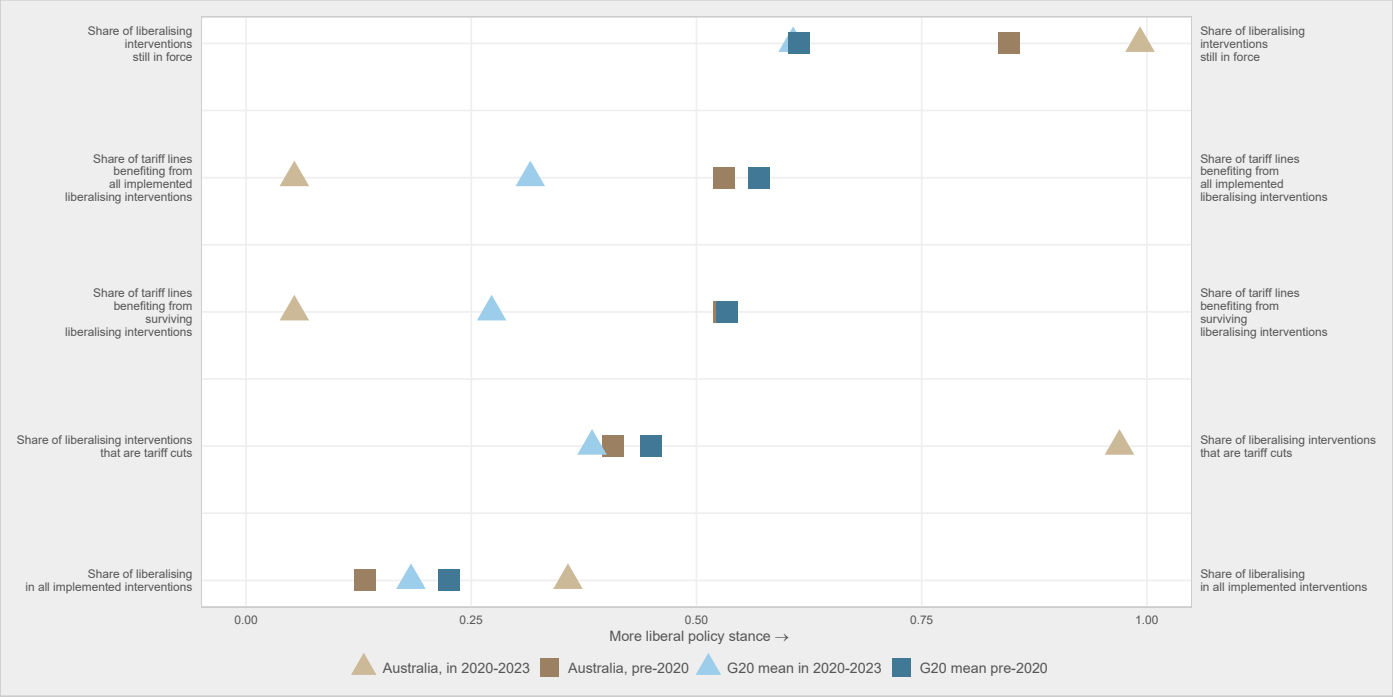


DISCRIMINATORY INTERVENTIONS HARMING AUSTRALIA'S INTERESTS



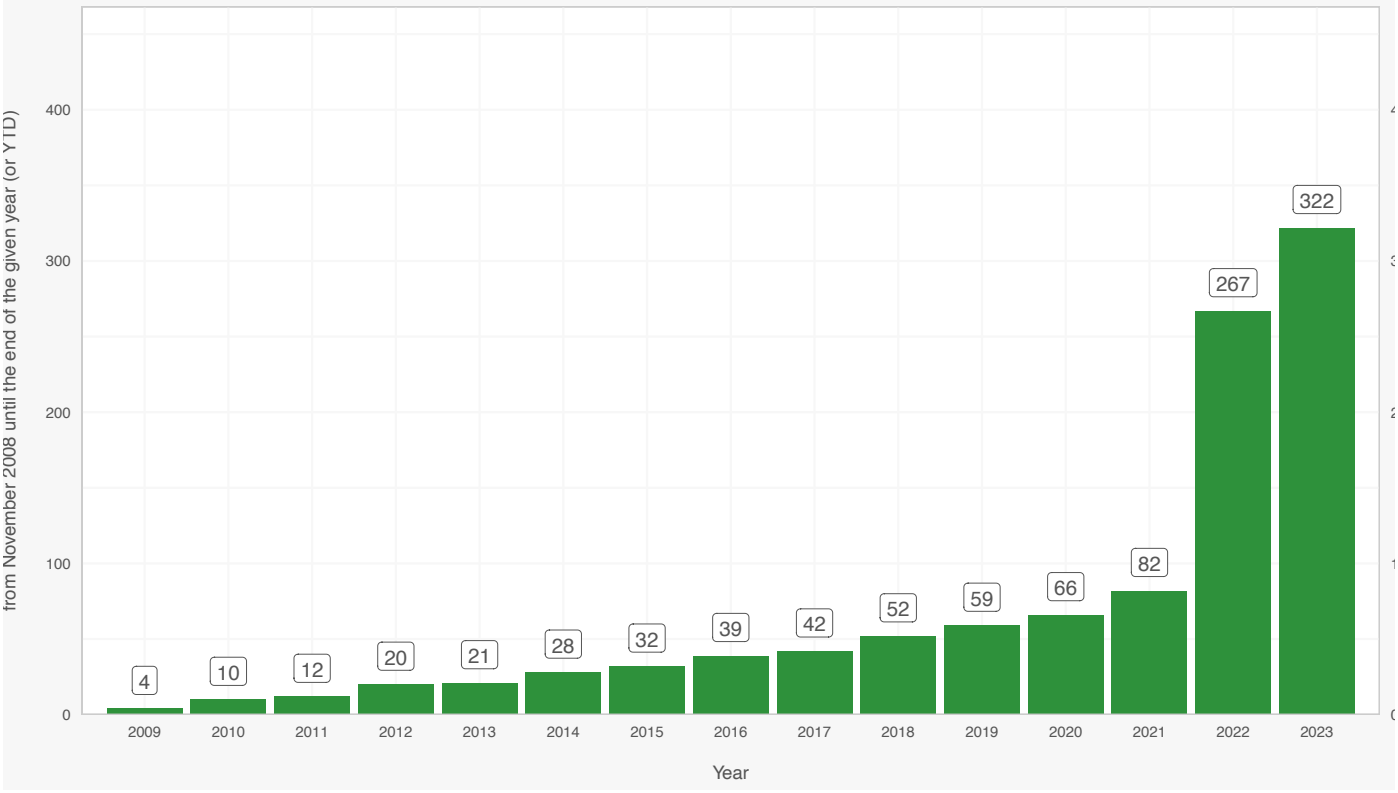
AUSTRALIA

Track record of liberalisation



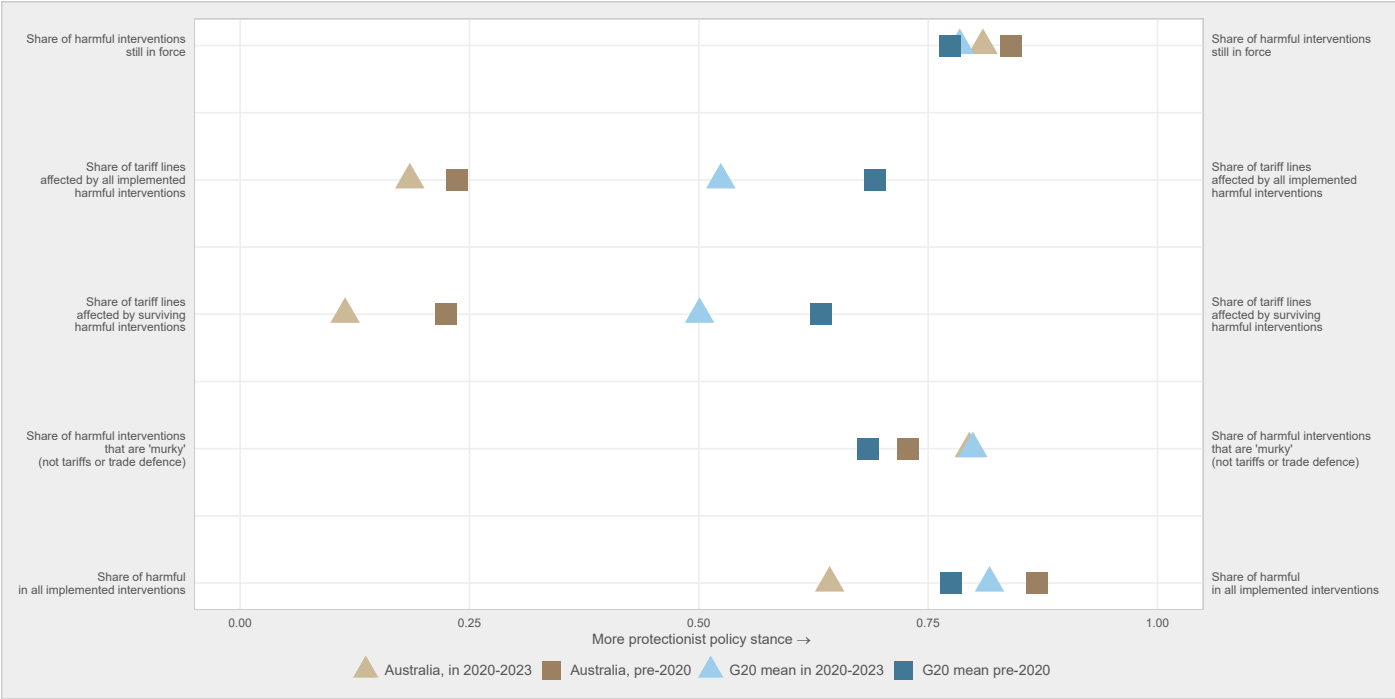
AUSTRALIA

Number of liberalising interventions imposed since November 2008



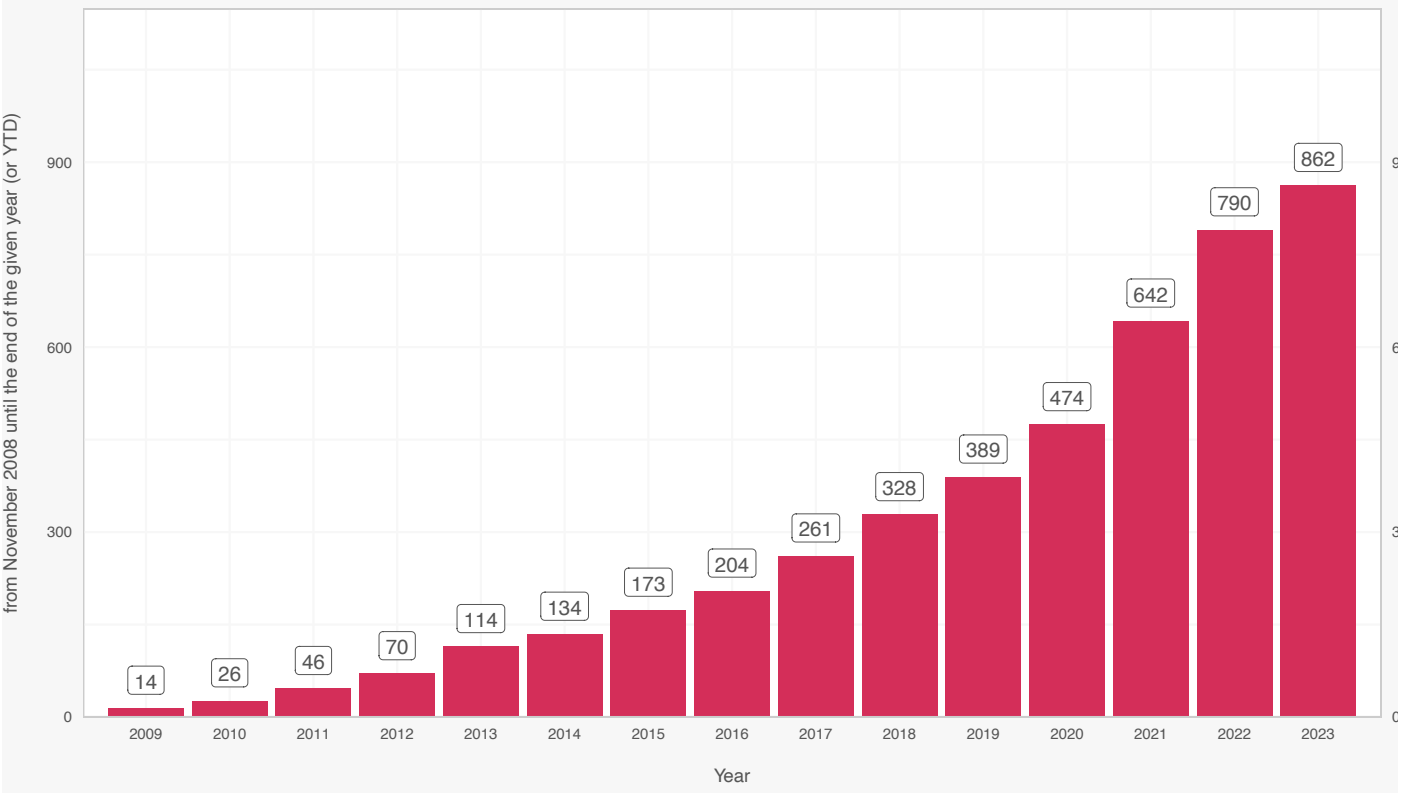
AUSTRALIA

Track record of protectionism



AUSTRALIA

Number of discriminatory interventions imposed since November 2008



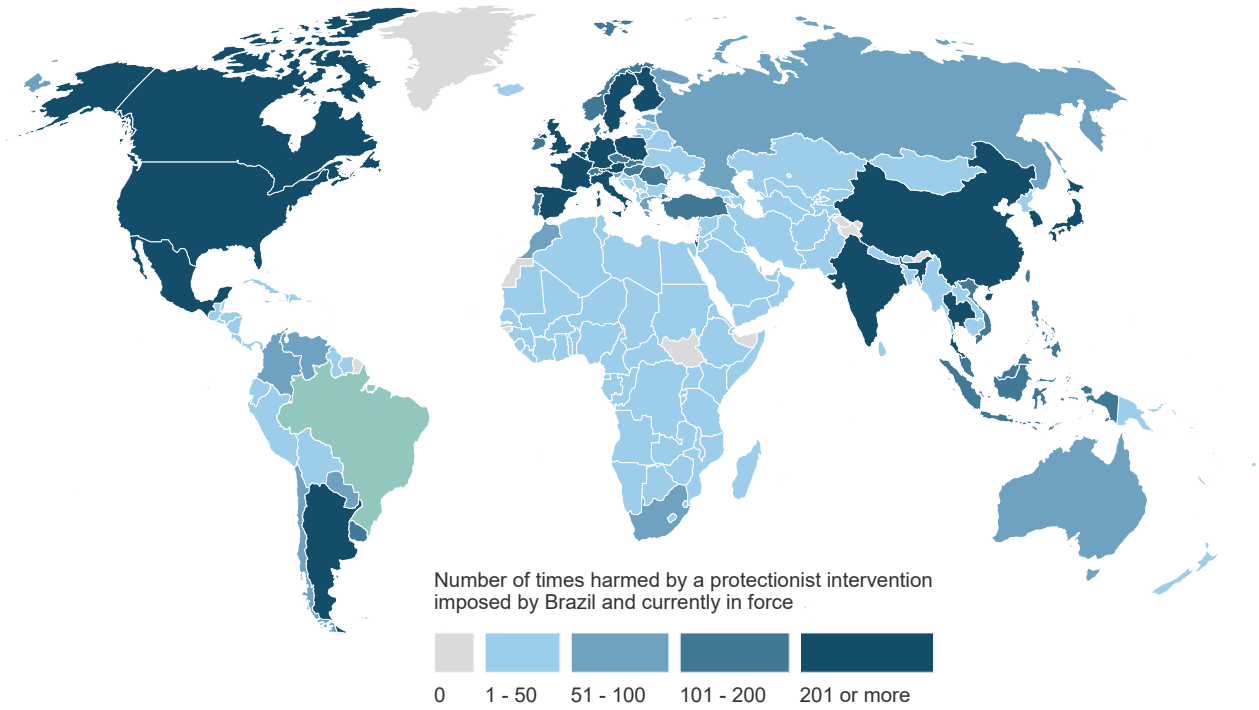
BRAZIL

What is at stake for Brazil's goods exporters?

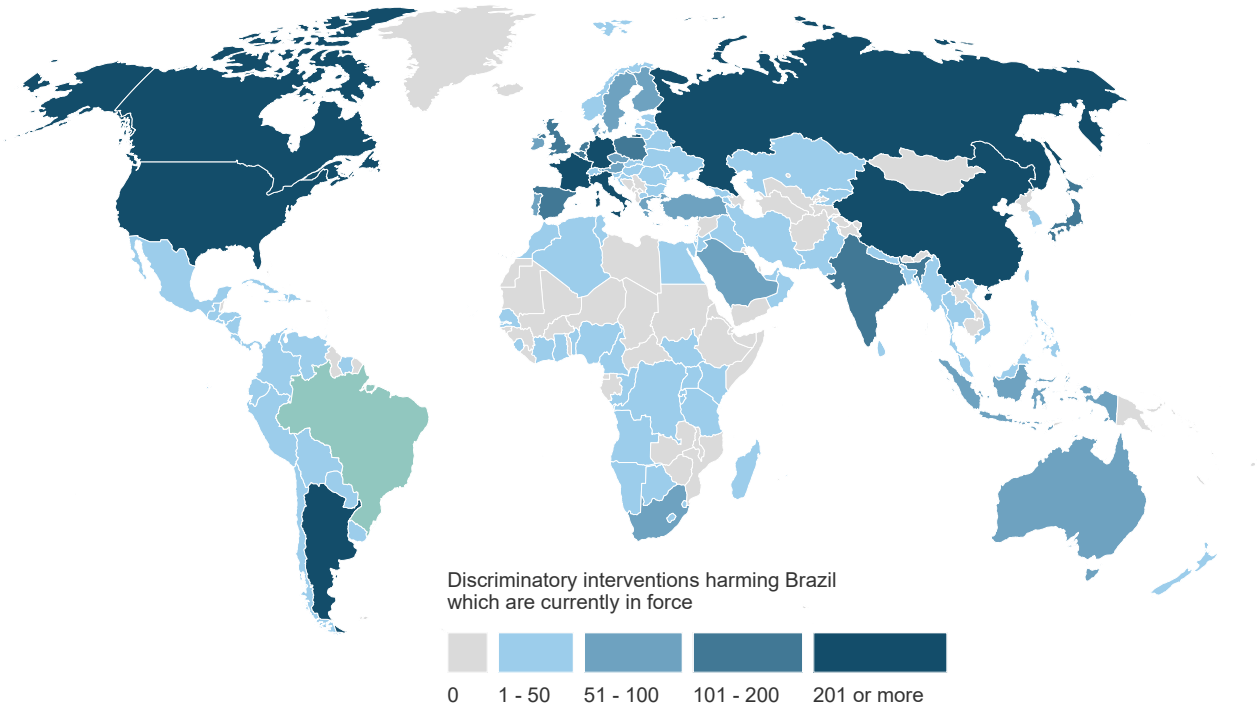
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	36.97	50.87	53.10	60.82	71.17	73.91	74.32	74.23	75.21	76.96	80.42	82.36	80.71	81.06	80.65
D	Contingent trade-protective measures	0.04	0.09	0.17	0.26	0.29	0.31	0.45	0.52	0.63	0.95	1.16	1.34	1.68	1.63	1.40
E	Non-automatic licensing, quotas etc.	7.74	8.81	12.56	17.74	19.28	19.46	18.74	15.88	16.88	16.69	16.74	18.67	18.86	19.47	19.74
F	Price-control measures, including additional taxes and charges	4.58	4.60	4.61	4.63	4.63	4.63	4.64	4.64	4.64	5.03	5.23	12.26	12.26	12.21	12.67
G	Finance measures	0.49	1.53	1.61	1.61	1.61	1.61	1.65	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67
I	Trade-related investment measures	0.63	2.55	3.54	4.02	4.03	4.10	5.00	5.67	5.68	5.77	5.65	5.64	5.73	5.80	5.83
L	Subsidies (excl. export subsidies)	7.15	17.76	21.82	23.60	36.81	44.33	46.87	45.55	48.54	48.69	49.17	50.16	49.37	50.84	51.70
M	Government procurement restrictions	2.64	2.66	2.21	3.48	4.91	5.92	6.62	6.95	7.39	7.47	7.78	7.83	8.42	9.48	9.70
P	Export-related measures (incl. subsidies)	25.36	36.58	41.37	45.31	51.48	51.35	51.67	56.66	57.88	59.63	67.36	68.15	65.87	65.48	65.05
	Tariff measures	1.56	2.00	2.76	6.01	10.77	11.14	11.72	12.60	14.68	16.00	16.48	18.32	18.33	18.43	18.56
	Instrument unclear	0.02	1.36	1.50	1.54	3.78	4.41	5.97	6.14	5.83	5.36	5.43	5.43	5.43	5.48	5.62

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY BRAZIL'S DISCRIMINATORY INTERVENTIONS



DISCRIMINATORY INTERVENTIONS HARMING BRAZIL'S INTERESTS

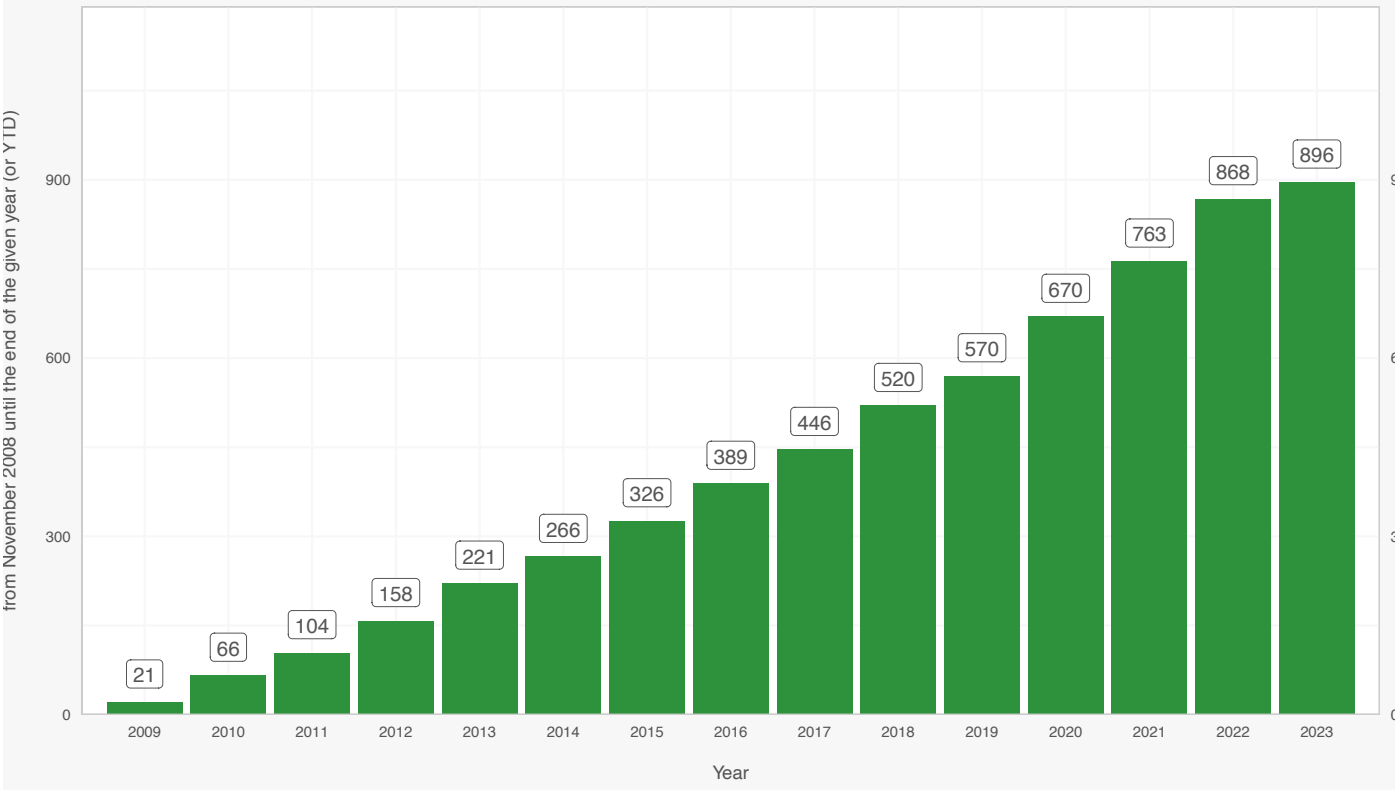


BRAZIL

Track record of liberalisation

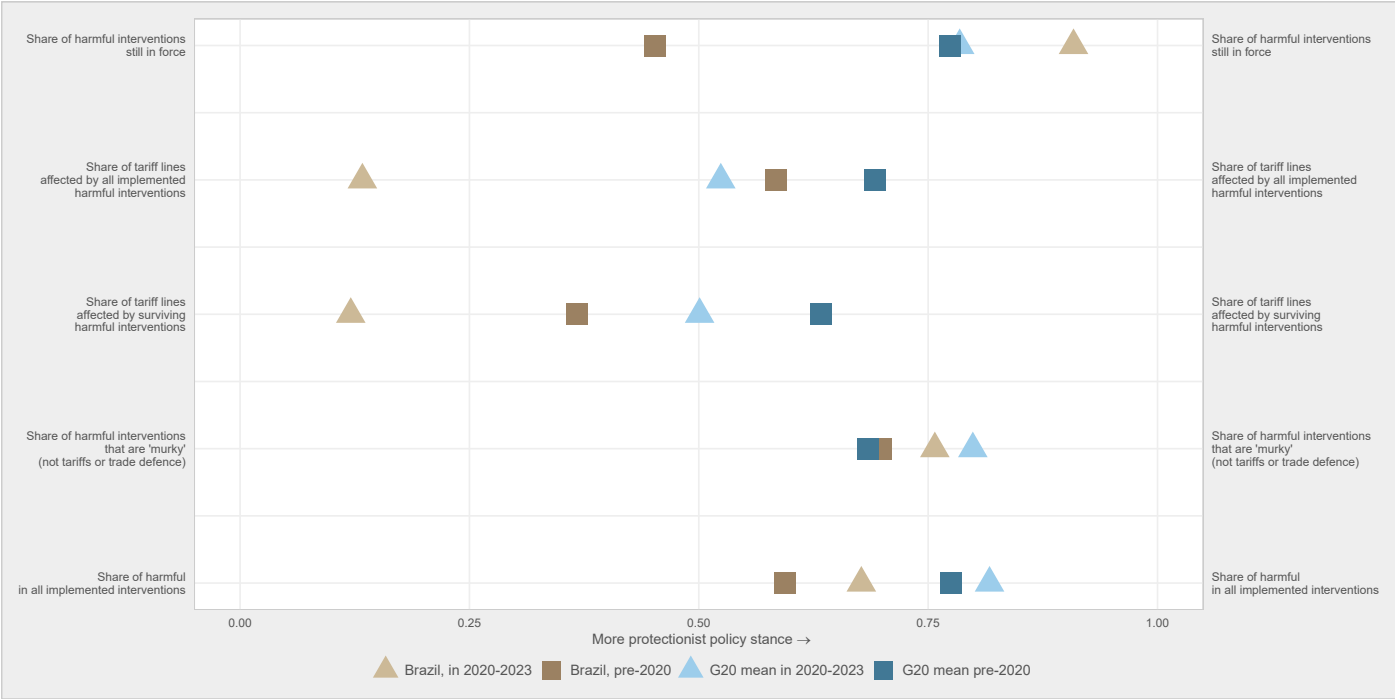
BRAZIL

Number of liberalising interventions imposed since November 2008



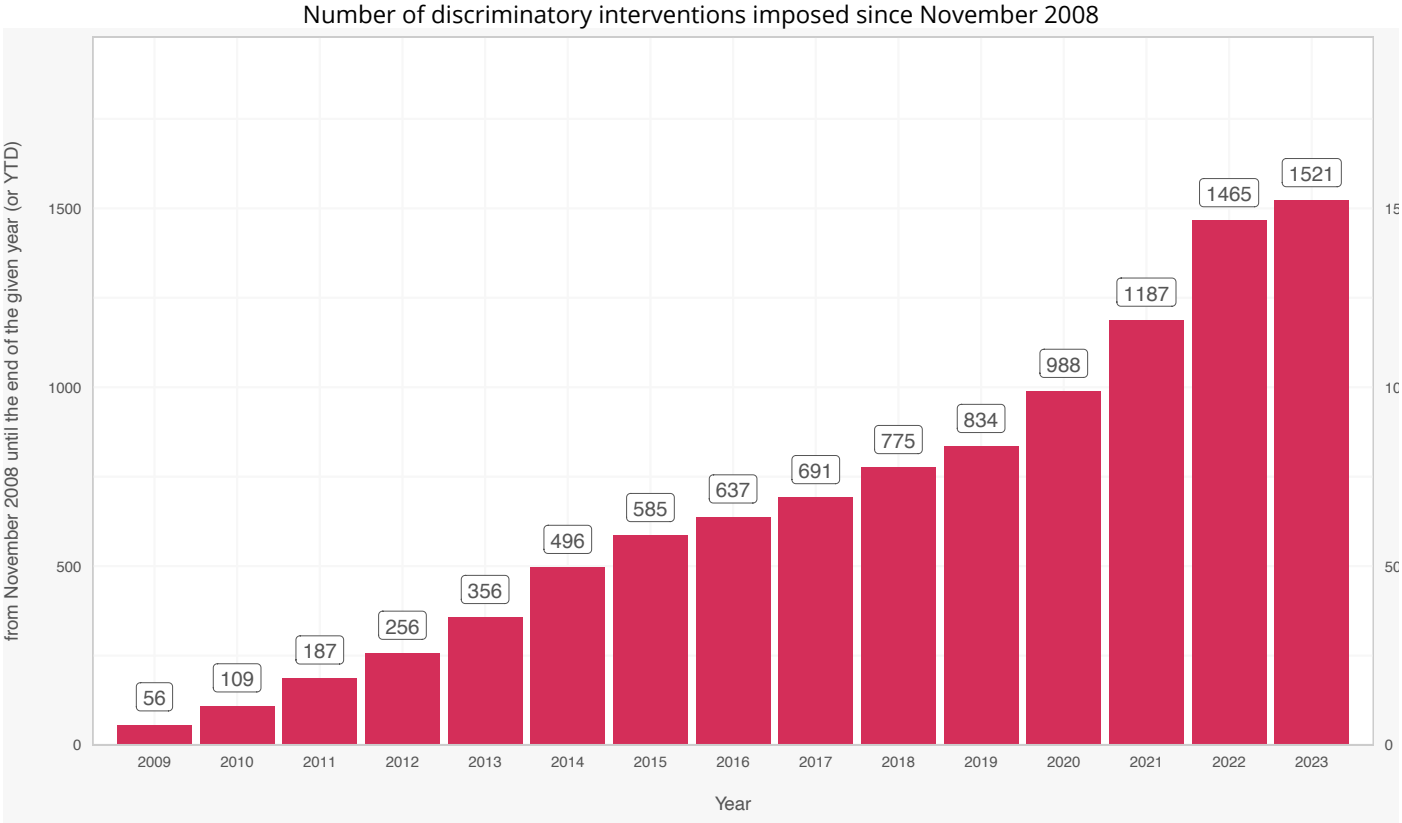
BRAZIL

Track record of protectionism



BRAZIL

Number of discriminatory interventions imposed since November 2008



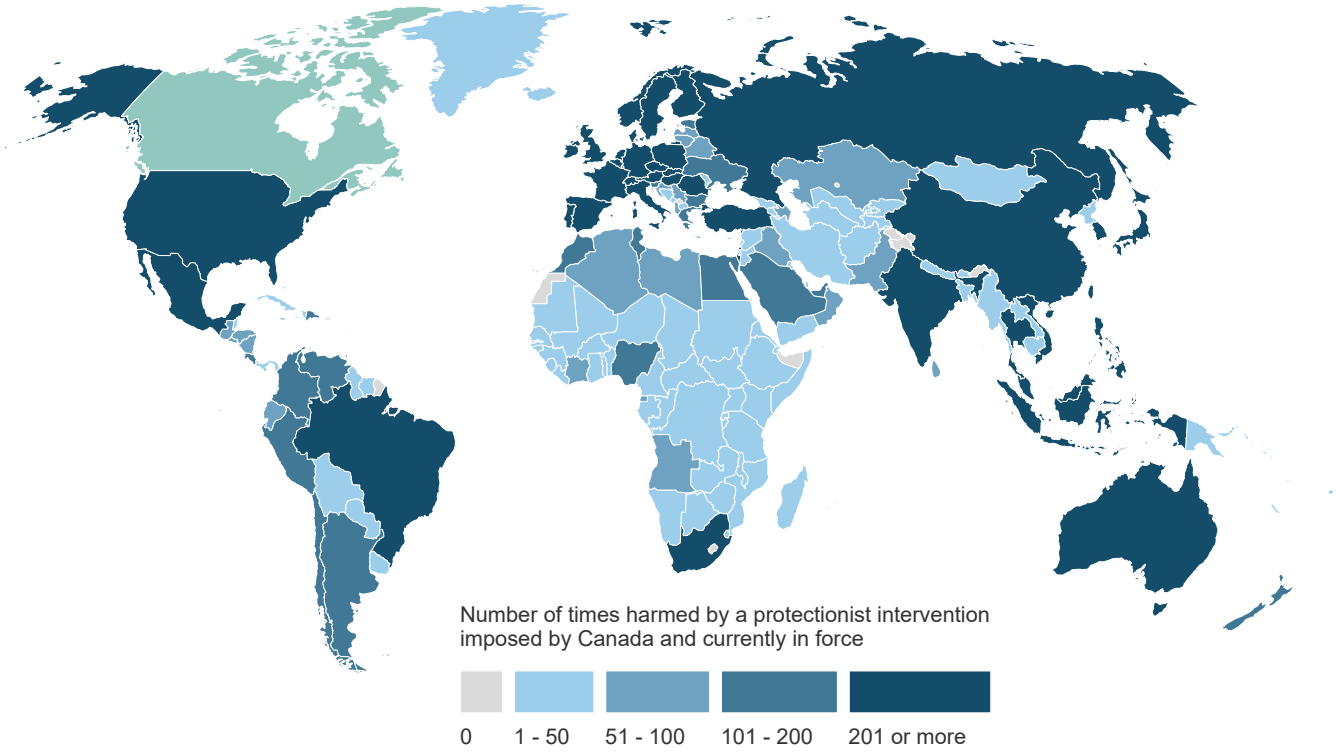
CANADA

What is at stake for Canada's goods exporters?

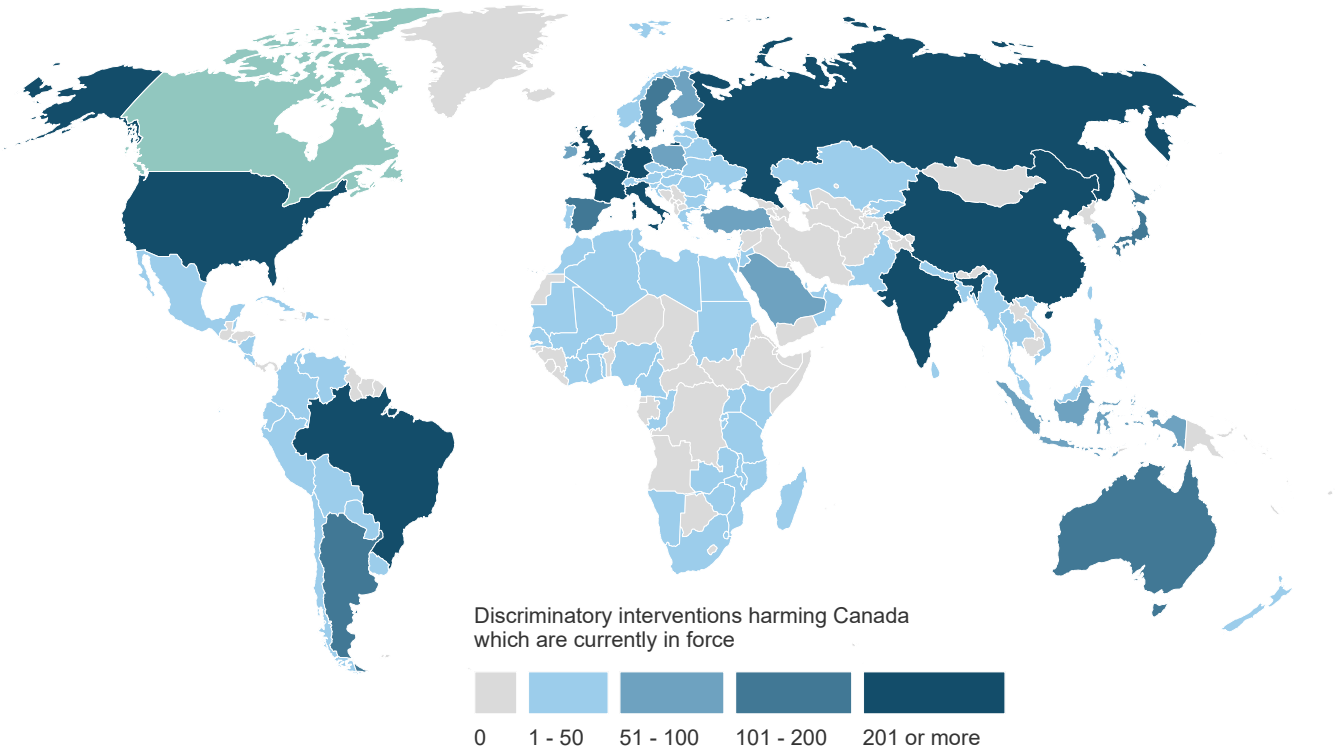
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	37.28	51.76	64.23	75.01	81.16	83.24	82.05	84.18	86.02	87.57	87.58	88.53	88.62	90.25	90.49
D	Contingent trade-protective measures	0.12	0.13	0.13	0.13	0.14	0.15	0.44	0.97	2.47	3.73	3.24	3.17	3.14	3.17	3.17
E	Non-automatic licensing, quotas etc.	0.62	0.73	0.83	0.90	1.11	1.13	1.22	1.27	2.50	3.23	3.32	3.38	4.48	5.55	5.39
F	Price-control measures, including additional taxes and charges	0.31	0.31	0.33	0.33	0.34	0.42	0.55	0.65	0.65	0.88	0.90	0.93	0.94	0.96	1.09
G	Finance measures	0.03	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11
I	Trade-related investment measures	0.36	2.92	2.71	2.72	2.73	2.73	2.98	3.39	3.92	3.92	3.92	3.93	4.60	4.98	5.03
L	Subsidies (excl. export subsidies)	12.96	18.14	23.01	32.28	40.10	44.43	44.84	47.06	48.61	52.36	53.01	58.16	61.35	68.40	75.61
M	Government procurement restrictions	2.18	2.60	2.90	3.18	3.23	3.63	4.19	4.19	4.69	5.29	6.49	7.07	11.12	20.46	21.56
P	Export-related measures (incl. subsidies)	23.61	34.44	51.93	64.37	66.00	55.90	53.57	54.18	57.24	57.93	58.64	59.60	58.93	58.81	59.07
	Tariff measures	0.17	0.28	0.63	0.74	0.69	0.70	0.87	1.25	2.91	5.91	4.55	5.07	6.01	6.07	6.14
	Instrument unclear	0.01	0.14	0.03	0.12	1.06	1.60	1.84	2.23	2.49	2.77	2.77	2.81	2.80	2.82	2.82

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY CANADA'S DISCRIMINATORY INTERVENTIONS

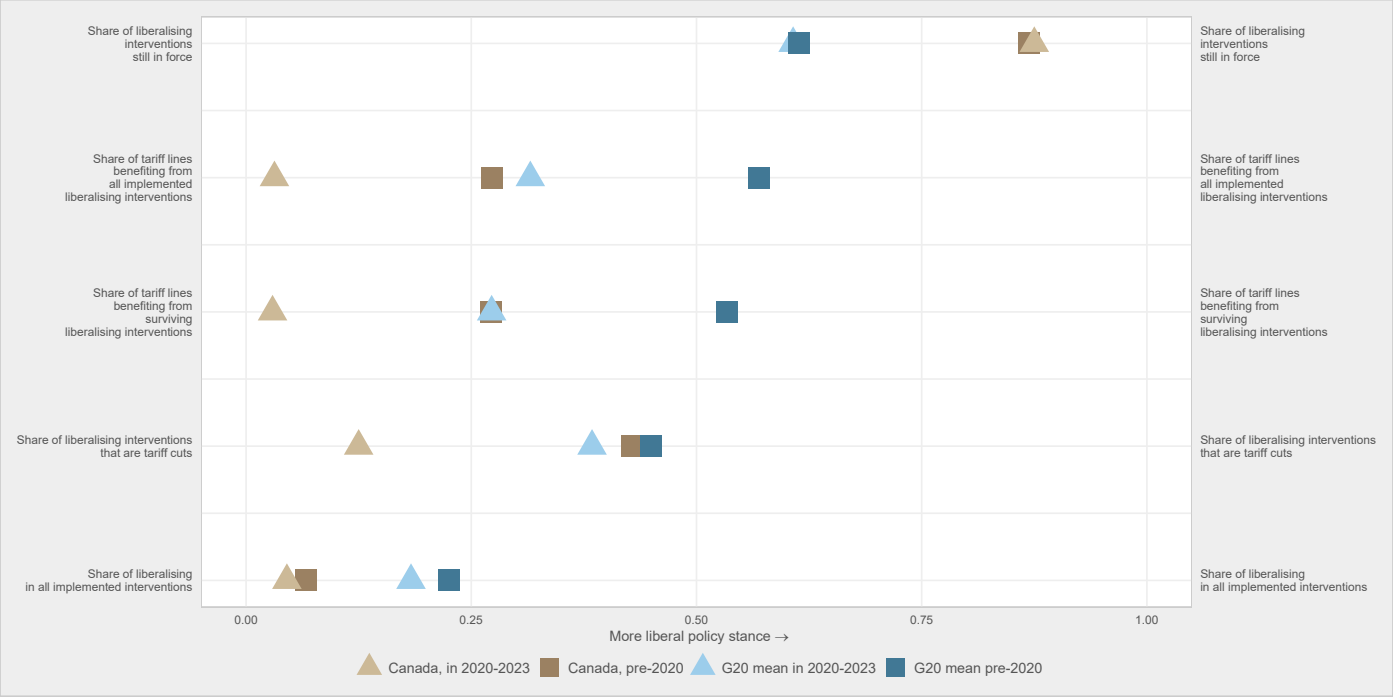


DISCRIMINATORY INTERVENTIONS HARMING CANADA'S INTERESTS



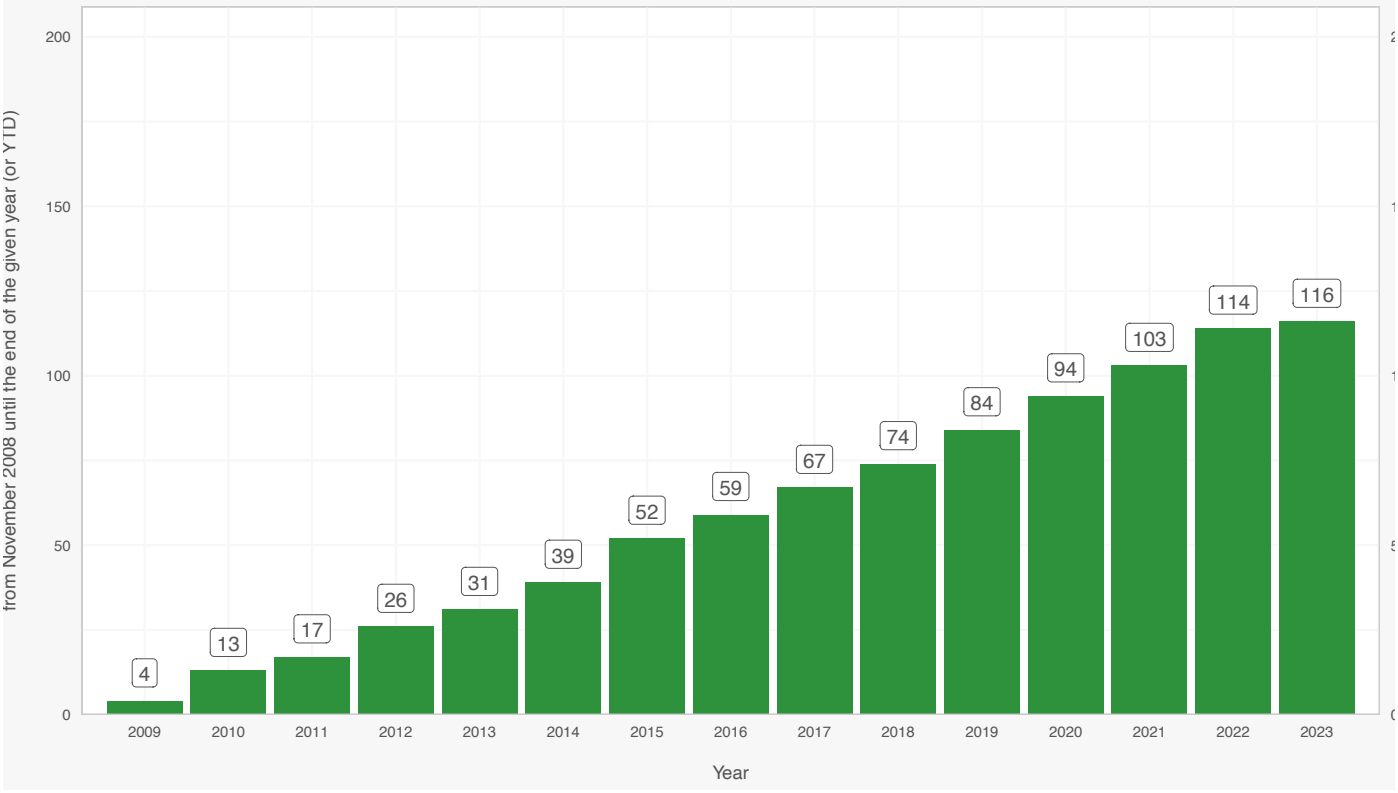
CANADA

Track record of liberalisation



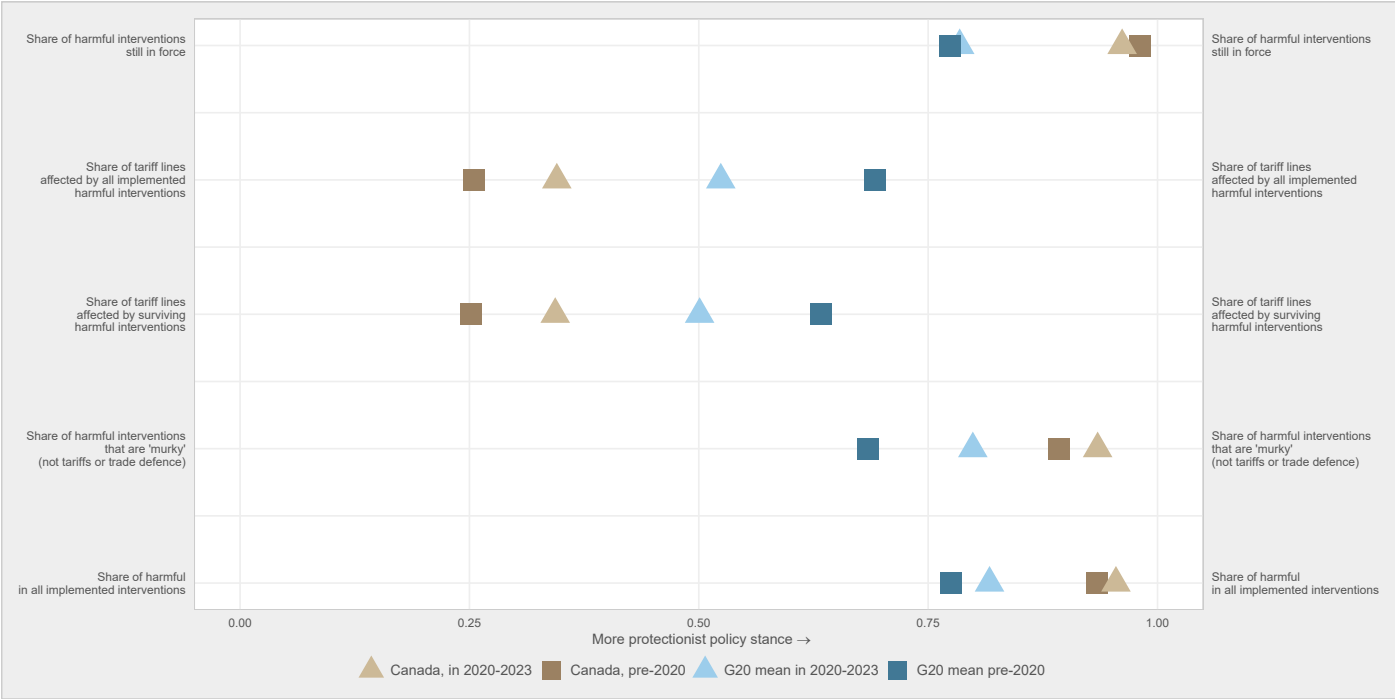
CANADA

Number of liberalising interventions imposed since November 2008



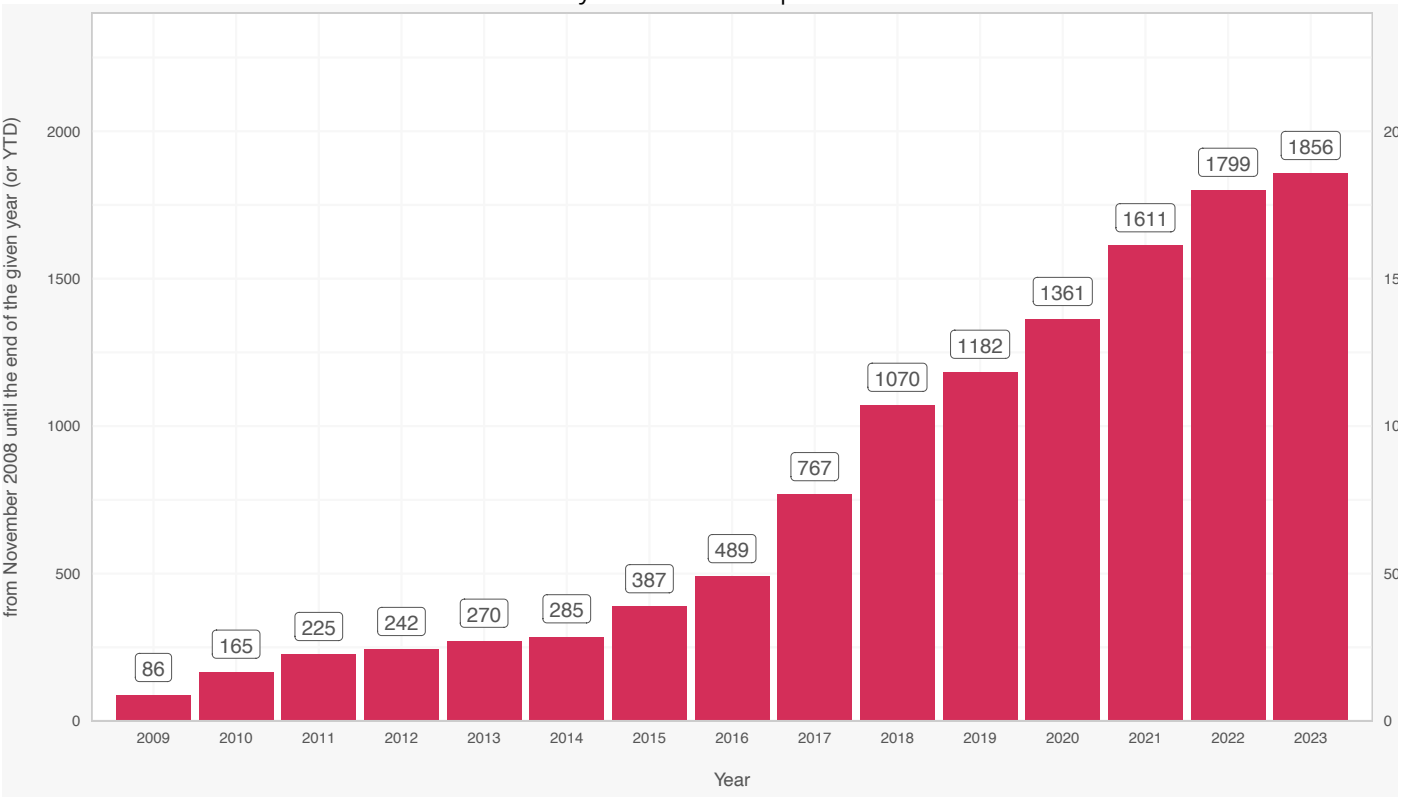
CANADA

Track record of protectionism



CANADA

Number of discriminatory interventions imposed since November 2008



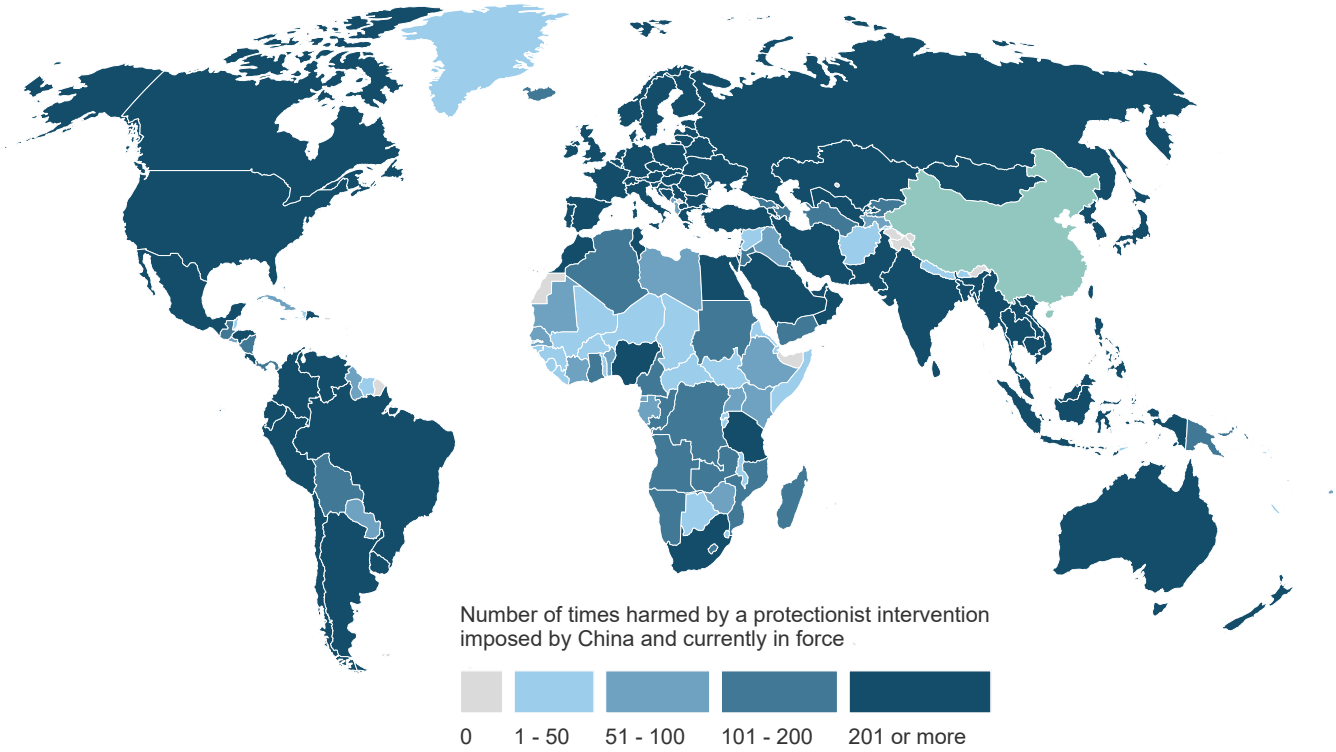
CHINA

What is at stake for China's goods exporters?

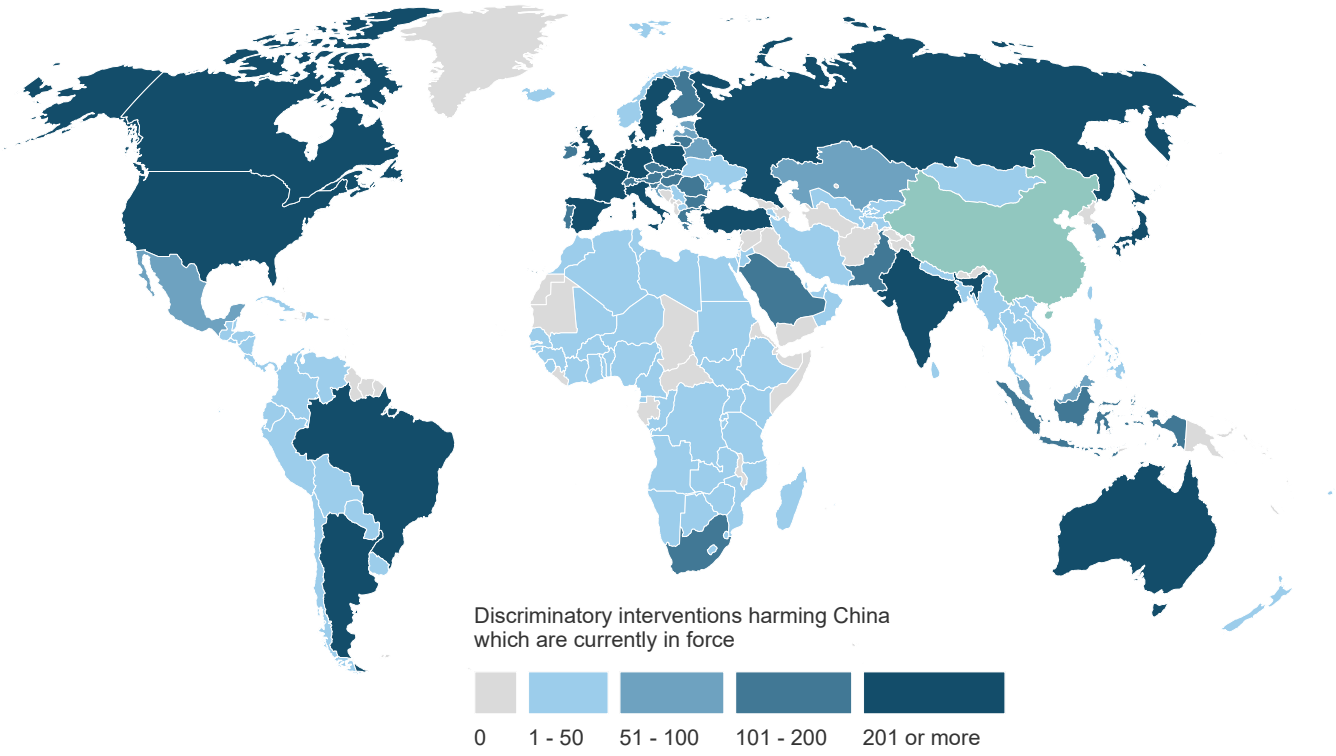
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	16.44	32.02	47.48	54.05	69.36	71.44	69.47	71.93	73.32	74.92	76.86	77.96	77.90	78.69	79.62
D	Contingent trade-protective measures	0.77	2.18	4.08	4.32	4.71	5.27	5.42	5.72	6.02	6.17	6.37	6.69	6.79	6.88	6.91
E	Non-automatic licensing, quotas etc.	0.27	0.25	0.40	0.52	0.65	0.69	0.93	1.20	1.55	1.60	1.85	2.25	2.70	4.23	4.15
F	Price-control measures, including additional taxes and charges	0.04	0.07	0.12	0.16	0.16	0.29	0.40	0.43	0.43	1.01	1.12	1.69	1.73	1.74	3.43
G	Finance measures	0.30	0.63	1.02	1.02	1.02	1.02	1.02	1.02	1.05	1.07	1.09	1.08	1.05	1.11	1.08
I	Trade-related investment measures	0.23	2.35	2.38	2.43	2.45	2.49	2.66	2.84	2.95	2.97	2.97	3.03	3.28	3.42	3.53
L	Subsidies (excl. export subsidies)	2.84	8.77	13.64	15.72	35.85	37.03	39.31	40.50	40.74	41.54	43.00	44.65	36.47	38.52	39.02
M	Government procurement restrictions	0.84	0.89	1.25	1.63	3.61	4.71	5.11	5.04	5.23	5.31	5.49	5.64	6.08	7.32	7.75
P	Export-related measures (incl. subsidies)	11.10	22.48	36.50	44.79	52.05	52.96	46.39	52.91	55.41	57.23	59.00	59.94	57.63	57.44	58.49
	Tariff measures	0.91	1.21	2.05	2.70	3.34	23.49	22.35	23.64	26.69	31.03	36.70	38.35	38.04	38.33	38.61
	Instrument unclear	0.15	0.33	0.38	0.40	0.51	0.87	0.96	1.03	1.01	1.07	1.17	1.23	1.28	1.42	1.88

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY CHINA'S DISCRIMINATORY INTERVENTIONS

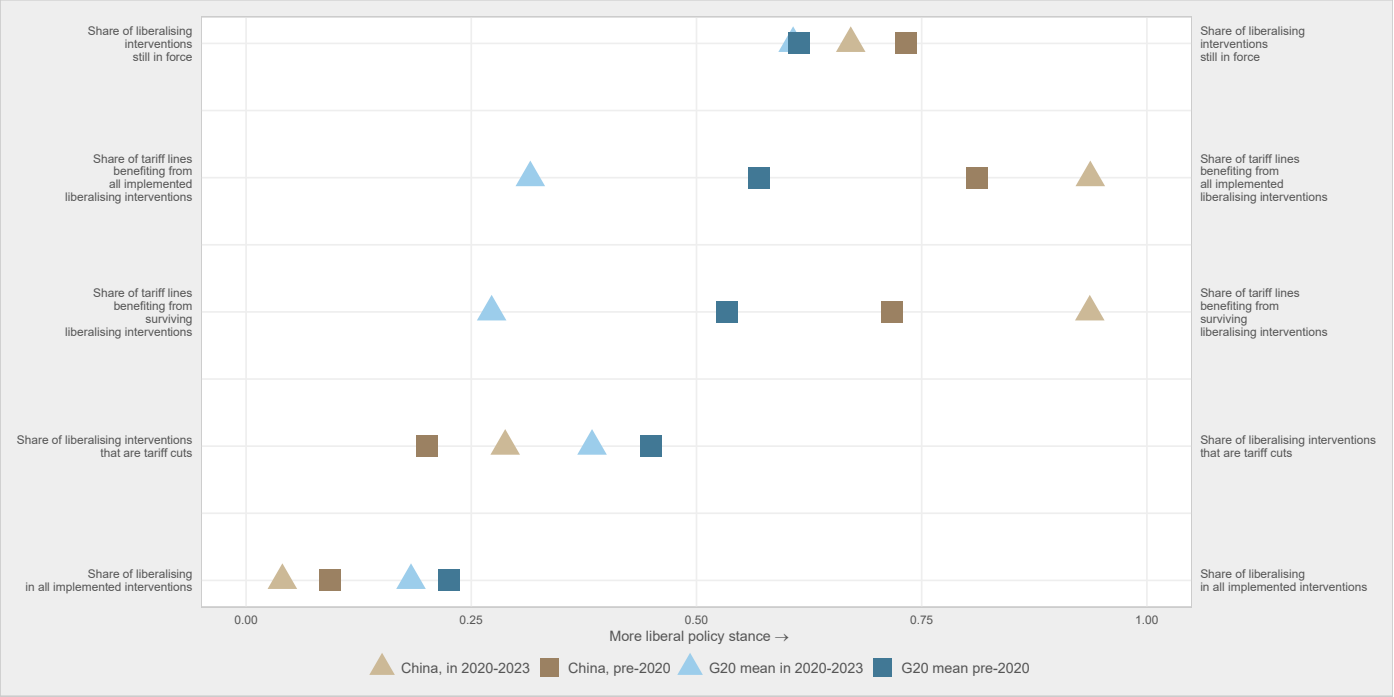


DISCRIMINATORY INTERVENTIONS HARMING CHINA'S INTERESTS



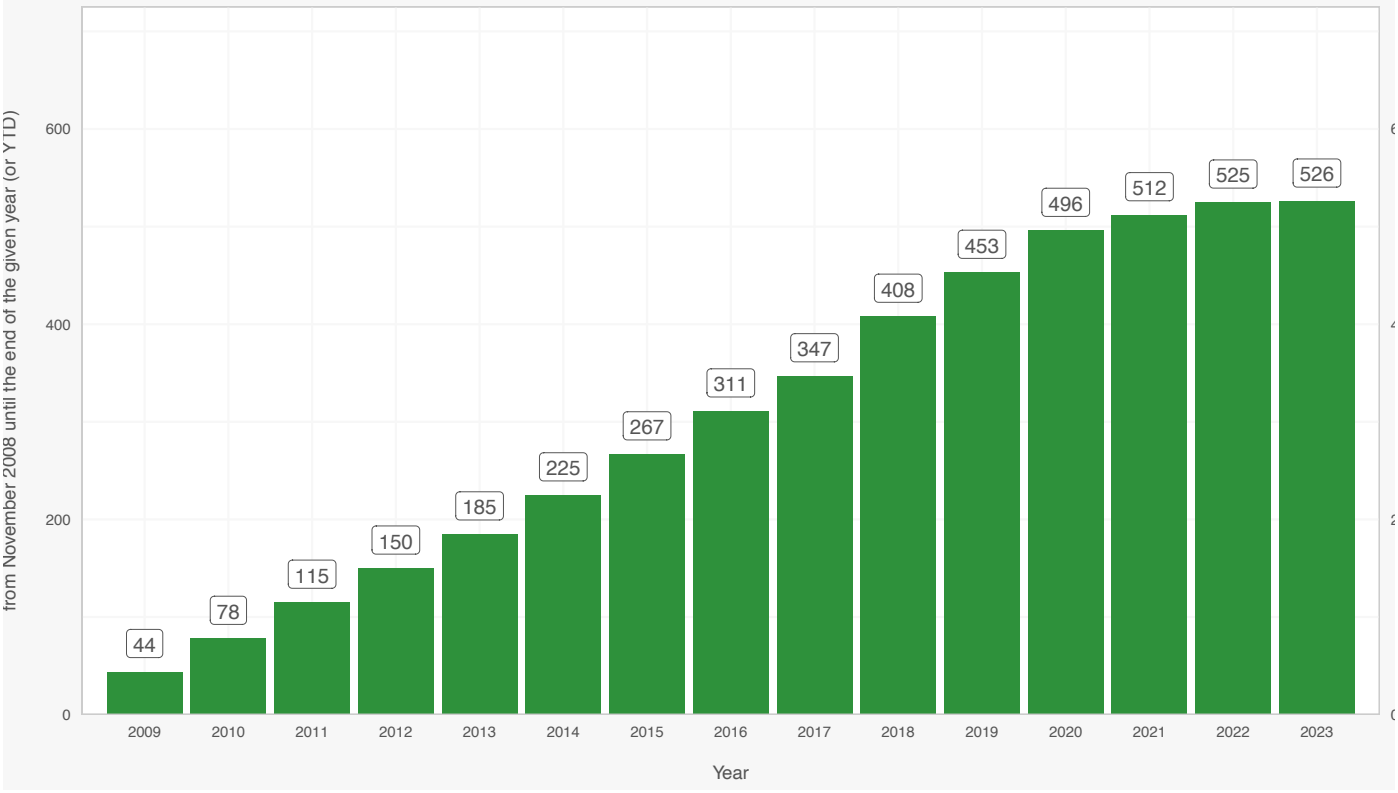
CHINA

Track record of liberalisation



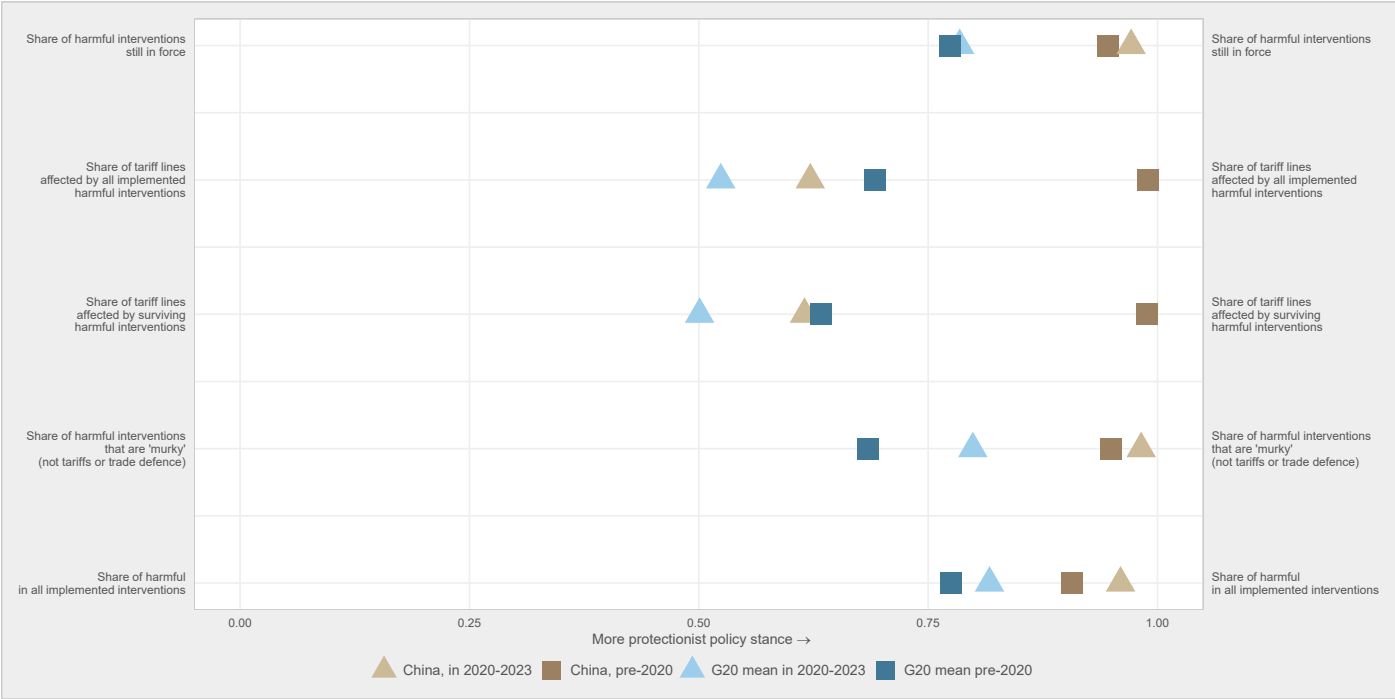
CHINA

Number of liberalising interventions imposed since November 2008



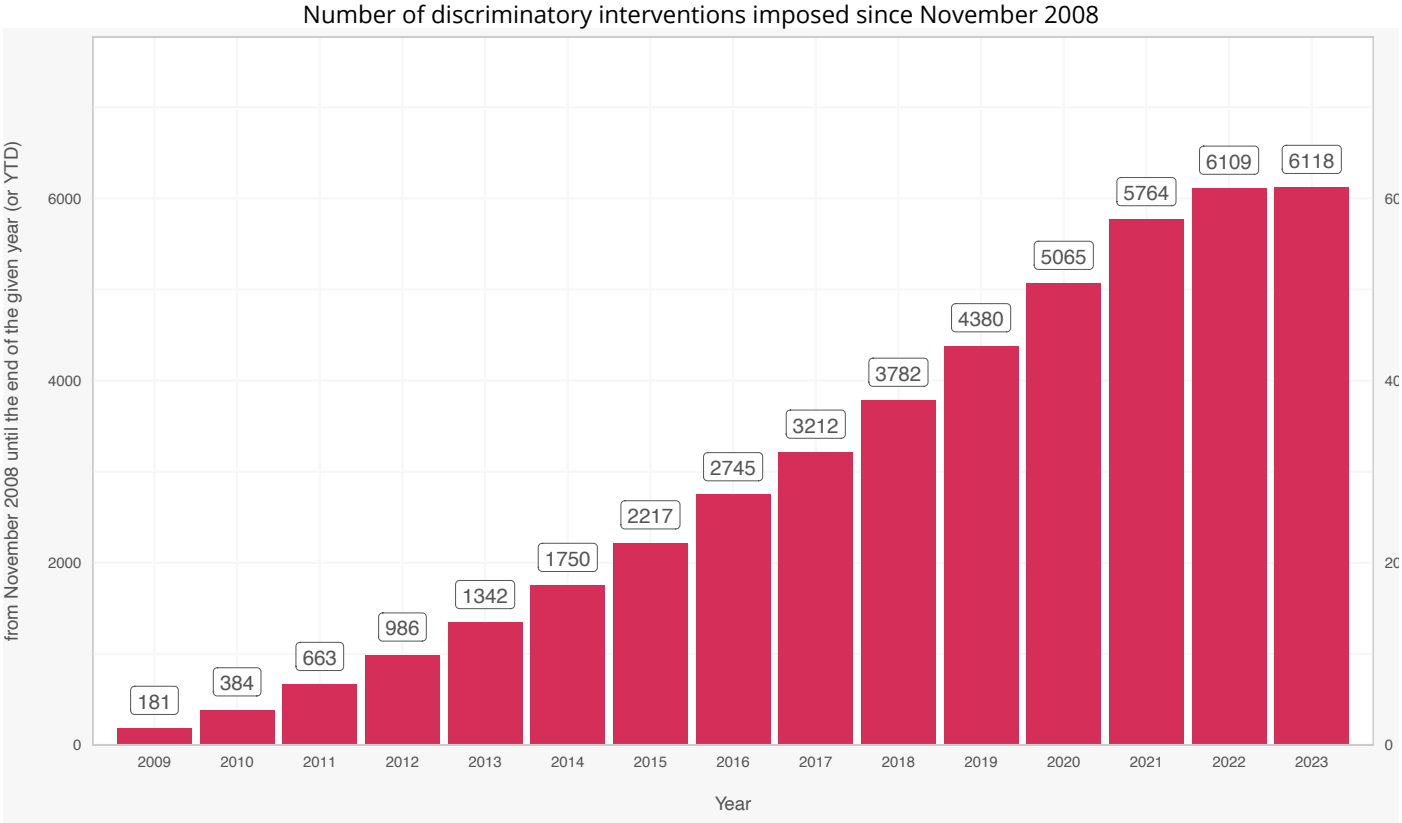
CHINA

Track record of protectionism



CHINA

Number of discriminatory interventions imposed since November 2008



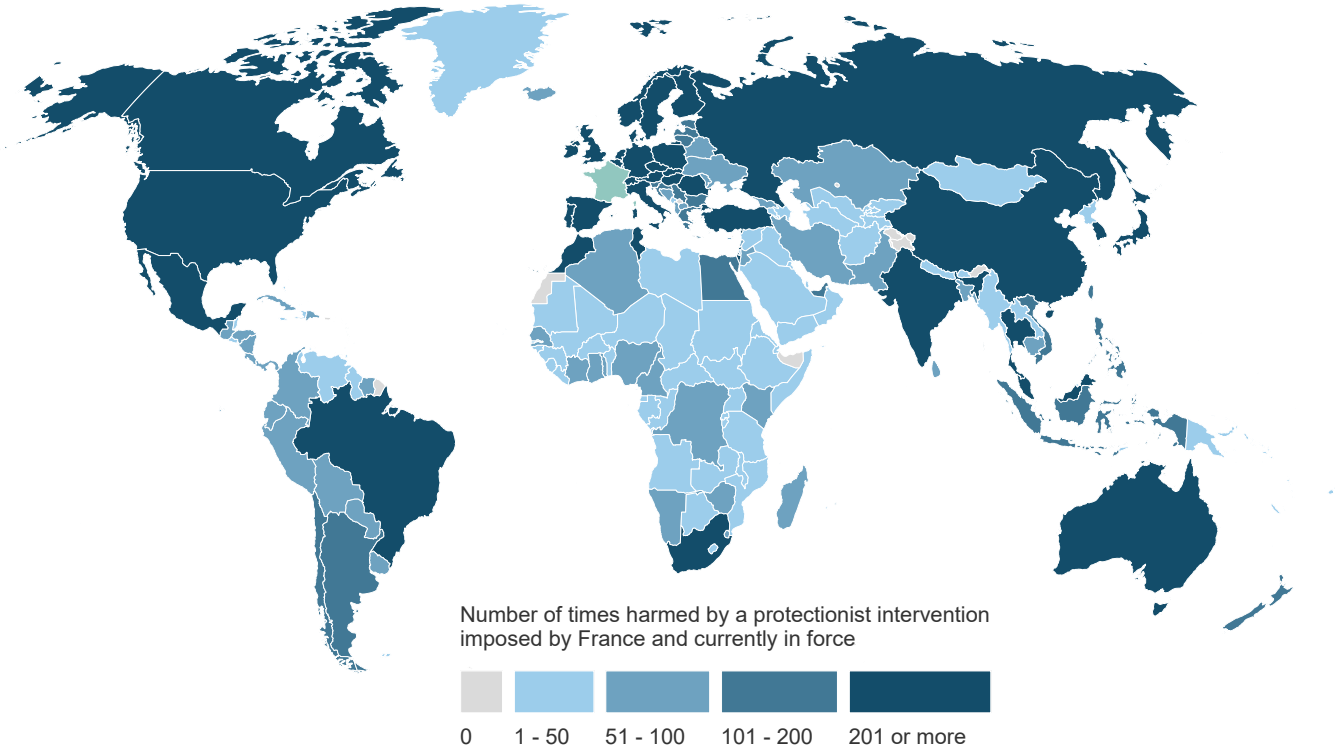
FRANCE

What is at stake for France's goods exporters?

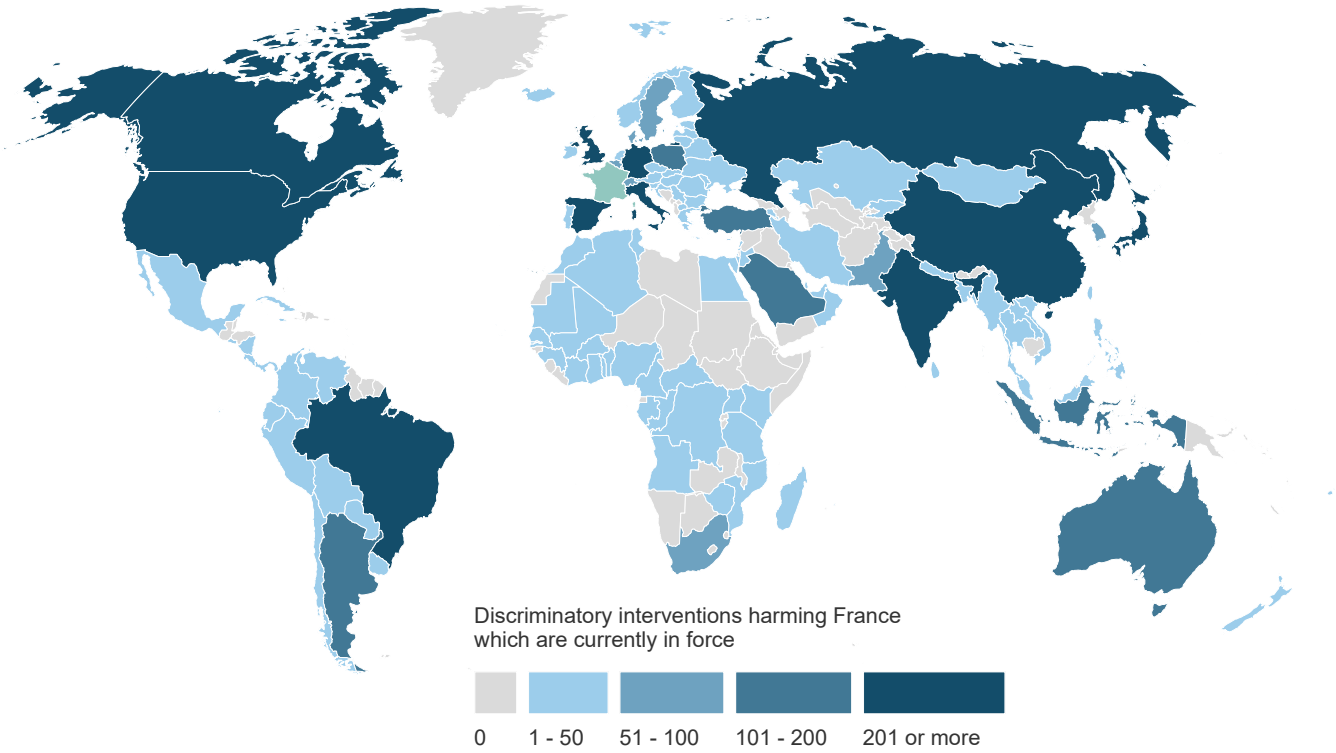
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	40.50	58.37	62.02	65.59	68.23	70.58	74.57	76.29	77.32	78.12	80.82	81.55	81.05	80.99	82.16
D	Contingent trade-protective measures	0.01	0.03	0.03	0.04	0.07	0.17	0.16	0.15	0.16	0.19	0.16	0.15	0.20	0.25	0.26
E	Non-automatic licensing, quotas etc.	0.22	0.30	1.16	1.28	1.38	1.56	1.64	1.63	2.11	2.73	2.78	2.82	3.02	3.30	3.48
F	Price-control measures, including additional taxes and charges	0.01	0.01	0.05	0.08	0.28	0.80	0.97	1.05	1.09	1.24	1.27	1.41	1.41	1.41	2.29
G	Finance measures	0.22	0.29	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
I	Trade-related investment measures	0.13	0.46	0.50	0.52	0.56	0.66	0.78	1.08	1.61	1.54	1.54	1.48	1.58	1.64	1.66
L	Subsidies (excl. export subsidies)	12.87	24.95	24.93	26.71	28.08	29.52	36.75	39.19	39.95	40.69	41.71	44.06	44.67	46.23	49.42
M	Government procurement restrictions	0.33	0.42	0.32	0.49	0.64	0.83	1.09	1.21	1.27	1.37	1.62	2.11	2.40	2.92	3.32
P	Export-related measures (incl. subsidies)	29.83	45.95	52.89	58.47	61.33	61.19	59.97	61.67	63.34	64.34	68.88	69.71	68.70	68.71	69.36
	Tariff measures	0.23	0.36	0.55	0.71	1.23	0.97	1.21	1.70	2.15	3.04	3.47	4.84	5.25	5.21	5.29
	Instrument unclear	0.14	0.27	0.31	0.33	0.93	1.22	1.33	1.40	1.48	1.56	1.53	1.51	1.51	1.51	1.51

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY FRANCE'S DISCRIMINATORY INTERVENTIONS

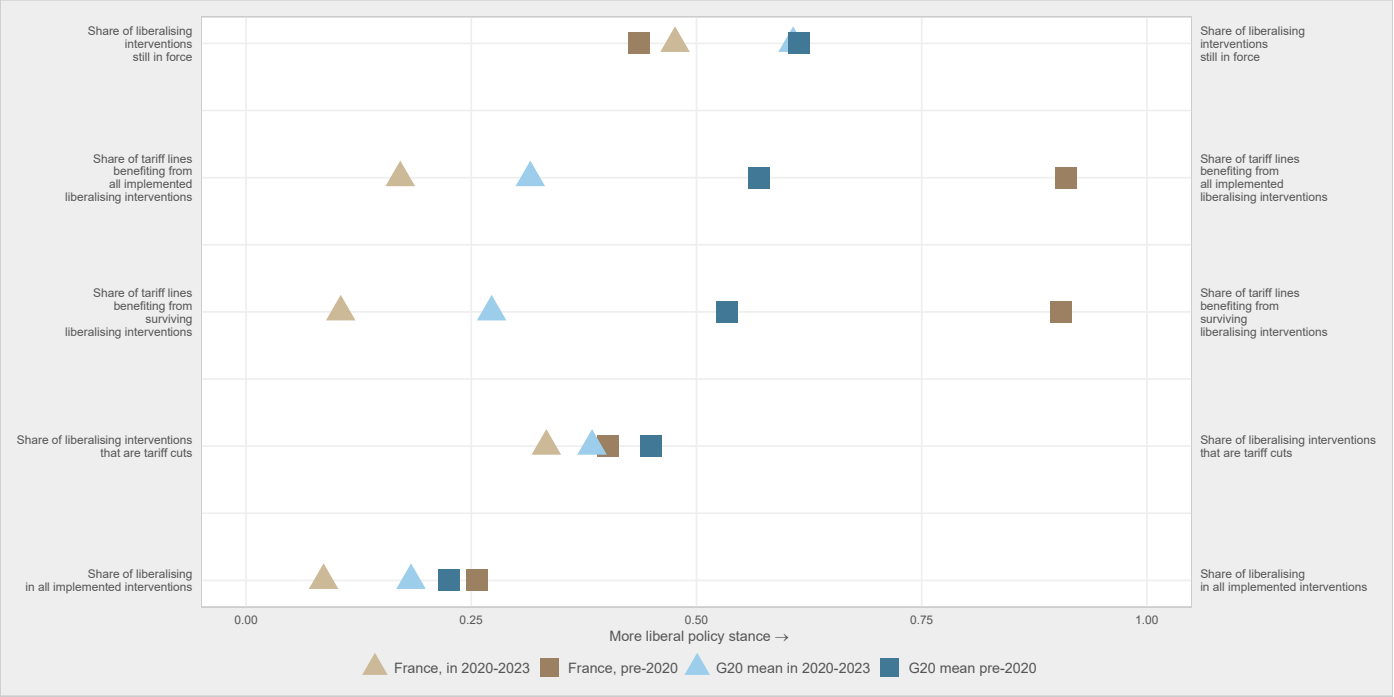


DISCRIMINATORY INTERVENTIONS HARMING FRANCE'S INTERESTS



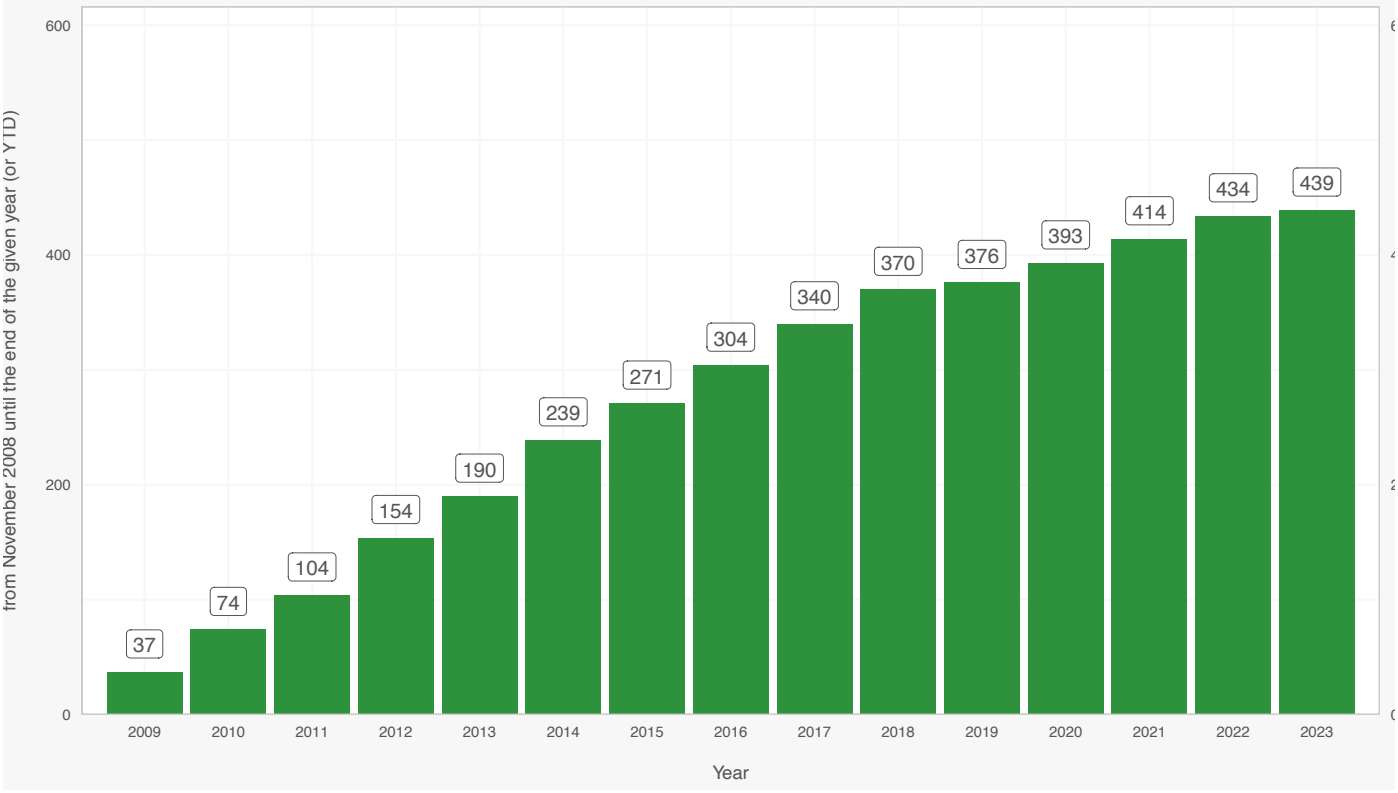
FRANCE

Track record of liberalisation



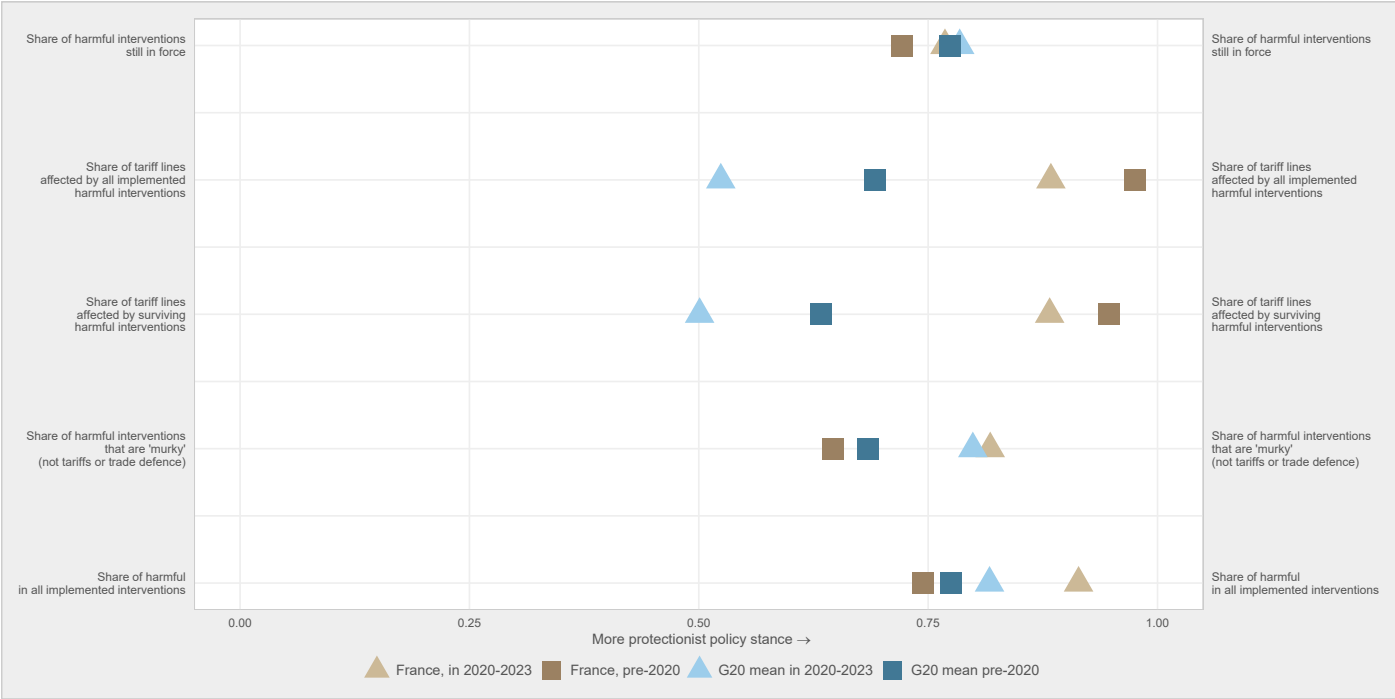
FRANCE

Number of liberalising interventions imposed since November 2008



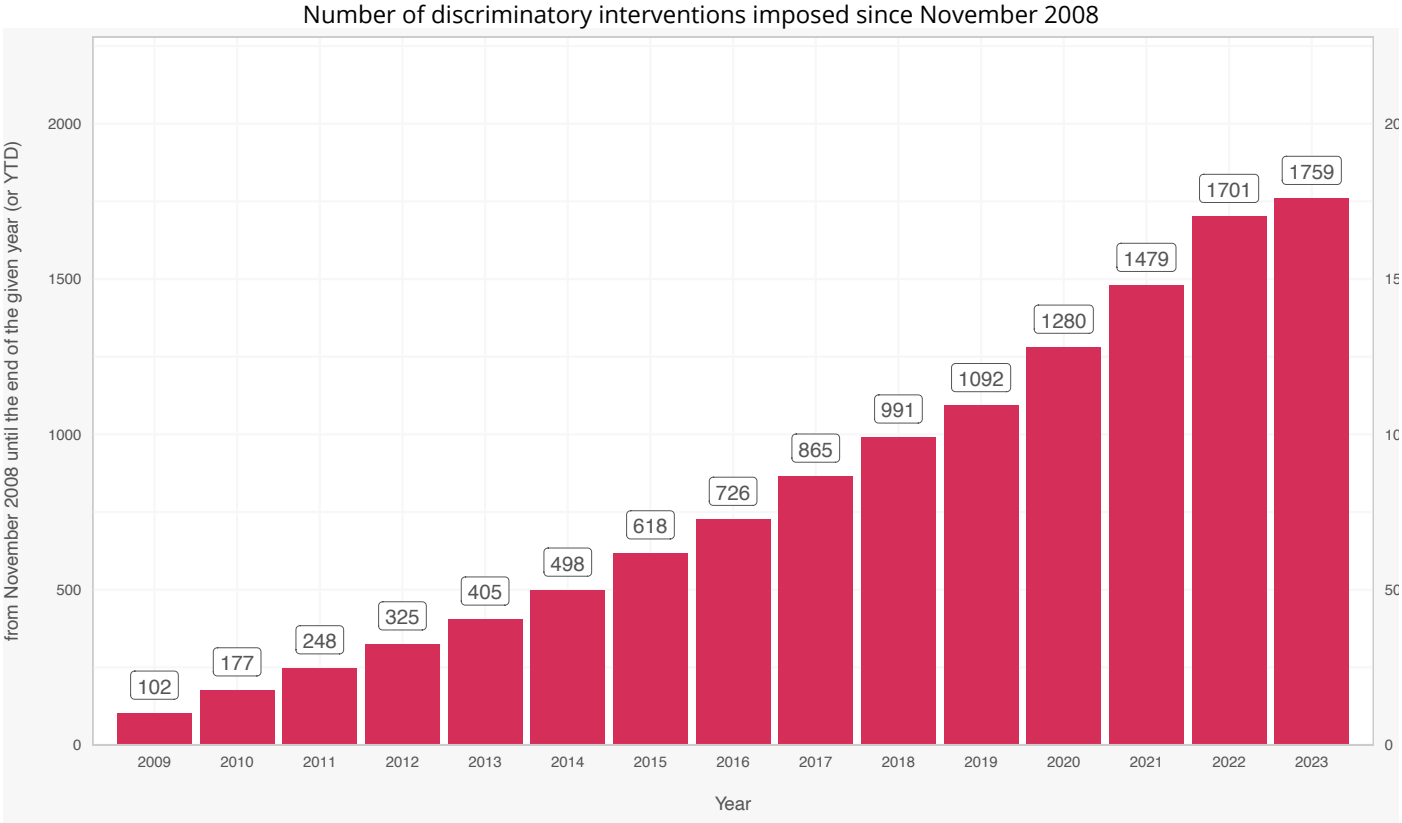
FRANCE

Track record of protectionism



FRANCE

Number of discriminatory interventions imposed since November 2008



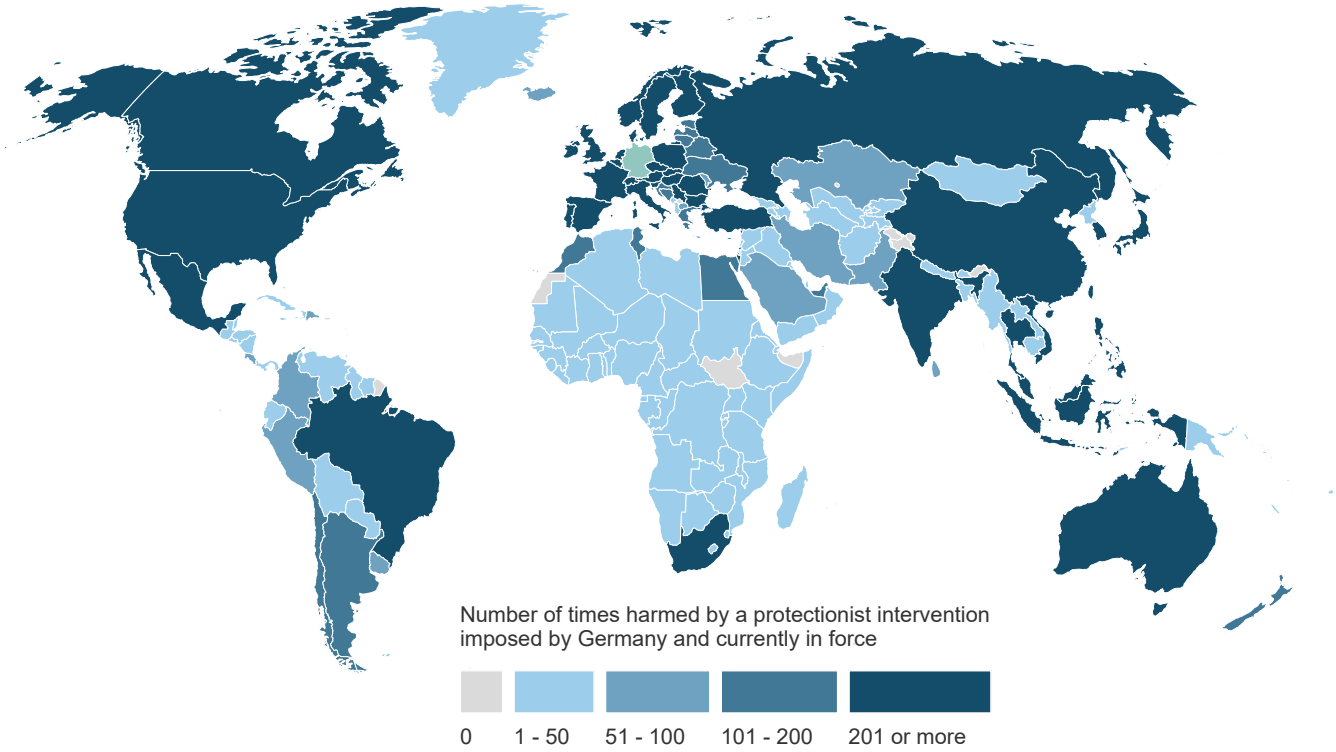
GERMANY

What is at stake for Germany's goods exporters?

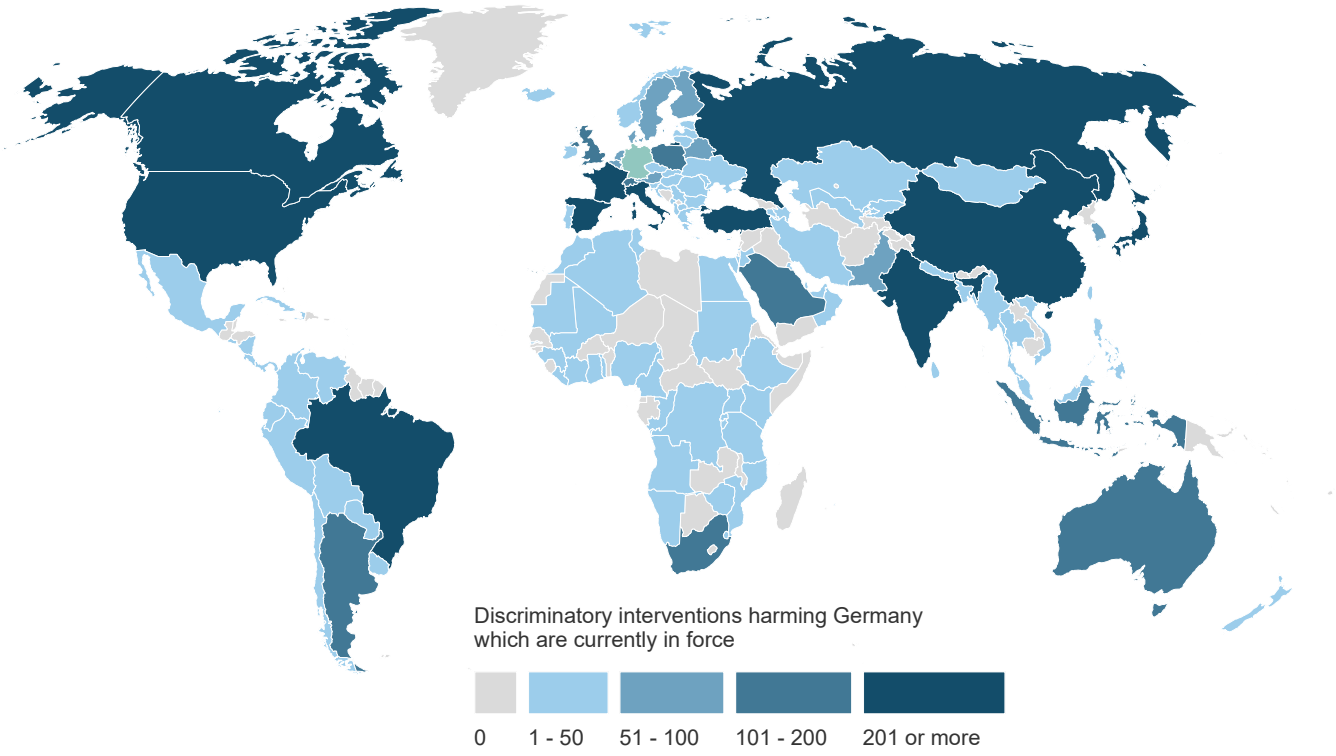
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	44.92	56.83	59.22	62.42	64.94	66.98	69.04	70.82	72.53	74.22	77.33	78.01	77.37	76.97	78.59
D	Contingent trade-protective measures	0.04	0.08	0.09	0.13	0.20	0.22	0.21	0.19	0.20	0.26	0.29	0.34	0.44	0.49	0.49
E	Non-automatic licensing, quotas etc.	0.77	0.91	1.63	1.72	2.02	1.81	1.87	1.87	2.19	2.58	2.65	2.73	2.82	2.88	2.95
F	Price-control measures, including additional taxes and charges	0.01	0.04	0.06	0.10	0.13	0.27	0.43	0.54	0.83	1.20	1.24	1.42	1.44	1.45	1.93
G	Finance measures	0.20	0.26	0.29	0.29	0.29	0.29	0.29	0.29	0.30	0.30	0.30	0.30	0.30	0.31	0.31
I	Trade-related investment measures	0.28	1.98	2.19	2.23	2.27	2.32	2.56	2.73	2.80	2.74	2.77	2.78	2.98	3.16	3.18
L	Subsidies (excl. export subsidies)	14.54	22.84	22.40	23.72	25.29	28.22	32.14	34.55	35.91	37.49	39.08	41.65	41.68	42.25	45.55
M	Government procurement restrictions	0.32	0.52	0.53	0.80	0.90	1.32	1.73	1.82	1.90	1.96	2.14	2.56	3.23	4.02	4.26
P	Export-related measures (incl. subsidies)	32.59	44.07	48.72	54.18	56.69	55.87	55.80	58.21	59.96	61.21	65.40	66.10	65.48	65.46	66.12
	Tariff measures	0.48	0.51	0.63	1.18	1.94	1.30	1.50	2.04	2.54	3.45	3.69	4.51	5.39	5.41	5.56
	Instrument unclear	0.05	0.23	0.32	0.34	0.48	0.56	0.77	0.80	0.88	0.94	0.90	0.89	0.92	0.91	0.91

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY GERMANY'S DISCRIMINATORY INTERVENTIONS

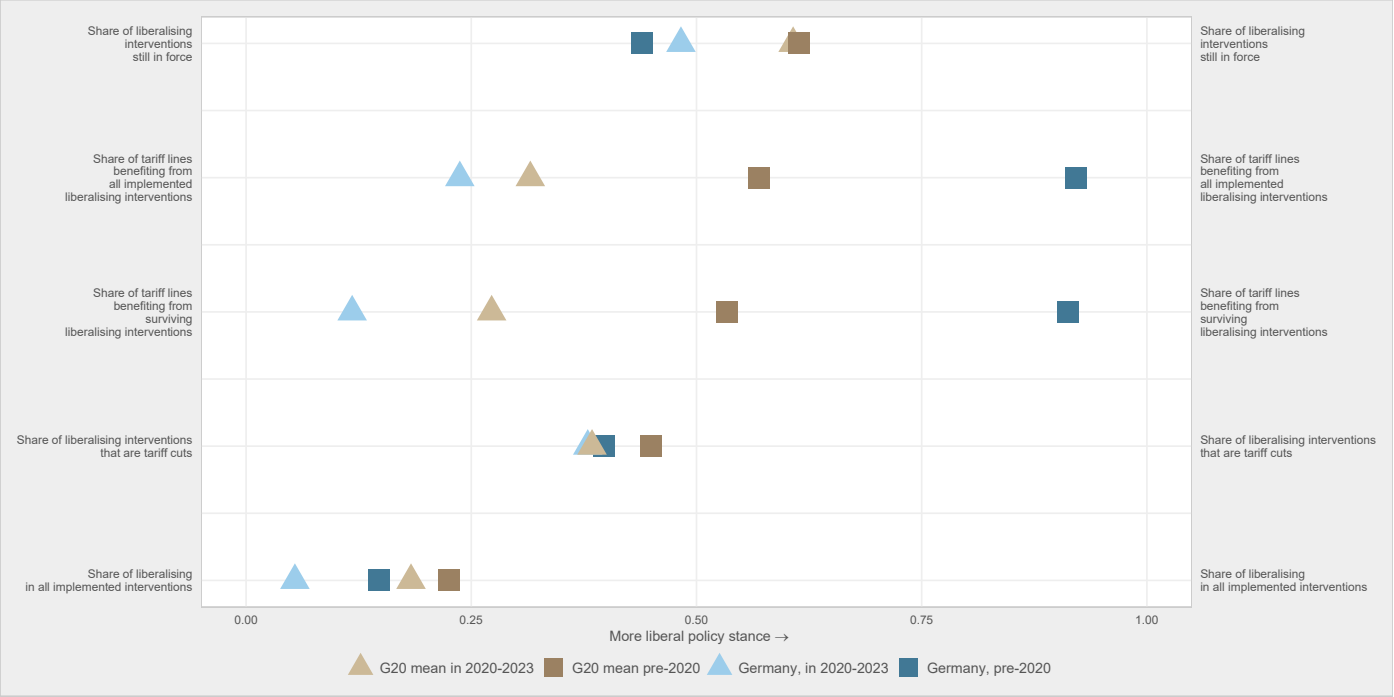


DISCRIMINATORY INTERVENTIONS HARMING GERMANY'S INTERESTS



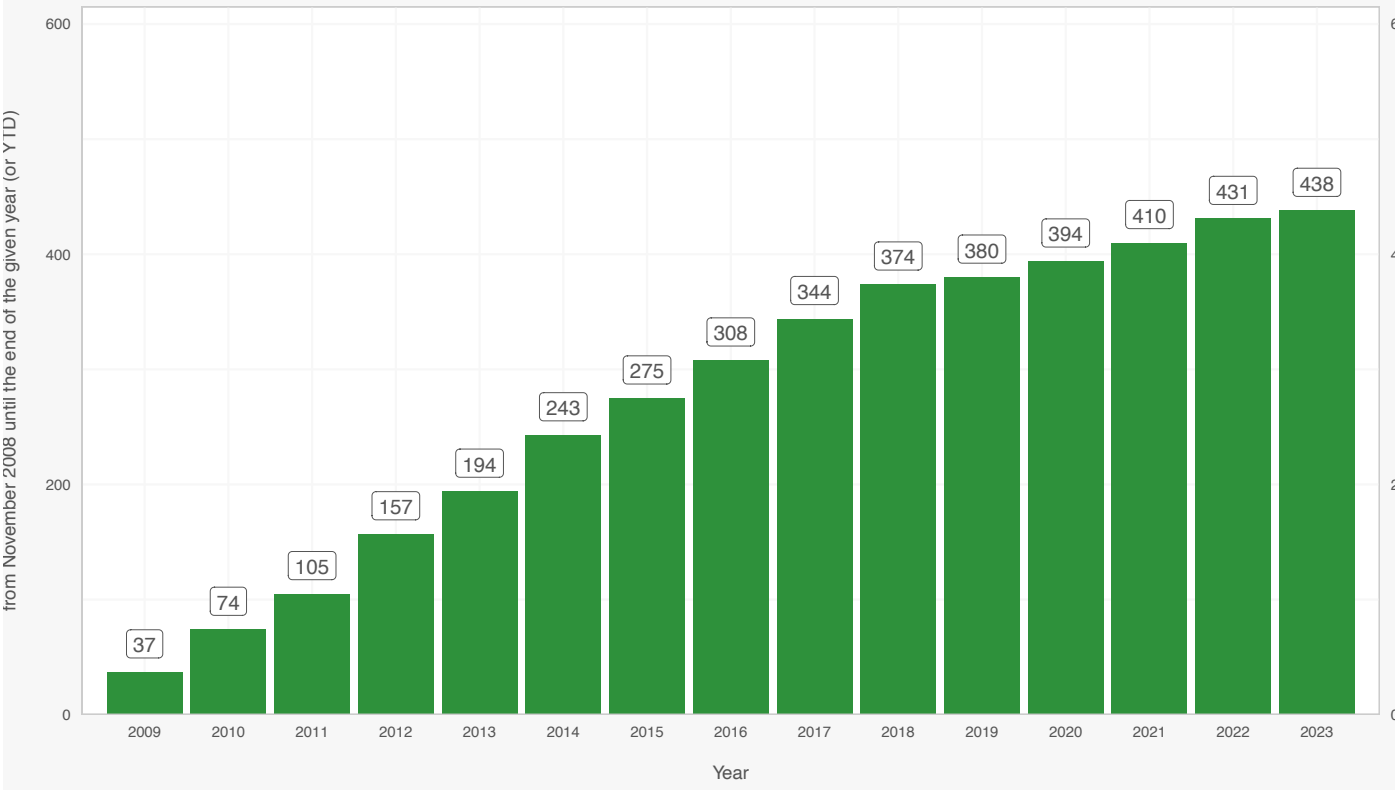
GERMANY

Track record of liberalisation



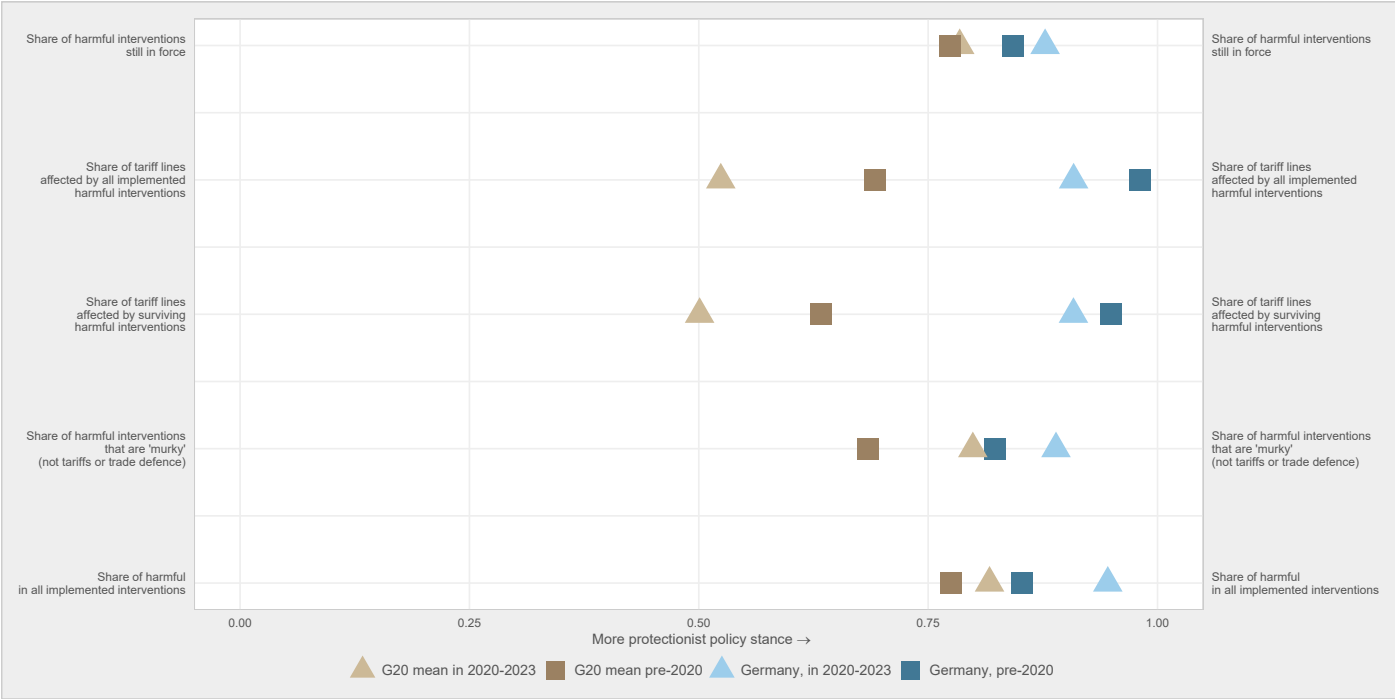
GERMANY

Number of liberalising interventions imposed since November 2008



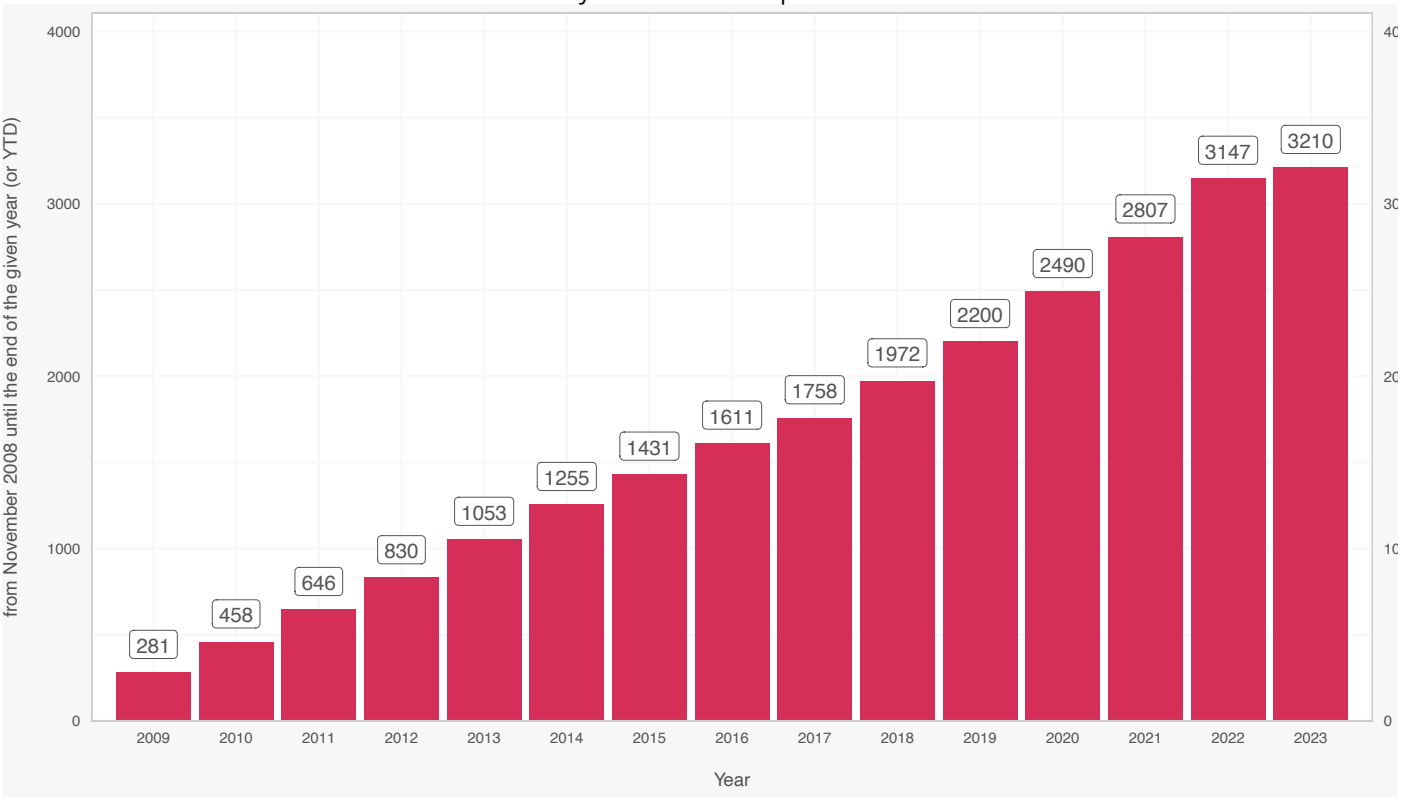
GERMANY

Track record of protectionism



GERMANY

Number of discriminatory interventions imposed since November 2008



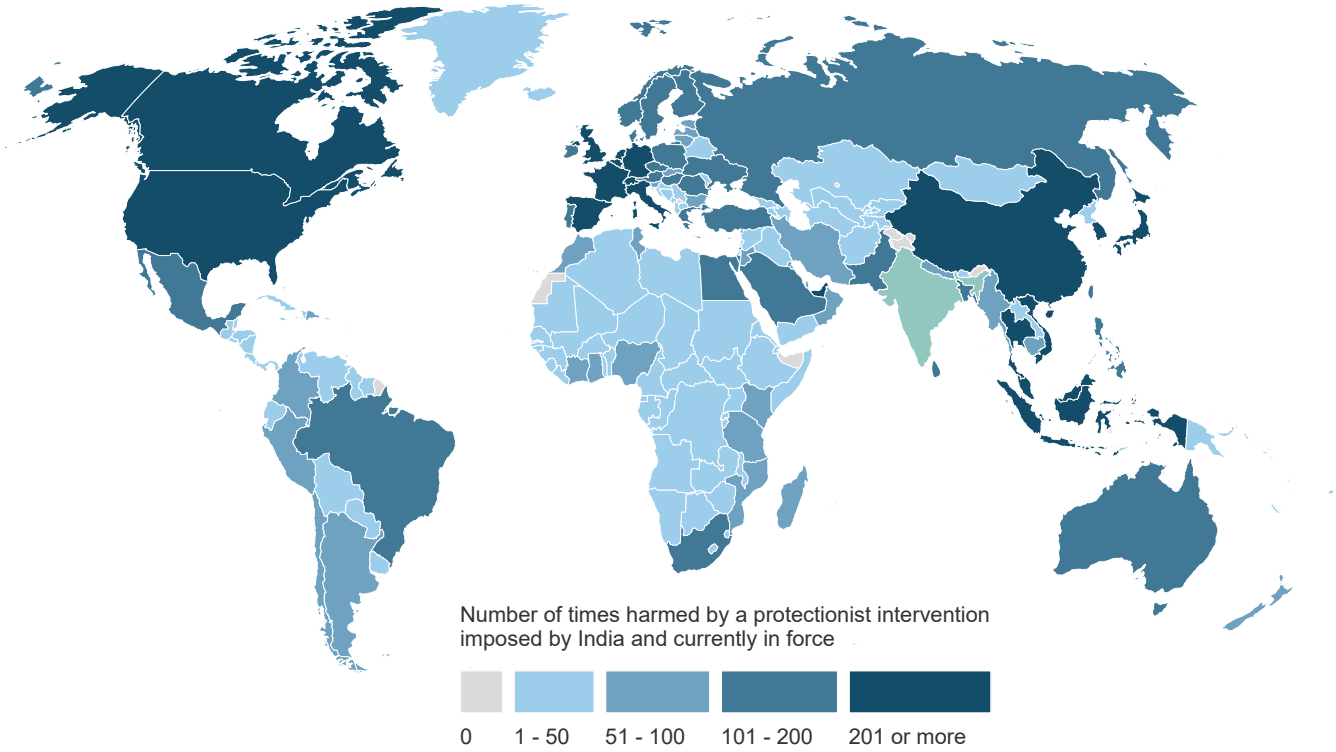
INDIA

What is at stake for India's goods exporters?

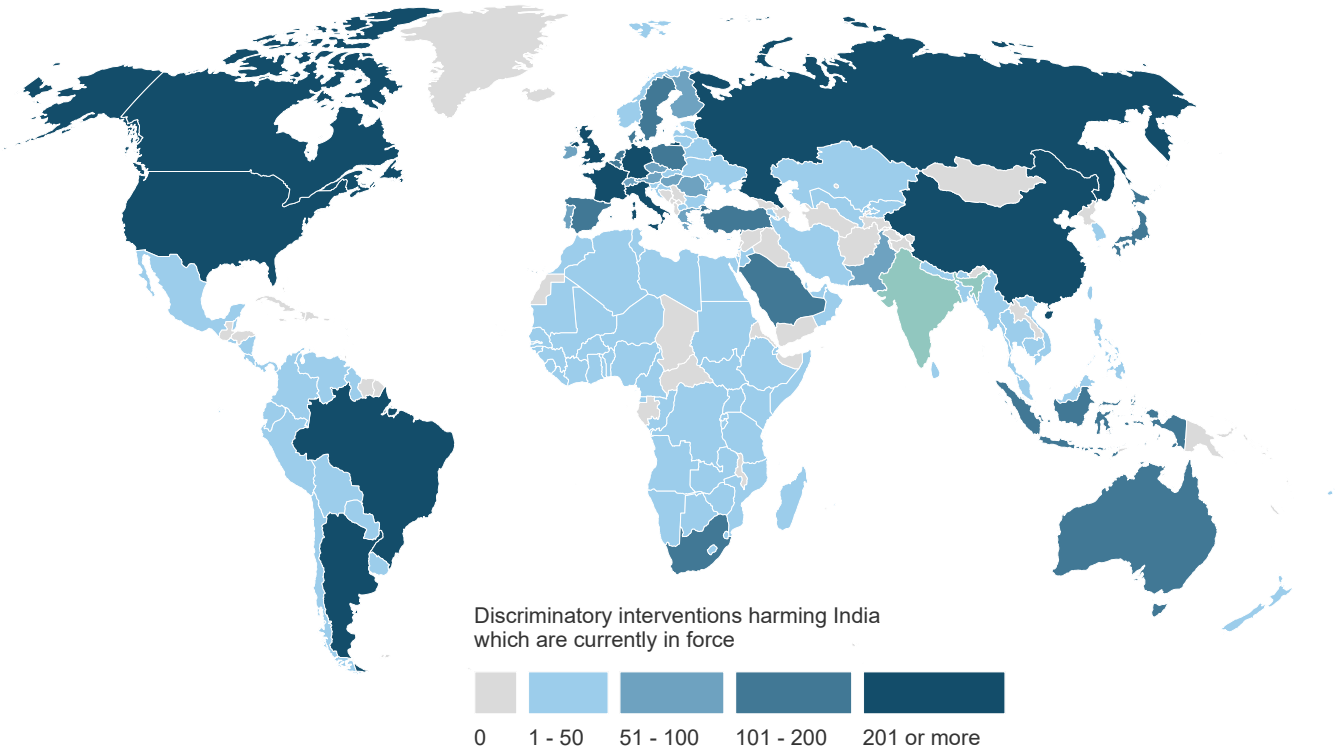
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	39.73	47.77	58.04	53.88	62.02	66.44	77.27	77.77	78.35	78.79	79.58	80.07	79.83	80.14	81.05
D	Contingent trade-protective measures	0.18	0.25	0.64	0.87	0.90	1.06	1.12	1.48	1.59	2.17	2.74	2.84	3.04	3.07	3.07
E	Non-automatic licensing, quotas etc.	5.66	6.14	6.43	7.98	7.22	7.55	7.89	8.79	9.98	10.27	10.13	10.07	9.60	9.63	8.82
F	Price-control measures, including additional taxes and charges	5.34	5.36	5.36	5.36	5.36	5.51	5.58	5.60	5.61	5.64	5.69	5.82	5.94	6.13	9.56
G	Finance measures	0.72	1.00	1.39	1.39	1.46	1.39	1.41	1.42	1.44	1.49	1.61	1.61	1.59	1.68	1.67
I	Trade-related investment measures	0.13	1.27	1.26	1.27	1.30	1.36	1.47	1.58	1.54	1.46	1.45	1.62	1.72	1.77	1.82
L	Subsidies (excl. export subsidies)	3.57	7.44	13.06	15.03	31.64	33.69	35.99	36.63	36.84	37.20	38.79	39.82	31.25	32.80	33.41
M	Government procurement restrictions	1.09	1.21	1.33	1.66	1.77	1.94	2.27	2.46	2.39	2.43	2.59	2.65	3.16	3.84	3.98
P	Export-related measures (incl. subsidies)	32.32	40.70	51.42	46.03	50.61	55.93	68.31	68.84	70.38	70.96	71.92	72.17	72.43	72.42	72.50
	Tariff measures	1.00	1.27	1.68	3.08	3.68	21.18	9.67	12.03	12.95	14.55	17.87	18.19	19.17	19.55	24.22
	Instrument unclear	0.09	0.25	0.17	0.20	0.25	0.43	0.54	0.71	0.79	0.85	0.91	0.91	0.95	1.25	2.21

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY INDIA'S DISCRIMINATORY INTERVENTIONS

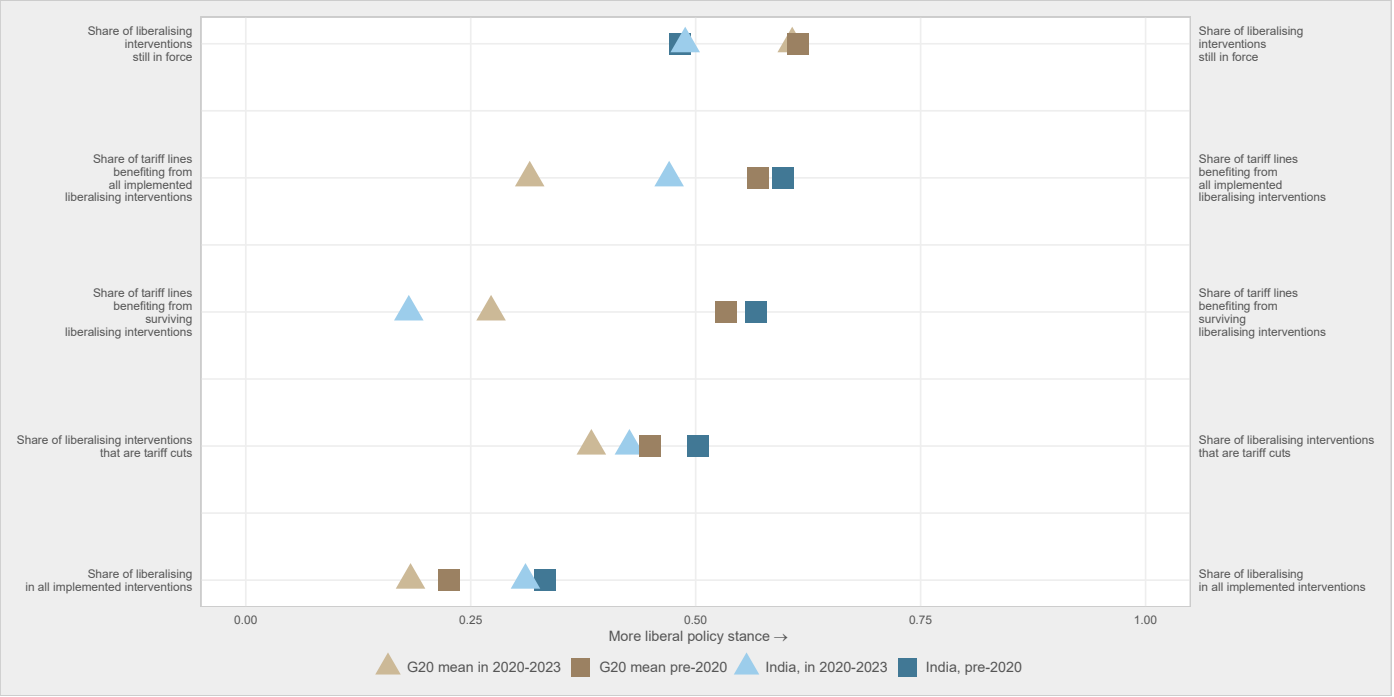


DISCRIMINATORY INTERVENTIONS HARMING INDIA'S INTERESTS



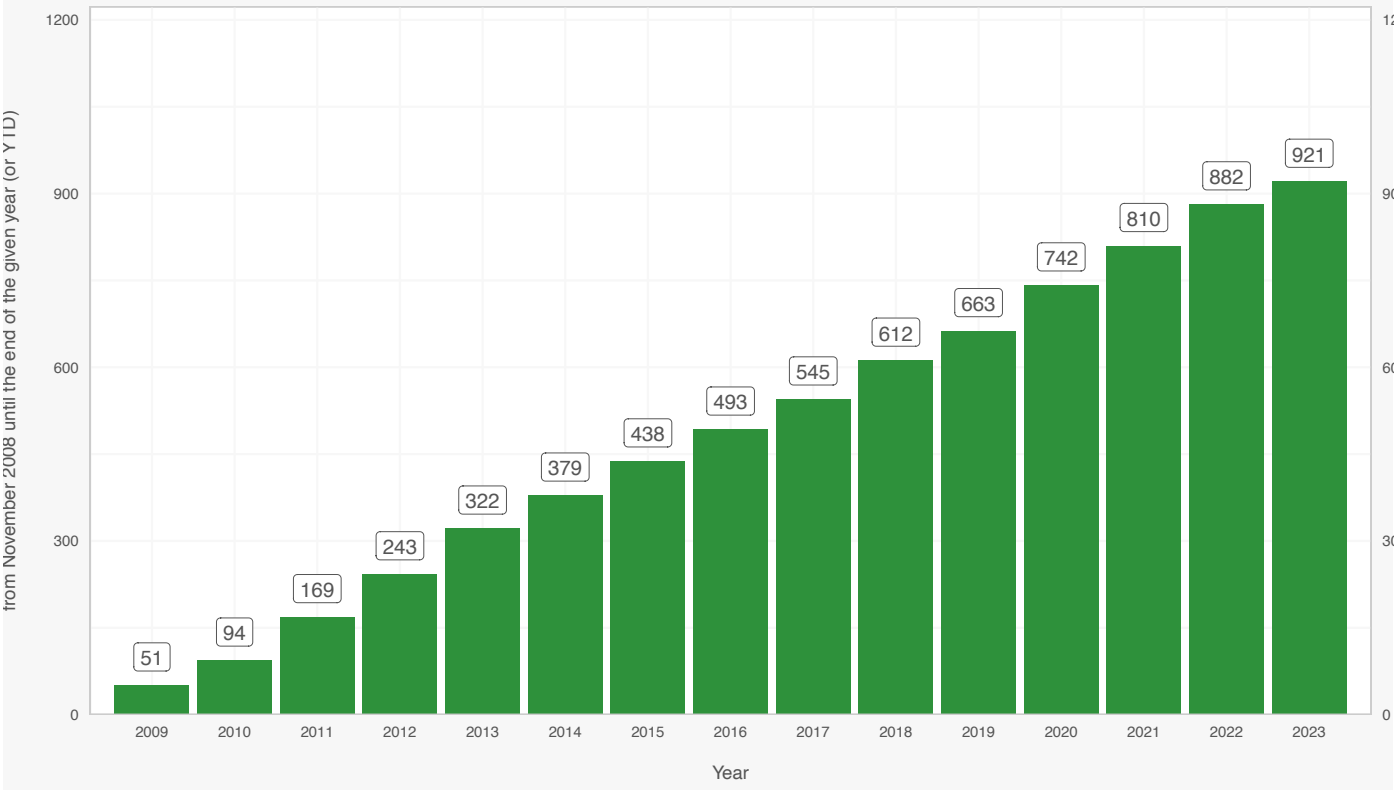
INDIA

Track record of liberalisation



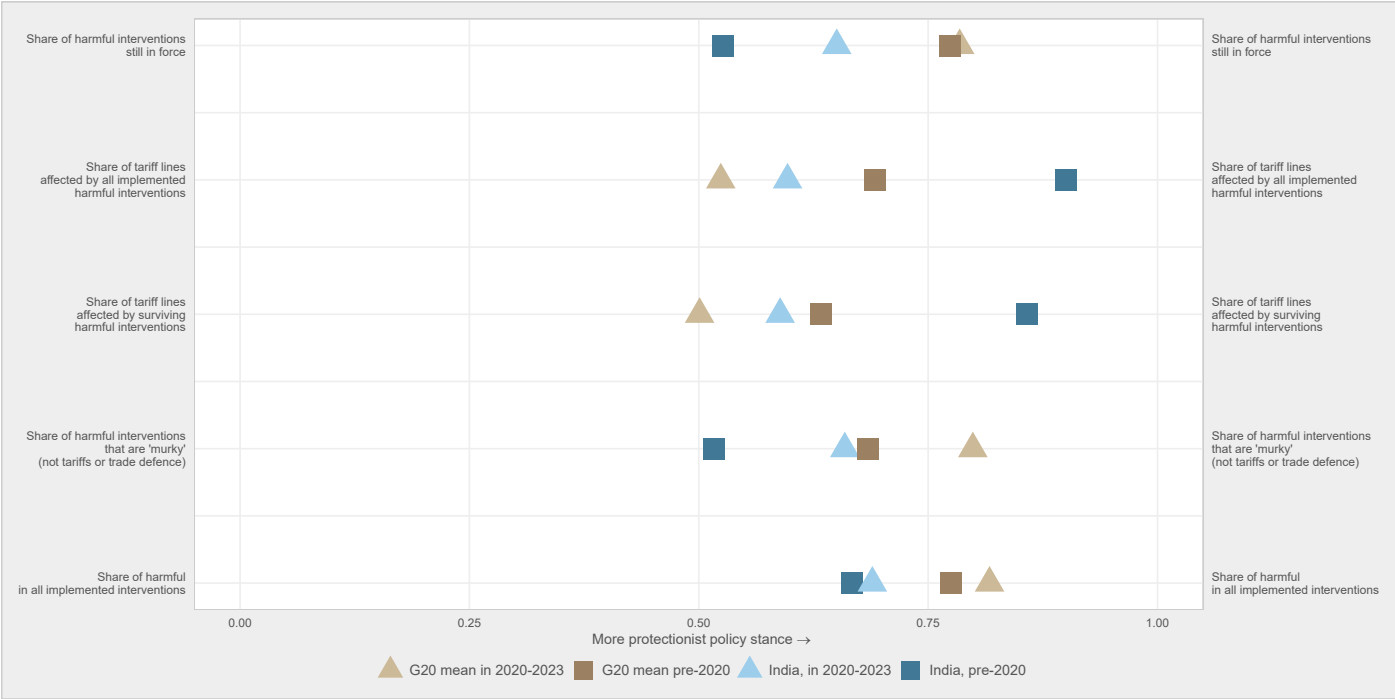
INDIA

Number of liberalising interventions imposed since November 2008



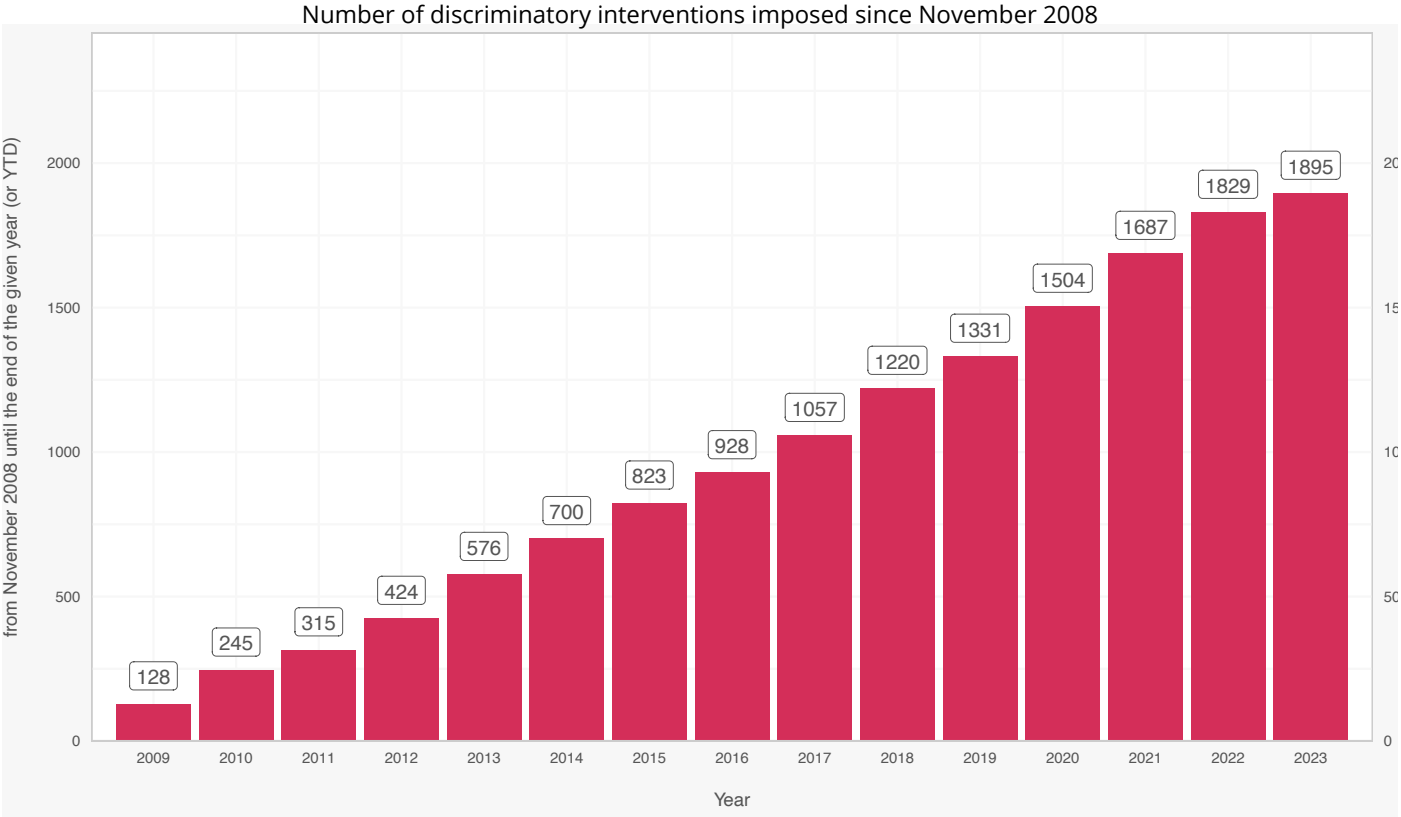
INDIA

Track record of protectionism



INDIA

Number of discriminatory interventions imposed since November 2008



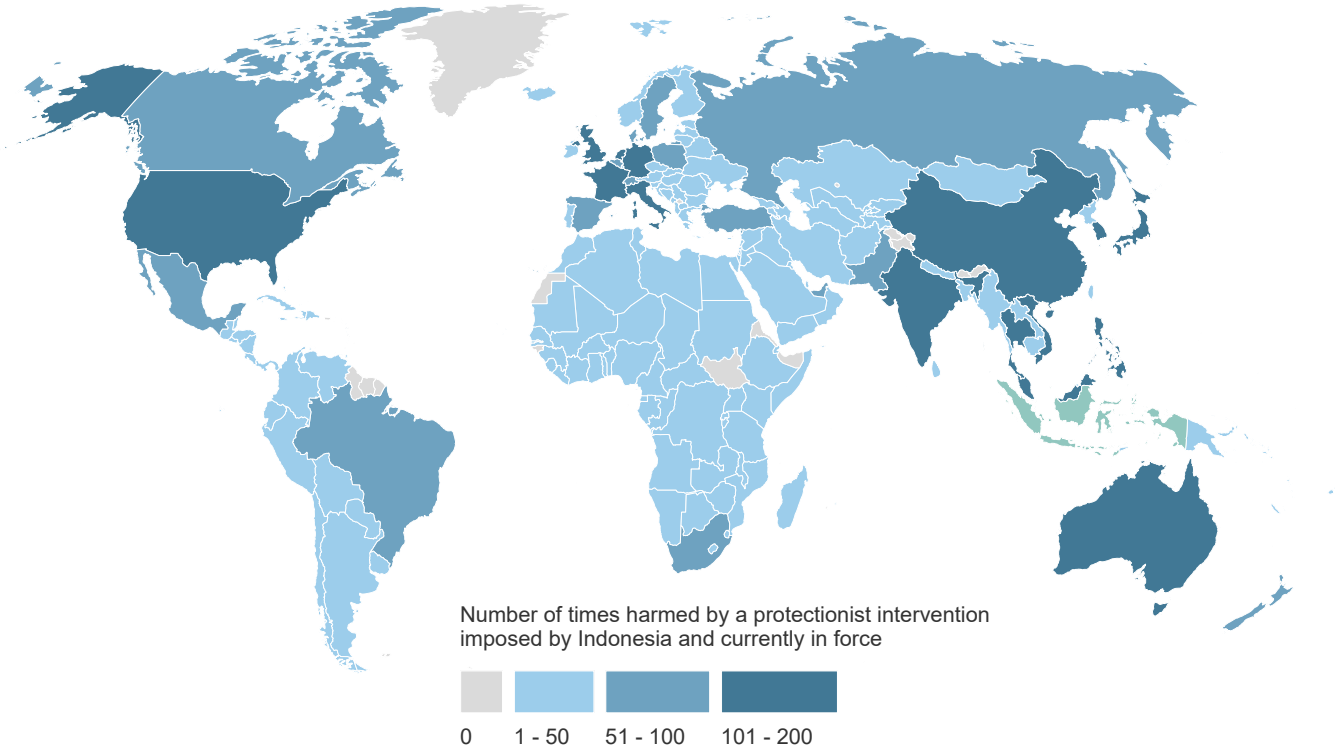
INDONESIA

What is at stake for Indonesia's goods exporters?

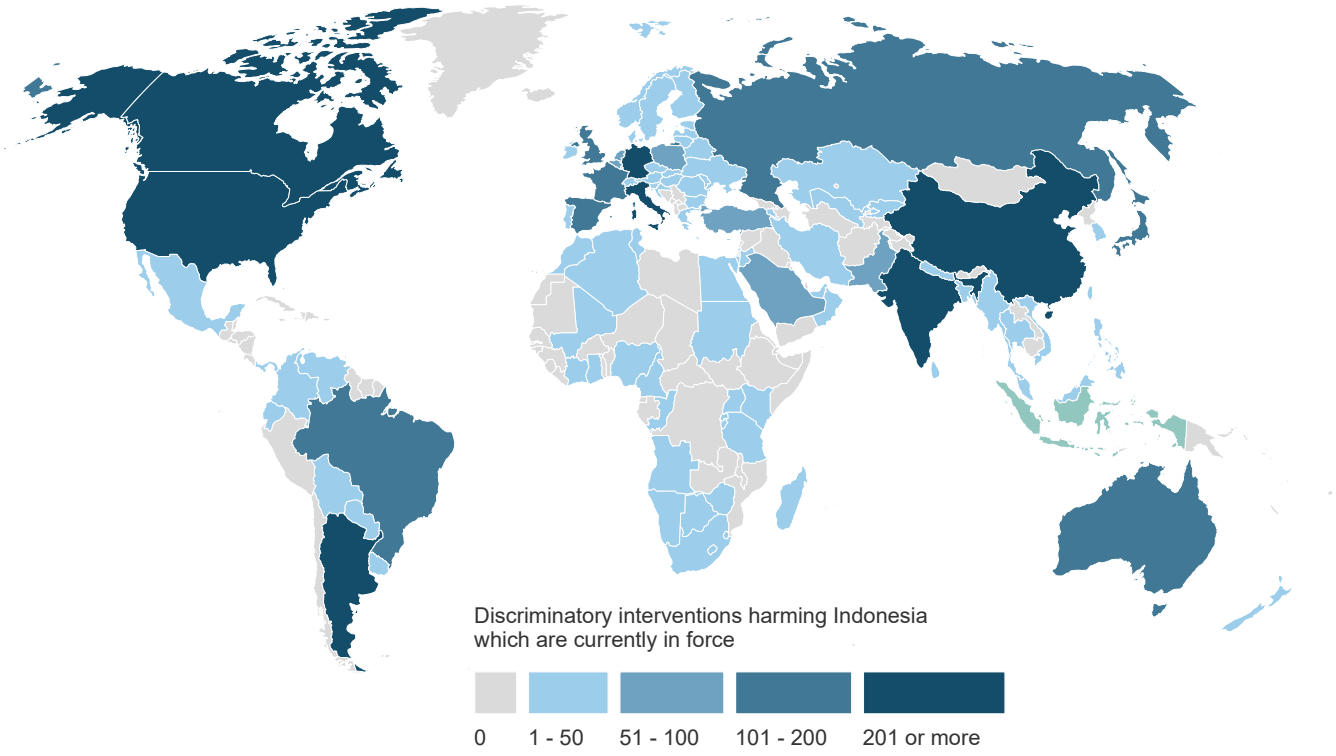
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	38.35	47.35	61.94	65.06	71.56	74.29	74.10	74.81	75.68	76.56	77.96	81.62	80.86	81.20	82.44
D	Contingent trade-protective measures	0.17	0.25	0.29	0.34	0.48	0.43	0.45	0.49	0.49	0.57	0.54	0.56	0.66	0.67	0.67
E	Non-automatic licensing, quotas etc.	4.15	3.87	4.16	4.47	4.21	4.26	4.57	5.11	5.23	5.26	5.28	5.54	5.59	6.63	6.60
F	Price-control measures, including additional taxes and charges	1.17	1.17	1.23	1.28	1.28	1.97	2.48	2.49	2.50	4.96	5.22	5.33	5.36	5.55	12.46
G	Finance measures	0.07	0.31	0.68	0.68	0.68	0.68	0.68	0.68	0.69	0.70	0.72	0.71	0.70	0.71	0.70
I	Trade-related investment measures	0.01	0.15	0.15	0.17	0.18	0.26	0.29	0.34	0.37	0.36	0.35	0.37	0.43	0.55	0.61
L	Subsidies (excl. export subsidies)	4.93	8.02	10.02	11.40	21.25	23.15	25.06	25.81	26.80	26.99	33.91	30.33	25.44	29.60	32.98
M	Government procurement restrictions	0.31	1.61	1.58	1.75	1.89	1.96	2.14	2.14	2.19	2.24	2.53	2.51	2.66	4.09	4.51
P	Export-related measures (incl. subsidies)	31.20	39.88	54.86	57.17	61.88	64.76	62.51	63.69	64.62	64.99	67.79	73.14	73.13	73.07	73.10
	Tariff measures	0.50	0.66	1.55	2.46	3.66	12.47	6.24	8.16	10.11	10.49	10.95	10.97	11.12	11.29	12.30
	Instrument unclear	0.01	0.21	0.05	0.05	0.13	0.18	0.33	0.70	0.97	1.00	1.01	1.01	1.08	1.17	1.08

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY INDONESIA'S DISCRIMINATORY INTERVENTIONS

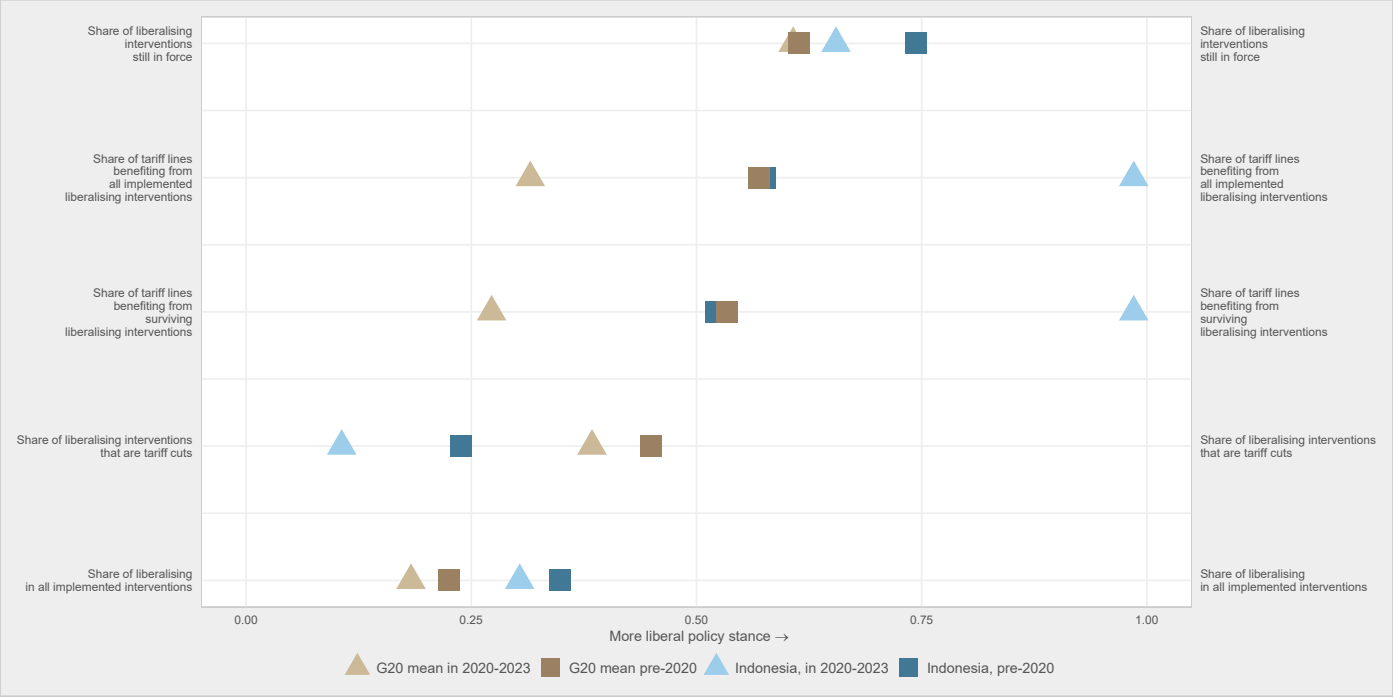


DISCRIMINATORY INTERVENTIONS HARMING INDONESIA'S INTERESTS



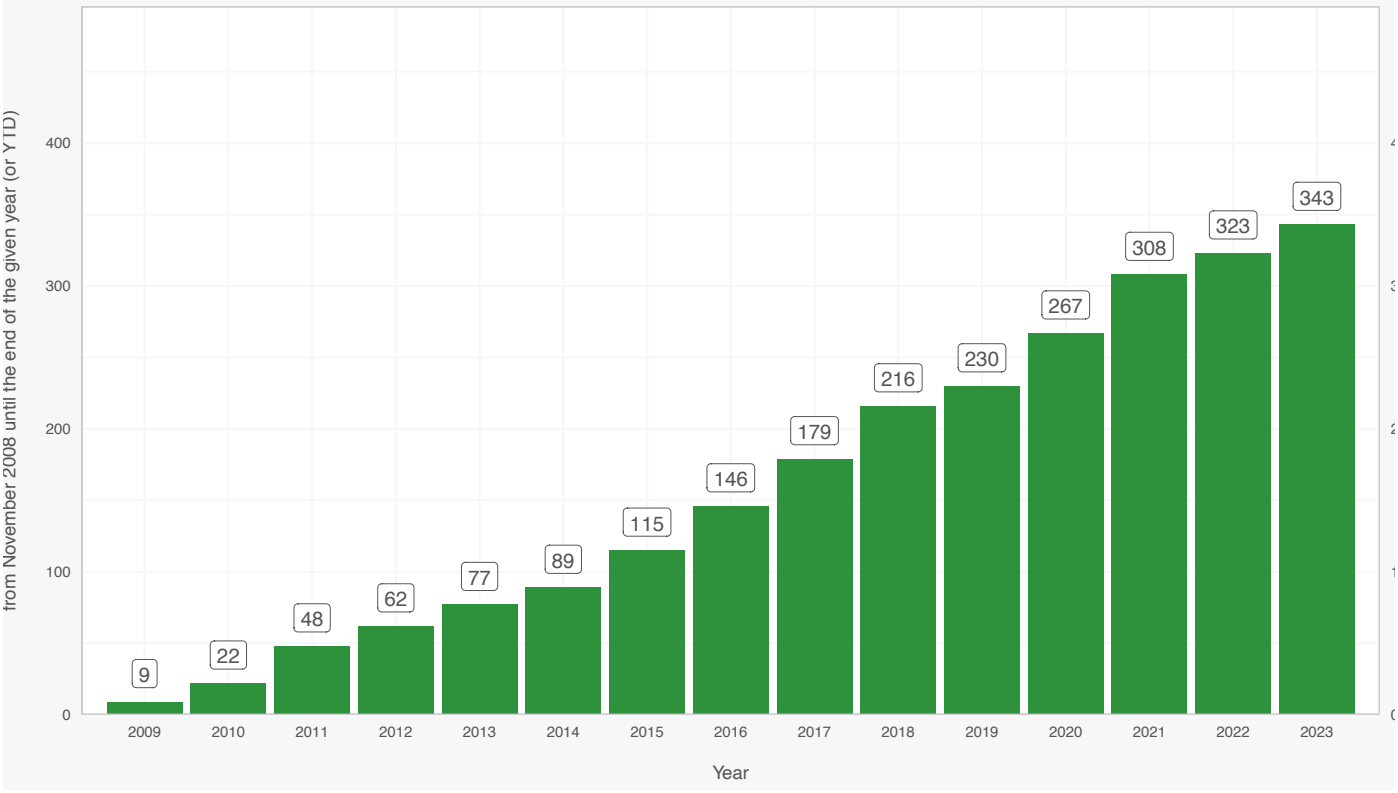
INDONESIA

Track record of liberalisation



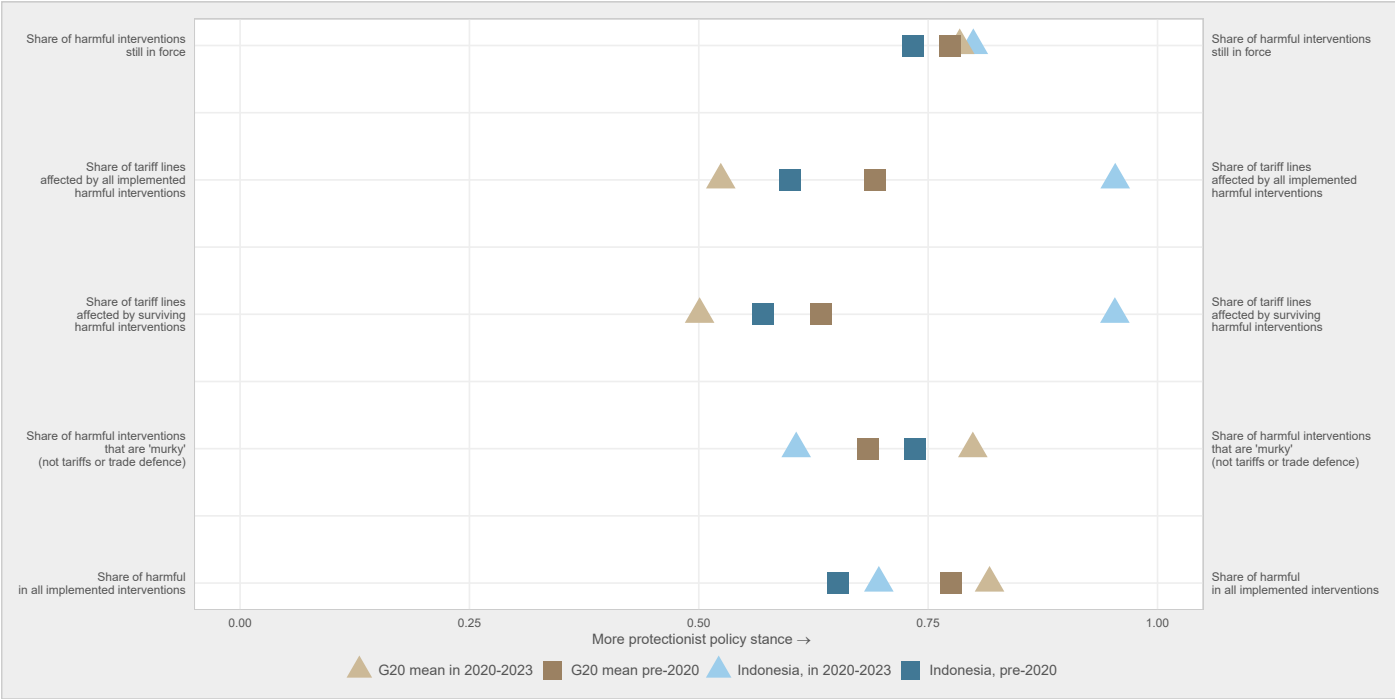
INDONESIA

Number of liberalising interventions imposed since November 2008



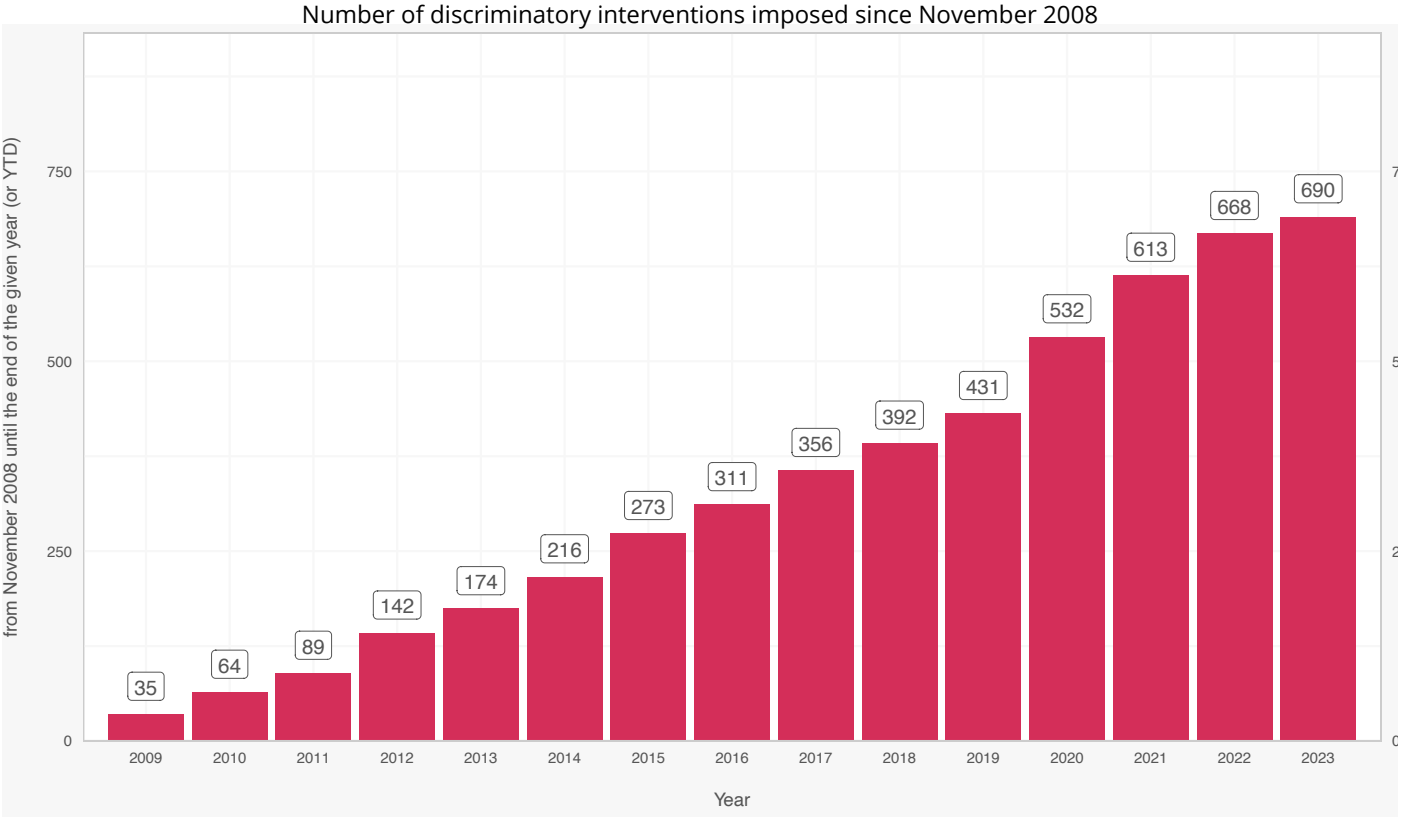
INDONESIA

Track record of protectionism



INDONESIA

Number of discriminatory interventions imposed since November 2008



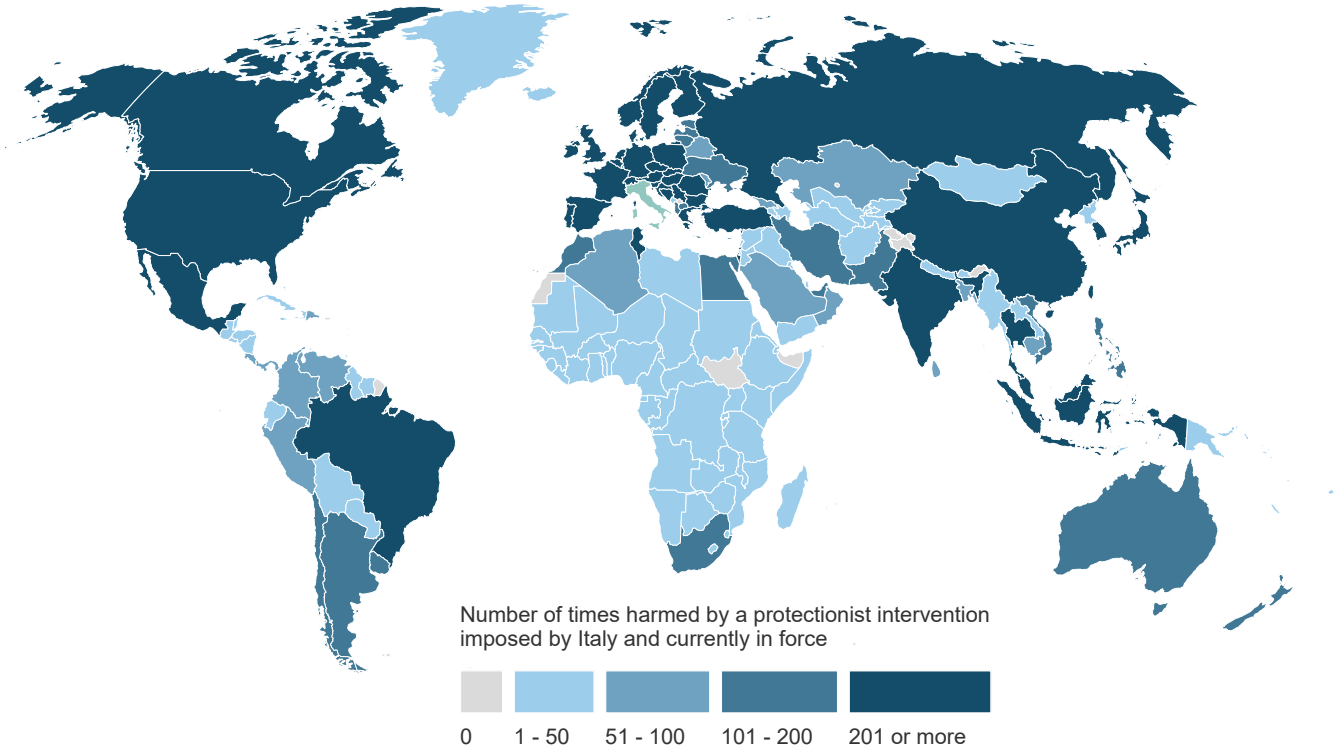
ITALY

What is at stake for Italy's goods exporters?

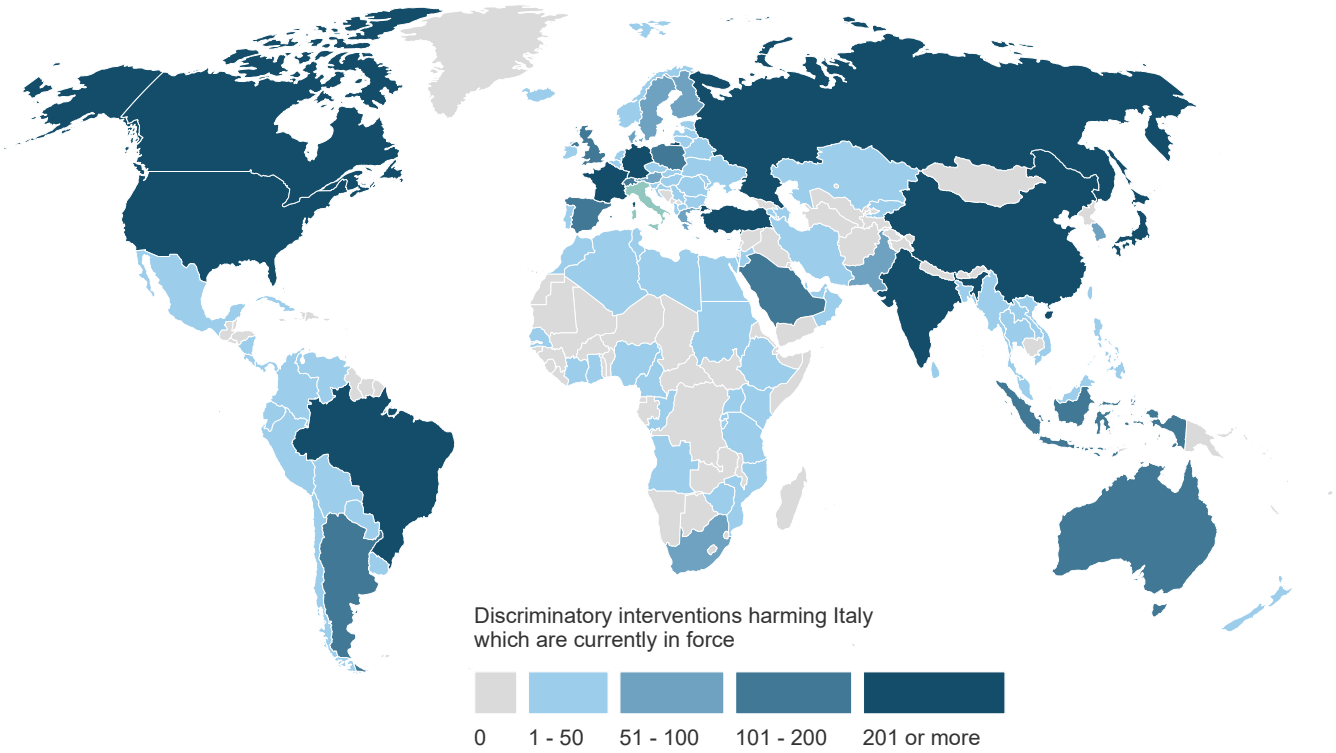
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	49.07	61.71	64.25	66.91	69.20	71.16	72.77	74.82	76.22	77.41	79.77	80.25	79.12	79.37	80.54
D	Contingent trade-protective measures	0.03	0.06	0.08	0.12	0.18	0.19	0.18	0.18	0.17	0.22	0.29	0.35	0.43	0.46	0.46
E	Non-automatic licensing, quotas etc.	0.35	0.38	0.67	0.79	0.84	0.87	1.12	1.13	1.42	1.69	1.75	1.80	1.81	1.98	2.09
F	Price-control measures, including additional taxes and charges	0.00	0.03	0.11	0.18	0.18	0.20	0.35	0.42	0.43	0.77	0.81	0.97	0.99	0.99	1.38
G	Finance measures	0.25	0.35	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.39	0.39	0.39	0.39	0.40	0.40
I	Trade-related investment measures	0.06	1.13	1.29	1.32	1.36	1.47	1.59	1.70	1.76	1.72	1.69	1.69	1.82	1.97	2.02
L	Subsidies (excl. export subsidies)	7.53	15.74	15.94	16.90	18.50	22.35	26.92	29.87	31.53	32.92	34.51	36.64	35.61	37.67	41.16
M	Government procurement restrictions	0.37	0.41	0.39	0.67	0.75	1.25	1.67	1.76	1.92	2.10	2.38	2.44	2.86	3.32	3.50
P	Export-related measures (incl. subsidies)	43.58	54.45	58.39	62.30	64.82	64.83	64.78	67.73	68.92	69.79	72.57	72.96	72.01	71.86	72.23
	Tariff measures	0.24	0.38	0.46	0.81	1.36	0.95	1.40	1.90	2.42	3.90	4.38	5.74	6.15	6.12	6.25
	Instrument unclear	0.07	0.14	0.15	0.16	0.26	0.29	0.47	0.61	0.64	0.67	0.68	0.68	0.69	0.70	0.70

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY ITALY'S DISCRIMINATORY INTERVENTIONS

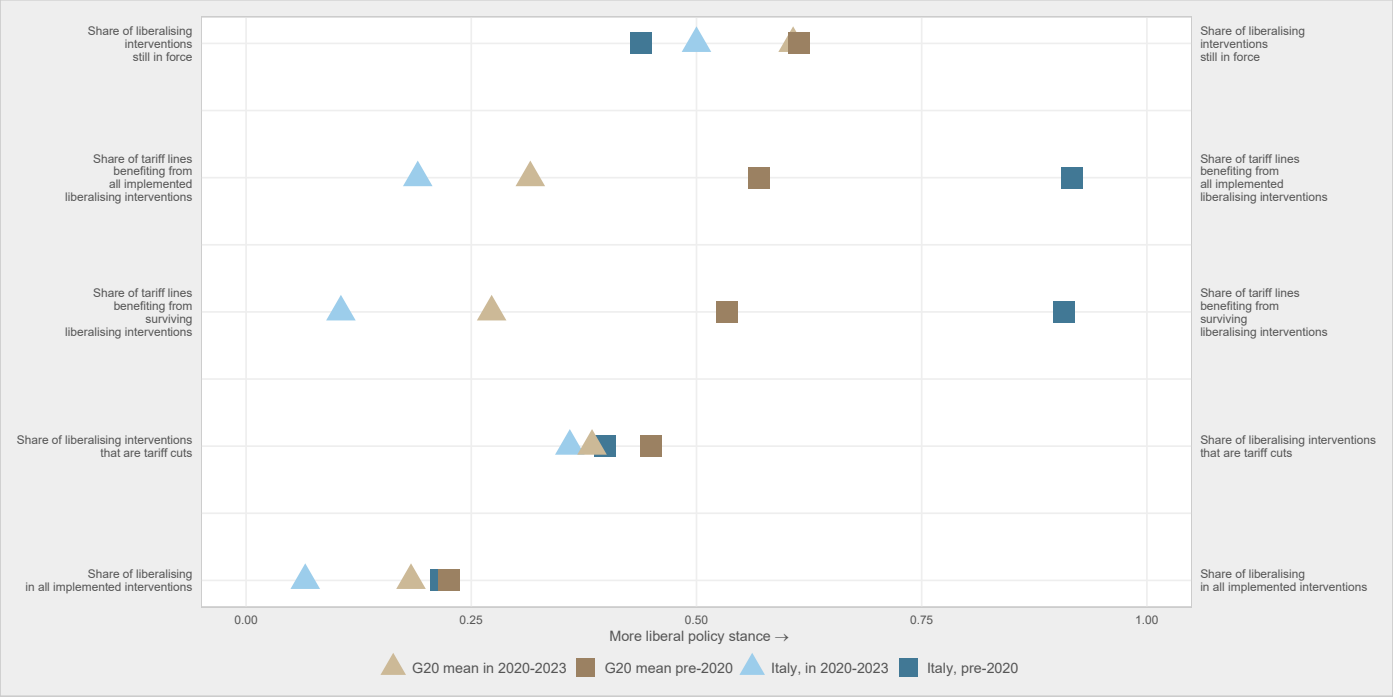


DISCRIMINATORY INTERVENTIONS HARMING ITALY'S INTERESTS



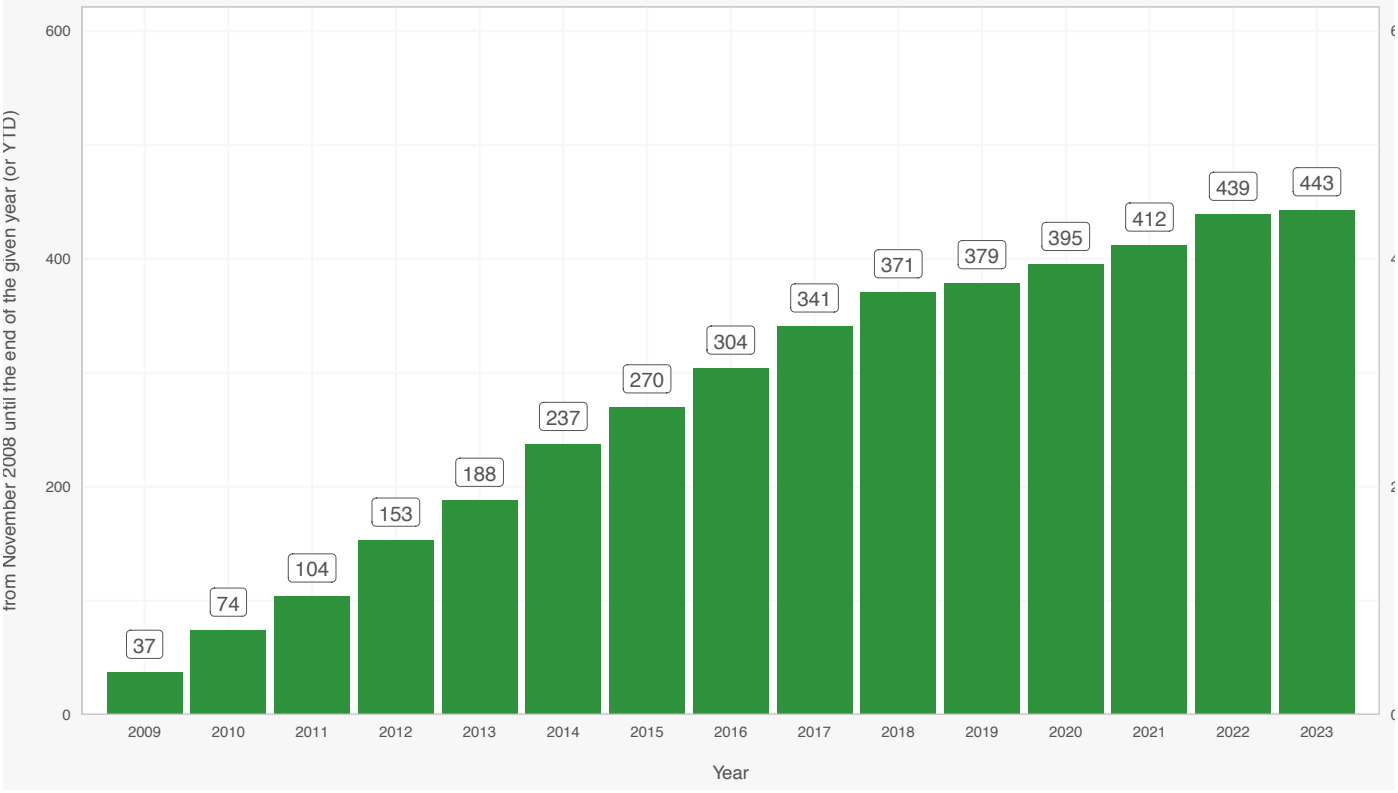
ITALY

Track record of liberalisation



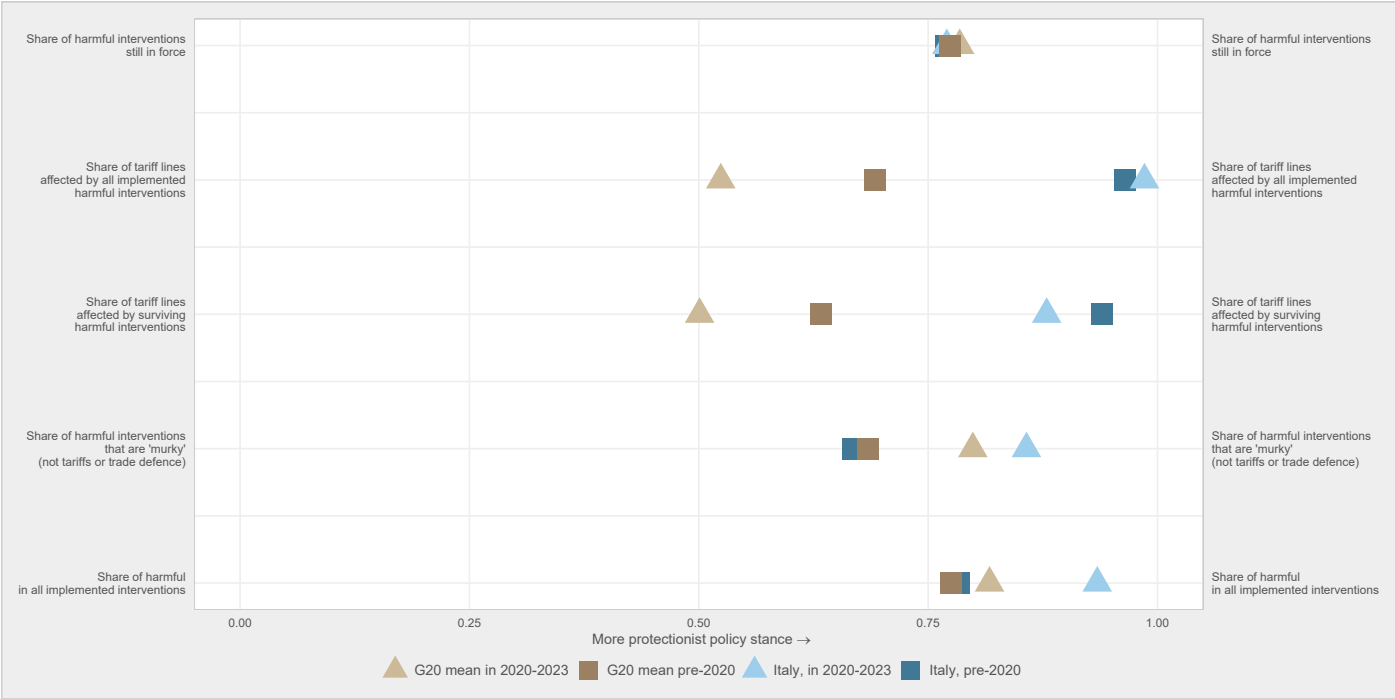
ITALY

Number of liberalising interventions imposed since November 2008



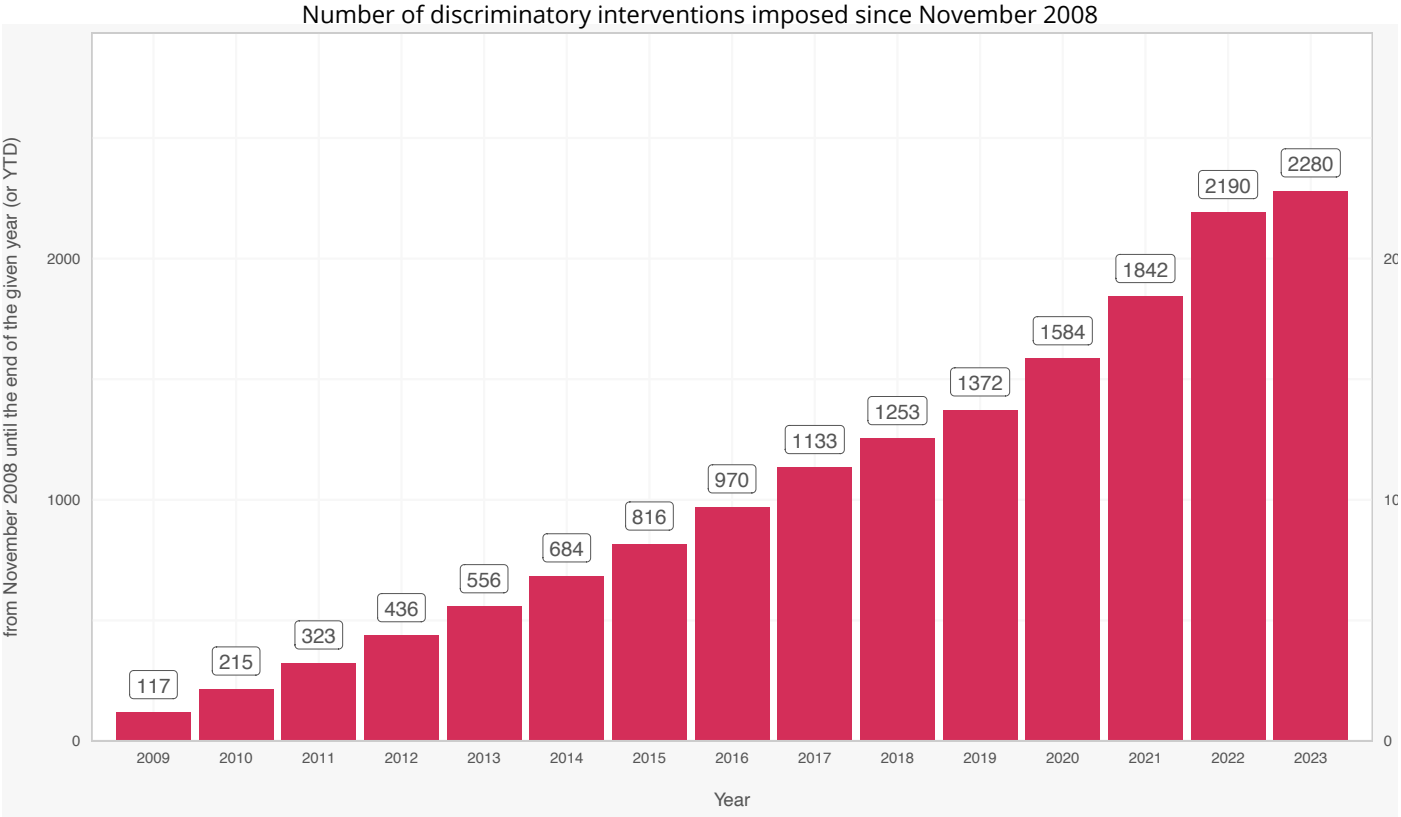
ITALY

Track record of protectionism



ITALY

Number of discriminatory interventions imposed since November 2008



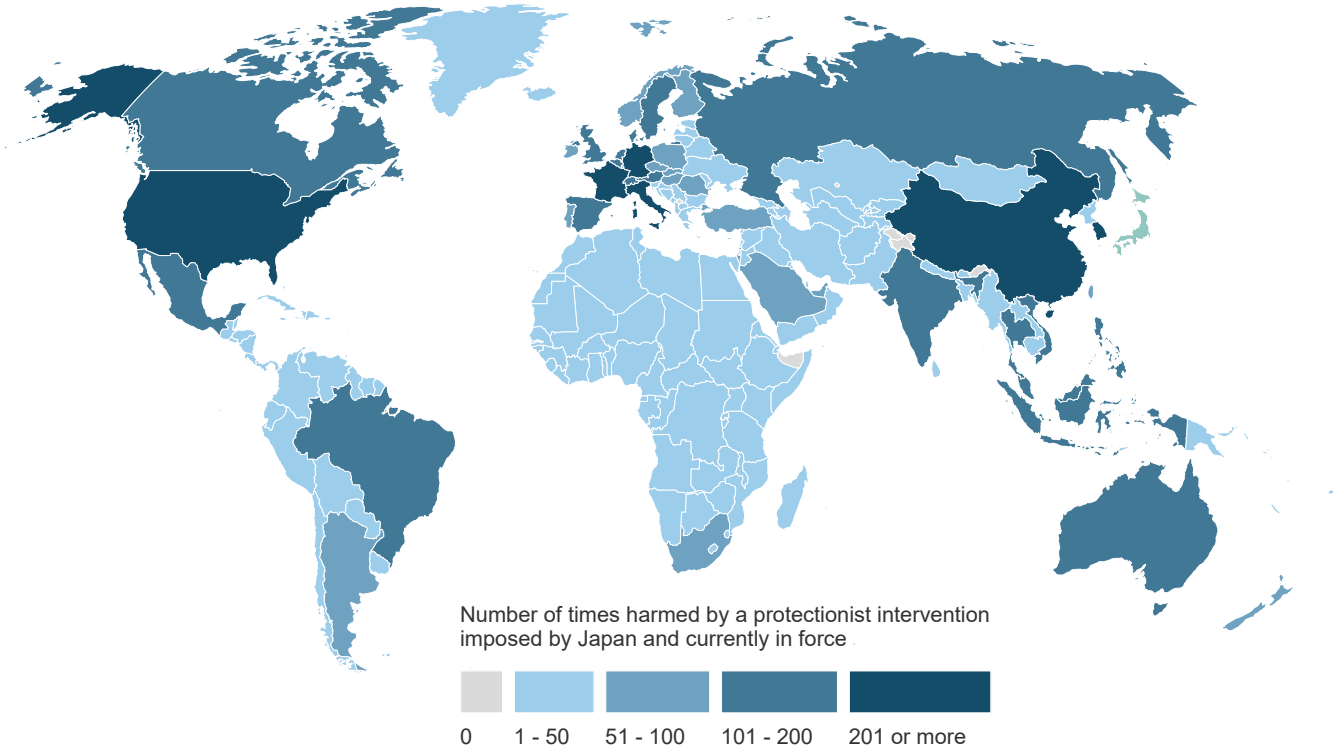
JAPAN

What is at stake for Japan's goods exporters?

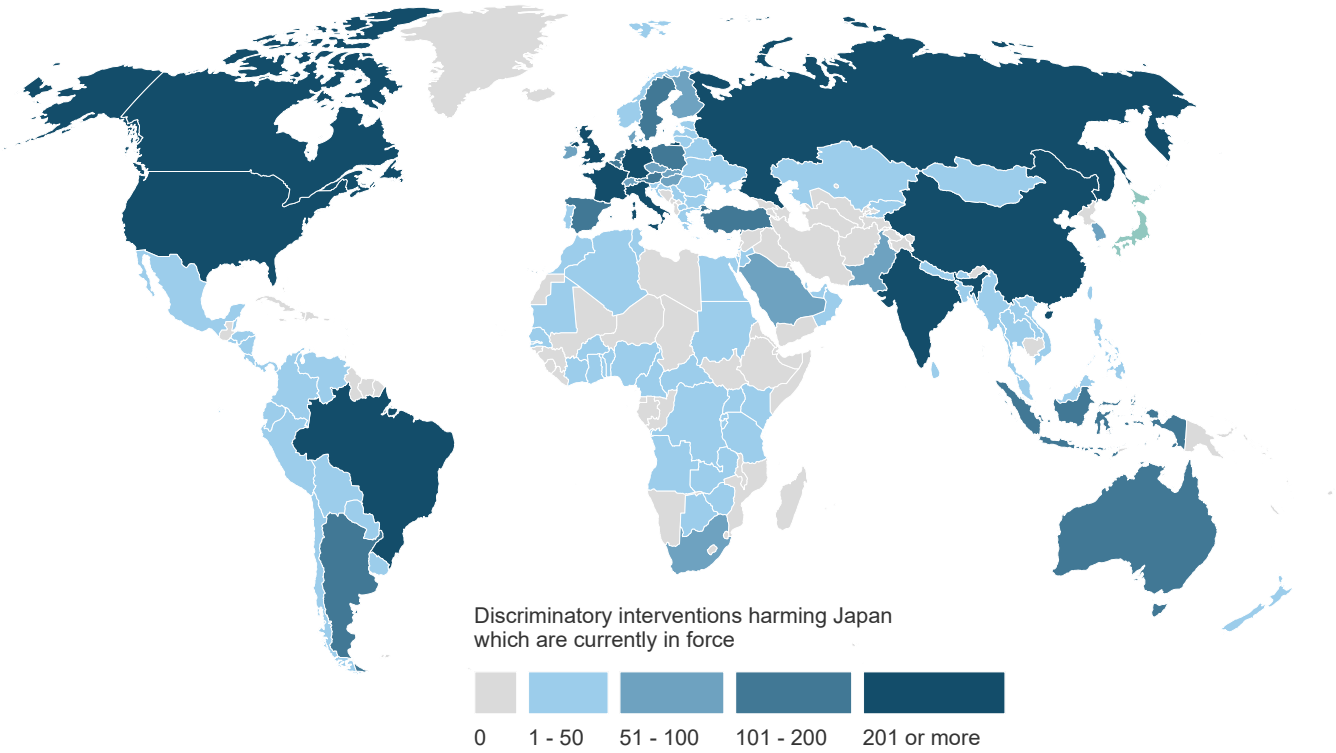
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	55.15	67.58	70.72	74.42	79.52	80.43	80.35	80.88	82.04	82.73	84.70	85.15	83.96	84.14	84.73
D	Contingent trade-protective measures	0.14	0.30	0.33	0.40	0.53	0.60	0.58	0.64	0.71	0.83	0.91	0.91	0.92	0.93	0.93
E	Non-automatic licensing, quotas etc.	2.67	3.23	5.03	5.34	5.95	5.72	6.45	6.74	7.10	7.17	7.23	7.75	8.37	8.76	9.07
F	Price-control measures, including additional taxes and charges	0.03	0.06	0.08	0.10	0.08	0.41	0.84	0.96	1.24	1.55	1.61	1.78	1.92	1.99	3.97
G	Finance measures	0.16	0.43	0.79	0.79	0.80	0.79	0.80	0.80	0.86	0.89	0.93	0.93	0.92	0.97	0.92
I	Trade-related investment measures	0.78	2.25	2.20	2.28	2.32	2.35	2.78	3.02	2.93	2.88	2.81	2.76	3.05	3.13	3.25
L	Subsidies (excl. export subsidies)	20.40	30.39	34.96	36.96	46.94	47.44	48.45	49.06	49.46	49.95	50.94	52.10	48.06	48.89	49.60
M	Government procurement restrictions	0.42	1.28	1.63	1.86	1.94	2.31	3.19	3.23	3.30	3.36	3.45	3.60	4.84	6.40	6.95
P	Export-related measures (incl. subsidies)	35.96	48.99	54.25	62.52	65.89	63.59	62.56	64.14	65.65	66.43	69.65	70.26	69.30	69.21	69.66
	Tariff measures	1.74	1.61	2.75	4.62	7.99	5.05	6.20	9.14	10.92	10.32	10.53	11.18	13.30	13.53	13.98
	Instrument unclear	0.25	0.89	1.28	1.32	1.38	1.81	1.79	1.69	1.74	2.02	2.08	2.08	2.20	2.32	2.39

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY JAPAN'S DISCRIMINATORY INTERVENTIONS

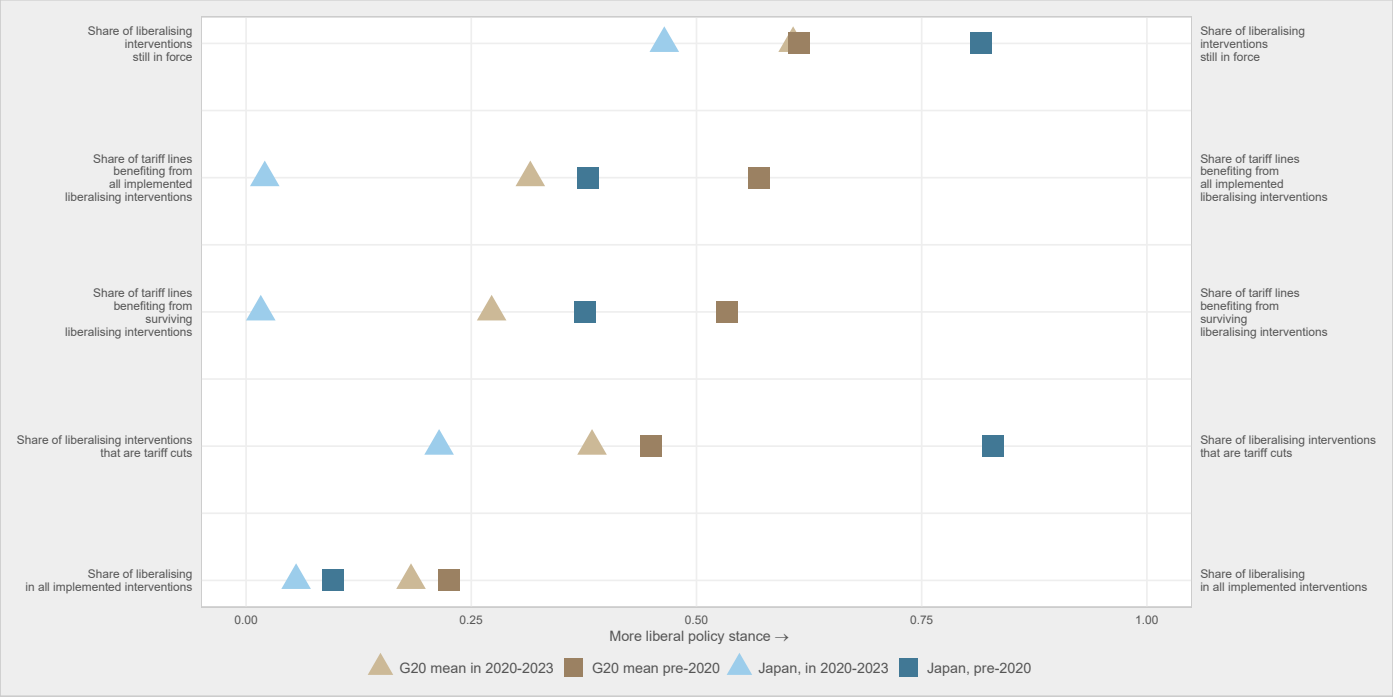


DISCRIMINATORY INTERVENTIONS HARMING JAPAN'S INTERESTS



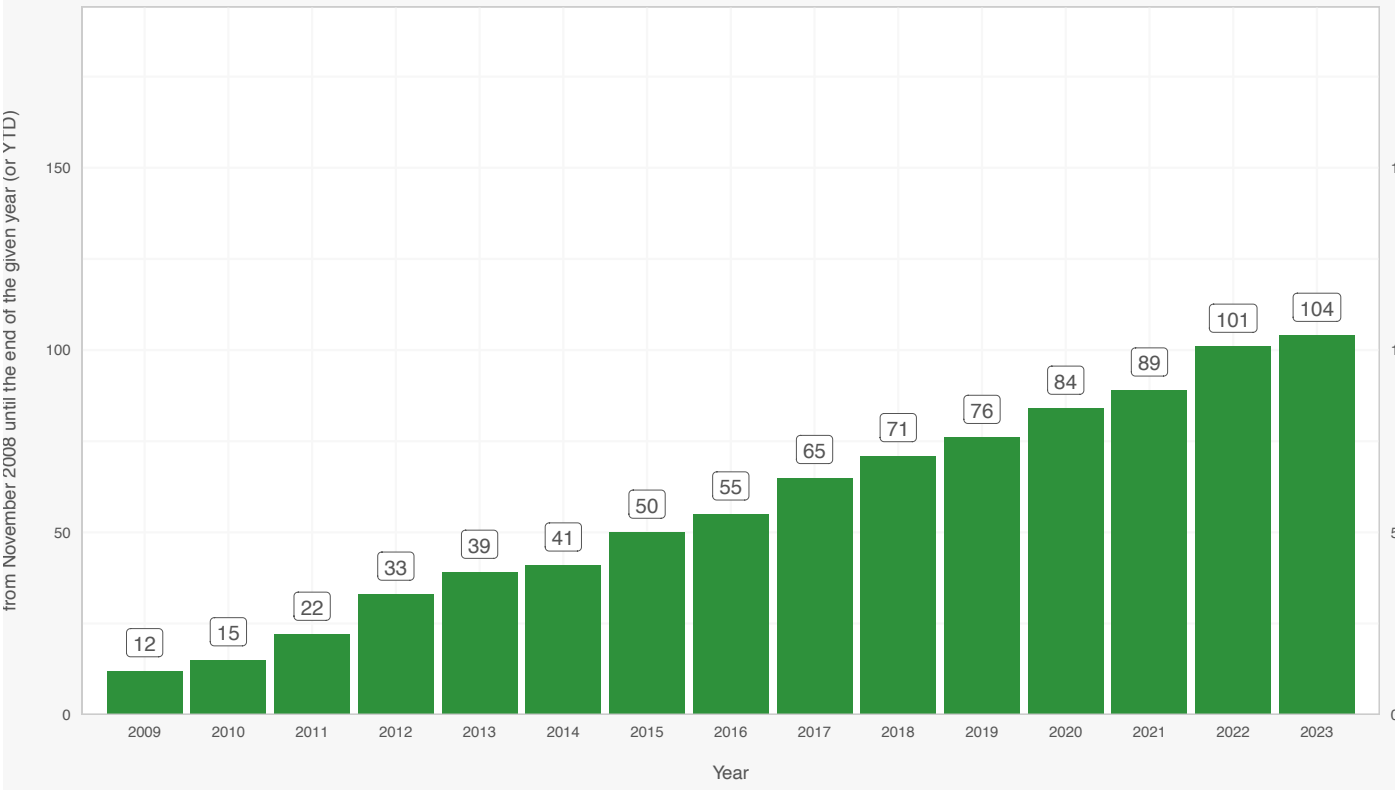
JAPAN

Track record of liberalisation



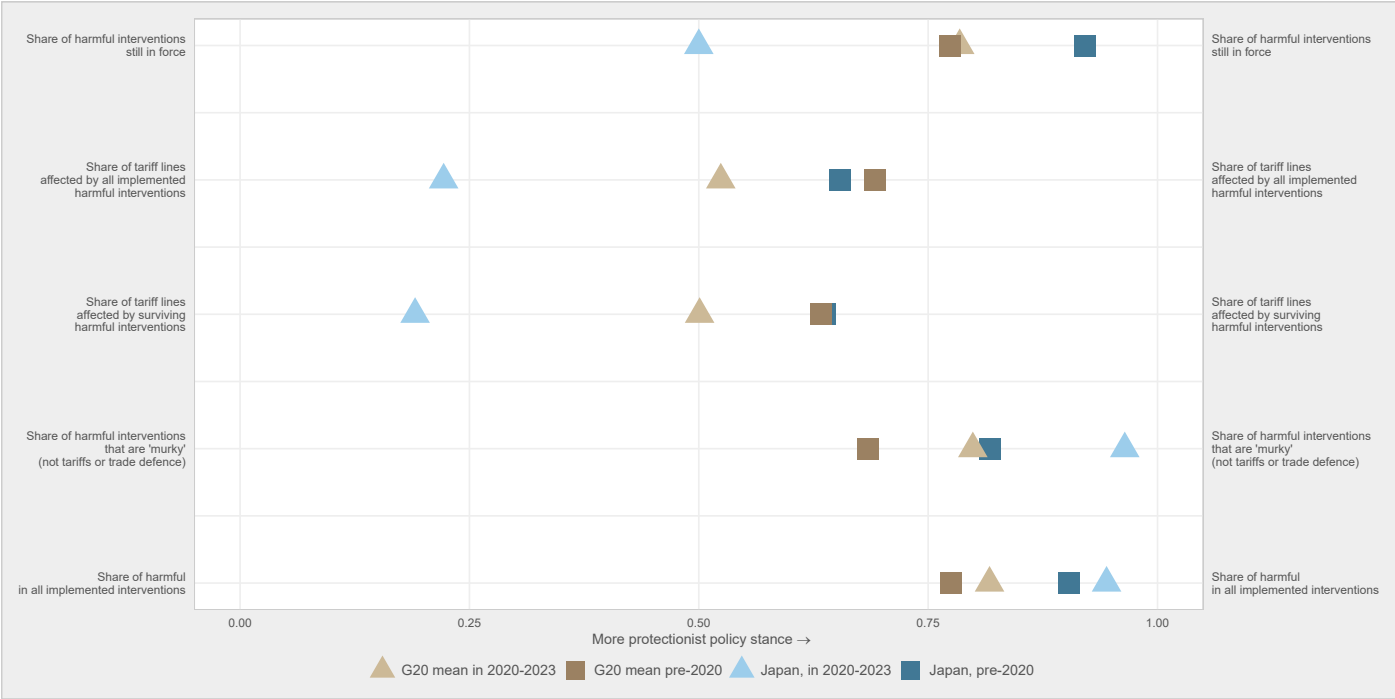
JAPAN

Number of liberalising interventions imposed since November 2008



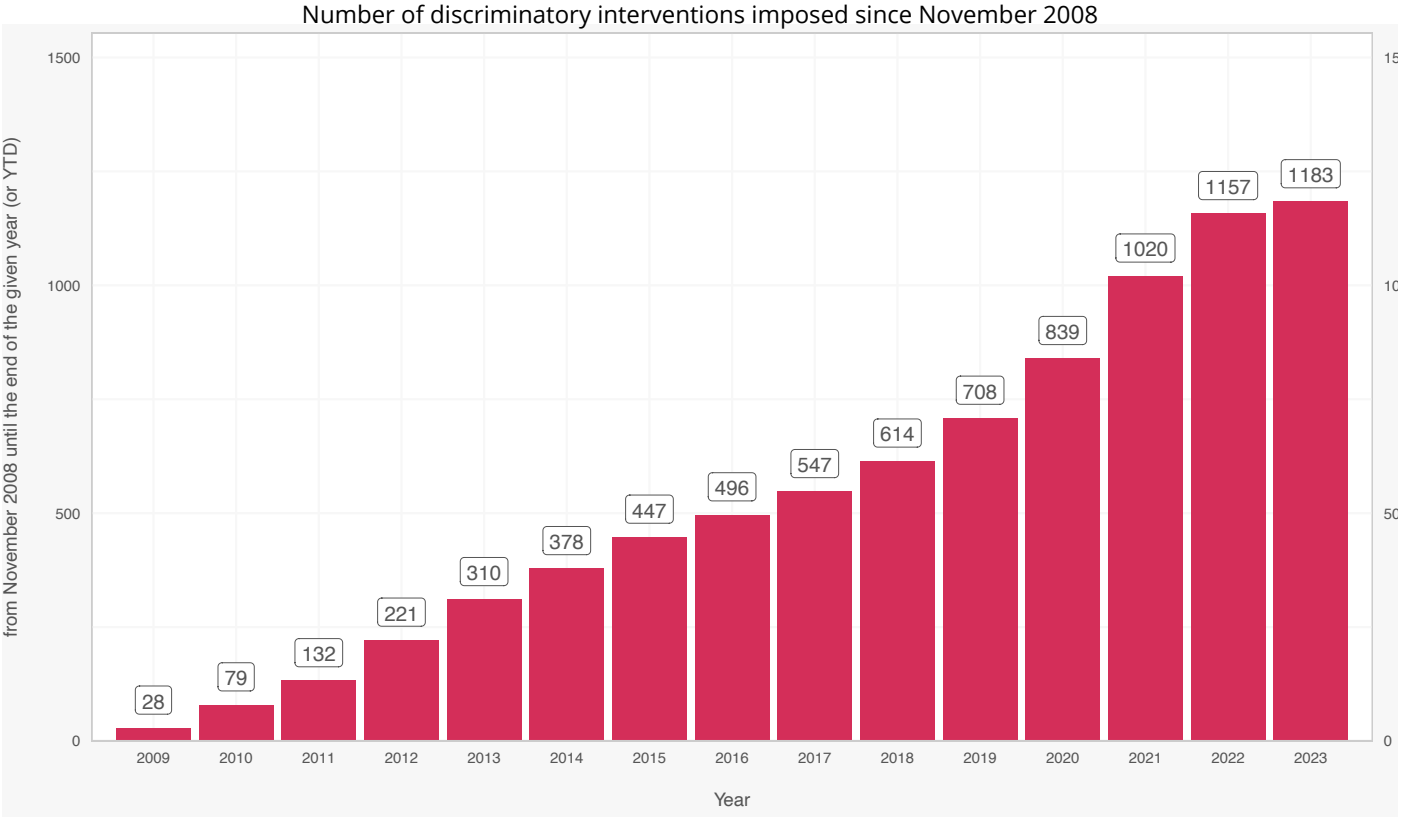
JAPAN

Track record of protectionism



JAPAN

Number of discriminatory interventions imposed since November 2008



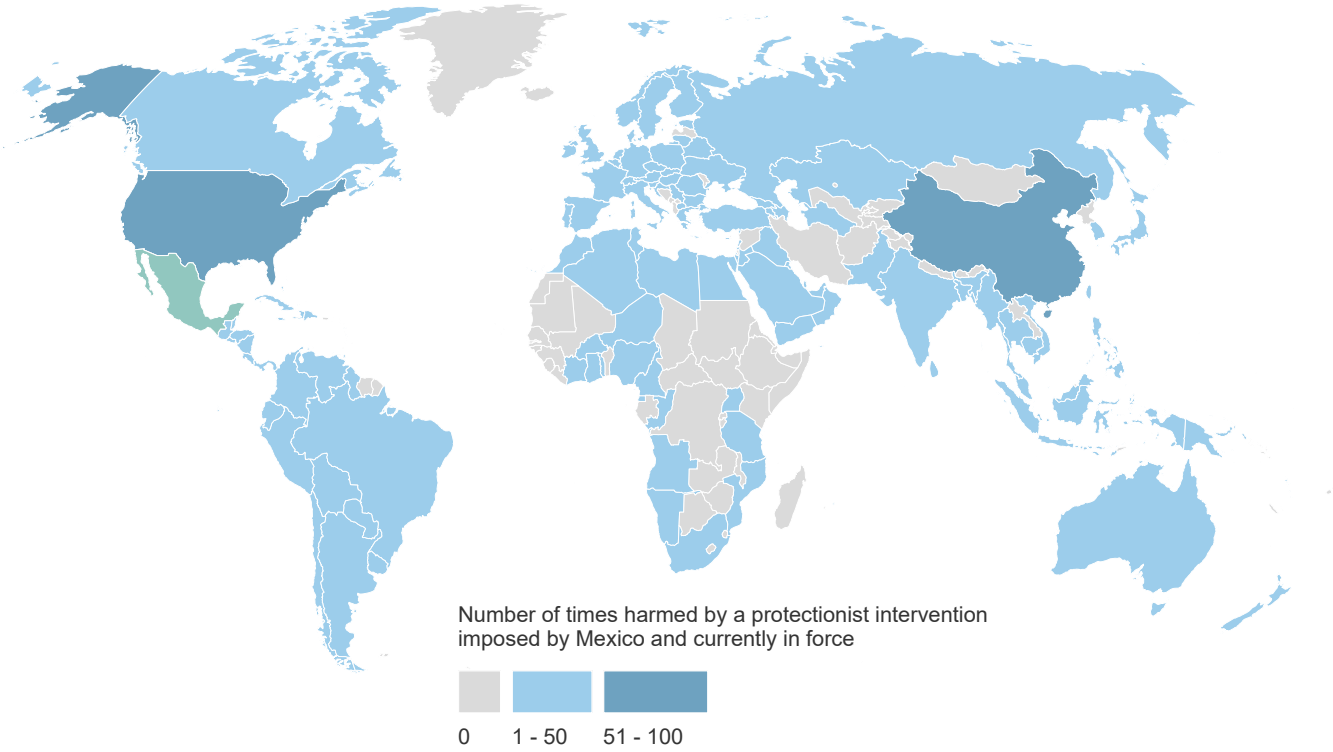
MEXICO

What is at stake for Mexico's goods exporters?

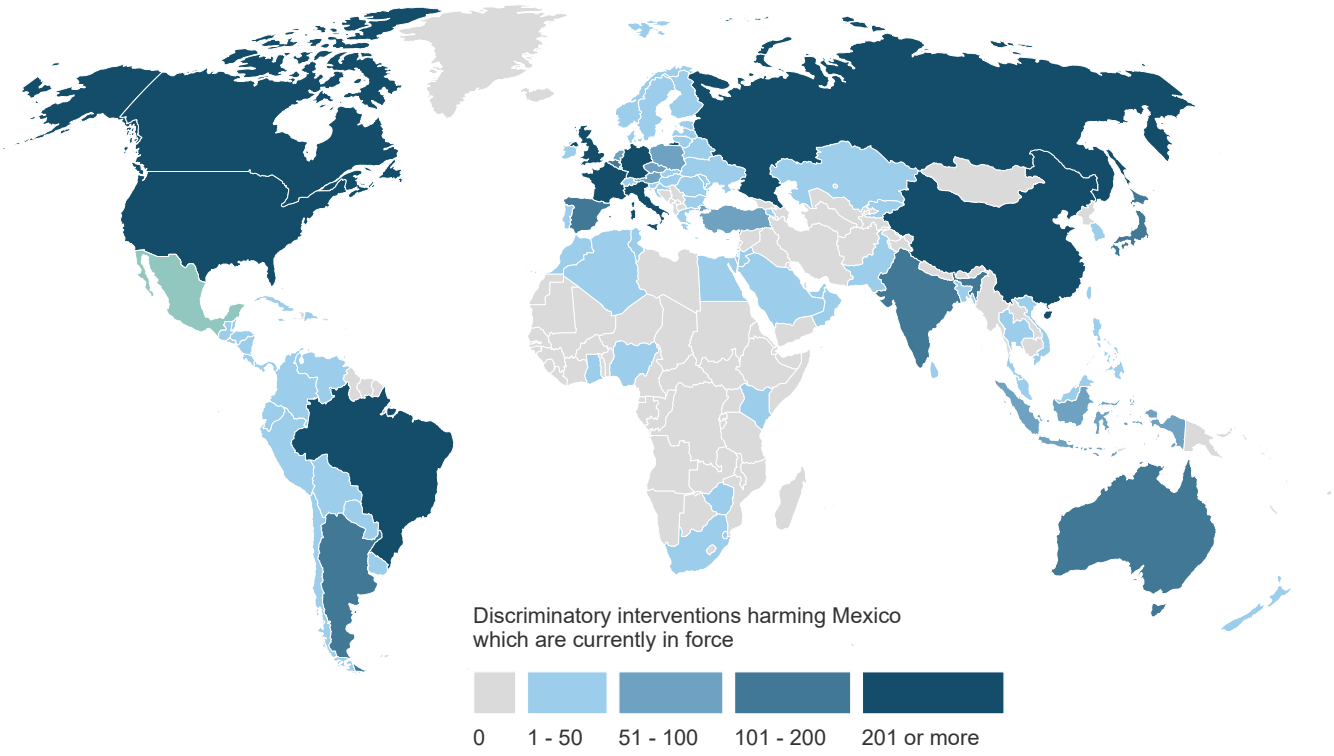
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	59.30	73.37	87.05	89.31	90.67	92.64	92.68	93.06	93.69	94.24	94.68	94.88	94.98	95.41	95.61
D	Contingent trade-protective measures	0.00	0.33	0.64	0.87	0.67	0.79	0.87	0.87	0.92	1.23	1.50	1.72	1.70	1.71	1.75
E	Non-automatic licensing, quotas etc.	0.27	0.34	0.65	0.87	0.97	1.03	0.89	0.84	1.71	1.78	1.77	1.88	2.37	4.17	4.02
F	Price-control measures, including additional taxes and charges	0.11	0.11	0.16	0.26	0.14	0.27	0.33	0.40	0.41	0.58	0.61	0.99	0.99	0.99	1.09
G	Finance measures	0.02	0.40	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
I	Trade-related investment measures	0.57	6.53	6.64	6.77	6.74	6.80	6.85	6.90	6.91	6.84	6.84	6.84	6.97	7.20	7.42
L	Subsidies (excl. export subsidies)	9.06	13.97	28.59	33.95	38.34	42.99	45.29	46.39	47.39	52.14	53.24	57.22	61.54	69.98	78.79
M	Government procurement restrictions	1.80	2.09	2.56	3.07	3.25	3.89	6.39	6.35	7.16	8.60	10.15	8.50	12.09	18.27	21.57
P	Export-related measures (incl. subsidies)	49.37	60.48	77.95	86.36	87.51	83.80	82.49	83.16	83.97	84.53	85.94	86.30	85.82	85.68	85.76
	Tariff measures	0.11	0.16	0.33	0.50	2.49	2.45	2.46	3.18	4.82	6.49	5.63	8.24	10.76	10.88	10.97
	Instrument unclear	0.00	0.13	0.08	0.09	0.29	0.62	0.64	0.73	0.85	0.89	0.90	0.90	0.91	0.93	0.93

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY MEXICO'S DISCRIMINATORY INTERVENTIONS

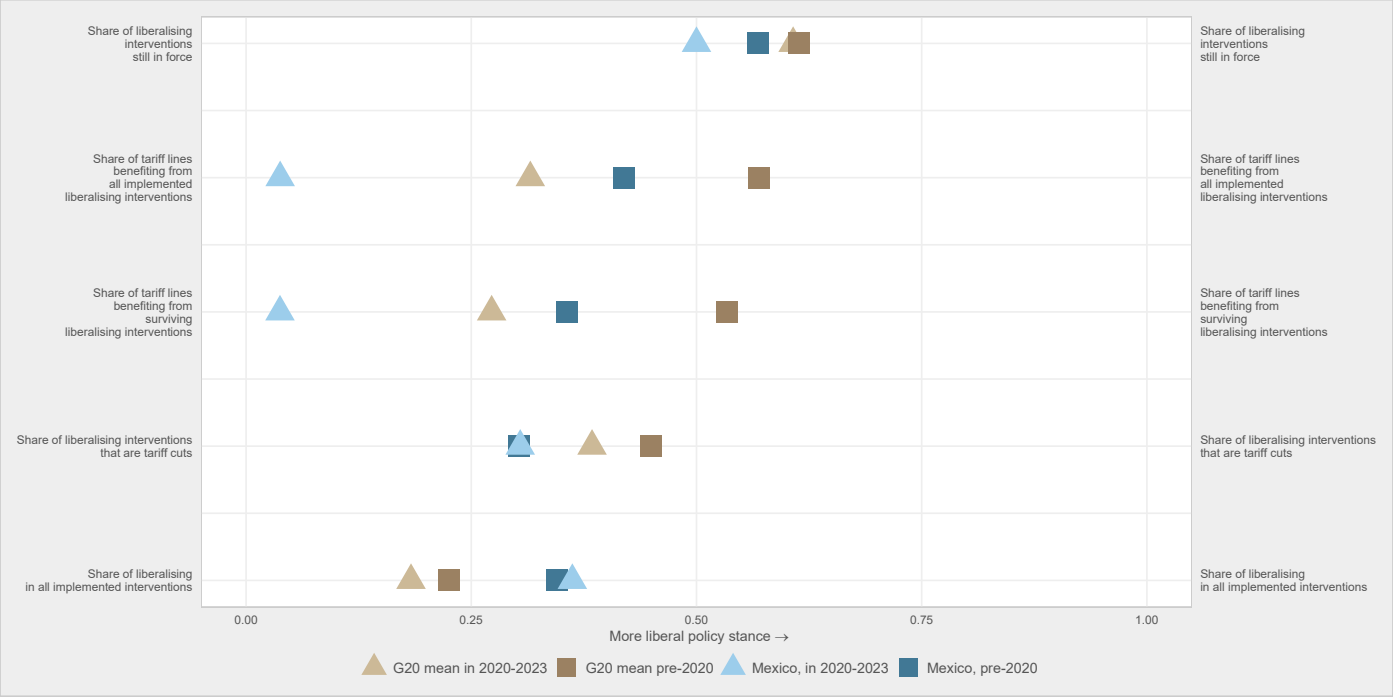


DISCRIMINATORY INTERVENTIONS HARMING MEXICO'S INTERESTS



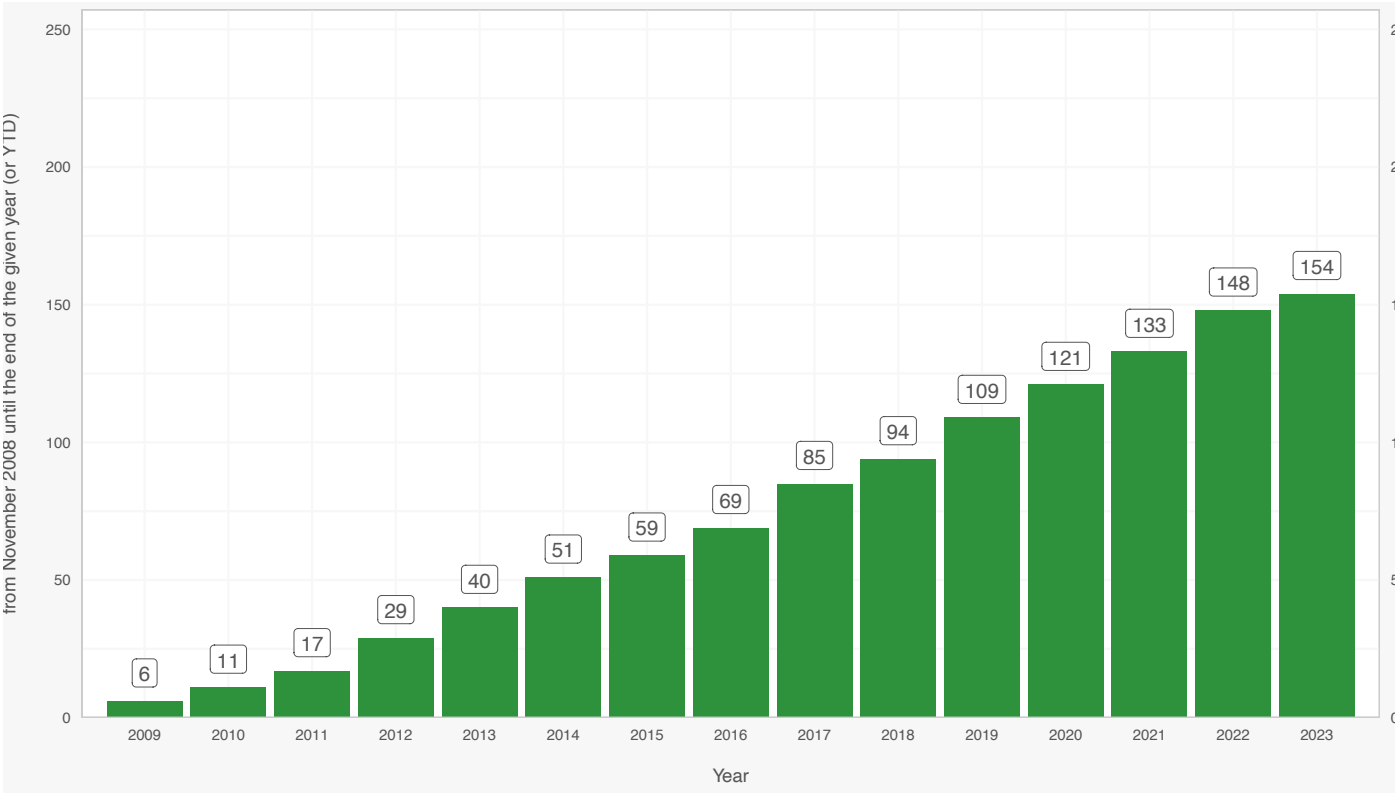
MEXICO

Track record of liberalisation



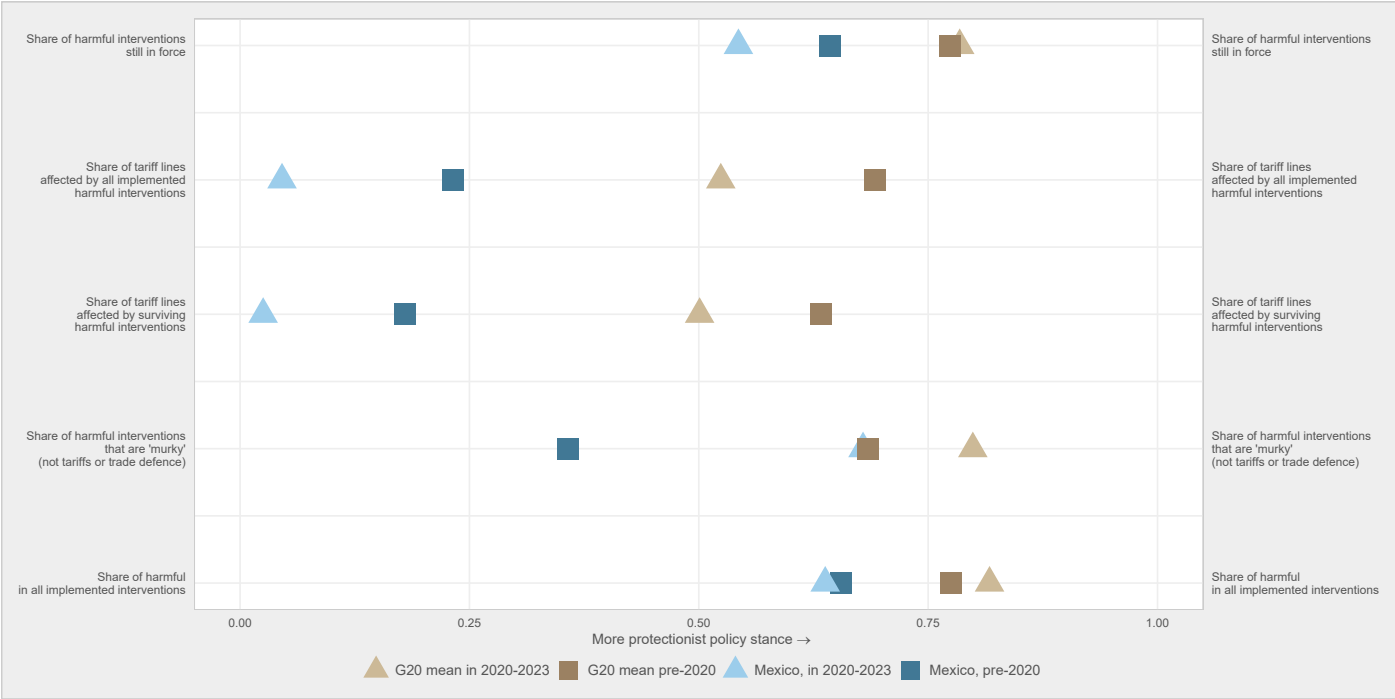
MEXICO

Number of liberalising interventions imposed since November 2008



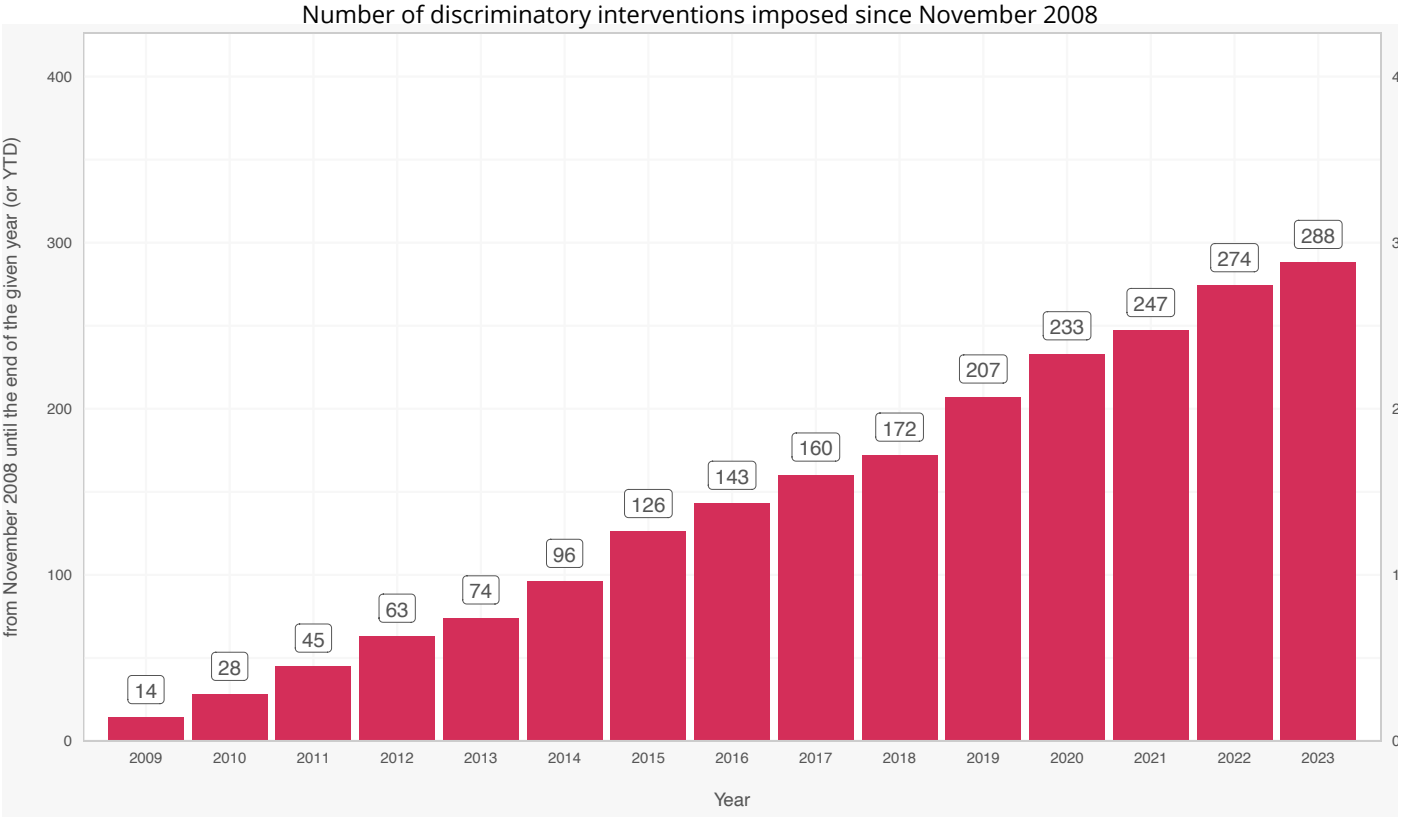
MEXICO

Track record of protectionism



MEXICO

Number of discriminatory interventions imposed since November 2008



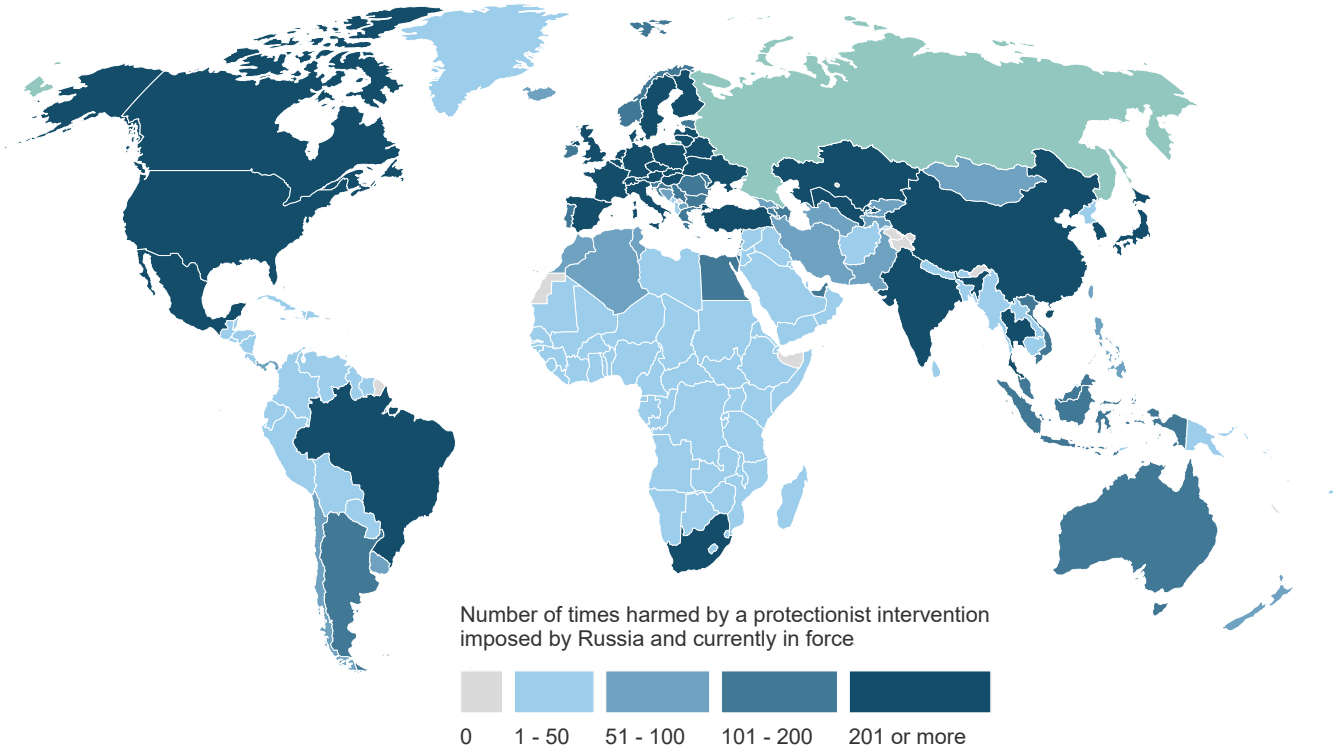
RUSSIA

What is at stake for Russia's goods exporters?

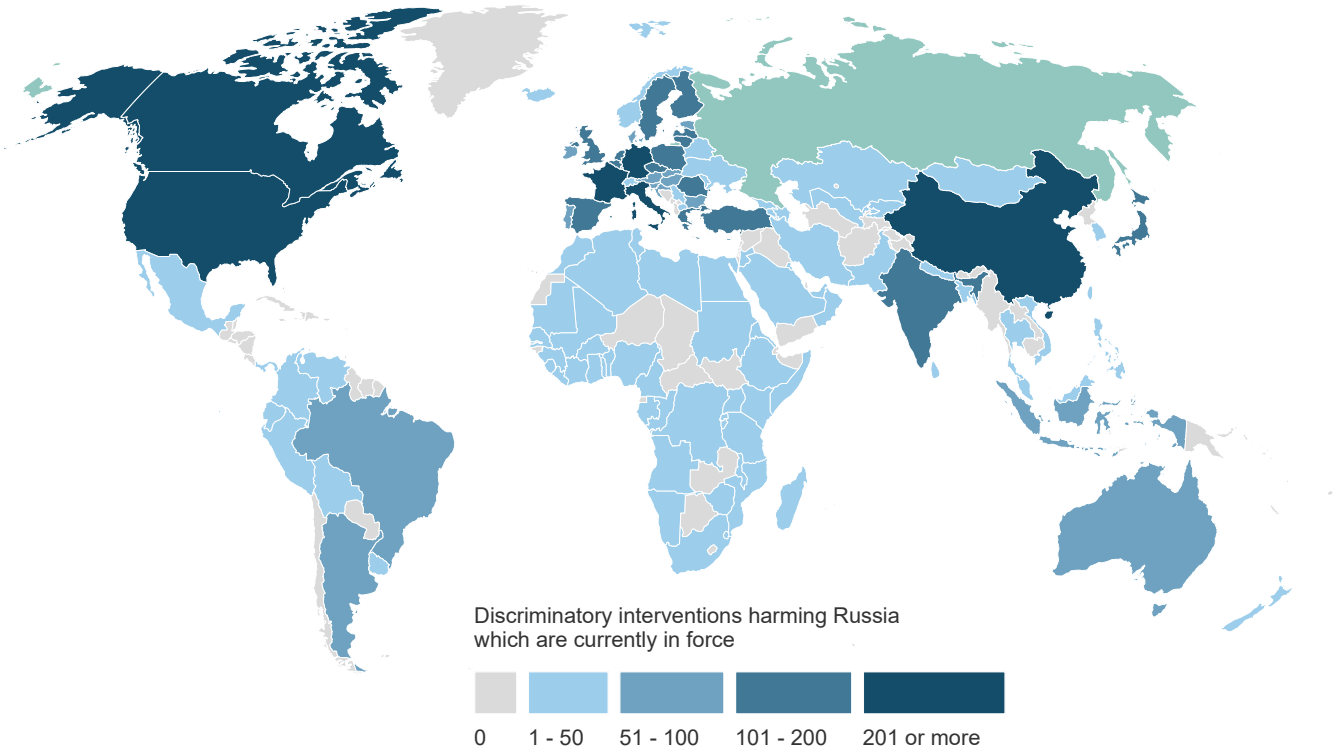
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	16.67	27.40	35.13	38.20	73.76	73.57	75.12	73.22	75.22	76.74	77.39	77.86	76.86	79.56	80.21
D	Contingent trade-protective measures	0.03	0.14	0.21	0.57	0.75	0.84	0.83	1.07	1.19	1.53	1.83	1.96	2.07	2.15	2.14
E	Non-automatic licensing, quotas etc.	3.99	3.60	3.71	3.96	4.60	4.53	4.57	5.02	5.56	5.67	5.73	8.12	8.17	18.46	17.61
F	Price-control measures, including additional taxes and charges	0.22	0.22	0.22	0.23	0.24	0.95	1.14	1.41	1.41	1.93	1.98	2.07	2.07	2.07	2.25
G	Finance measures	2.74	3.12	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.23	3.23	3.23	3.22	3.23	3.23
I	Trade-related investment measures	0.05	1.40	1.40	1.39	1.49	1.59	1.59	1.59	1.60	1.60	1.64	1.65	1.75	1.89	1.89
L	Subsidies (excl. export subsidies)	7.42	15.49	17.20	17.72	52.37	53.15	52.21	53.19	53.51	54.16	56.07	60.05	60.46	62.26	63.21
M	Government procurement restrictions	0.49	0.71	0.81	0.82	0.84	0.85	0.91	0.97	1.10	1.14	1.14	1.14	1.28	2.30	2.37
P	Export-related measures (incl. subsidies)	4.39	9.71	19.83	24.20	26.54	25.07	26.21	26.99	31.37	32.61	41.50	42.14	40.80	40.55	41.15
	Tariff measures	1.00	1.87	2.05	2.20	12.21	12.36	17.25	14.65	15.07	16.72	17.05	17.51	17.56	54.48	63.06
	Instrument unclear	0.00	0.06	0.00	0.08	0.19	2.16	3.47	3.59	3.72	3.66	3.74	3.74	3.74	6.32	32.21

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY RUSSIA'S DISCRIMINATORY INTERVENTIONS

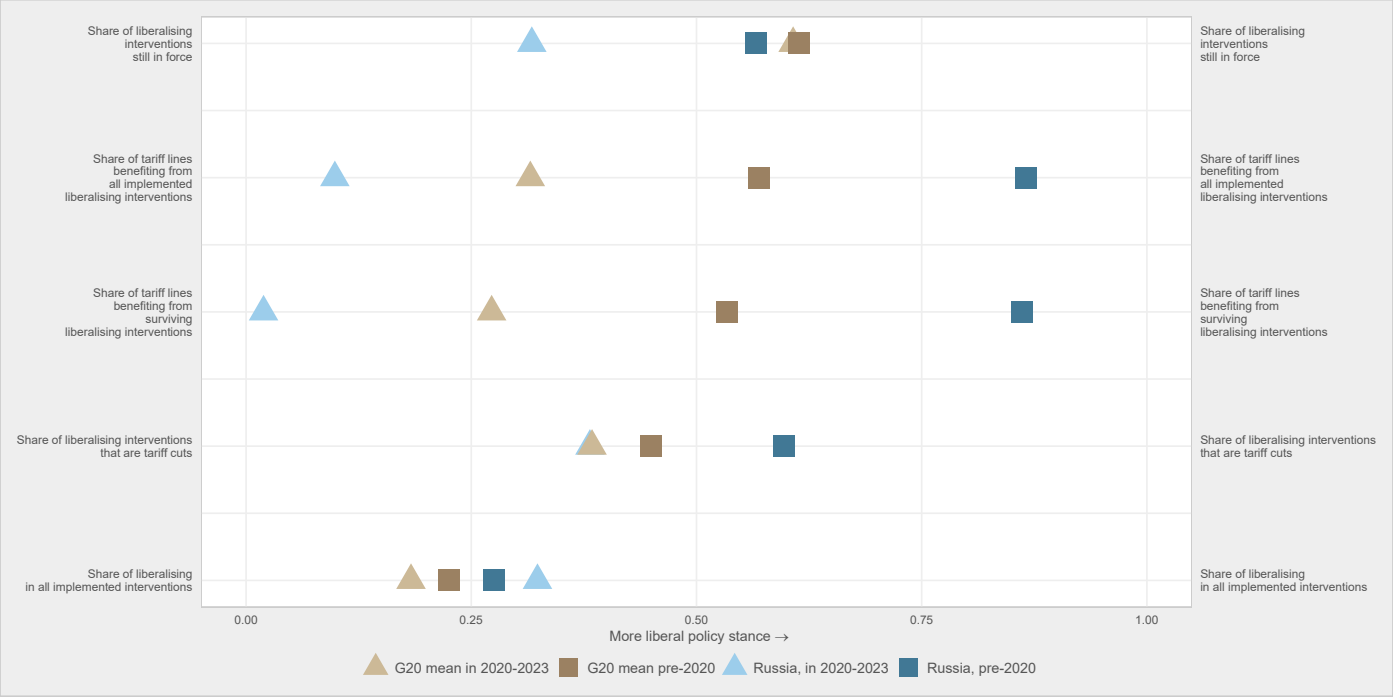


DISCRIMINATORY INTERVENTIONS HARMING RUSSIA'S INTERESTS



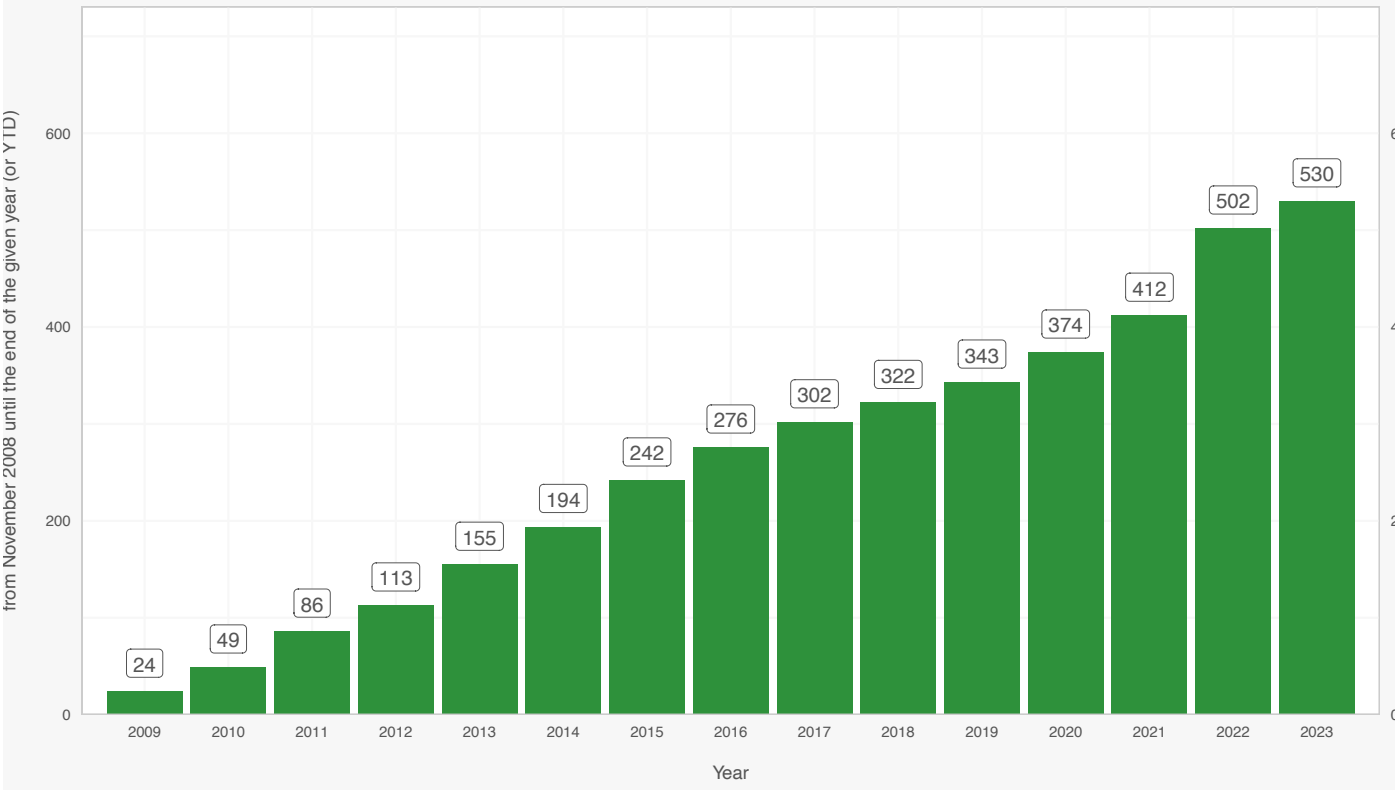
RUSSIA

Track record of liberalisation



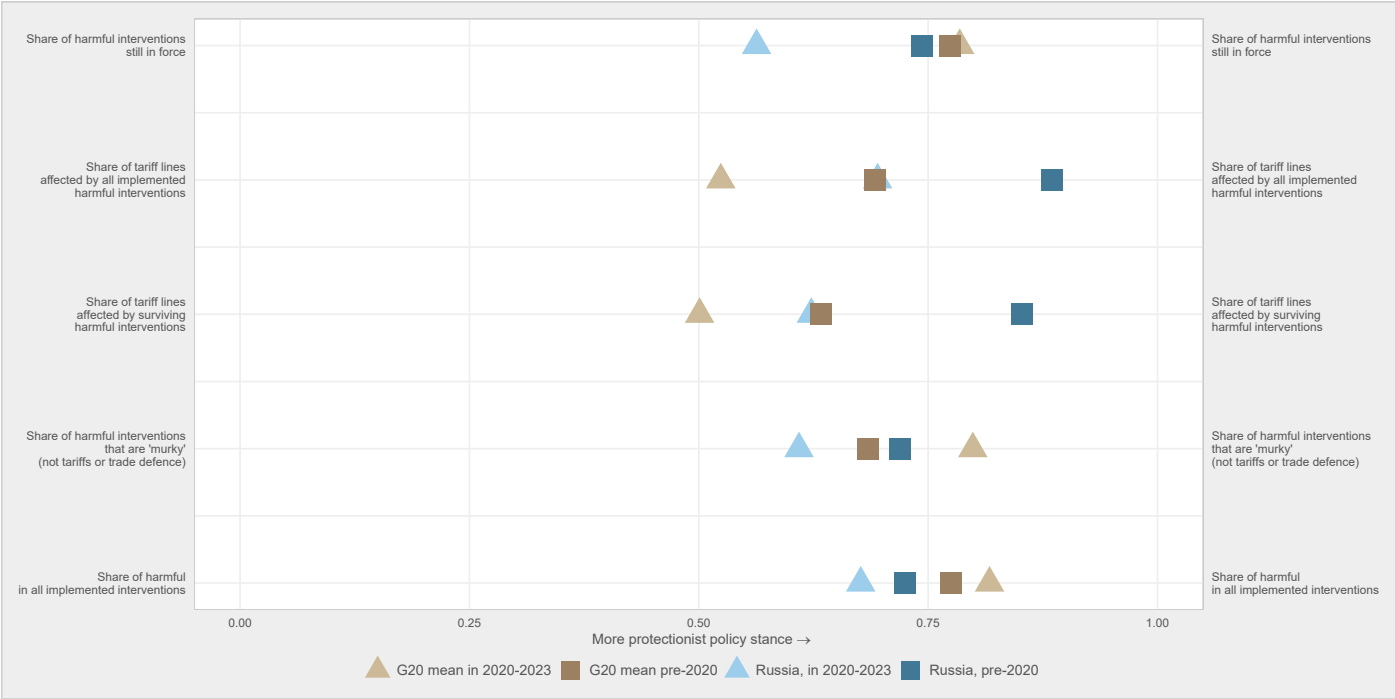
RUSSIA

Number of liberalising interventions imposed since November 2008



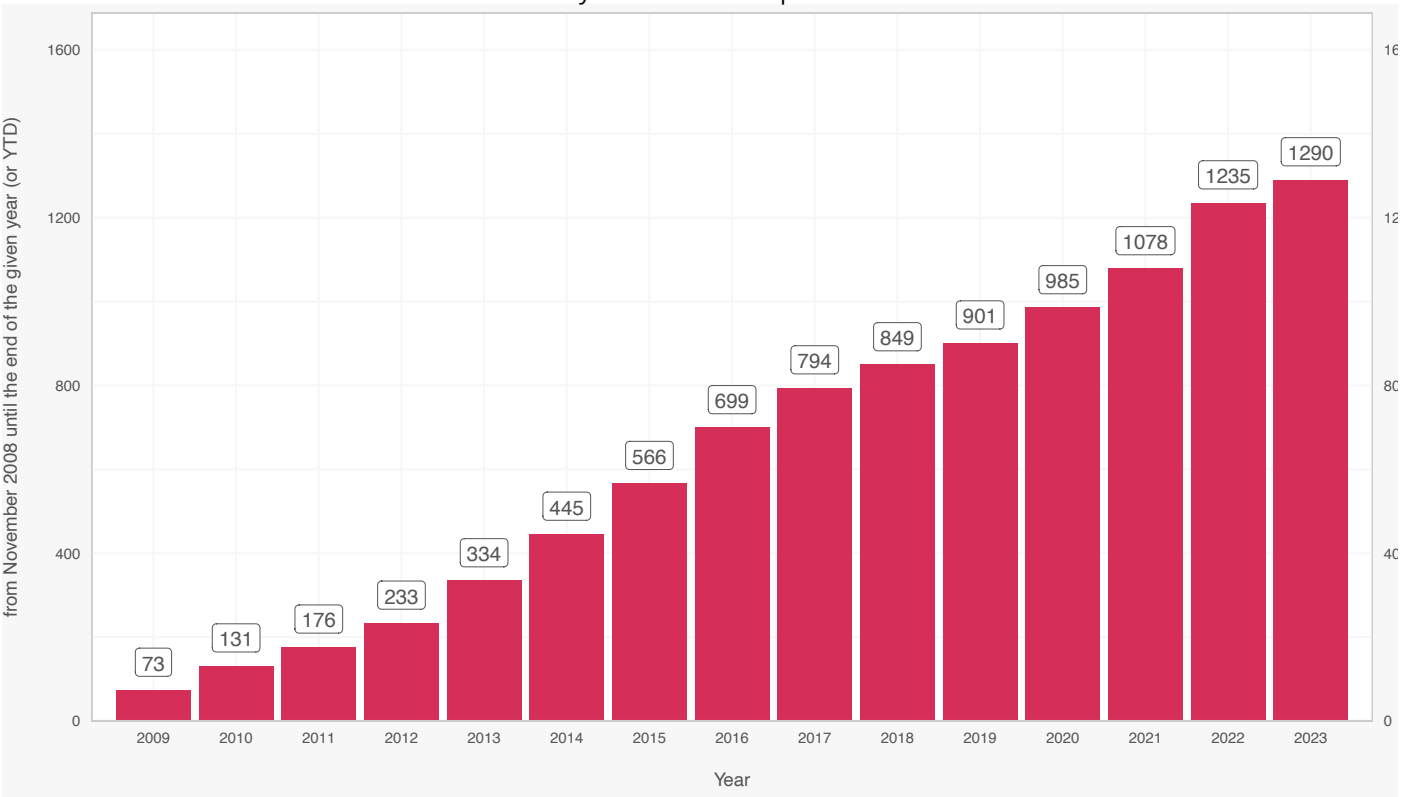
RUSSIA

Track record of protectionism



RUSSIA

Number of discriminatory interventions imposed since November 2008



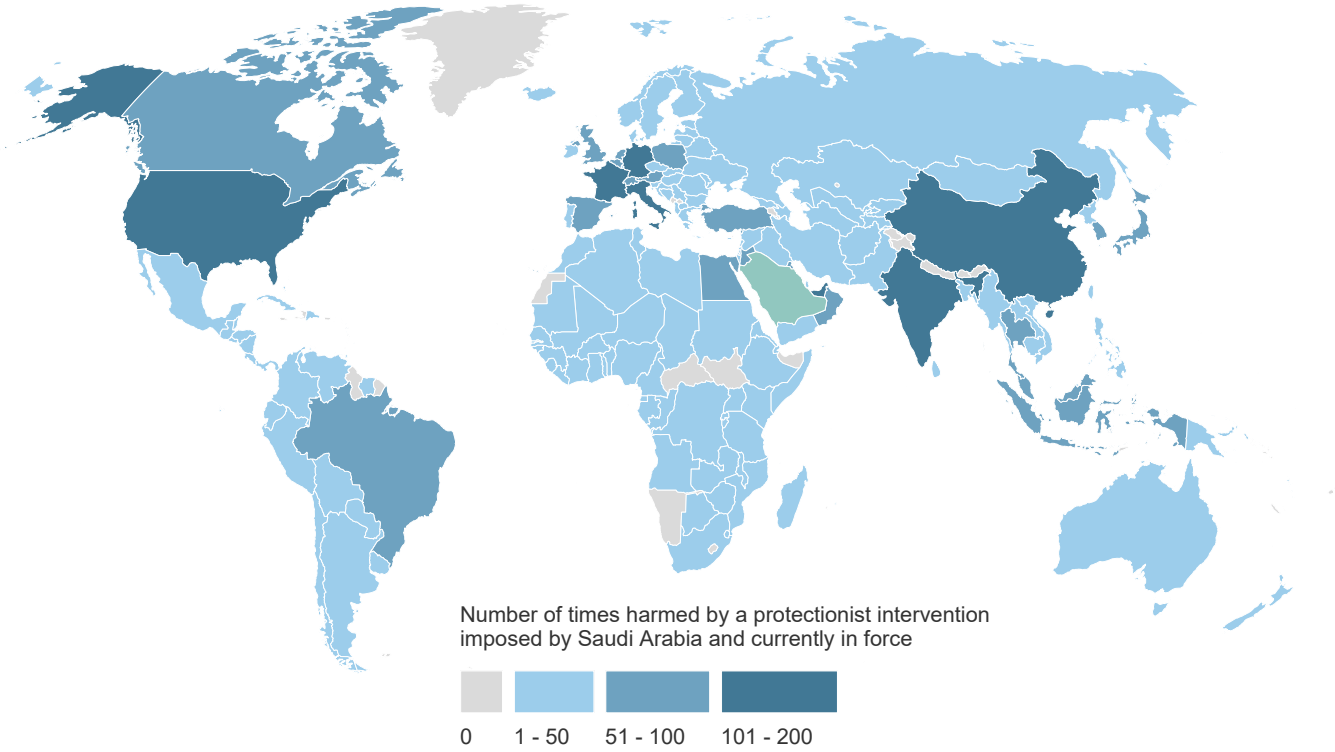
SAUDI ARABIA

What is at stake for Saudi Arabia's goods exporters?

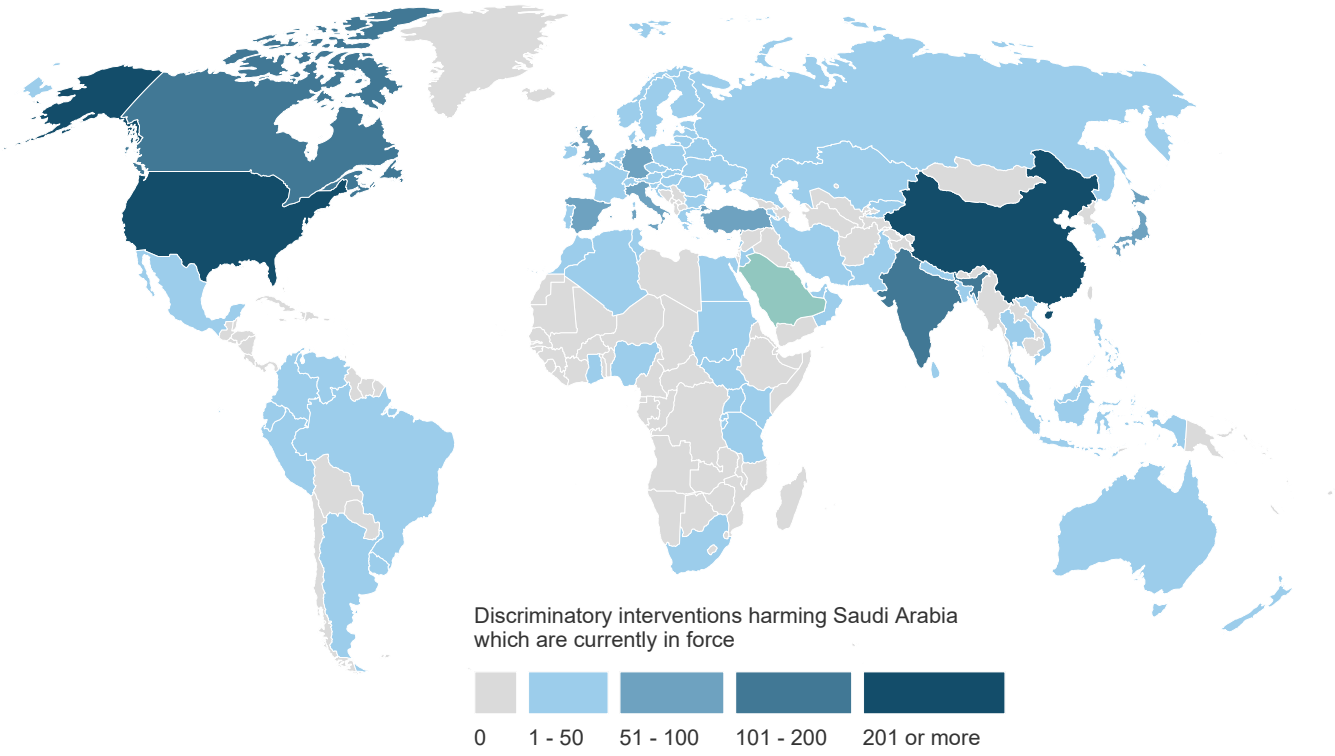
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	17.92	46.66	83.40	84.76	87.20	87.85	89.34	90.47	90.82	90.37	91.52	92.44	91.94	91.87	92.48
D	Contingent trade-protective measures	0.01	0.04	0.08	0.09	0.08	0.08	0.05	0.00	0.00	0.00	0.00	0.00	0.06	0.11	0.11
E	Non-automatic licensing, quotas etc.	9.89	5.64	5.64	6.34	5.69	5.70	6.90	7.43	7.52	7.70	8.20	8.32	7.83	11.88	11.46
F	Price-control measures, including additional taxes and charges	0.06	0.06	0.15	0.26	0.26	0.37	0.38	0.38	0.38	4.57	4.97	4.98	5.00	5.08	9.62
G	Finance measures	0.04	0.06	0.09	0.09	0.09	0.09	1.11	1.44	1.45	1.45	1.45	1.45	1.45	1.46	1.45
I	Trade-related investment measures	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38	3.89
L	Subsidies (excl. export subsidies)	8.25	23.79	25.94	26.64	38.87	39.21	39.09	39.17	39.74	40.02	51.73	44.61	44.67	54.00	59.93
M	Government procurement restrictions	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.03
P	Export-related measures (incl. subsidies)	2.36	21.43	80.67	82.56	84.17	84.56	84.89	86.22	86.62	85.34	86.25	86.45	86.58	86.42	86.89
	Tariff measures	7.13	8.65	8.99	9.43	12.47	12.62	14.96	17.14	17.17	17.21	19.47	23.34	24.09	24.15	24.32
	Instrument unclear	0.00	0.00	0.00	0.00	0.04	0.82	0.83	0.83	0.84	1.28	2.20	2.20	2.21	2.29	2.21

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY SAUDI ARABIA'S DISCRIMINATORY INTERVENTIONS

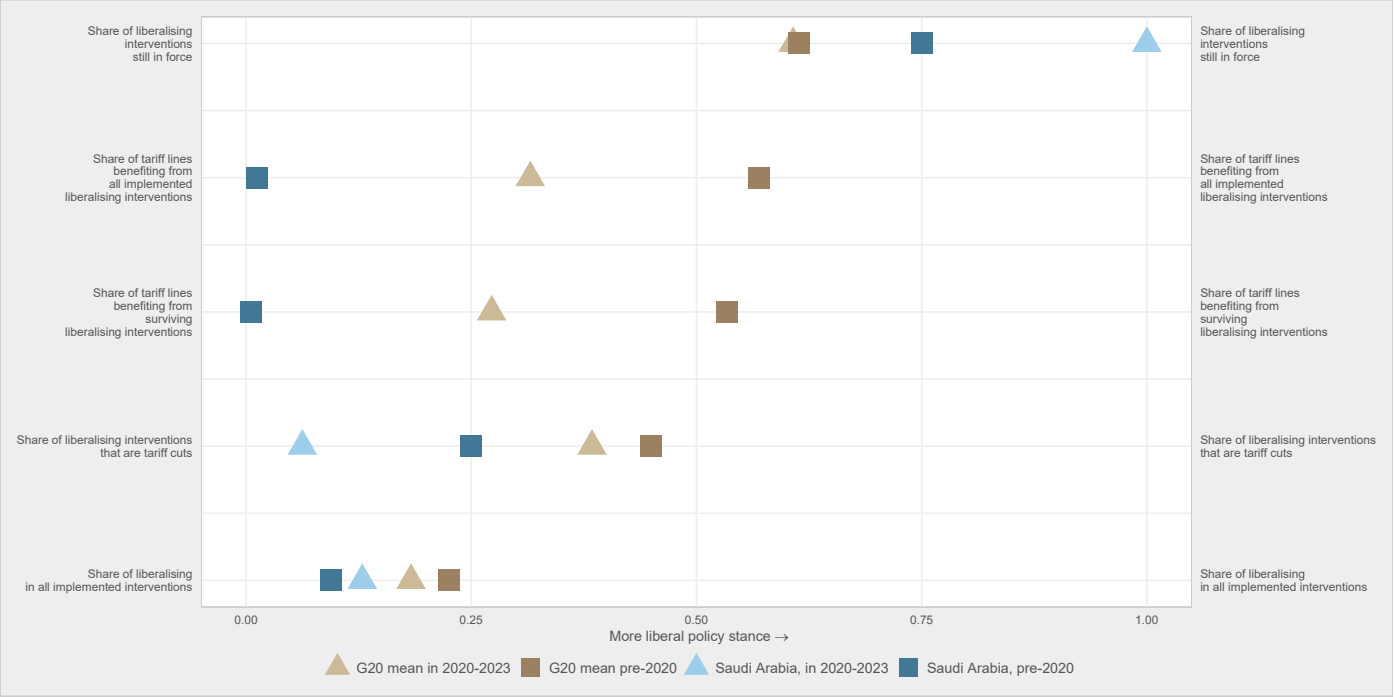


DISCRIMINATORY INTERVENTIONS HARMING SAUDI ARABIA'S INTERESTS



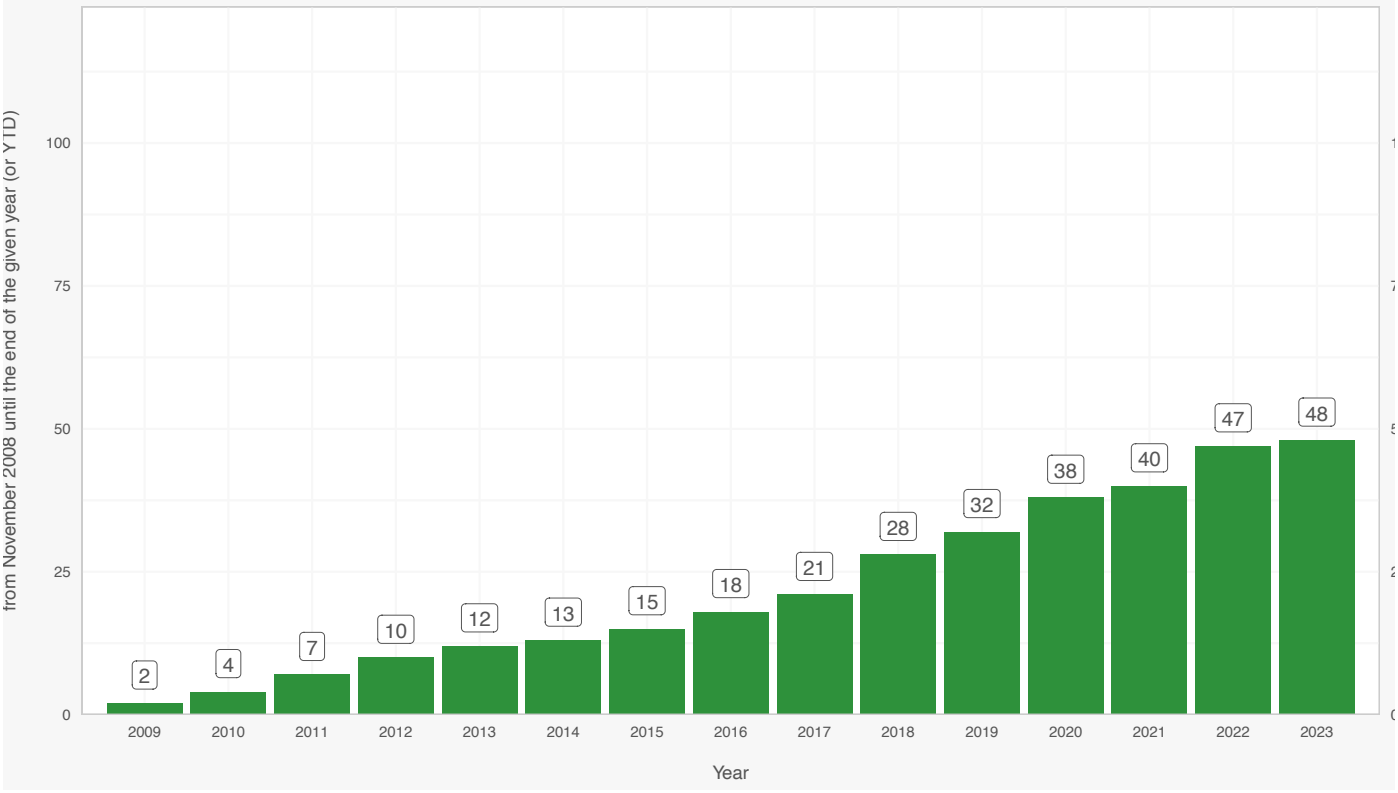
SAUDI ARABIA

Track record of liberalisation



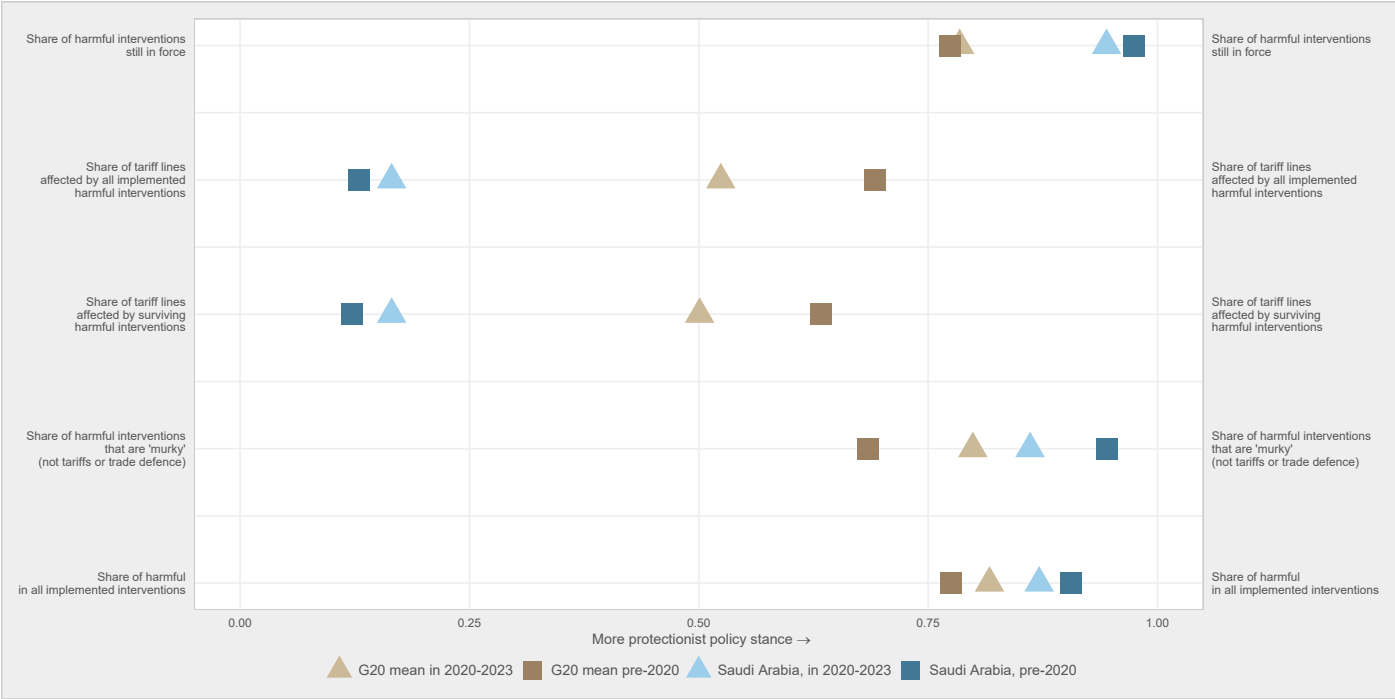
SAUDI ARABIA

Number of liberalising interventions imposed since November 2008



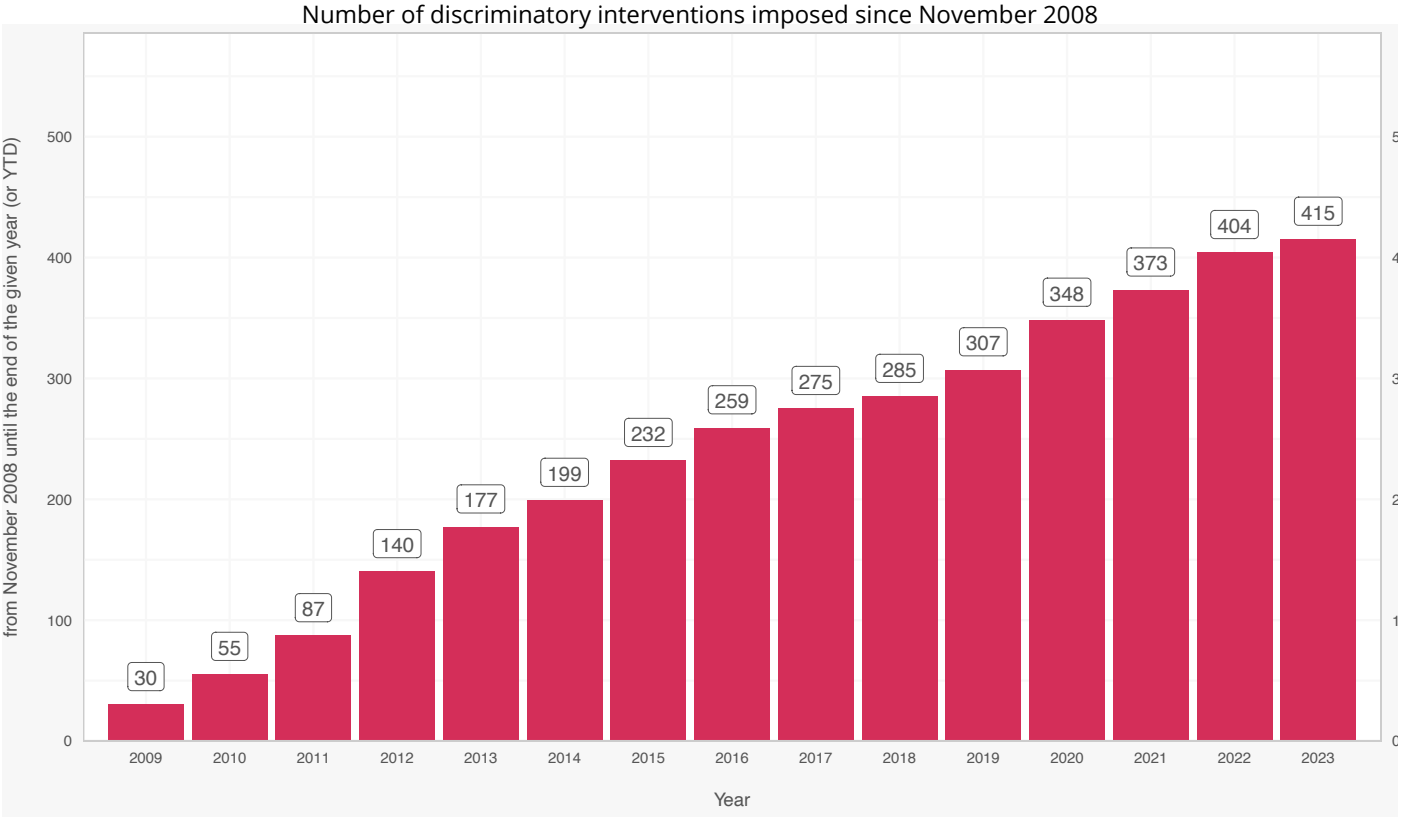
SAUDI ARABIA

Track record of protectionism



SAUDI ARABIA

Number of discriminatory interventions imposed since November 2008



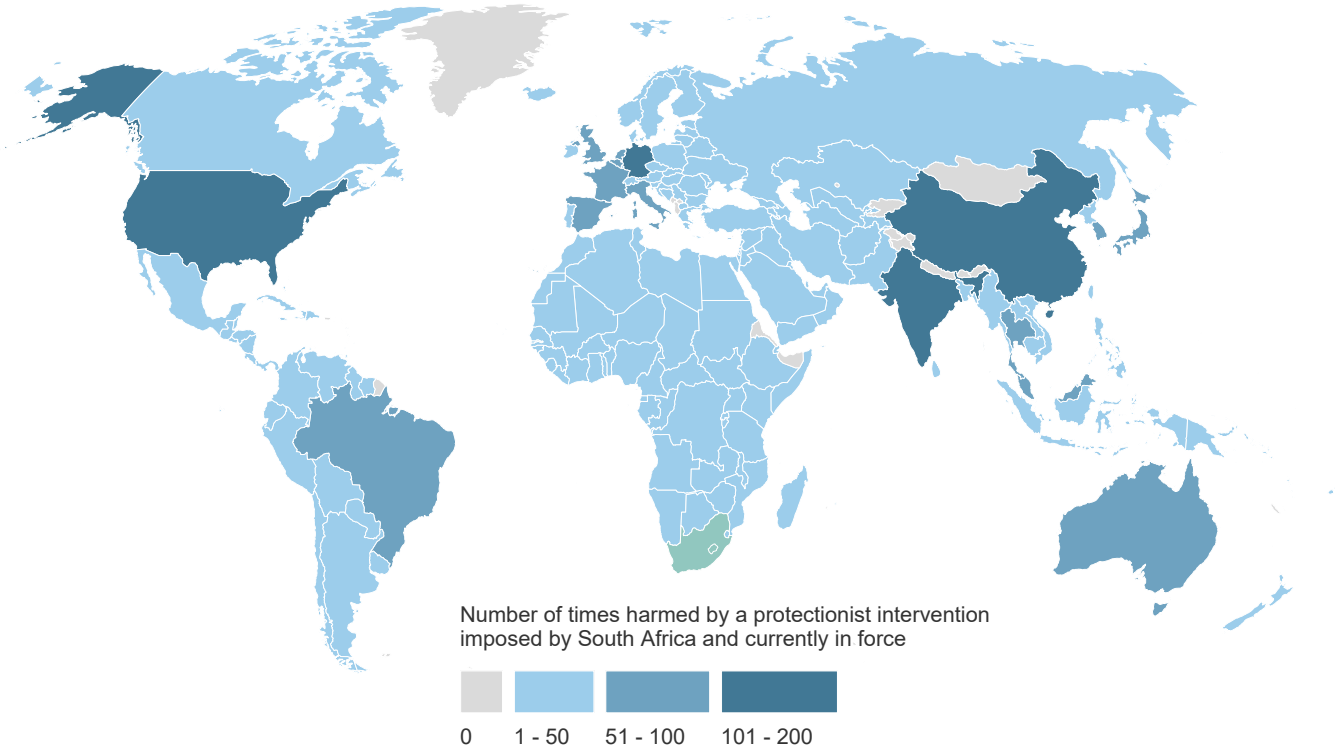
SOUTH AFRICA

What is at stake for South Africa's goods exporters?

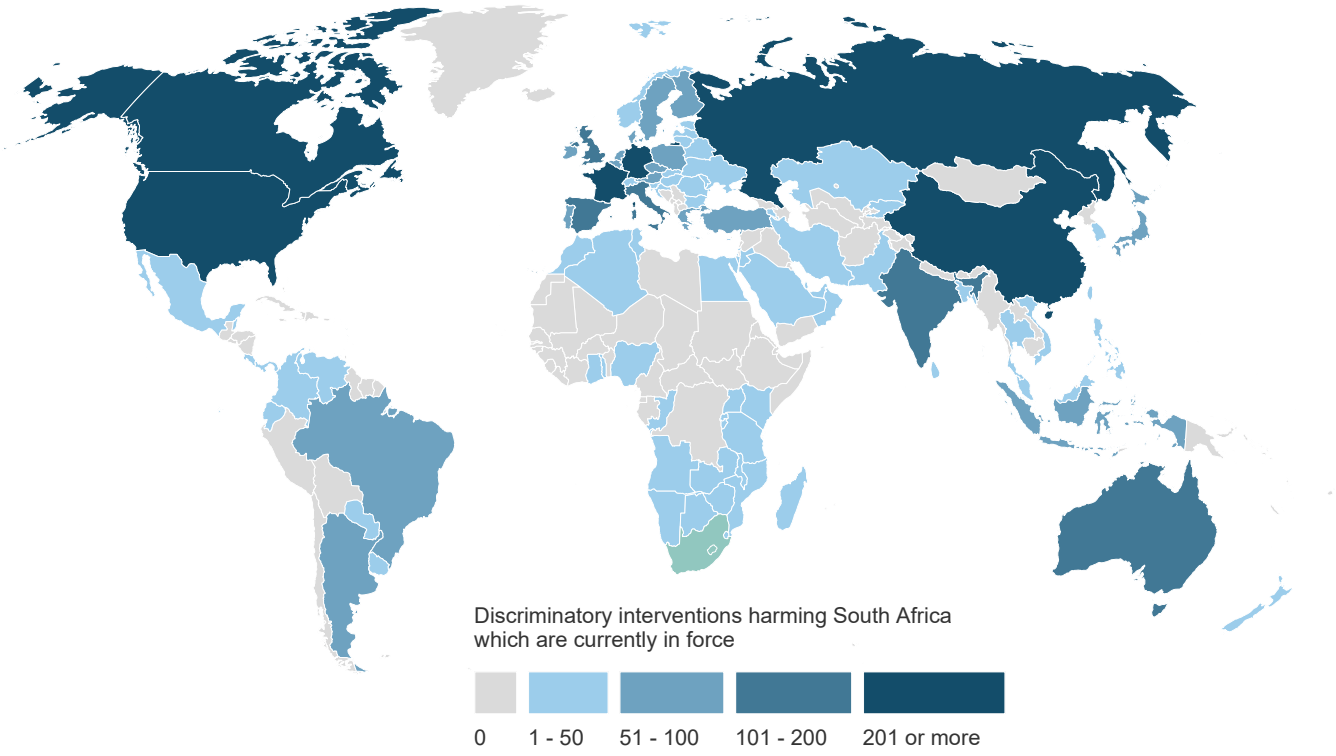
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	27.40	33.94	41.30	46.76	60.51	58.34	54.85	56.21	57.82	60.01	66.42	69.69	67.77	69.69	72.95
D	Contingent trade-protective measures	0.03	0.04	0.08	0.12	0.12	0.17	0.20	0.22	0.25	0.29	0.27	0.36	1.79	1.07	0.74
E	Non-automatic licensing, quotas etc.	2.93	3.28	4.54	5.15	5.29	5.74	5.49	6.07	6.46	6.68	6.66	8.06	8.18	8.19	8.14
F	Price-control measures, including additional taxes and charges	2.04	2.04	2.08	2.15	2.15	2.16	2.17	2.18	2.20	4.73	4.98	5.08	4.93	5.10	5.03
G	Finance measures	0.52	0.55	0.59	0.59	0.59	0.59	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.61	0.61
I	Trade-related investment measures	0.02	0.44	0.50	0.53	0.56	0.62	0.63	0.66	0.68	0.66	0.64	0.62	0.80	0.92	1.13
L	Subsidies (excl. export subsidies)	6.14	9.47	10.59	12.51	35.84	37.01	33.15	33.23	33.62	34.46	36.22	36.54	38.07	42.23	42.93
M	Government procurement restrictions	0.87	0.85	1.02	1.10	1.15	1.24	1.39	1.46	1.45	1.52	1.62	1.62	1.85	5.87	7.10
P	Export-related measures (incl. subsidies)	18.56	24.15	32.97	37.37	39.30	32.75	30.44	33.32	35.72	37.03	46.04	52.26	48.35	47.33	52.48
	Tariff measures	0.37	1.95	2.35	5.10	13.64	13.46	14.06	15.00	15.46	18.44	18.39	20.13	20.38	20.26	20.42
	Instrument unclear	0.05	0.68	0.67	0.67	1.71	2.55	0.29	0.38	1.00	2.08	2.11	2.11	2.12	2.25	2.63

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY SOUTH AFRICA'S DISCRIMINATORY INTERVENTIONS

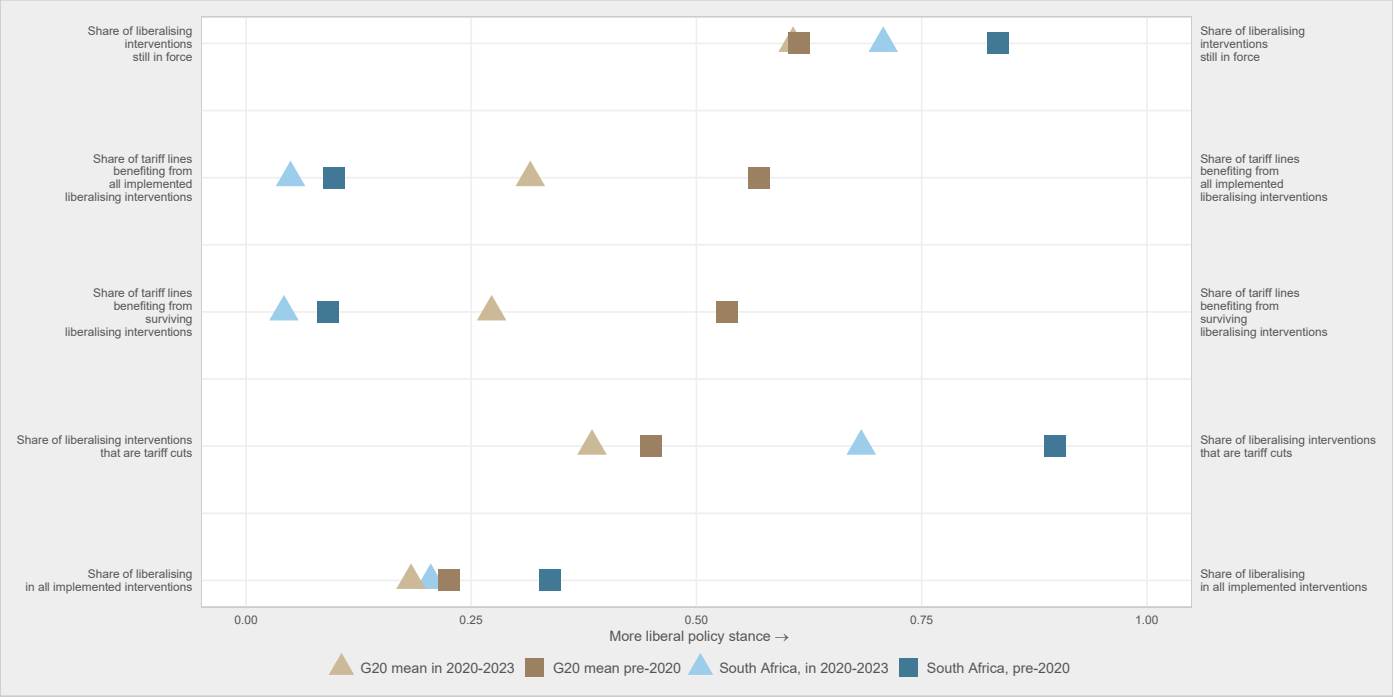


DISCRIMINATORY INTERVENTIONS HARMING SOUTH AFRICA'S INTERESTS



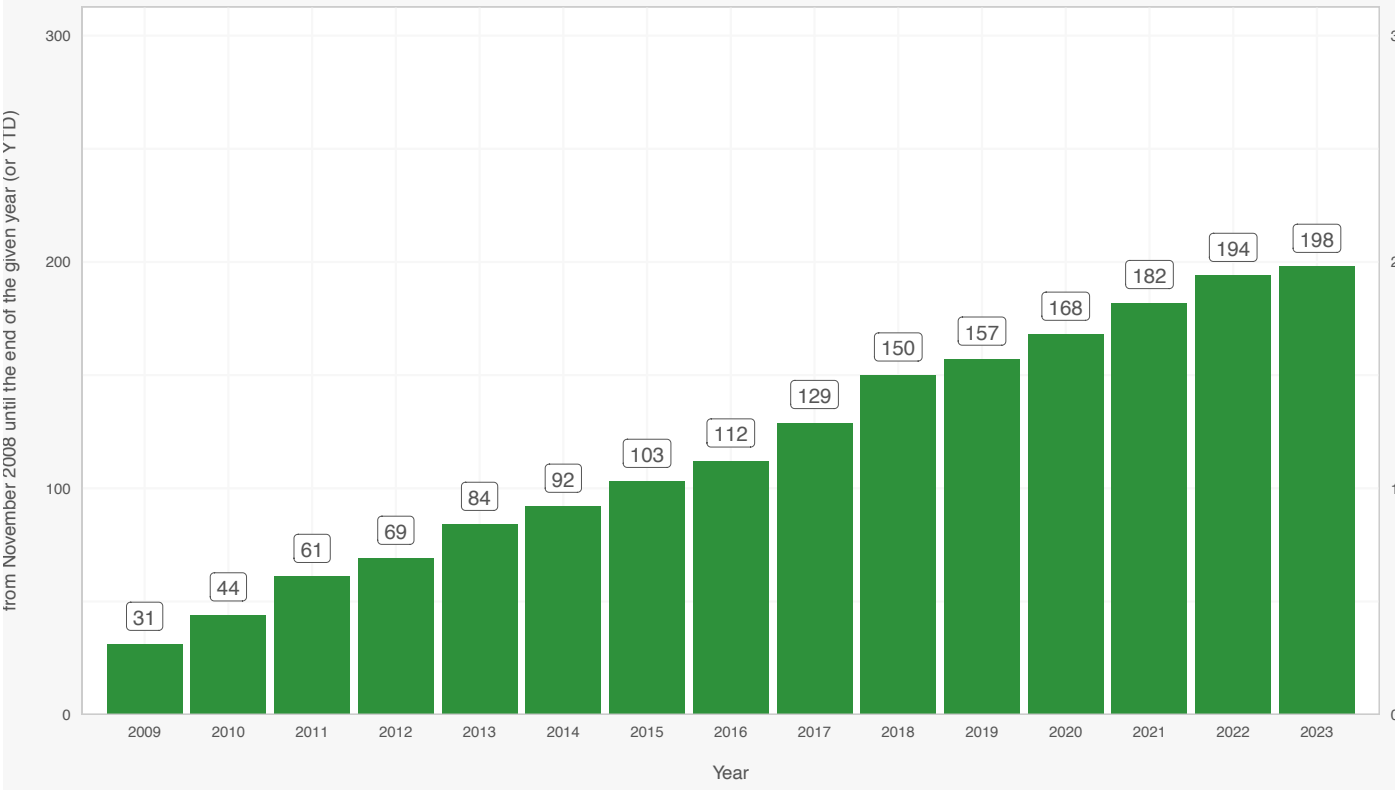
SOUTH AFRICA

Track record of liberalisation



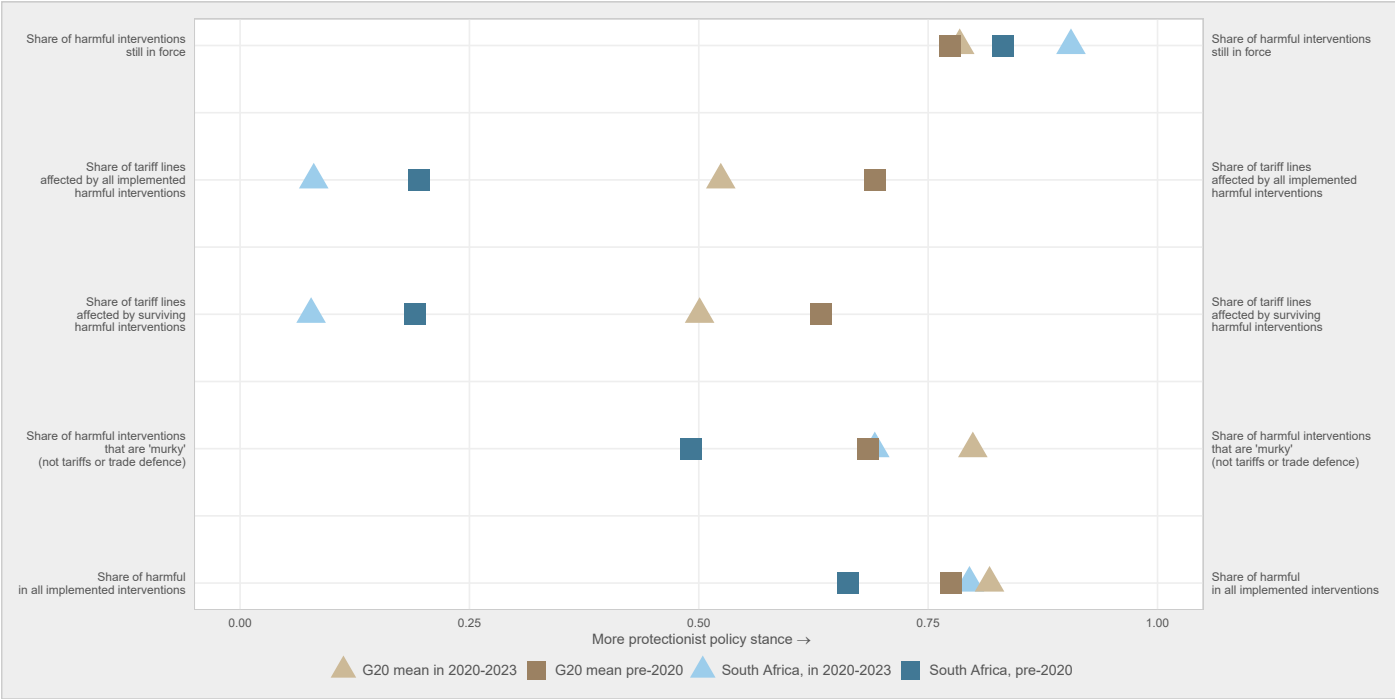
SOUTH AFRICA

Number of liberalising interventions imposed since November 2008



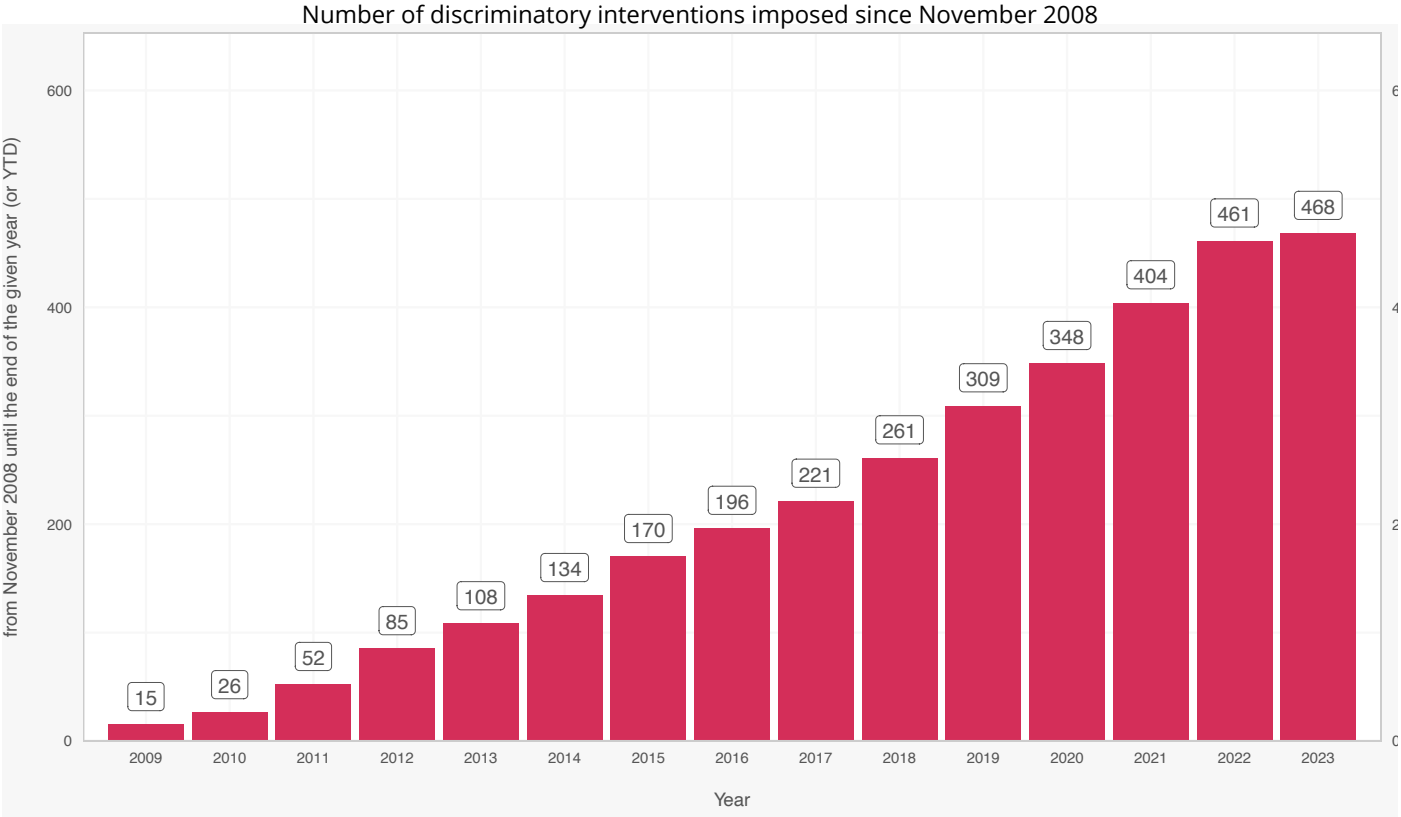
SOUTH AFRICA

Track record of protectionism



SOUTH AFRICA

Number of discriminatory interventions imposed since November 2008



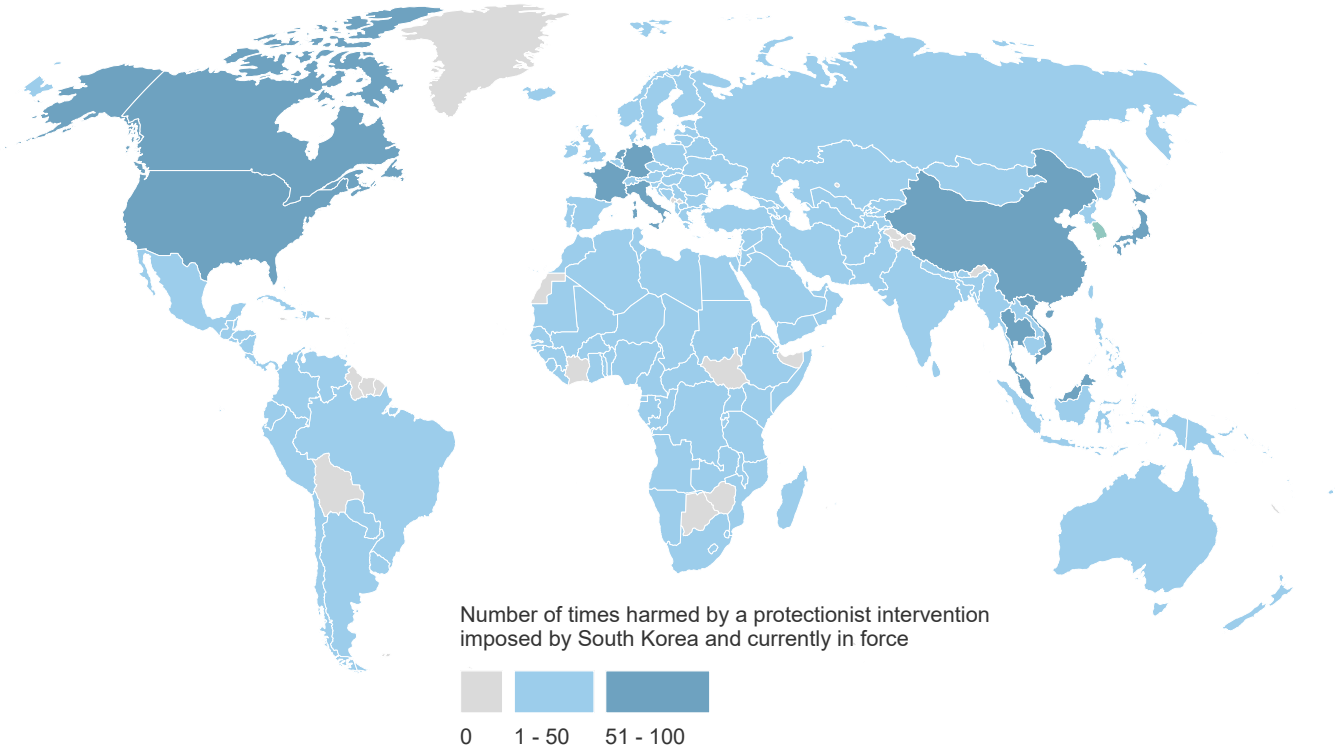
SOUTH KOREA

What is at stake for South Korea's goods exporters?

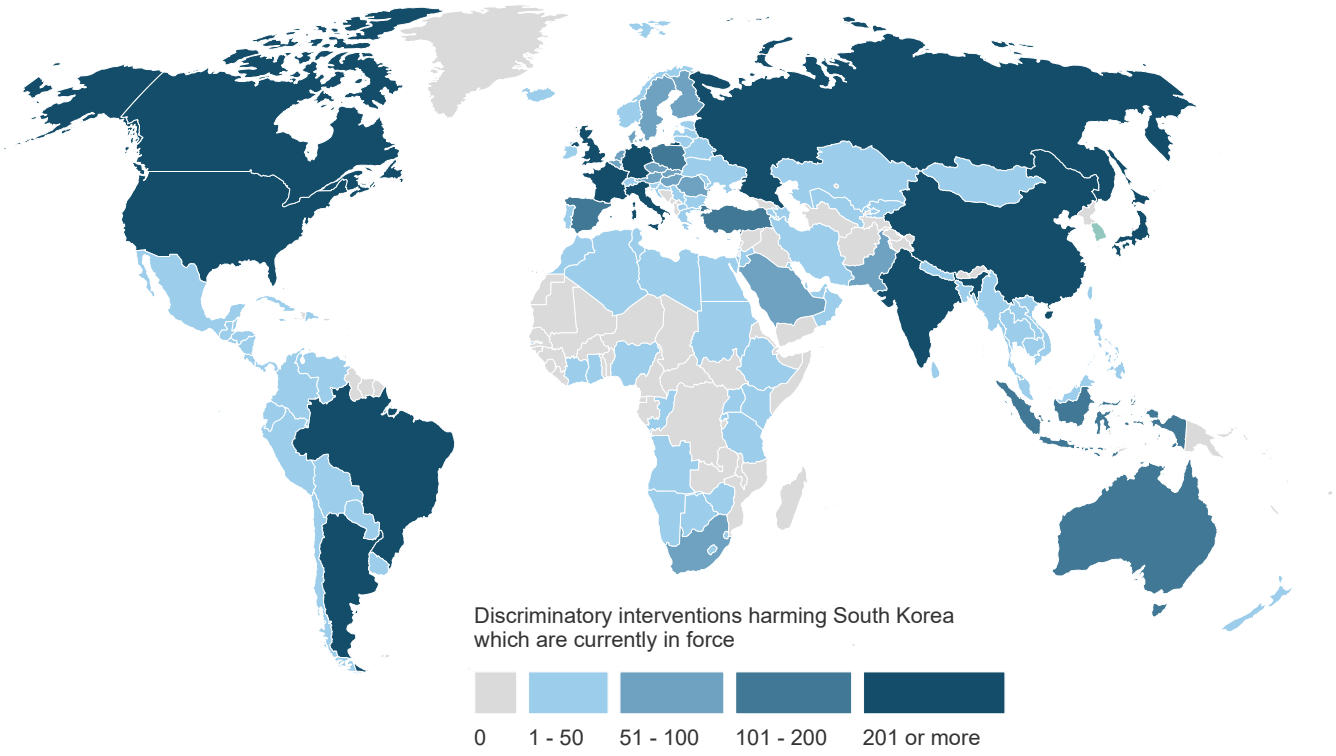
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	57.28	71.19	73.84	77.03	82.07	82.77	82.30	82.90	84.03	84.91	87.00	87.51	86.58	86.60	87.06
D	Contingent trade-protective measures	0.21	1.12	1.25	1.50	1.65	1.72	1.74	2.04	2.24	2.77	3.19	3.40	3.64	3.66	3.66
E	Non-automatic licensing, quotas etc.	3.12	3.46	5.44	5.58	5.68	5.92	6.80	7.60	7.95	8.08	8.30	8.51	9.81	10.58	11.42
F	Price-control measures, including additional taxes and charges	0.06	0.12	0.12	0.11	0.07	1.35	1.73	1.79	1.99	2.76	3.01	3.41	3.43	3.47	5.15
G	Finance measures	0.21	0.64	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.31	1.31	1.30	1.34	1.32
I	Trade-related investment measures	0.56	3.21	3.39	3.53	3.55	3.58	3.88	4.07	4.12	4.18	4.17	4.08	4.23	4.43	4.49
L	Subsidies (excl. export subsidies)	23.30	31.40	37.67	39.84	49.09	49.58	51.31	51.95	52.66	53.49	55.00	55.46	52.93	54.53	54.91
M	Government procurement restrictions	0.78	1.93	2.06	2.21	2.55	2.93	3.30	3.29	3.49	3.64	3.68	3.98	4.57	5.92	6.11
P	Export-related measures (incl. subsidies)	38.44	53.02	57.66	64.58	68.73	68.59	66.83	67.94	68.95	70.16	74.30	74.85	74.04	73.86	74.22
	Tariff measures	1.74	2.07	5.77	6.73	12.26	8.33	8.75	12.76	14.97	13.34	13.79	13.86	15.58	15.82	16.05
	Instrument unclear	0.11	0.52	0.75	0.79	0.71	0.76	0.79	0.90	0.90	1.20	1.34	1.34	1.37	1.46	1.70

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY SOUTH KOREA'S DISCRIMINATORY INTERVENTIONS

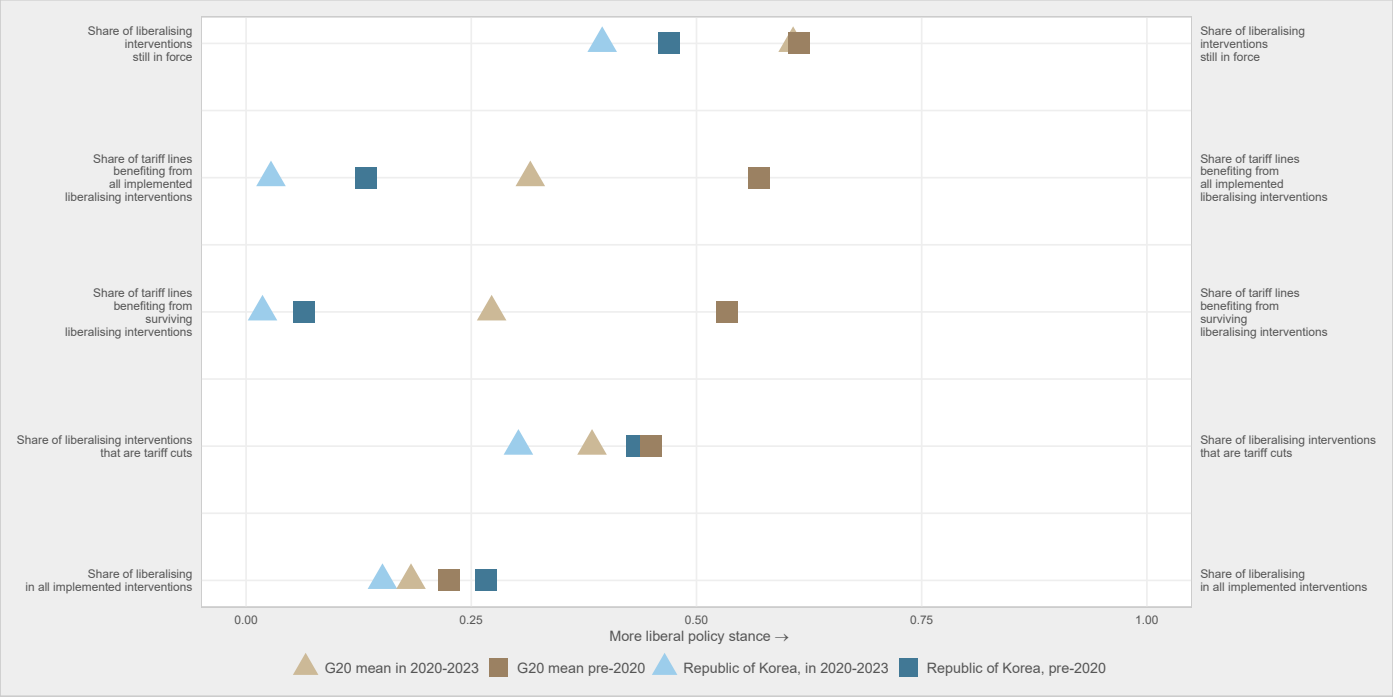


DISCRIMINATORY INTERVENTIONS HARMING SOUTH KOREA'S INTERESTS



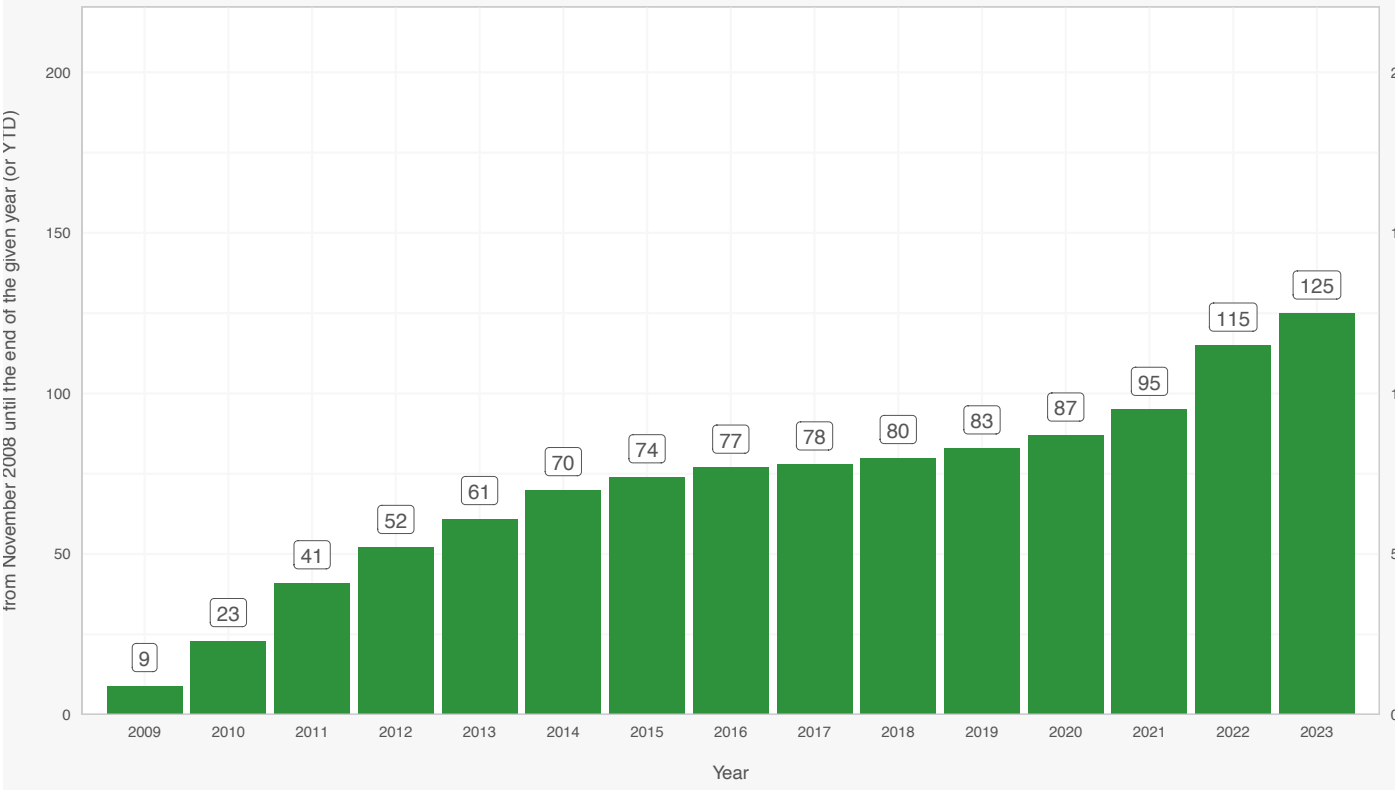
SOUTH KOREA

Track record of liberalisation



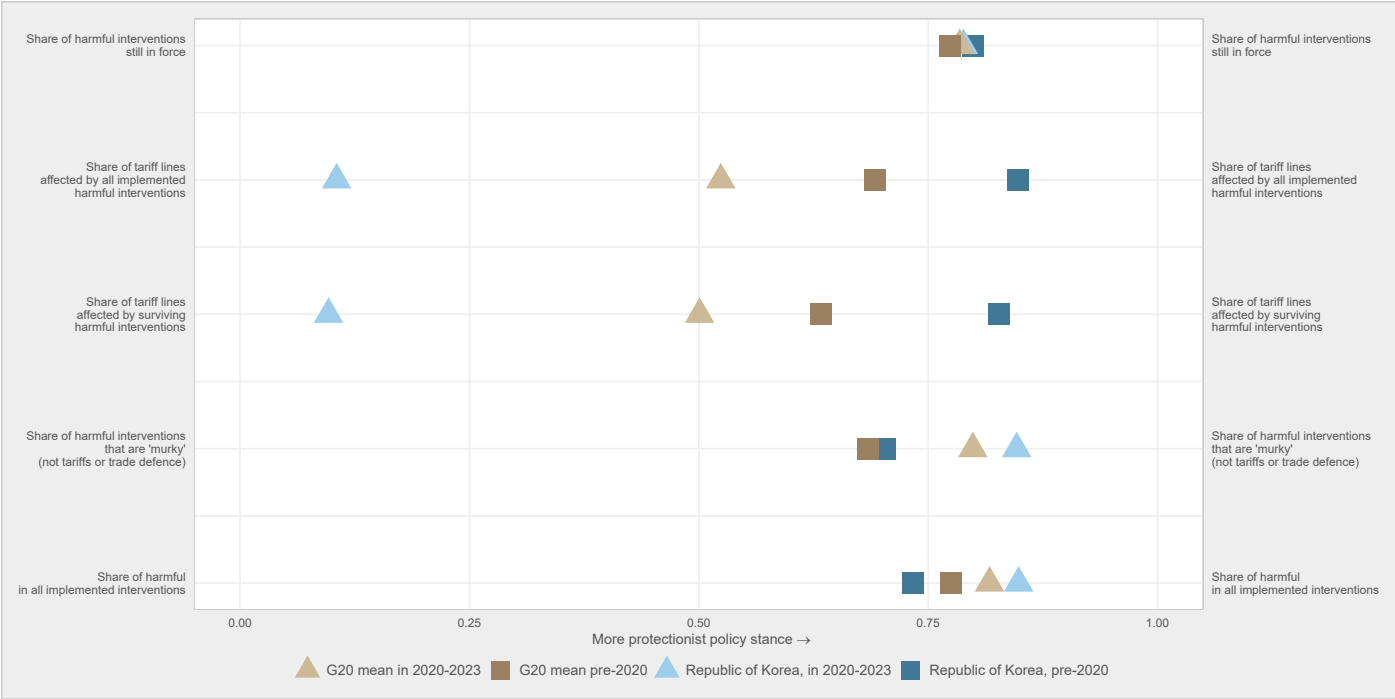
SOUTH KOREA

Number of liberalising interventions imposed since November 2008



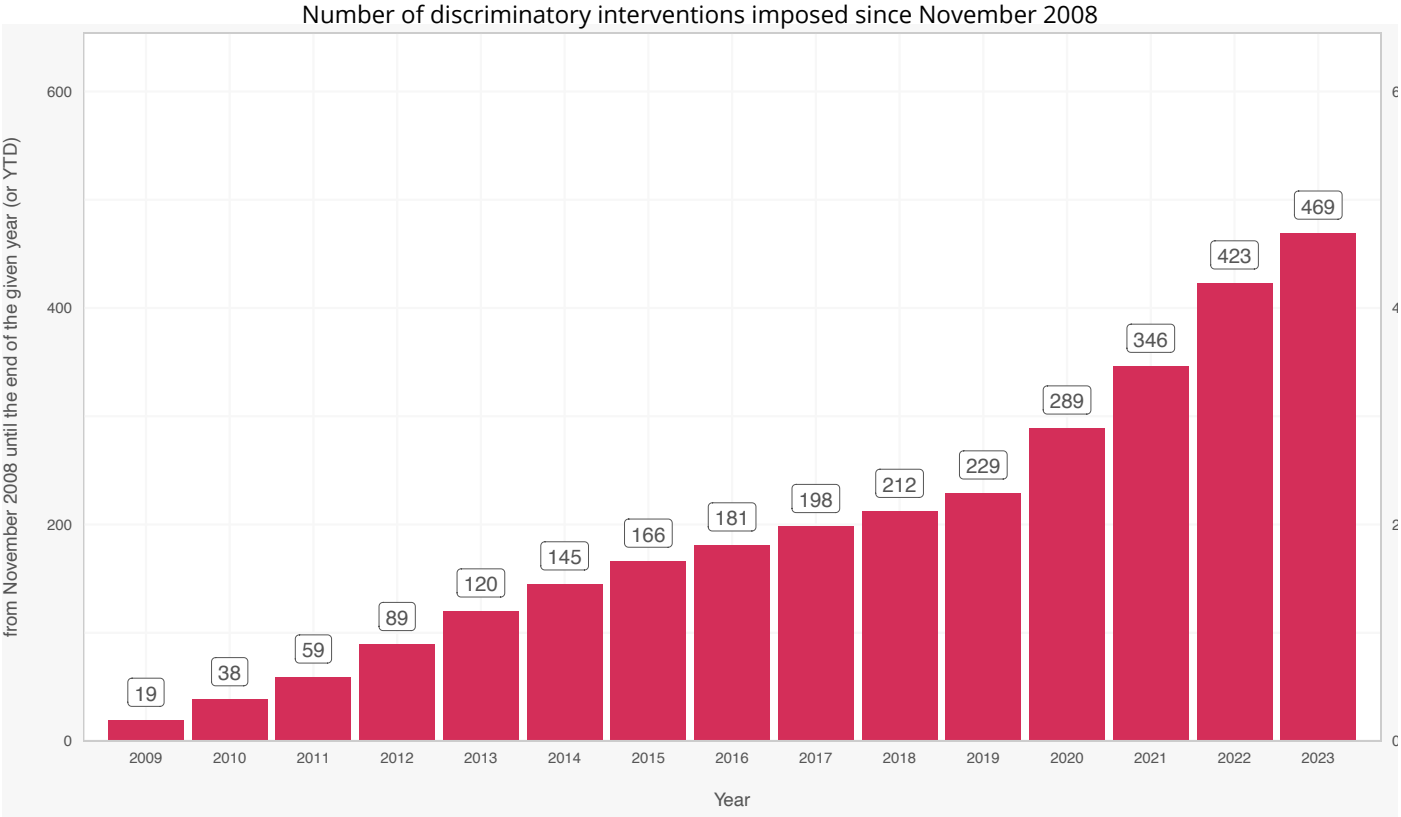
SOUTH KOREA

Track record of protectionism



SOUTH KOREA

Number of discriminatory interventions imposed since November 2008



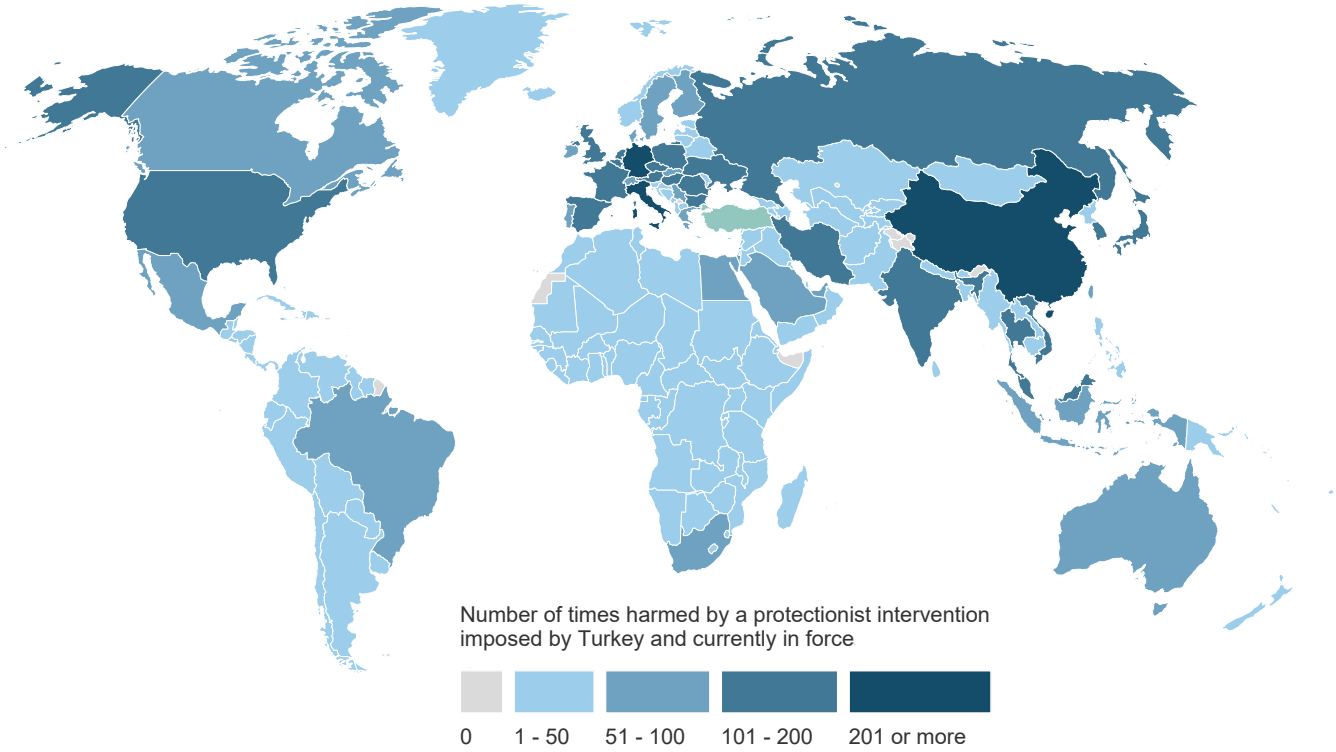
TURKEY

What is at stake for Turkey's goods exporters?

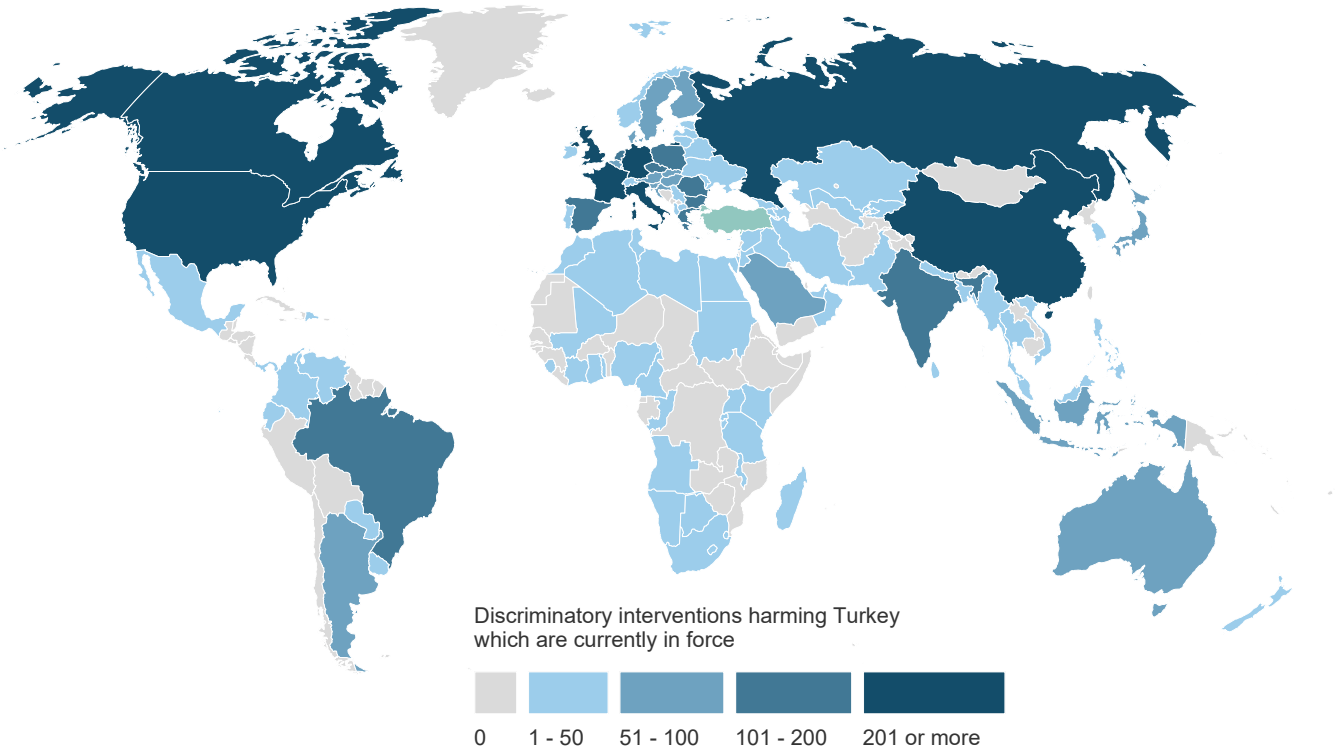
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	53.77	64.47	66.75	68.93	76.90	78.55	78.12	78.75	79.44	80.04	81.05	81.57	79.79	80.00	80.59
D	Contingent trade-protective measures	0.07	0.01	0.03	0.05	0.24	0.71	0.81	0.88	0.96	2.04	3.28	3.34	3.63	3.49	3.51
E	Non-automatic licensing, quotas etc.	0.11	0.20	0.72	0.92	0.94	0.97	1.19	2.71	4.19	4.34	4.33	3.60	3.06	2.80	1.93
F	Price-control measures, including additional taxes and charges	0.41	0.44	0.44	0.44	0.45	0.54	0.57	0.58	0.58	0.95	0.99	1.02	1.03	1.04	1.21
G	Finance measures	0.50	0.48	0.48	0.48	0.48	0.48	0.68	0.75	0.75	0.77	0.78	0.77	0.77	0.78	0.77
I	Trade-related investment measures	0.51	2.86	3.09	3.10	3.12	3.15	3.23	3.24	3.25	3.22	3.22	3.29	3.39	3.73	3.78
L	Subsidies (excl. export subsidies)	11.61	18.67	18.55	19.39	57.60	61.12	61.98	62.67	62.90	63.62	64.52	65.65	44.41	45.87	46.49
M	Government procurement restrictions	0.89	1.35	1.30	1.37	1.44	1.91	2.39	2.60	2.73	2.76	2.75	3.15	3.40	3.53	3.63
P	Export-related measures (incl. subsidies)	44.96	55.74	58.84	61.73	63.94	63.47	62.65	64.55	65.49	66.20	69.33	69.94	69.48	69.32	69.29
	Tariff measures	0.28	0.34	0.68	1.15	1.37	1.19	4.50	4.86	5.40	6.76	8.35	9.10	9.14	9.21	9.21
	Instrument unclear	0.00	0.43	0.62	0.66	0.67	0.71	0.77	0.85	0.87	1.01	1.23	1.23	1.22	2.00	4.36

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY TURKEY'S DISCRIMINATORY INTERVENTIONS

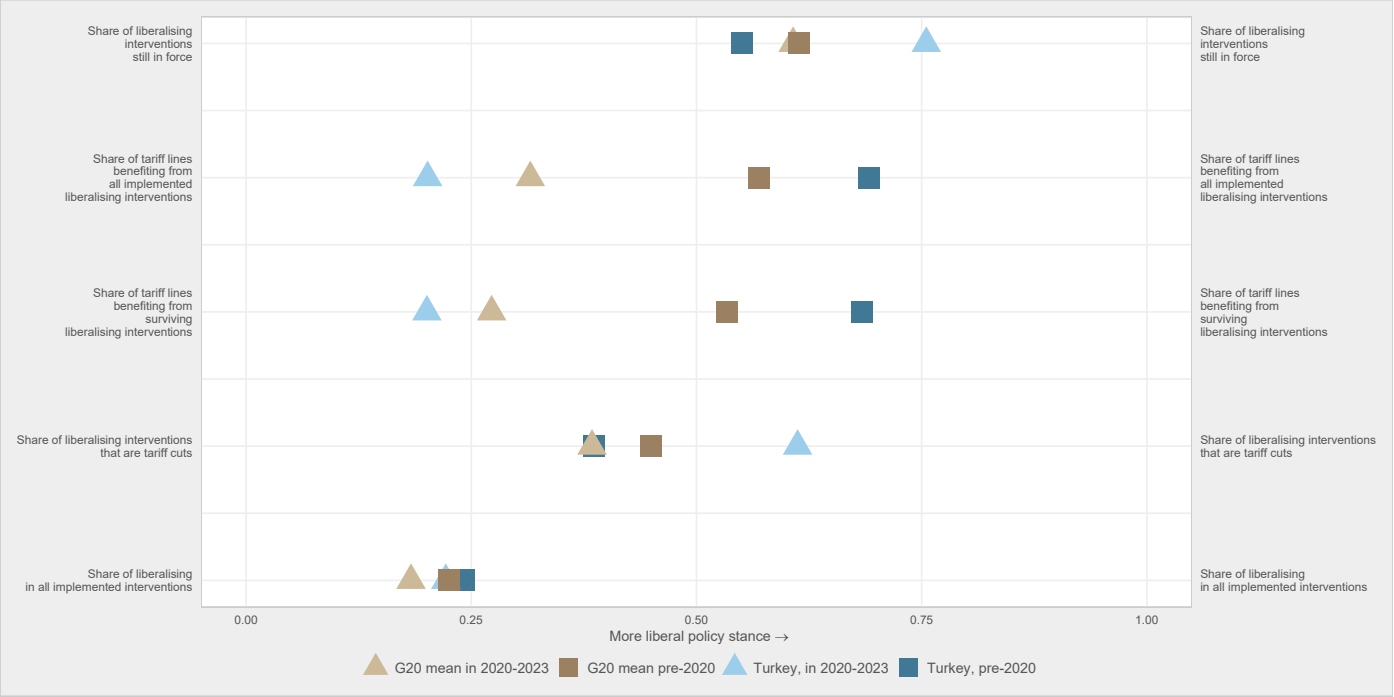


DISCRIMINATORY INTERVENTIONS HARMING TURKEY'S INTERESTS



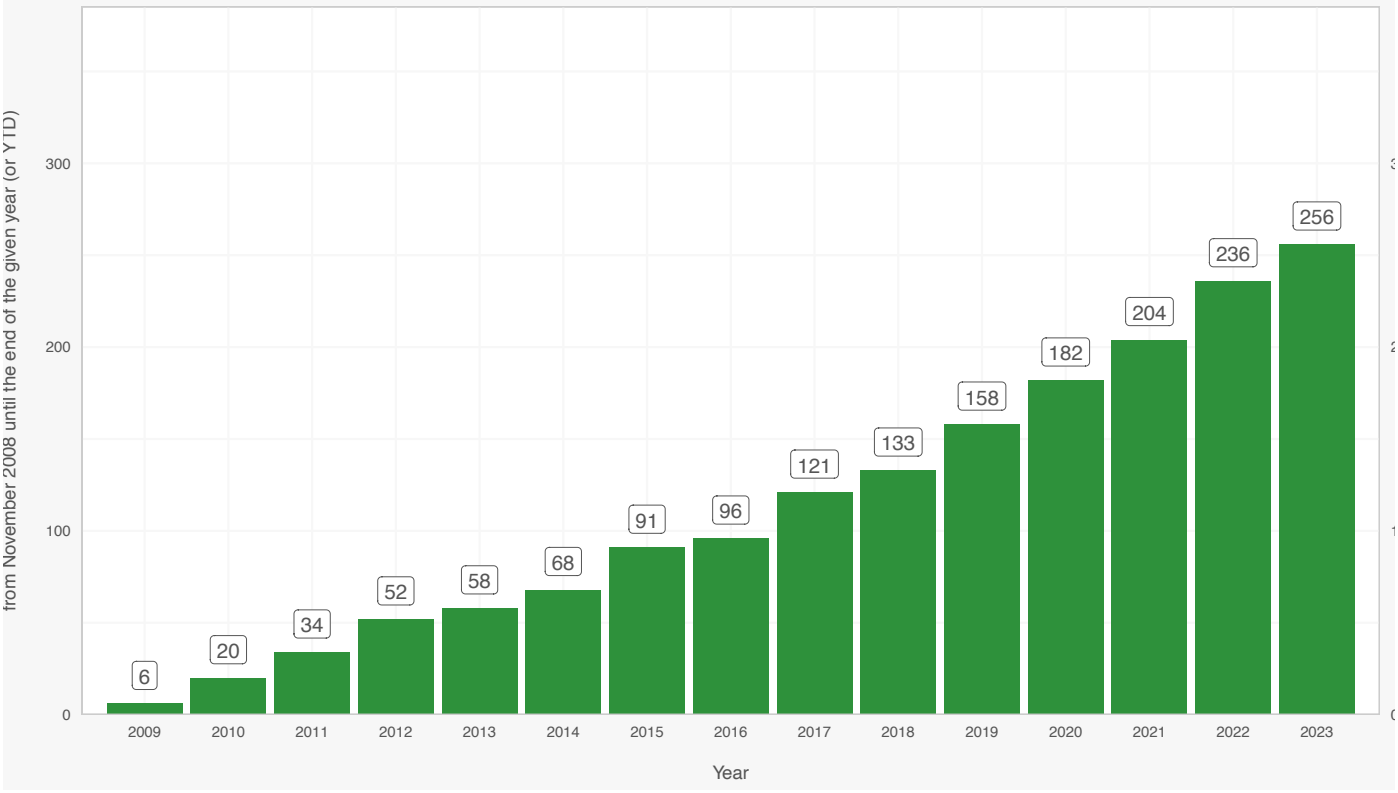
TURKEY

Track record of liberalisation



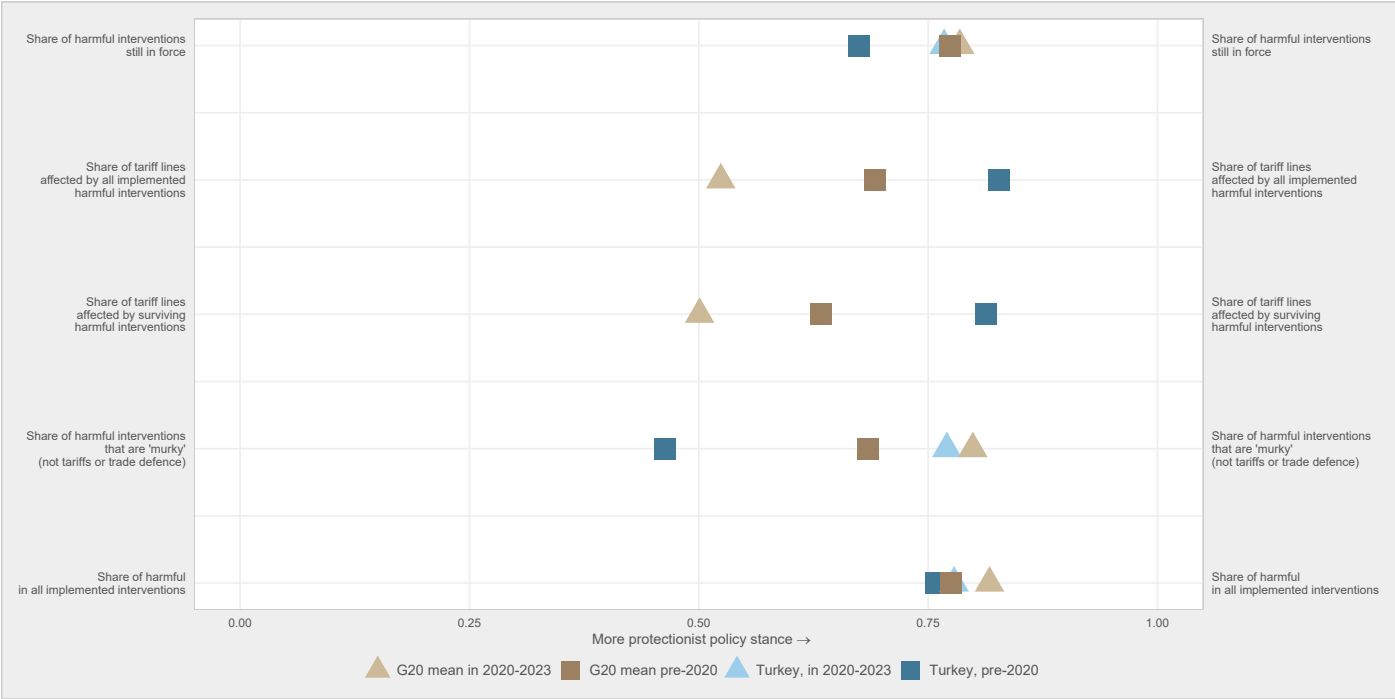
TURKEY

Number of liberalising interventions imposed since November 2008



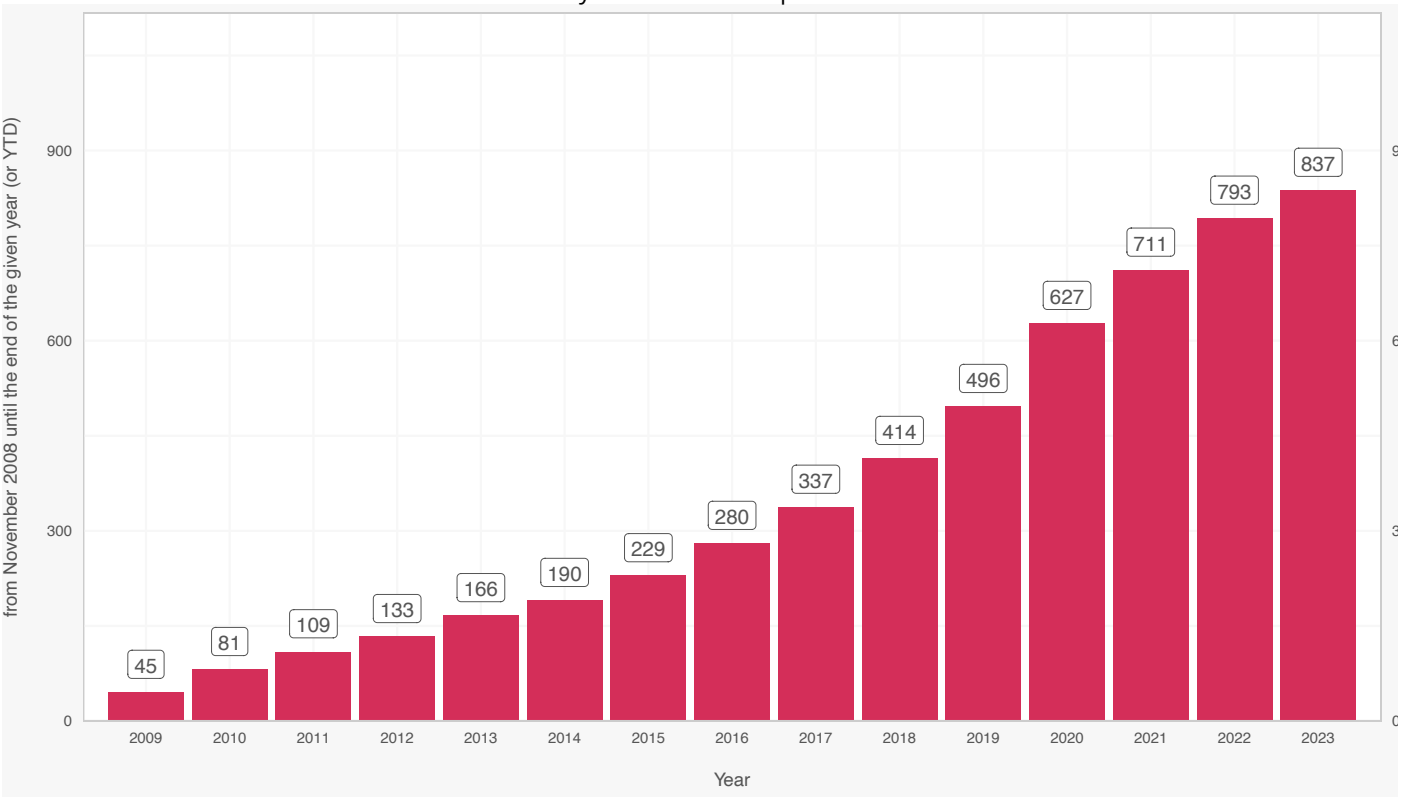
TURKEY

Track record of protectionism



TURKEY

Number of discriminatory interventions imposed since November 2008



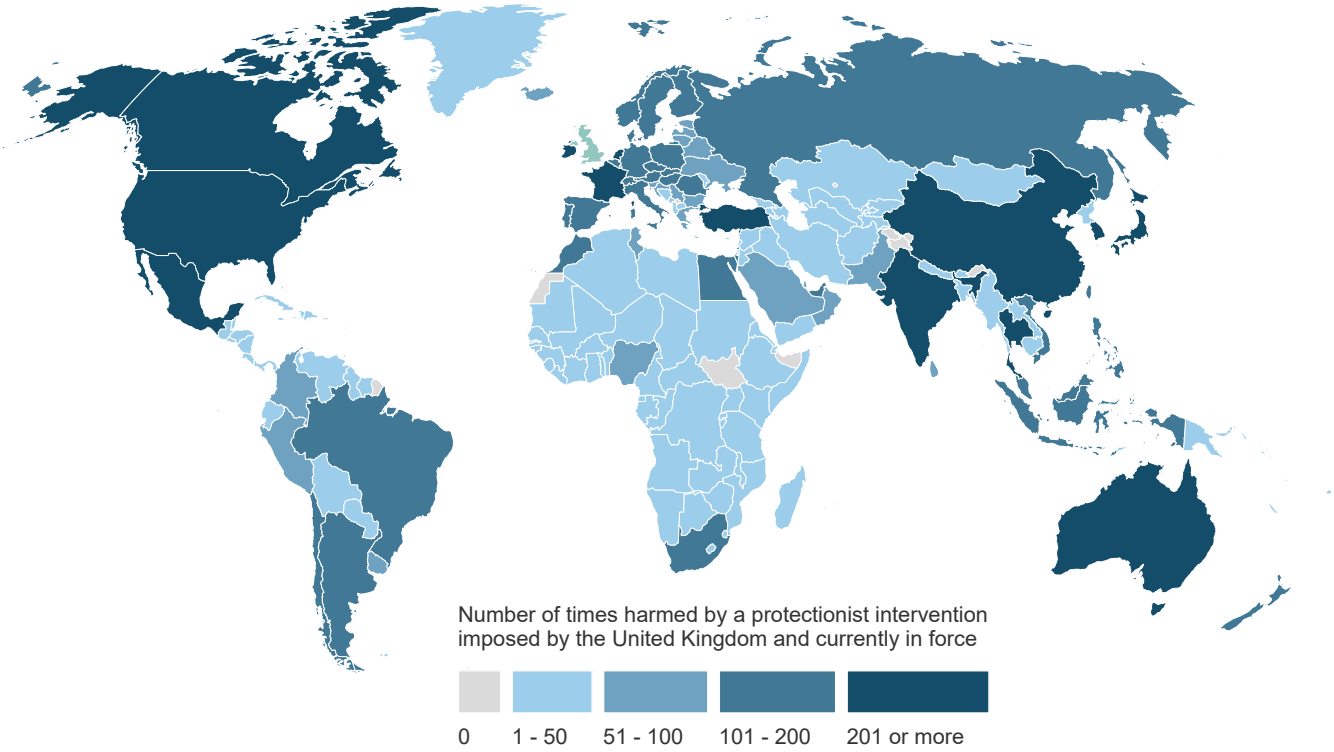
UNITED KINGDOM

What is at stake for the United Kingdom's goods exporters?

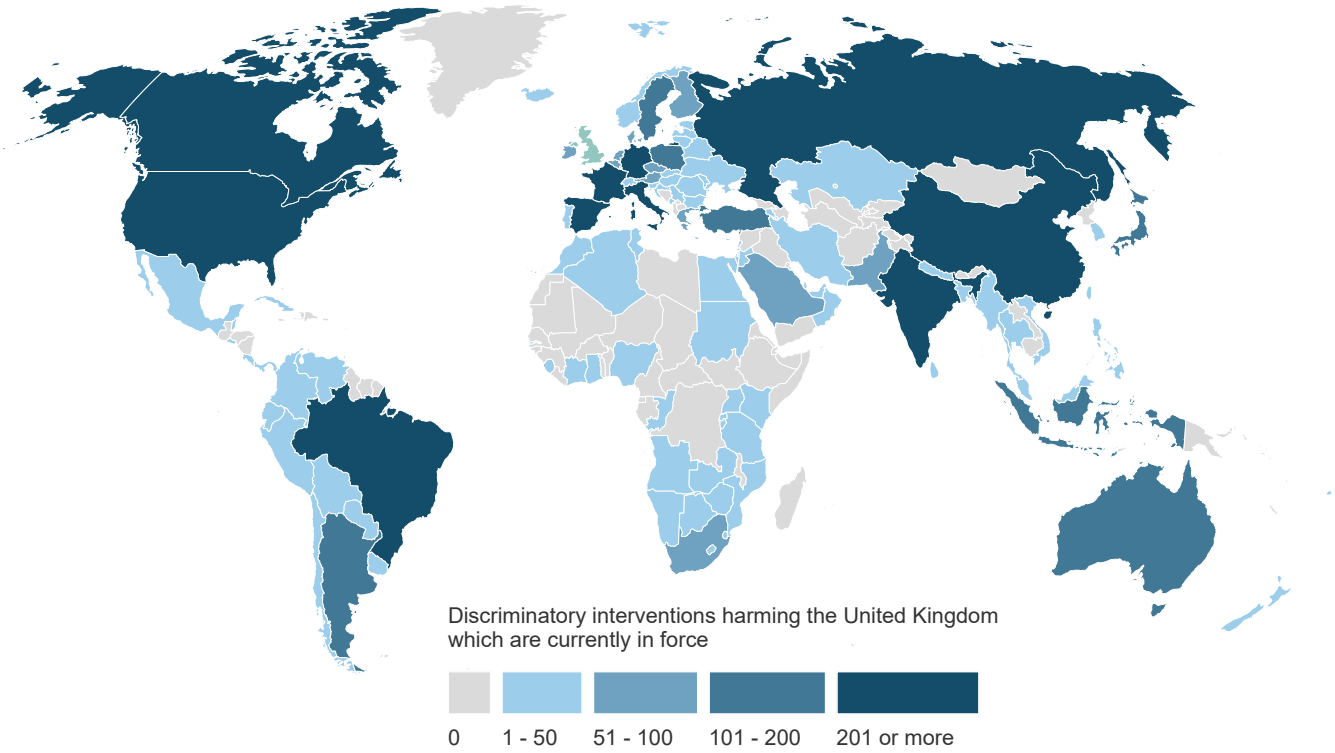
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	39.23	52.55	61.15	65.74	69.38	71.25	73.53	75.26	76.55	77.77	80.50	82.57	81.87	81.50	82.55
D	Contingent trade-protective measures	0.01	0.02	0.03	0.04	0.06	0.07	0.10	0.08	0.08	0.11	0.12	0.12	0.12	0.12	0.11
E	Non-automatic licensing, quotas etc.	0.39	0.46	0.64	0.71	0.79	0.83	0.93	0.90	1.56	2.39	2.42	3.40	3.81	4.53	2.67
F	Price-control measures, including additional taxes and charges	0.01	0.03	0.06	0.08	0.06	0.09	0.16	0.21	0.32	1.08	1.17	1.27	1.32	1.36	2.20
G	Finance measures	0.44	0.50	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.52	0.53	0.53	0.52	0.53	0.53
I	Trade-related investment measures	0.36	1.66	1.79	1.81	1.81	1.83	1.91	1.99	2.01	1.99	2.03	2.08	2.15	2.19	2.21
L	Subsidies (excl. export subsidies)	9.62	18.95	21.62	23.65	25.30	29.38	31.88	33.88	37.51	38.99	40.98	48.58	48.87	50.85	52.43
M	Government procurement restrictions	0.36	0.68	0.77	0.98	1.04	1.25	1.62	1.65	1.68	1.73	1.89	2.59	2.94	4.16	4.74
P	Export-related measures (incl. subsidies)	30.47	41.08	52.63	60.01	63.34	61.46	62.84	65.38	66.88	67.69	70.62	71.41	70.46	70.41	71.25
	Tariff measures	0.58	0.57	0.63	1.01	1.65	1.70	2.06	2.50	2.85	3.53	3.77	4.65	5.14	5.27	5.97
	Instrument unclear	0.02	0.28	0.41	0.42	0.50	1.76	2.03	2.10	2.21	2.34	2.34	2.34	2.37	2.68	3.61

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY THE UK'S DISCRIMINATORY INTERVENTIONS

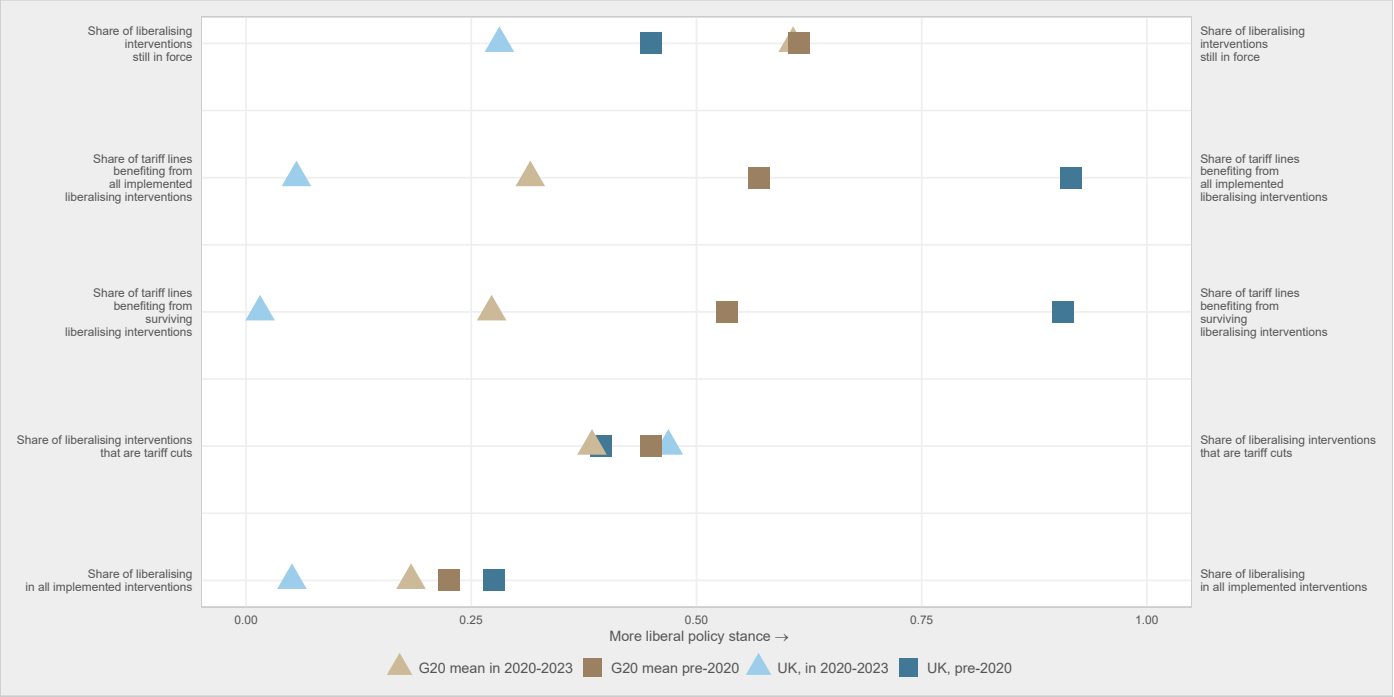


DISCRIMINATORY INTERVENTIONS HARMING THE UK'S INTERESTS



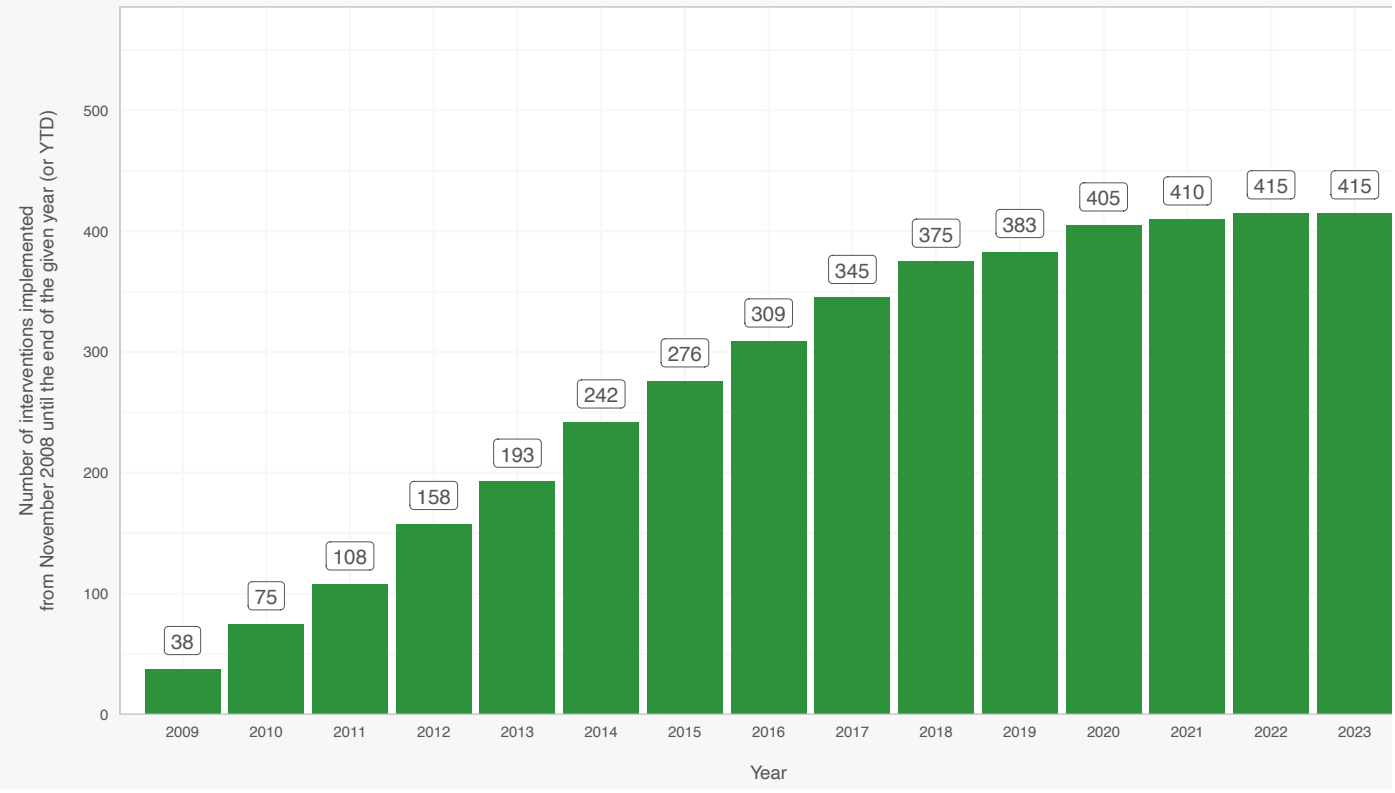
UNITED KINGDOM

Track record of liberalisation



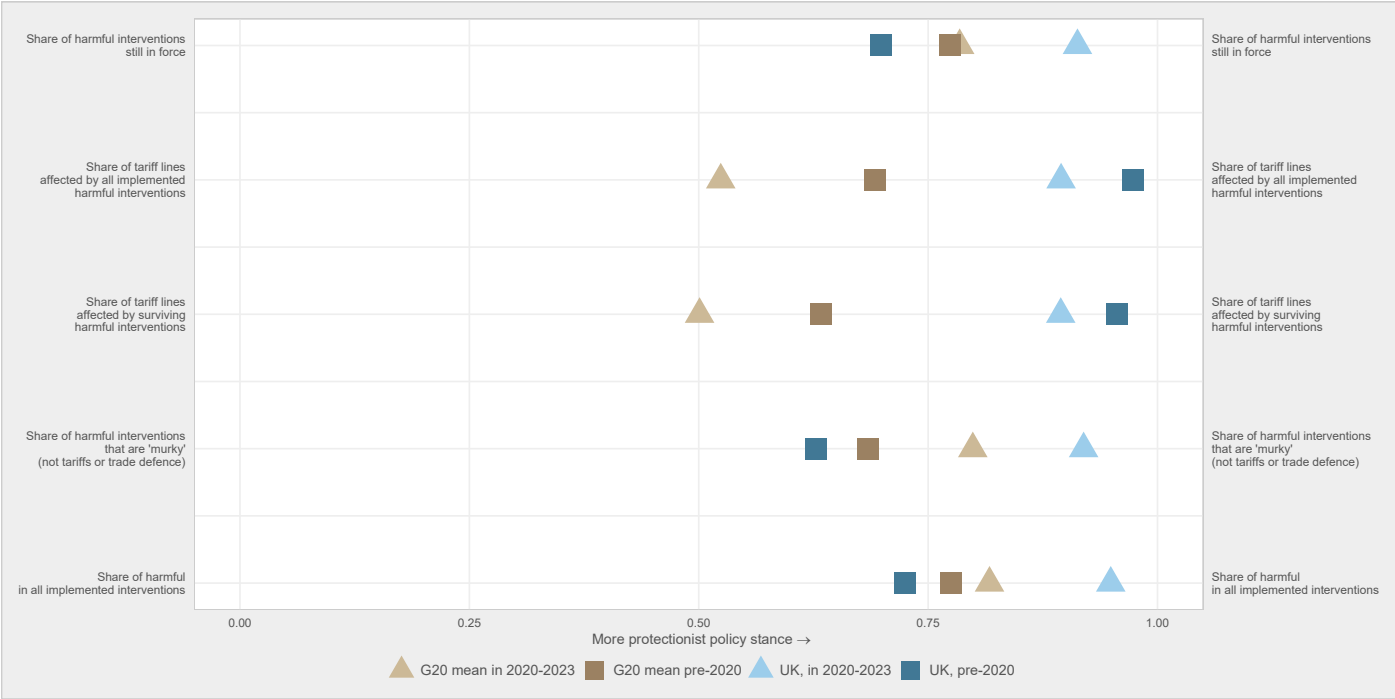
UNITED KINGDOM

Number of liberalising interventions imposed since November 2008



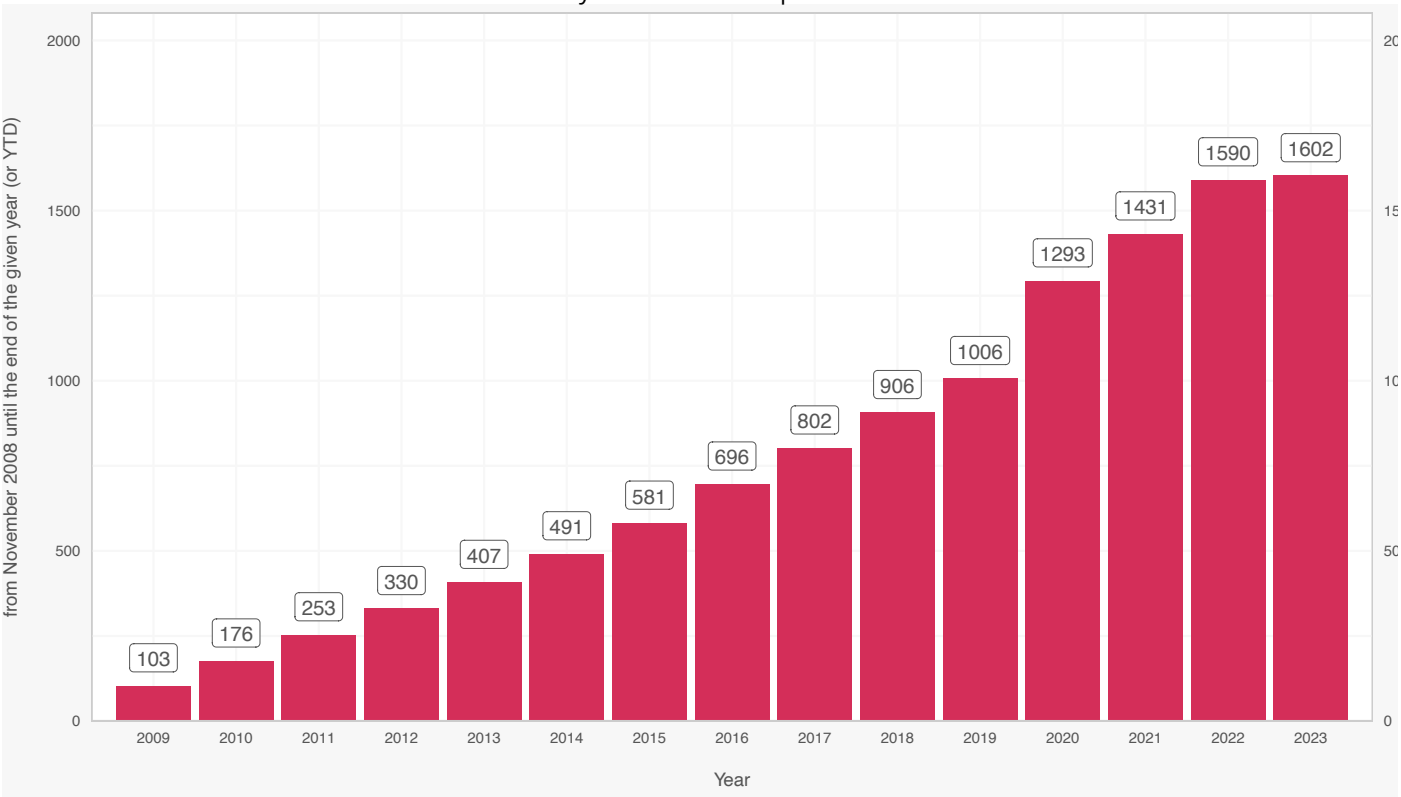
UNITED KINGDOM

Track record of protectionism



UNITED KINGDOM

Number of discriminatory interventions imposed since November 2008



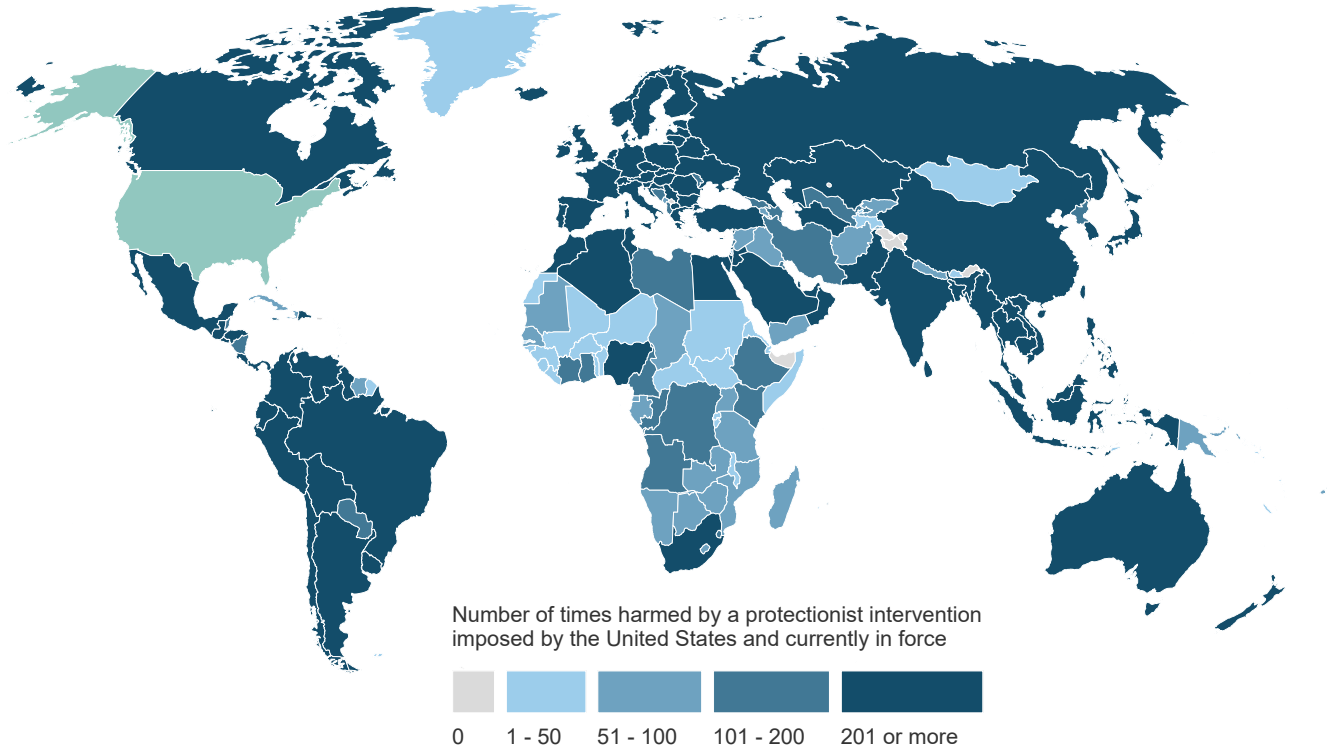
UNITED STATES

What is at stake for the United States' goods exporters?

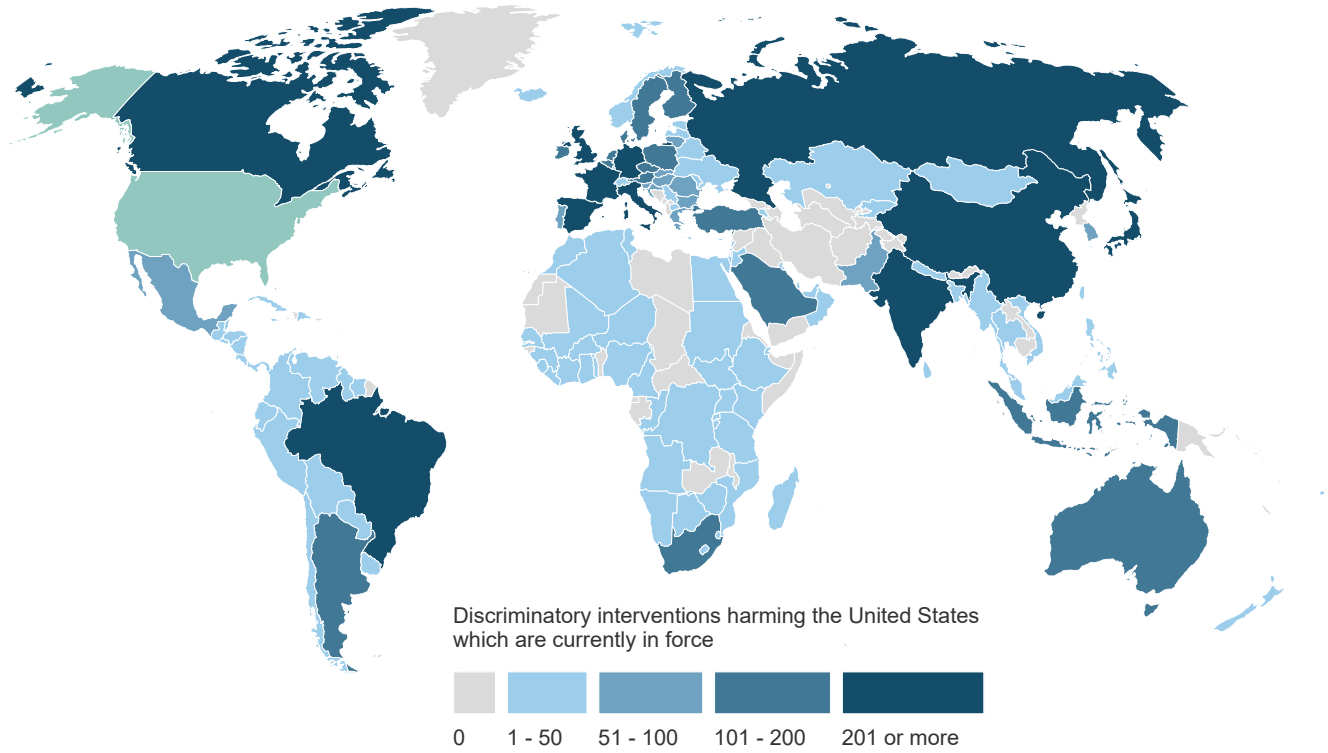
UN MAST chapter	Foreign discriminatory policy instrument	Percentage of this G20 member's exports at risk due to ...													
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	All instruments	42.58	52.95	59.18	64.05	71.17	73.26	74.63	75.69	77.68	79.76	81.84	82.54	81.79	82.20	82.87
D	Contingent trade-protective measures	0.28	0.41	0.46	0.57	0.63	0.60	0.61	0.66	0.67	0.76	1.04	1.34	1.34	1.35	1.33
E	Non-automatic licensing, quotas etc.	1.02	1.42	2.20	2.80	3.75	3.72	5.12	5.17	5.32	5.39	5.39	5.97	5.94	6.09	6.00
F	Price-control measures, including additional taxes and charges	0.08	0.09	0.14	0.20	0.32	0.64	0.87	1.02	1.09	1.49	1.57	2.11	2.14	2.16	4.26
G	Finance measures	0.36	1.02	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.10	1.10
I	Trade-related investment measures	0.35	0.76	0.45	0.50	0.52	0.58	1.23	1.60	1.17	1.08	1.07	1.10	1.17	1.23	1.26
L	Subsidies (excl. export subsidies)	7.94	11.64	14.04	15.73	31.94	33.44	35.06	35.65	36.95	38.26	40.72	41.88	36.52	39.19	40.49
M	Government procurement restrictions	0.07	0.31	0.31	0.52	0.81	1.31	1.86	1.75	1.76	1.89	1.98	2.09	2.23	2.21	2.19
P	Export-related measures (incl. subsidies)	35.05	43.17	50.05	55.91	58.76	60.30	60.50	62.51	65.19	66.57	69.83	70.72	70.30	70.33	70.78
	Tariff measures	1.63	2.24	2.74	2.52	3.77	2.83	4.44	6.15	9.81	12.47	14.53	15.80	17.35	17.55	17.78
	Instrument unclear	0.10	0.23	0.33	0.42	0.56	1.50	1.84	1.90	1.91	2.34	2.68	2.68	2.76	2.86	2.97

Note: This table presents estimates of the percentage of a nation's exports that face different harmful policy interventions in their export markets. Only those harmful interventions implemented after November 2008 count towards these totals--therefore, the estimates indicate the exposure of national exports to crisis-era policy intervention that favours domestic commercial interests. The trade data used in the estimation is taken from UN Comtrade and at the six-digit level of the Harmonised System product classification. For each product exported by a nation, the foreign markets accounted for in this estimate are those where bilateral exports exceeded $1 million for the given product. De minimis trade flows are therefore excluded. To limit endogeneity problems (that is, the harmful policy interventions affecting the total value of exports observed) pre-crisis shares of world trade are employed in these calculations. The pre-crisis shares are computed as the mean weight for the years 2005-7. The calculations also take into account when a harmful policy intervention comes into force and, where relevant, lapses. When an intervention lasts for only part of a year, the trade flow is discounted by the fraction of the year the harmful measure is not in force.

COUNTRIES HARMED BY THE US' DISCRIMINATORY INTERVENTIONS

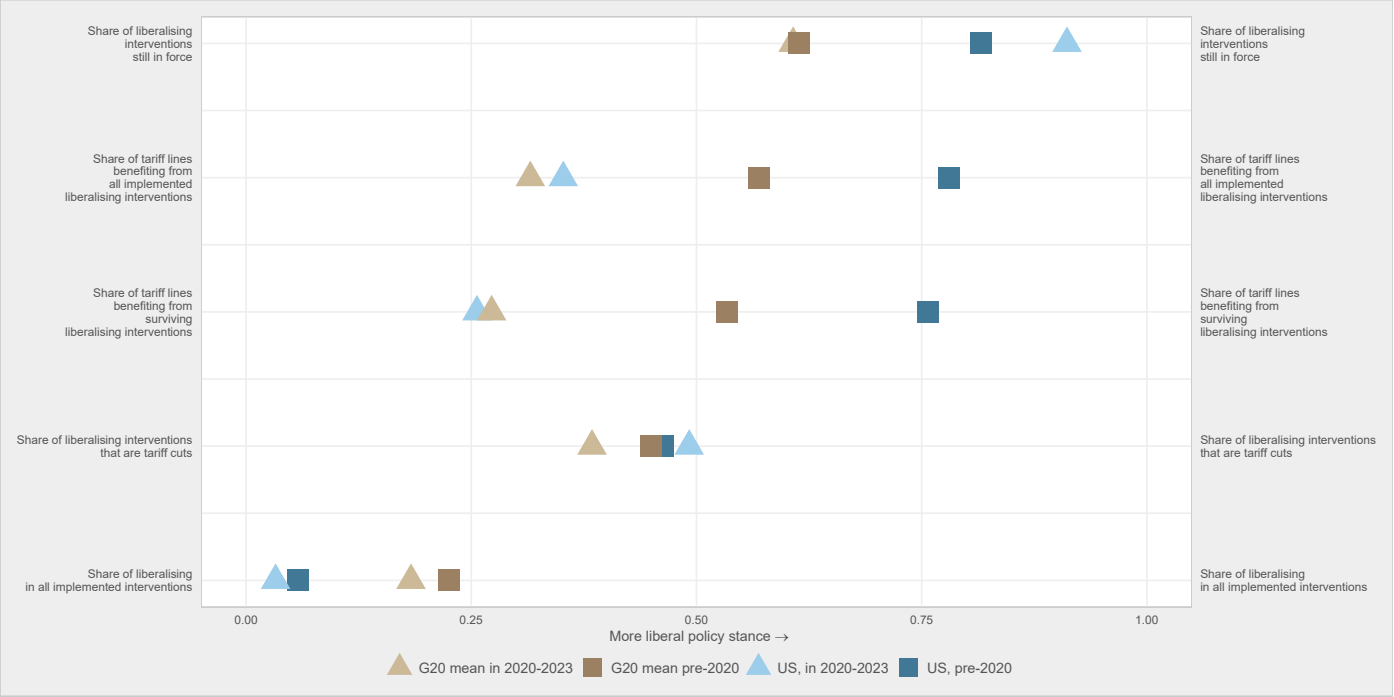


DISCRIMINATORY INTERVENTIONS HARMING THE US' INTERESTS



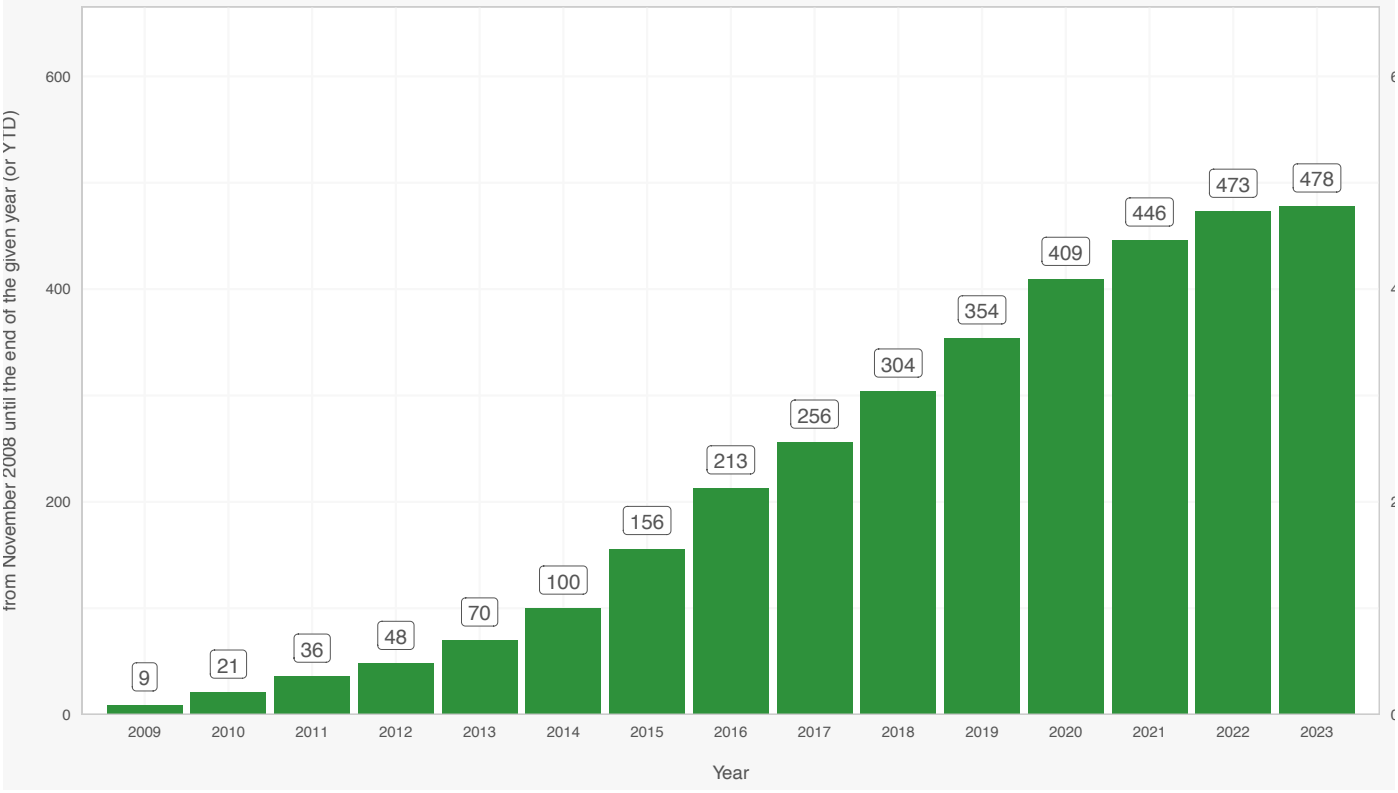
UNITED STATES

Track record of liberalisation



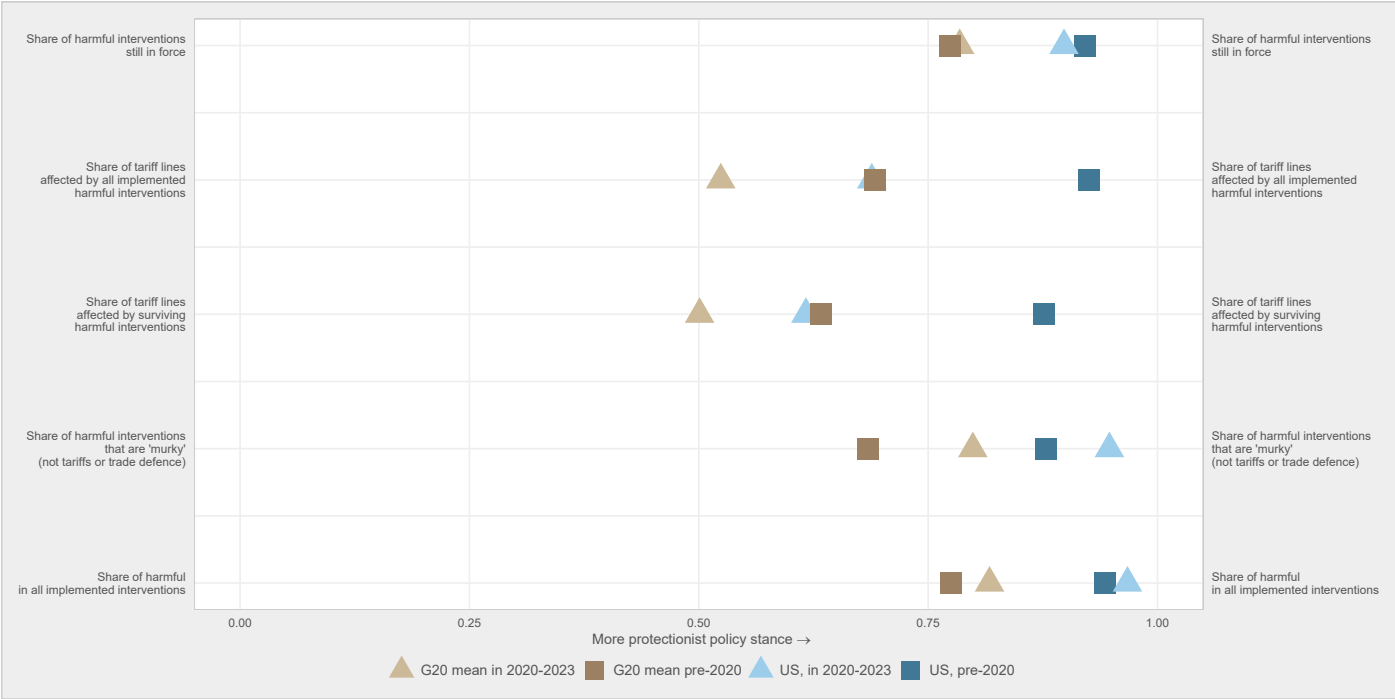
UNITED STATES

Number of liberalising interventions imposed since November 2008



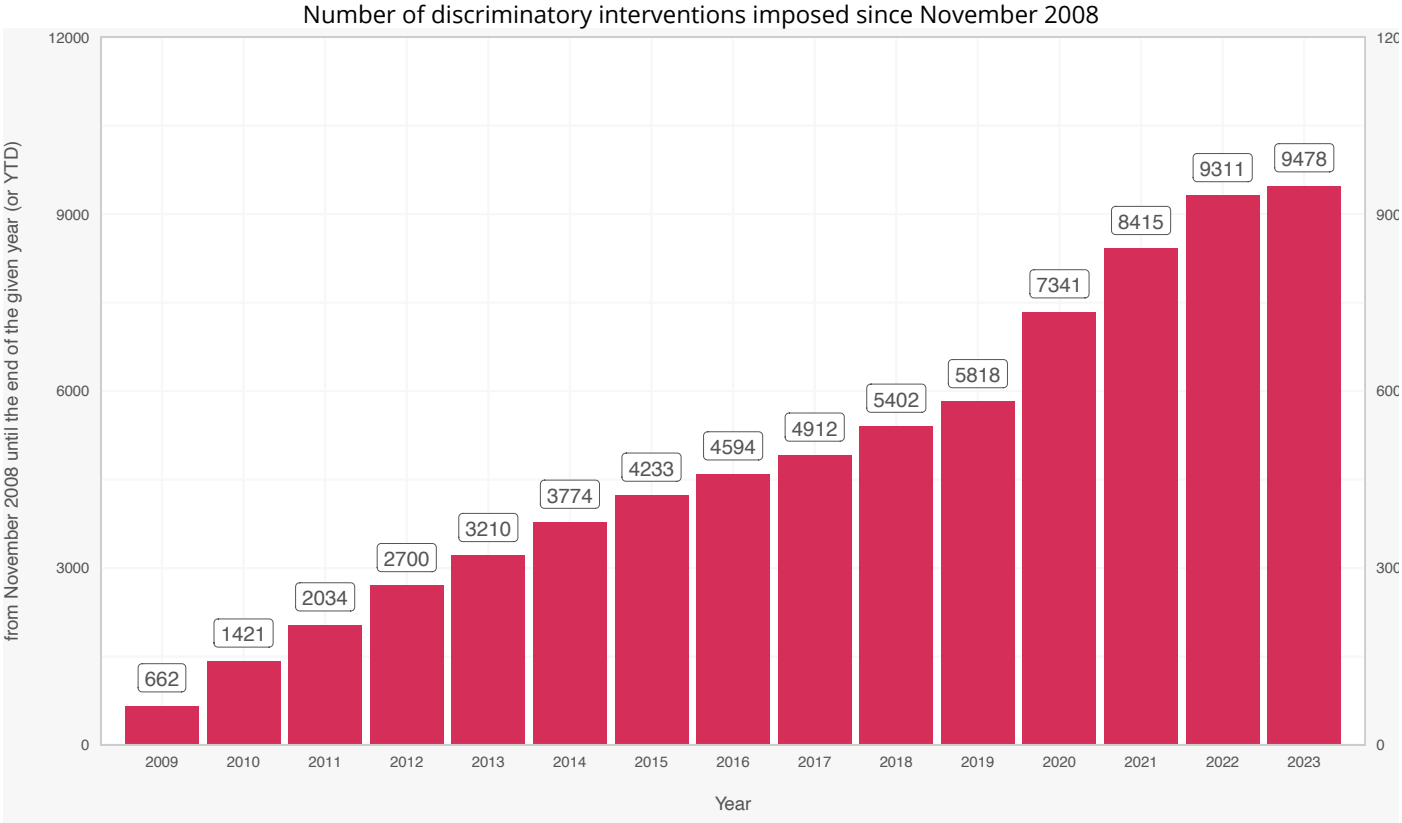
UNITED STATES

Track record of protectionism



UNITED STATES

Number of discriminatory interventions imposed since November 2008



Many Western governments frame the trade-related aspects of Critical Raw Materials in terms of security of supply and fret about "dependency" on hostile trading partners. Governments of lower per-capita income nations that have lots of material reserves see the matter differently. For them the sharp predicted increases in demand for these materials in the decades ahead is too good an opportunity to miss to develop processing industries, to upgrade technology and, ultimately, to modernise their economies. Both groups frequently talk past each other, a practice made worse by the suspicions created by intensified geopolitical rivalry.

The ensuing scramble for critical raw materials is the subject of this report, the 31st prepared by the Global Trade Alert team. Part I of the report examines the very notion of a critical raw material and what factors underlie the expected shortages and volatility in world markets for these goods. The pros and cons of enumerating lists of critical raw materials is discussed, not least given the tendency of some producer groups to claim their materials deserve state largesse. Given the frequent mention of Rare Earth materials in deliberations on critical raw materials, a chapter is devoted to alleged attempts to weaponise trade in them.

Part II of the report provides detailed evidence on the unilateral policy intervention undertaken by governments towards critical raw materials. Here we examine if there is a mismatch between the narratives used by policymakers to characterise their policies towards critical raw materials and the actual policy mix chosen. A subsequent chapter is devoted to steps taken by governments, sometimes in concert, to produce or secure critical raw materials abroad. Having found these approaches wanting, we advocate an approach to thickening over time markets of critical raw materials.

In policy deliberations, it is mistaken to view market structures and international sourcing patterns for critical raw materials as immutable. They can evolve over time guided by market-supportive government intervention. Still, the fundamental uncertainty facing demand for critical materials as societies undertake the digital and energy transitions means that, whatever steps are taken to thicken markets over time, there will be occasional shortages and market disruption. Private and public sector decisionmakers should expect such disruption and take mitigating measures in advance such as, where viable, stockpiling.

CEPR Press

Centre for Economic Policy Research
33 Great Sutton Street
London EC1V 0DX

Tel: +44 (0) 20 7183 8801
Fax: +44 (0)20 7183 8820
Email: cepr@cepr.org
Web: www.cepr.org