Edited by Luis Garicano, Dominic Rohner
and Beatrice Weder di Mauro

Global Economic Consequences of the War in Ukraine

Sanctions, Supply Chains and Sustainability

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Foreword

Six months of war has caused extensive damage to Ukraine and has had a transformative impact on the world's economic, financial, and geopolitical status quo. The effects have been wide-ranging and unequal among countries, contributing towards global food shortages, a European energy crisis, mounting geopolitical tensions, and rising inflation.

In response to these extraordinary circumstances, CEPR set up a VoxEU debate which invited research contributions to assess and inform the evolving policy debate. This eBook gathers a selection of the most pertinent of these submissions and organises them into five sections.

The first section discusses the economic consequences of sanctions, which were widely and aggressively implemented by Ukraine's allies. The analysis reveals doubts about the overall effectiveness of sanctions, details Russia's response, and assesses the best route forward to limit European imports of Russian oil and gas. The second reviews the impact of the war on world trade and supply chains, highlighting the economic damage caused by global trade disruptions and the uncertain future of the international trade regime. Section three emphasises the impact on developing countries, which face increasing food and energy insecurity as a result of the conflict. Section four discusses the devasting economic and societal impact of the war on Ukraine itself and offers policy solutions to limit long-term damage. Section five considers the long-run impact on multilateralism and the global order.

While many uncertainties remain, the analysis provides useful policy insights into a broad range of key issues affecting Ukraine and the global economy. Containing the current economic fallout and limiting future damage is imperative.

CEPR is grateful to the authors for their contributions to this eBook and to the editors, Luis Garicano, Dominic Rohner and Beatrice Weder di Mauro. Our thanks also go to Anil Shamdasani for his skilled handling of its production.

CEPR, which takes no institutional positions on economic policy matters, is delighted to provide a platform for an exchange of views on this important topic.

Tessa Ogden
Chief Executive Officer, CEPR
September 2022

Introduction

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IE Business School and CEPR; University of Lausanne and CEPR; Graduate Institute of
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Will the war in the Ukraine upend the world economic, financial, and political order? Five months after the Russian invasion, we know that the consequences of the war will be massive, far-reaching, and enduring. Since we opened a channel on CEPR/VoxEU to promote and disseminate rapid analysis, we have published more than 50 contributions on the consequences of the war. This book selects a few representative contributions for an early stocktaking of lessons and to provide a first assessment on what might lie ahead. It goes without saying that uncertainties at this stage are enormous, and that risks to both the Ukrainian and the European and global economies – the main objects of our analysis – seem strongly biased towards the downside.

LOCAL SUFFERING AND POSSIBLE GLOBAL CONSEQUENCES

The tragedy that has been unfolding in front of our eyes since the Russian invasion of Ukraine on 24 February 2022 was, on some level, predictable given the previous annexation of Crimea by Russia and the build-up of Russian troops at the Ukrainian border since late 2021. However, most analysts did not expect such a rapid and large-scale Russian attack – an attack that was not confined to the Donbass region but targeted the whole of Ukraine. The length of the war was also underestimated by military experts – most predicted a Russian victory within a week.

The first and most important consequence of the war is the massive loss of human life. The Ukrainian population has suffered terribly while fighting off the attack by one of the world's most powerful armies with courage and determination. According to the UN High Commissioner for Human Rights, from its beginning up to 18 July, the war had caused an estimated 11,862 civilian casualties in the country (5,110 killed and 6,752 injured).[1] The US government estimates military casualties among the invading Russian forces at around 15,000 killed and perhaps 45,000 wounded, and a similar, slightly smaller number on the Ukrainian side.[2]

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1   www.ohchr.org/en/news/2022/07/ukraine-civilian-casualty-update-18-july-2022.
2   ''CIA director estimates 15,000 Russians killed in Ukraine war'', Reuters, 21 July 2022 (www.reuters.com/world/europe/cia-director-says-some-15000-russians-killed-ukraine-war-2022-07-20/).

As detailed in the chapters that follow, beyond lost lives and injuries, the economic losses are enormous and take many forms. The simplest measures are consumption losses. Oleksiy Blinov and Simeon Djankov (Chapter 25), using bank card activity, show that private consumption fell by half during the first month of the war and then recovered half of the loss, up to 70–74% of the previous year's level by June.

A macroeconomic crisis is looming because the Ukrainian government has been forced to partially finance the war with an inflation tax. Revenues only cover about a third of the Ukrainian government's monthly deficit of $5 billion; another third has been covered by loans and grants; and the rest by the central bank. Promised financial support from the West has been falling short, inflation in the Ukraine has been accelerating and the fixed exchange rate is unsustainable (Becker et al. 2022).

Noam Angrist, Simeon Djankov, Pinelopi Goldberg and Harry Patrinos (Chapter 26) show enormous losses of education and human capital – particularly coming after the pandemic. Ukranian children are estimated to have lost one year of schooling due to the combined impact of the Covid-19 pandemic and the war. Worryingly, Tilman Brück, Michele Di Maio and Sami Miaari (Chapter 27), using data from the intifada, show that these schooling and human capital losses are likely to have persistent effects. Finally, as Sascha Becker points out (Chapter 28), there are the huge costs from the internal and external displacement of over 10 million Ukrainians due to the war. Investing in the human capital of these refugees is crucial, but the 'uprootedness' comes with a potential silver lining. World War II history shows a shift in preferences post-displacement towards investment in human capital rather than physical capital, as those forcibly displaced realise it is the only thing they and their children can truly take with them. It is thus crucial to invest in education of refugees as quickly and as comprehensively as possible.

The consequences of the war reach far beyond the Ukrainian–Russian border. In fact, the conflict could hardly be more global in its implications. In terms of long-term geopolitics, Putin's challenging of Ukrainian sovereign borders violates the (in recent decades) sacrosanct doctrine of the inviolability of sovereign borders. A shift away from a liberal, rules-based international order to one where great powers create their spheres of influence and force small countries into choosing sides would be a slippery slope that could trigger further wars worldwide and threaten the freedom and self-determination of billions of people.

Moreover, the current conflict bears a non-zero risk of direct confrontation between the biggest nuclear powers on the world stage – the Western defensive alliance NATO, which supports Ukraine, versus Putin's Russia. Beyond geopolitical shifts, the global economic implications are vast.

ECONOMIC CONSEQUENCES OF THE SANCTIONS

The West responded to Russian aggression with unprecedented economic force. Freezing Russian central bank reserves and limiting the access of Russian banks to the Western payments' system was a reaction that showed unity and strength. Sanctions have been deployed incrementally over the last years and increasingly appear to be the economic weapon of choice, as demonstrated by Gabriel Felbermayr, Aleksandra Kirilakha, Constantinos Syropoulos, Erdal Yalcin and Yoto Yotov (Chapter 5).

The effectiveness of financial sanctions on Russia has been disputed. An often-cited indicator of ineffectiveness has been the ruble exchange rate. Russia's currency depreciated sharply, losing almost half of its value in March, but has since recovered to the pre-war level. Oleg Itskhoki and Dmitry Mukhin (Chapter 6) argue instead that the ruble appreciation is the result of the effective sanctions on Russian imports, which lowered demand for foreign currency, as well as financial repression. Similarly, Mark Harrison (Chapter 3) argues that import sanctions are effective, since Russia is unable to spend its growing export revenues and is simply accumulating financial claims on Western economies through energy sales which it cannot use.

Financial sanctions on Russia have been imposed sequentially since the annexation of the Crimea in 2014. Studies on the real and financial effects of these previous sanctions support a more sceptical view. Mikhail Mamonov, Anna Pestova and Steven Ongena (Chapter 4) find that Russian banks largely anticipated global sanctions and not sanctioned banks were partly able to compensate for them. Anna Pestova, Mikhail Mamonov and Steven Ongena (Chapter 11) show that those sanctions had some measurable effects on Russian firms but that they are rather small. In fact, according to Nigmatulina (2021), the sanctions exacerbated misallocation and hit the 'wrong' firms, as the ones close to power were shielded.

Payments for Russian oil and gas were exempt from sanctions. Nevertheless, Russia started to restrict the flow of gas to various European countries in the spring, partly claiming technical problems and partly non-compliance with their new payments policy. Why Russian suddenly demanded payment in rubles was a puzzle, since it needs foreign currency, not rubles, to pay for imports or to support the exchange rate. The suspicion was that it was just a pretext to be able to allege non-compliance by buyers and cut supplies while claiming to be sticking to contracts. Moreover, Gazprombank had been exempted from sanctions precisely to ensure the flow of payments. Michele Savini Zangrandi (Chapter 2) suggests that the 'rubles only' policy may have been a move to protect MICEX, the main foreign exchange platform, from any sanctions.

The intention of economic sanctions was to increase the cost of the war to Russia while at the same time limiting the cost to the West. The high dependence of many European countries meant that they continued to buy gas and oil from Russia while at the same time attempting to refill their storages and diversify energy suppliers. The result was a

sharp increase in prices (from about €20/MWh in 2021 to about €180 in mid-July 2022) as well as a more than 30% increase in Russian fiscal revenue. Thus, part of the cost of war is being paid through higher prices charged to citizens around the world, even if they are opposed to the war.

Early on, there were many calls for a full embargo on Russian energy (see Chapter 10 by Anette Hosoi and Simon Johnson), but some feared the economic costs of such an embargo would be too high. This is why a paper written by group of economists (see Chapter 15 by Rüdiger Bachmann et al.) led to a very heated debate in Germany. The authors were the first to estimate the macroeconomic effects in a multi-sector macro model (specifically, the one by Baqaee and Fahri 2021). They found the cost of a full gas embargo on the German economy was substantial but manageable, at below 3% of GDP. Smaller sized effects were estimated for France.

Short of an embargo, there are two tools that can be used: import tariffs and price caps. Philippe Martin and Beatrice Weder di Mauro (Chapter 1) argue that a combination of these two would be the best European response for several reasons. An import tariff on Russian oil would reduce the rents that Russia receives from these sales, while a price cap is the right tool to use on gas. Given the number of buyers and suppliers in the oil market, it is a more effective instrument than attempts to organise a buyer cartel and implement a price cap (which is what the G7 had agreed to do). For the pipeline gas market, on the other hand, Europe should organise a single buyer and negotiate a price schedule with Russia. The infrastructure of the pipelines conveys both seller and buyer market power, in principle. However, up to now Europe has chosen not to exercise such buying power. The resulting competition between different countries and energy companies has led to the above-mentioned price hike and huge profits for all suppliers (including Norway and Algeria). A single European buyer and price cap would have to go hand-in-hand with a binding energy saving and rationing scheme and securing the sharing of energy in the coming winter.

WORLD TRADE WAR AND DISRUPTED SUPPLY CHAINS?

The belief that increasing international trade and lengthening global value chains would secure not only economic prosperity but also a peaceful world has been one of the underpinnings of the great globalisation of the last decades. This belief is now in doubt.

Most of the existing literature supports the view that interdependence and trade reduce the scope for conflict (Polachek 1980, Martin et al. 2008, Rohner et al. 2013, Gallea and Rohner 2021). Higher interdependence and more business increase the opportunity cost of conflict, and hence warrant peace. In dynamic settings, however, vicious and virtuous cycles can arise. Rohner et al. (2013) show that a conflict may deplete mutual trust and drive down trade between conflict parties, which may then find it cheaper to engage in

future conflict, leading to a 'war trap'. The world seems currently in the middle of such a spiral of conflict, destroying trust and trade and potentially making future wars more likely.

A distinction that this existing literature has not made is the difference between trade in general versus trade in fossil fuels and other precious natural resources such as rare metals and minerals. While for all types of trade the ensuing interdependence is in principle a force of peace, for trade in fossil fuels there is a second, countervailing effect: resource wealth may enrich autocrats and prop up belligerent regimes in petro-states. Gallea et al. (2022) show that leaders of countries that are central nodes of the international gas network manage to cling to power for longer, among other things by fending off international sanctions. More generally, resource wealth tends to hollow out democracy and to favour autocratic regimes (e.g. Acemoglu et al. 2004).

What does this mean for the future of the international trade regime? Will world trade remain to a large extent global, involving different political systems, or will there be 'clubs' where democracies trade with each other and non-democratic states interact in separate trade networks? One aspect that makes the latter scenario not too likely is that many key natural resources are concentrated in autocratic countries. Consequently, it may be not so easy for democracies to fully cut trade links with non-democracies. However, accelerated regionalisation and reshoring of supply chains may still be unintended outcomes of the aggression.

In the short term, the war is adding to the stress of global value chains, which have still not recovered from the pandemic shock – whether manufacturing or agricultural. Deborah Winkler and Lucie Wuester (Chapter 17) study the position and role of Russia in global value chains. They point out that the country sits very high in those value chains – exporting raw materials (mostly metals) and chemicals and energy (notably, coke and petroleum). Hence, disruptions to trade with Russia have a global impact through price hikes, notably for energy goods, which affect transportation costs and virtually all global value chains.

Alvaro Espitia, Simon Evenett, Nadia Rocha and Michele Ruta (Chapter 19) worry about the impact of policy interventions in terms of worsening the war-related losses due to trade disruptions. Focusing on the escalating reactions to the fear of loss of food exports from Ukraine and Russia, they show that as countries impose export restrictions to protect themselves against the loss of imports, a 'multiplier effect' is induced: export restrictions mitigate pressures on domestic food markets by diverting supplies from the world market, and the surge in world prices that results from these measures leads other governments to retaliate by imposing new export restrictions, leading to a further surge in prices. Thus, supply chain distortions multiply as they extend. Michele Ruta (Chapter 18) notes that inertia is likely to preserve supply chains, and that even when substitution

takes place from one country to another, it is unlikely to affect costs significantly. It is only the misguided reactions by governments, inducing autarky and reshoring, that lead to very significant losses in productivity and high economic costs.

How persistent are these costs likely to be? Tobias Korn and Henry Stemmler (Chapter 20) show in their chapter that when violence persists over time (as it already has in this war), the relocation effects caused by violence tend to persist in the long run. Once relocation away from a certain supplier or buyer takes place, it remains after peace is established. Thus, supply chains are likely to remain permanently altered by the conflict, away from Ukraine and Russia.

What are the key policy consequences of this analysis? We would highlight three.

1. This war has shown as how urgent and necessary is to strengthen the resilience of supply chains.

2. Government intervention to restrict trade, while a priori appealing, is likely to increase the losses due to the war and must be very carefully employed, if at all.

3. Absent a positive intervention, the exclusion of Ukrainian (and Russian) firms from global value chains is likely to be persistent. Reversing this will require permanent positive policy interventions by Ukraine's partners in the West.

IMPACT ON DEVELOPING COUNTRIES

Poverty is a main driver of conflict. This has been shown in dozens of studies exploiting adverse income shocks (Miguel et al. 2004, Jia 2014, König et al. 2017). This body of evidence stresses that bad productivity shocks fuel the scope for conflict, including by reducing the opportunity cost of engaging in appropriative activities. Commodity price shocks can also have adverse effects (Bazzi and Blattman 2014, McGuirk and Burke 2020).

There is a significant and growing risk that we will soon see soaring food prices in developing countries that will impoverish parts of the population and trigger a heightened risk of social unrest. As Erhan Artuc, Guillermo Falcone, Guido Port and Bob Rijkers (Chapter 24) note, Ukraine and Russia combined account for over a quarter of global wheat exports, and Ukraine alone accounts for 14% of global corn exports. As a result, prices have soared and are expected to remain high. Using a simulation tool, Artuc et al. estimate welfare impacts of up to a 10% loss (Armenia's case) for the poorer 40% of the population, with an average of almost 2% loss in welfare for that population. The burden is large, and the impact is disproportionately in the South. In a separate simulation, also including energy prices, Maksym Chepeliev, Maryla Maliszewska and Maria Filipa Seara e Pereira (Chapter 22) find drops of a similar magnitude in real income in developing

countries of around 1% of GDP on average. Whereas energy is the main driver of the impact in high-income countries, more expensive food is the main source of the impact on poorer countries.

The direct impact of food and energy restrictions on low-income countries is accentuated by the potential sudden stop of lending from one key and common lender to all developing countries – China. Using a new data set, Sebastian Horn, Carmen Reinhart and Christoph Trebesch (Chapter 23) show that China has become the most important official player in international sovereign debt renegotiations but that, except for symbolic debt cancelations of small zero-interest loans, Chinese lenders almost never provide deep debt relief with face value reduction. They also show that China's multi-year overseas lending boom had mostly come to an end before the war and was further hit by it.

Thus, low-income countries face a drop in financing on top of a huge increase in energy and food prices. The consequences are very concerning, as Eoin McGuirk and Marshall Burke (Chapter 21) show. The impact is very heterogeneous, depending on the net position of the individual countries. While countries that are net exporters may see an increase in prosperity and less conflict, net food and energy importers will likely see hunger, misery, food riots and an increase in inter-group conflict.

What are the policy implications? We would emphasise the following key lessons:

1. As Chepeliev et al. (Chapter 22) point out, policies to cushion the blow by reducing demand for energy and food in rich countries could help contain the impact on food and energy prices. At the very least, rich countries should 'do no harm' and avoid imposing export restrictions.

2. Policy must also aim to cushion the impact on poorer countries via targeted support measures, focusing particularly on net food importers.

3. The financial consequences of 'sudden stops' of finance may significantly increase the damage, and rich countries must stand ready to substitute Chinese financing, for the sake of poor countries and for their own sake – avoiding riots and war is in everyone's interest.

POLITICAL FALLOUT AND LONG-RUN IMPACT ON MULTILATERALISM AND THE GLOBAL ORDER

Political economists and political scientists have long stressed the harmful political side effects of the world's addiction to fossil fuels (which adds to their devastating environmental impact).[3] Fossil fuels are associated with a greater risk of civil wars (Ross 2012, Dube and Vargas 2013, Morelli and Rohner 2015), inter-state wars (Caselli et al.

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3   In this chapter, we often refer to recent work in the literature on the economics of conflict. For recent literature surveys, see, for example, Anderton and Brauer (2021) and Rohner (2022).

2015), mass killings (Esteban et al. 2015), corruption (Caselli and Michaels 2013), and hollowing-out of democracy (Ross 2012). External threats and wars often act as catalysts to promote nation-building (Sambanis et al. 2015, Alesina et al. 2020).

Several chapters in the book address the long-run consequences of the conflict for the world order – specifically on the trading system, the monetary system, and the identity of the European Union.

Concerning the trade architecture, the main potential consequence, as Eddy Bekkers and Carlos Góes (Chapter 31) argue, is the division of the world into two blocs: a Western-centric bloc and a China-centric bloc. How costly would such a division be? Using a simulation, the authors show that the costs are significant – 5% of world GDP on average and up to 10% for poorer countries. Hence, they argue, preserving the current trading system is essential.

Second, the unprecedented use of sanctions, as Markus Brunnermeier, Harold James and Jean-Pierre Landau (Chapter 30) argue, will have a long-term impact on the international monetary system, although it will leave the central role of the dollar in it unchanged, given its unique set of advantages. Instead, the changes will have to do with the demand for reserves by third countries, who now see that reserves do not provide the advantage in terms of cushioning potential shocks that they had anticipated. Instead of using reserves in that role, countries will choose to protect themselves by reducing their integration with the global financial system, leading to increasing fragmentation of financial markets and accentuating an existing trend – the almost complete stop in global financial integration.

Finally, the war is having profound effects in the European Union. In the face of adversity, different factions may close ranks and move closer together. This is surely something that has been observed for the European Union since the beginning of the war. Indeed, the chapter by Kai Gehring (Chapter 29) shows that the Russian attacks on Ukraine in 2014 increased European identity and trust in European institutions. Of course, as he also points out, the jury is still out on whether this effect of closing ranks in Europe and the West will be permanent or will crumble if the costs of a prolonged war, winter energy insecurity, spiralling energy prices and inflation become more apparent.

It is worth noting this closing of ranks has been limited to the West. China has sided with Russia and Asian or many lower-income countries have chosen to abstain from condemning Russia's aggression. As a result, the entirety of UN multilateral institutions, from the Security Council to the World Bank and IMF, are now hobbled because their shareholders are split. The G20 can no longer be the prime forum for international agenda setting either. So right now, the multilateral order seems broken, and it is unclear how it can be fixed.

SOME UPSIDES?

The war in the Ukraine represents a critical juncture for the world. At this stage, many risks are on the downsides. But as far as EU countries are concerned, one can point to a few potential upsides.

Democratic countries and the liberal world order have been shaken to their foundations. Many would have anticipated only a feeble and hesitant response from the European Union and NATO. The reaction from liberal democracies was more decisive and united than expected. Europe and NATO may come out stronger. The European Union has already decided to open up candidacy to Ukraine and Moldova, and other Eastern European countries might follow. EU enlargement will require a deeper rethinking and strengthening of European governance.

A possible positive outcome may be a strengthening of democracy around the world. This would be the case if smaller countries concluded that their freedom and self-determination hinges on a democratic world order. But let's face it – we might also be heading into a new Cold War, a divided world where the superpowers compete on the territories of smaller, poorer countries.

Another silver lining to this tragedy might be a willingness to boost the green energy transition away from fossil fuels, as discussed by Luis Garicano, Dominic Rohner and Beatrice Weder di Mauro (Chapter 32). Although in the short run greenhouse gas emissions are increasing because of the war, it has become abundantly clear that energy provided by green sources yields a double dividend: limiting global warming and fostering energy security. High energy prices caused by the anticipation of fossil fuel sanctions and by damage to the energy infrastructure may accelerate investment in renewables and in energy efficiency, and may contribute to reducing climate change.

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SECTION I: THE IMPACT OF ENERGY SANCTIONS

CHAPTER 1

Winter is coming: Energy policy towards Russia

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In the heat of summer, with most of Europeans thinking about flying away to distant beaches, winter may seem far away. But it will be here soon, and it may become a winter of discontent, with European unity severely tested, again.

So far, the EU's response to the Russian invasion of Ukraine has been common and strong on general sanctions but weak and divided on energy. This partly reflects differential dependence on Russian gas across countries and the desire to build 'own' buffers and storages. It does not bode well for energy sharing and solidarity, should the coming winter be tough. And, of course, Russia has every incentive to increase the pain and to play countries against each other. The uncertainty about the North Stream One restart after the summer inspection may just be a foretaste of the coming strategic games.

RESULTS OF POLICIES SO FAR

So far, energy policy has aimed at securing quantities, at all costs. As a result, EU gas storages stand at about 65%, which is a high filling rate at this time of the year. However, total underground storage capacity is about 100 billion cubic metres while consumption was around 400 billion cubic metres in 2020 (European Commission 2022). Storage filling rates are public information, and it is unlikely that Putin is ignoring them in planning his deliveries.

In the meantime, Russian federal budget revenues were up by 34% in the first four months of 2022 compared to the same period of 2021 (Bank of Finland 2022), with the revenue rise driven entirely by high prices for oil and gas. This suggests that sanctions have not been very successful in achieving their primary objective of increasing the cost for Russia of waging this war and making it more difficult to finance it. At the same time, the spike in energy prices has been hurting Europeans since it is a key driver of inflation. Energy prices are still climbing as Russia has stopped gas deliveries claiming technical difficulties or non-compliance with payments in rubles.

Several avenues have been suggested to make sanctions both more effective and less costly for European households and firms: an embargo, tariffs, and price caps.

A FUTURE EMBARGO ON OIL

An embargo on Russian energy products (oil and/or gas) has been subject to a fierce debate with differing estimates of the growth impact, ranging from comparable to the Covid-19 shock to considerably smaller in countries less dependent on Russian gas (e.g. Bachmann et al. 2022, Baqaee et al. 2022).

On 30 May 2022, the EU decided to impose an embargo on imports of Russian oil and petroleum products, but it will only take effect in six months. This announcement led to an increase in the price of oil (by around 5%), but it had already been preceded by an upward trend since mid-May when the embargo became more likely. The expectation of the announcement therefore generated a windfall for Russia. For gas, since the beginning of the war, the expectation of possible future sanctions was also behind the price hikes. Natural gas prices are about nine times higher than before the war.

Arguably, the expectation of the announcement of an embargo on energy in the future without immediate action leads to the worst of both worlds: high economic costs for EU countries due to an energy price increase and an increase in revenues for Russia.

The US has pressed for an oil price cap to reduce revenues to Russia and the G7 announced that they would "explore additional measures such as price caps" at their last meeting in Elmau (European Council 2022). However, organising a cartel of buyers for the oil, which is a much larger market with many buyer-supplier relationships, is going to be extremely difficult. We argue that a temporary import tariff on Russian oil would be easier to implement and a price cap would make more sense for Russian gas.

AN IMPORT TARIFF ON OIL

A tariff on imports of Russian oil would have several advantages: it would reduce imports from Russia as buyers would have a strong interest to substitute to other sources, and it would probably push Russia to lower its price to EU consumers, as it already does for other countries with a 30% discount on oil. It could be raised gradually to prepare for the embargo that amounts to an infinite tariff.

The rent that is presently captured by Russian authorities would be partly taxed by the EU, which could use the money to compensate the most fragile households and firms and/or to start financing the reconstruction in Ukraine. Relative to an immediate embargo, the economic cost for the EU (especially for firms and countries most dependent on Russian oil and gas) would be reduced as the remaining (high priced) imports would go to those that need them most.

An import tax is not an ideal instrument – it will create incentives to circumvent it and it may further increase prices of oil. By how much oil prices increase would depend on tax incidence, that is, how much Russia would be pushed to decrease its export price to be competitive with other producers not hit by the tariff. Substitution towards non-Russian imports is easier for oil than for gas.

SINGLE BUYER AND WHOLESALE PRICE SCHEDULE ON RUSSIAN GAS

Pipeline gas is special. It is characterised by infrastructures that directly link sellers and buyers and, in principle, create market power on both sides of the pipeline. At present, Russia is exercising market power but Europe is not, choosing instead to let different buyers compete for the gas and pushing up prices. A single European buyer platform has been created but is voluntary and therefore cannot exercise buyer power. This is very different from the single-buyer consortium that allowed the EU to successfully secure and share vaccines during the pandemic.

A single European buyer would change the rules of the game from being at the mercy of Russia to a truly strategic negotiation: the buyer would offer a price and quantity schedule. The price could even be high compared with historical standards and production costs, but not exorbitant. If Russia 'defaults' on the quantity, the single buyer would lower the offer price.

The abnormally high price for gas currently reflects market power of Russia in exceptional circumstances as well as the uncertainty around future expected sanctions and disruptions. Pipeline gas prices were around €20 per megawatt hour before tensions with Russia mounted, around €80 per megawatt hour (MWh) until mid-June, and in mid-July they have climbed to €185/MWh.[1]

A credible wholesale pipeline gas price cap set by the EU at today's level of, say, around €100 could serve to take out the uncertainty about future price spikes. Market participants would not speculate on future price hikes in case of disruptions. To be credible, such a price cap requires a precise protocol on potential rationing both domestically and between countries. The price cap should be lowered gradually afterwards and could be articulated with a progressive embargo.

A price cap set at a high level may generate windfall profits for some wholesalers. In the present exceptional circumstances, a tax on exceptional profits in the energy sector should therefore not be excluded. The single buyer would apply to Russian pipeline gas only, not to liquefied natural gas (LNG). But given the integrated European market, the same offer price would apply to other gas; suppliers like Norway and Algeria would still be enjoying huge windfalls.

1   See www.powernext.com/spot-market-data

It is important to distinguish between the single-buyer price wholesale pipeline price cap and various schemes to limit energy price rises at the retail level. Many EU governments have attempted to shield households from the impact of higher energy prices through price caps, rebates, tax decreases, and market segmentation. Such interventions at the retail level are not only fiscally very costly, they are also mostly ineffective and send the wrong signals in terms of climate change. They favour the rich, who consume more energy than poorer households. A cheaper and fairer intervention would be targeted transfers to low-income households and those most affected, for example because of poor access to public transport.

CONCLUSION

An import tariff on oil and a single buyer with a price cap on pipeline gas are not first-best instruments. But they are best responses in an extremely bad situation. Having energy prices paid by European consumers to Russia increase in part because of the announcement of a future embargo is not acceptable. Also, it should not be acceptable that come winter, Europe is at the mercy of aggressive Russian strategic gaming with gas supplies.

Both instruments need to be temporary, targeted, and aligned with an accelerated green transition. The European Council has already mandated the European Commission to study a temporary price cap, which should be extended to an import tariff on Russian oil. A single buyer for pipeline gas would not only help implement a price cap but also rebalance market power and revenue away from Russia.

This winter will be a major stress test of European unity and solidarity. Exposures to a cut in gas vary hugely across countries. Flanagan et al. (2022) show that Scandinavian countries are practically immune to a cut in gas, while Eastern European countries are highly exposed. Moreover, the extent of output losses will depend crucially on whenever energy markets remain integrated or fragmented. For instance, output losses for Germany in the case of a cut-off are estimated at about -3% in a fragmented case, as opposed to -1% in an integrated case. This winter, solidarity and sharing will have to 'flow' in new directions. To get through the winter, common energy buying, saving, and sharing arrangements need to be agreed and tested now.

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CHAPTER 2

Ruble payments: Shielding the ruble from financial sanctions

Michele Savini Zangrandi

Bank of Italy

25 July 2022

In March 2022, the Kremlin set out a complex mechanism for ruble settlement of gas exports to "unfriendly countries". The request sparked a lively debate on the Kremlin's objective. In fact, the purpose of the measure – and the consequences of going by it – remain unclear.

Close inspection of the Kremlin's decree yields an important clue as to what might be going on. In March, the Kremlin did not just mandate payments to be settled in rubles, but also for rubles to be obtained on the Moscow Interbank Currency Exchange MICEX-RTS (MICEX). This detail is striking: there is no immediately obvious reason for the Kremlin to be interested in where the currency exchange takes place.

In this column, I argue that the ruble payment scheme is intended to protect MICEX – a cornerstone of ruble trading and a central piece of Russia's financial architecture – from financial sanctions. MICEX's reliance on correspondent accounts with Western banks makes it vulnerable to US sanctions. Should it come under sanctions, ruble price fixing and ruble trading could be thrown into disarray. While alternative pricing mechanisms and trading venues would emerge, the short-term damage to Russia's economy could be material.[1] In making MICEX indispensable to the settlement of gas transactions, the Kremlin might therefore be signalling that sanctions aimed in that direction would come at a high price.

SETTLE IN RUBLES

On 31 March 2022, a Russian presidential decree required that gas importers from "unfriendly countries" to follow a new procedure to settle gas payments.[2] The procedure entails the following steps:

1. Open two 'Special K' accounts with Gazprombank – one in foreign exchange, and one in rubles

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1   For additional analysis on sanctions on Russia, see also Harrison (2022) and Schropp and Tsigas (2022).
2   Presidential decree No. 172.

2. Pay the contractual sums on the special foreign exchange account

3. Instruct Gazprombank to convert the sums on MICEX into rubles and pay them in the special ruble account

4. Instruct Gazprombank to use the resulting ruble balance to pay for its gas imports

Crucially, gas transactions are only considered settled upon receipt of the ruble balances obtained through the outlined procedure.[3] To stress this further, a subsequent decree mandates Gazprombank to deposit the foreign exchange to be converted on the correspondent accounts of the National Clearing Center, a non-financial institution fully owned by the Moscow Exchange, which also hosts MICEX.[4]

UNCLEAR OBJECTIVE

While a number of hypotheses have been put forward, no consensus exists as to what the Kremlin aims to achieve through this measure.

A first set of hypotheses sees the measure as supporting the ruble. The regime of forced export revenue conversion and capital controls, however, proved more than sufficient to stem pressures on the ruble (Itskhoki and Mukhin 2022).

A second set of hypotheses sees the measure as a way to weaponise gas supplies. One hypothesis postulates that by charging exorbitant exchange commissions, Gazprombank could de facto increase the price of gas (Mihailov 2022). An alternative sees the measure as preparing for a halt in supplies should payment of gas supplies be locked into an escrow account. The measure also appears to make it easier for Gazprom to declare force majeure, thus skirting penalties for breach of contract (Ason 2022). Gas prices however are already at record highs, exchange rate risk appears to remain with the exporter,[5] and Russia has already halted gas supplies without much consideration for contractual binds.[6]

A third set of hypotheses sees the measure as a ploy to circumvent financial sanctions. One hypothesis concerns the circumvention of central bank sanctions (Astrasheuskaya et al. 2022, Demertzis and Papadia 2022). Another hypothesis sees the channelling of payments through Gazprombank as a means to cut out EU banks and take foreign exchange funds outside of Western jurisdictions (Merler 2022). In the first case, however, it is unclear why Russia's central bank would participate – even indirectly – in foreign exchange transactions, at the risk of adding to the stock of its frozen reserves. In the second case, the hypothesis discounts the fact that – even when held by non-residents –

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3   Presidential decree No. 172, Articles 6 and 7.
4   Presidential decree No. 254, Article 7.
5   This interpretation also appears confirmed by Italian gas importer ENI: https://www.eni.com/it-IT/media/comunicati-stampa/2022/05/eni-apertura-conti-gazprom-bank-avviata.html
6   To date, gas supplies have been halted to Poland, Bulgaria and Finland.

assets tend not to leave their native jurisdiction. For instance, it would be reasonable to expect euro payments to Gazprombank to be credited to its euro-correspondent – Bank GPB International SA, a fully owned subsidiary chartered in Luxembourg.[7]

A fourth set of hypotheses sees the measure as heralding the internationalisation of the ruble. Taken together with the Russian central bank's decision to resume gold purchases in late February, some hypotheses see the ruble settlement request as drawing a connection between the ruble and gold (Merler 2022). Ruble internationalisation, however, appears incompatible with Russia's current account surplus and its (temporarily) closed capital account. Rule of law and geopolitical considerations would also contribute to the headwind. Linkage of the currency to gold, in addition, would require two-way convertibility, that is, a standing commitment to redeem ruble in gold.

Finally, the measure is also seen as a ploy to sow political division among EU member states (Concha 2022, Osmolovska 2022), or as grandstanding on the part of President Putin.

HIDING IN PLAIN SIGHT

Most of these surveyed hypotheses overlook the role that MICEX plays in the new settlement architecture. MICEX is the main ruble trading venue. The ruble can, however, also be obtained bilaterally, including through a limited number of foreign banks. While the offshore market is now much diminished, alternatives to MICEX exist and there appears to be no obvious reason for the Kremlin to be so specific about the trading venue.

What is unique about MICEX, however, is that it is the sole organised exchange for ruble trading, and by far the most liquid ruble market. Arguably, no other market is deep enough to provide a solid anchor for ruble price-formation.

In clearing the foreign exchange leg of transactions, MICEX relies on euro and dollar correspondent accounts with foreign banks. Specifically, the National Clearing Centre – which provides clearing services for the exchange – holds its euro and dollar correspondent accounts with US bank J P Morgan.[8] Should the US freeze these accounts, MICEX would no longer be able to clear transactions in euros or dollars, throwing the main ruble trading venue into disarray. While alternative pricing mechanisms and trading venues would emerge, the short-term damage to Russia's economy could be material.

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7   https://www.gazprombank.ru/en/finance/correspondent_network/
8   https://www.nationalclearingcentre.com/catalog/5105.html

SHELTERING THE RUBLE

To see how ruble-settlement could be a measure to shelter MICEX from US sanctions, it helps to focus on two key tenets of the Kremlin's decree: (i) the currency exchange must take place on MICEX, and (ii) the transaction is considered settled once the ruble payment is received by the gas exporter. With this in mind, it is clear that, should MICEX come under sanctions, it would no longer be able to clear the foreign exchange leg of transactions. As a consequence, Gazprombank would be unable to convert foreign exchange into rubles and payments for gas supply transactions could not be considered settled. If the transactions are not settled, gas supplies are shut off.

The measure effectively binds MICEX into the gas settlement procedure, which previously only entailed Gazprombank. Whereas Gazprombank had to stay outside of the sanction perimeter in order to allow for the payment of EU gas supplies, the same must now apply to MICEX. In tying gas exports to the EU to the functioning of MICEX, the Kremlin might have constructed a clever incentive scheme by which it encourages the EU to lobby the US against sanctions that the US could otherwise impose on a unilateral basis.

This hypothesis could mark a new step in the dynamic of 'weaponisation of interdependencies'. Indeed, economic sanctions evolved from straight bilateral trade restrictions, to extraterritorial financial sanctions, to value-chain propagated target trade restrictions. As sanctions broaden their extraterritorial reach, so might sanction defences.

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CHAPTER 3

Western sanctions on Russia are working, an energy embargo now is a costly distraction

Mark Harrison

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13 June 2022

Russia is a major exporter of energy to the world, including the West. From the first days of Russia's invasion of Ukraine, it has been said that by paying a billion euros a day to Russia (*Fortune* 2022), Western economies are effectively paying for Putin's war (*The Guardian* 2022). There were immediate calls for a Western embargo on Russian energy, despite the wrenching adjustments that this would require (European Parliament 2022). After difficult negotiations the path to an EU embargo has now been agreed, but with an opt-out for Hungary (*Financial Times* 2022).

Who stands to lose more by stopping Russia's energy exports? When Putin's war is grinding on far longer than anyone anticipated, the argument that it is paid for out of Russia's export revenues suggests that Russia must be desperate to keep its place in the world energy market. Meanwhile, most Western powers are working hard towards an embargo on Russia's exports. They are also expending considerable political capital on efforts to bring backsliders into line, notably Hungary.

Yet Russia itself does not seem so desperate. Rather, the Russian government has set obscure financial conditions for Western buyers, such as payment in rubles (*The Brussels Times* 2022), and has already halted gas supplies to Poland, Bulgaria, and Finland (BBC News 2022).

It seems that both sides are treating Russian exports as their own weapon. While NATO threatens Russia with a stop on purchases, Russia threatens NATO with a stop on sales.

If you find this confusing, then you've been paying attention. Too many Western commentators have fallen victim to an old mercantilist error – that the strength of an economy is measured by its ability to attract gold from others through its export trade.

WHAT ARE THE UNDERLYING FACTS?

First, Russia has a large and growing export surplus. *The Economist* (2022) puts last year's trade surplus at 7.5$ of Russia's GDP. This year, it is expected to rise to 15% of last year's GDP (this year's GDP will be smaller by an unknown amount, perhaps 10% or 20%, pushing the share of the trade surplus still higher).

The reason for Russia's growing export surplus is that, while exports are holding up, imports from a broad sample of Russia's trading partners are collapsing – running at half the level of before the war's outbreak. Why? There are two possibilities. One is that Western sanctions on Russia's imports are working. The other is capital flight – holders of ruble balances are converting them into Western currencies, causing the ruble exchange rate to decline sharply and pushing up import prices for Russian consumers. In the short run, it does not matter which.

An expert quoted in The Economist finds Russia's growing trade surplus "disappointing". Although sanctions on Russia's imports may be working, it seems we are still buying Russian energy exports at levels similar to before. We are still 'paying for Putin's war' – or so it is said.

To understand what Russia's growing trade surplus really means, it is necessary to recall that the money flows are the counterpart of flows of real resources. As money flows into Russian hands, real resources flow the other way. If Russia's trade surplus will be 15% (or more) of its GDP this year, then in terms of the real resources produced, Russia is sending the same proportion of its domestic product abroad to be utilised by foreigners.

How does that matter for financing Putin's war? It is often said that GDP is a measure of a country's capacity to fight a war, and this is correct – approximately. But when the shooting begins, wars are not fought with GDP. They are fought using the real resources available. For this purpose, exports are not available. What is available is domestic production not exported, plus imports.

The national accounting concept of the resources available to a country at war is not GDP but 'domestic absorption' – the total of domestic expenditure, *including expenditure on net imports.*

With percentage points of last year's GDP as the units, Russia's trade surplus of 7.5 units left 92.5 for domestic absorption. This year, absorption will fall by the fall in GDP (say 20) plus the increase in the trade surplus (7.5), so 27.5. A GDP decline of one fifth becomes an absorption decline of one third.

Two things follow. One, the fact that Russia is exporting one seventh of its national income to the rest of the world is weakening, not strengthening, its war effort. Two, Russia's exports are not 'paying for Putin's war'. They are certainly paying for something, but not that. What they are paying for is the accumulation of idle balances of foreign

currency. This currency may be held by the state (within Russia) or by private citizens abroad (in the case of capital flight). But, if they cannot be used to import resources into Russia, they are *not* paying for Putin's war.

A reality check is available. In two World Wars, the Allies blockaded Germany to prevent the import – not export – of resources. In both wars, Germany responded by confiscating resources from the countries it occupied, just as Russia today is accused of stealing grain and other valuables from Ukraine. In fact, in WWII Germany's plan of overland occupation of the Eastern territories was designed in the expectation of an Allied blockade of German overseas trade. It has been calculated that net imports from Germany's wartime empire paid for more than one quarter of Germany's war effort (Klemann 2019). Net *imports*, not net exports!

These calculations concern only the *volume* of resources. The *quality* of resources matters too. Despite attempts at import substitution, Russia remains dependent on a wide range of imported microchips and machine and vehicle components and maintenance services (Shagina 2020). Russia needs these now to re-arm after its early military equipment losses. Using an energy embargo to stop Russia from getting them is like pushing on a piece of string. The more direct way, which is already working, is to sanction Russia's trade credit and imports, coupled with self-sanctioning by Western companies that no longer want to do business with or in Russia.

WHAT ARE THE IMPLICATIONS?

First, Western sanctions are working. They are working either directly (by cutting Russia's imports) or indirectly (by causing capital flight). By the measure of real resources, Russia's economy is suffering arterial blood loss at an increasing rate.

Second, Russia's most likely retaliation will indeed be to reduce exports by cutting off energy supplies to the West. The rationale for this will be not only to damage Western economies but also to redirect capital and labour from the energy sector to Russia's war sector.

It is sensible for Western countries to prepare for this. An efficient way to do so is to impose a tax on purchases of Russian energy, reflecting the risk attached to continued reliance (Sturm 2022). But it is also wise to ensure that, when the pinch comes, the blame for disruption is seen to lie where it belongs – with Russia.

Fourth, by pressing the unwilling – not only in Hungary but potentially in all Western countries – to do without Russian energy before the need arises, we are pointlessly spending NATO's political capital (and sympathy for Ukraine) while exacerbating the national and social divisions on which Putin relies to make progress.

Finally, are there risks in allowing Russia to continue to accumulate financial claims on Western economies accruing from energy sales? Yes, but as long as sanctions on Russia's imports and financial institutions remain in place these risks are long term. The shape of the long term will be decided by the outcome of Putin's war, which is being decided now.

Shifting the focus from Russia's energy exports is not an argument for doing nothing. Rather, it is an argument for preferring more effective instruments to less effective ones. It is far more important for everyone to do what it takes to help Ukraine win the war now, focusing first of all on Ukraine's immediate military needs. We should not be distracted by worries about the distant financial implications of continuing to buy and pay for Russian energy for as long as we can – using cash that Russia cannot currently spend.

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CHAPTER 4

"Crime and Punishment": How Russian banks anticipated and dealt with global financial sanctions

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CERGE-EI; CERGE-EI; University of Zurich and CEPR

10 June 2022

Politics affects the banking sector in many ways (e.g. Calomiris and Huber 2014). For example, governments in many countries direct commercial bank lending to specific sectors and/or stimulate lending to small and medium-sized enterprises (e.g. Brown and Dinc 2005). And during the recent COVID-19 pandemic, many governments created emergency loan guarantee schemes that were covering and spurring their banks' lending. In this column, we turn to another recent and striking episode of political impact, namely, the global financial sanctions on Russian banks with close ties to their domestic government that commenced in 2014 and were sequentially imposed on various banks during a five-year period. In general, economic sanctions become increasingly popular from 2010s, being mostly driven by the US to restrain politically unfavourable regimes (Felbermayr et al. 2021). While their effects at the firm level are well studied (Crozet et al. 2021, Ahn and Ludema 2020, Belin and Hanousek 2020),[1] the effects of sanctions at the bank level remain unclear.

The sequential imposition of the Western sanctions against Russia's largest state banks constitutes a very interesting and policy-relevant laboratory to analyse not only the immediate effects on the already-sanctioned banks, but also the effects on those banks that are not yet sanctioned but that seem to be targeted and may be sanctioned in the near future. The point is that such targeted banks have time to adjust their international operations before the actual sanctions materialise. Henceforth, we refer to the immediate effects of sanctions on the sanctioned banks as *direct effects*, and we refer to the adjustments of the potentially targeted but not yet sanctioned banks to the anticipated sanctions as *informational effects*.

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1   Several studies complement our bank-level analysis by exploring the effects of sanction at the firm level. Belin and Hanousek (2020), for example, focus on Russian non-financial firms and study the effects of sanctions on their international trade flows vis-à-vis their US and EU trade partners. Ahn and Ludema (2020) also investigate the effects of sanctions against Russian firms, showing that the targeted approach to sanctions (i.e., smart sanctions), was new but efficient since they negatively affected the firms' activities while causing minimal 'collateral' damage. Davydov et al. (2021) analyse how European firms perceive Russia-related sanctions. Crozet et al. (2021) study the impact of sanctions against Russia (and other countries like Iran, Cuba, and Myanmar) on the probability of serving a market at the firm-level using monthly custom data on French firms.

According to the US Office of Foreign Assets Control (OFAC), over the period of 2014–2019, financial sanctions were imposed on 44 banks that were owned or controlled by either the state or major oligarchs in Russia. However, the ownership structure of banks is fuzzy – some banks could be formally private but are in fact influenced by the state through a chain of other state-owned firms and banks. As shown by Karas and Vernikov (2019), who attempted to unfold such chains through a comprehensive analysis of firms' annual financial reports, there are at least 40 banks that are controlled by the state but left uncovered by the sanctions. This creates an interesting effect of treatment diffusion, since not only the actually sanctioned banks but also the (as yet) uncovered banks could adapt their operations in advance.

In a recent study, we estimate and compare the direct and informational effects of sanctions against the largest Russian banks with respect to their international and domestic operations and address the issue of *treatment diffusion* due to fuzzy bank ownership structure (Mamonov et al. 2021).

STYLISED FACTS, OR WHAT THE RAW BANK DATA SAY ABOUT THE SANCTIONS
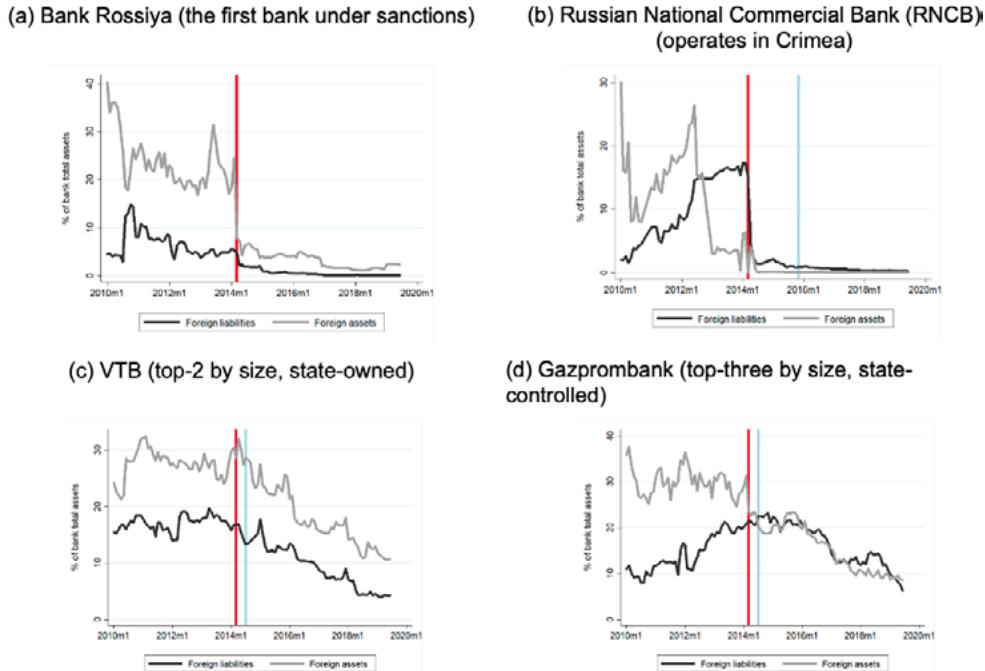
From the OFAC database one can infer that there are two major types of sanctions: those affecting debt and those restricting assets. The former represent restrictions mainly on placement of new debt in international markets; the latter impose restrictions on foreign asset holdings of treated banks. Henceforth, we label these two types of sanctions *'debt'* and *'asset'* sanctions, respectively.[2]

Figure 1 plots the evolution of foreign liabilities and foreign asset holdings of selected Russian banks that faced sanctions between 2014 and 2019. The very first sanction arrived in March 2014 and crucially restricted the international operations of the Rossiya bank, owned by the Kovalchuk family (one of richest oligarch families in Russia). The assets sanctions had an immediate negative effect – the bank dramatically decreased its foreign assets (from 25% to 8%) and foreign liabilities (from 5% to 2%) within just one month.[3] Other potentially targeted banks follow the Rossiya Bank.

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2 According to the US Department of the Treasury, debt sanctions are called 'sectoral' while assets sanctions are titled 'entity'.
3 Before the sanctions, the bank Rossiya had intensive international operations borrowing funds from financial markets and granting loans to foreign banks and foreign non-financial firms. All these became minor after the sanctions in the long run. Another implication of sanctions is that Visa and Mastercard had blocked all operations of the bank's credit cards. The bank had lost its ability to carry out transactions in foreign currency. However, the Russian government had fully, and even over-, compensated these restrictions to the bank by increasing its deposits and by replacing "Alfa-bank" (the largest private bank in Russia, inside top-10 banks in terms of assets, never facing sanctions) with the bank Rossiya as an operator of the wholesale energy-market in the country (with annual turnover equalling 1.5% of GDP).

FIGURE 1   EVOLUTION OF FOREIGN ASSETS AND LIABILITIES BEFORE AND AFTER SANCTIONS FOR SELECTED LARGEST RUSSIAN BANKS

(a) Bank Rossiya (the first bank under sanctions)

(b) Russian National Commercial Bank (RNCB) (operates in Crimea)

(c) VTB (top-2 by size, state-owned)

(d) Gazprombank (top-three by size, state-controlled)

Note: The figures report foreign liabilities (black line) and foreign assets (grey line), as a percentage of respective total assets, of selected banks that faced sanctions. The red vertical line marks March 2014 – the month in which financial sanctions against Russian banks were imposed for the first time (the Bank Rossiya). The blue vertical line represents the period when individual sanctions were then introduced.
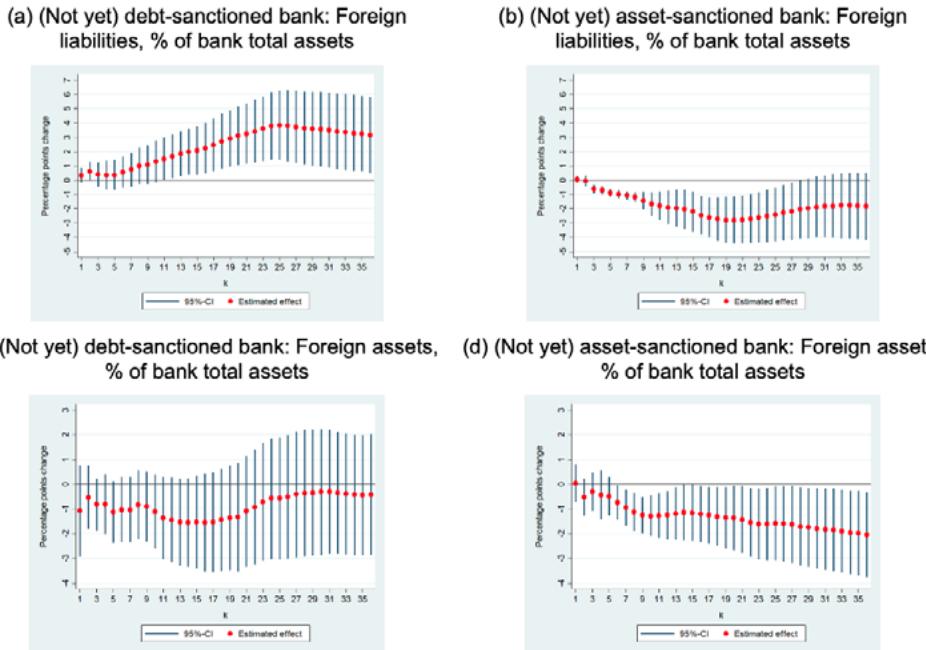
PRIMARY EFFECTS OF FINANCIAL SANCTIONS: INTERNATIONAL OPERATIONS

To test the sanction effects, we first match sanctioned banks with never sanctioned banks using observable characteristics (1:4 nearest neighbourhood matching). We then run a difference-in-differences regression analysis on the matched sample of banks showing how the not yet sanctioned banks adjusted their international operations vis-à-vis matched banks in a specific time window around March 2014 (see Figure 2).

The estimation results clearly indicate that, first, not yet debt-sanctioned banks raised, rather than decreased, their international borrowings after March 2014 (by 3.8% of their total assets at peak). This implies the banks were treating foreign financial markets as an important source of (possibly cheaper than domestic) funds.

Second, not yet asset-sanctioned banks exhibited different reactions. After March 2014, they turned to decreasing both international borrowings (by 2.5% of their total assets at peak) and international asset holdings (by 2.2%). These figures suggest the banks decided to avoid gambling for Western funds.

FIGURE 2   EVOLUTION OF THE INFORMATIONAL EFFECTS OF FINANCIAL SANCTIONS ON FOREIGN ASSETS AND LIABILITIES (PERCENTAGE POINTS CHANGES IN TERMS OF TOTAL ASSETS)

(a) (Not yet) debt-sanctioned bank: Foreign liabilities, % of bank total assets

(b) (Not yet) asset-sanctioned bank: Foreign liabilities, % of bank total assets

c) (Not yet) debt-sanctioned bank: Foreign assets, % of bank total assets

(d) (Not yet) asset-sanctioned bank: Foreign assets, % of bank total assets

Note: The figures report the difference-in-differences estimates on expanding windows [-k,k] with k=1,2... 36 months after the sanction imposition on the bank, Rossiya (March 2014). Sanctioned and non-sanctioned bank groups are matched within 1 year prior to March 2014.

Our further analysis shows that geography matters a lot in explaining these informational effects of the sanctions. First, not yet debt-sanctioned banks were less likely to expand foreign liabilities if located further from Moscow. Second, those not yet debt-sanctioned banks whose headquarters were located further from Moscow were more likely to reduce their international assets. Therefore, these banks could reveal a fear of asset freezes while being less sure on which of the two types of sanctions will be introduced. Third, not yet asset-sanctioned banks behave differently – specifically, they were less likely to reduce their international borrowings in the months after March 2014 if they were located outside Moscow. Geography may proxy for a differential exposure of these banks to the information on upcoming sanctions.
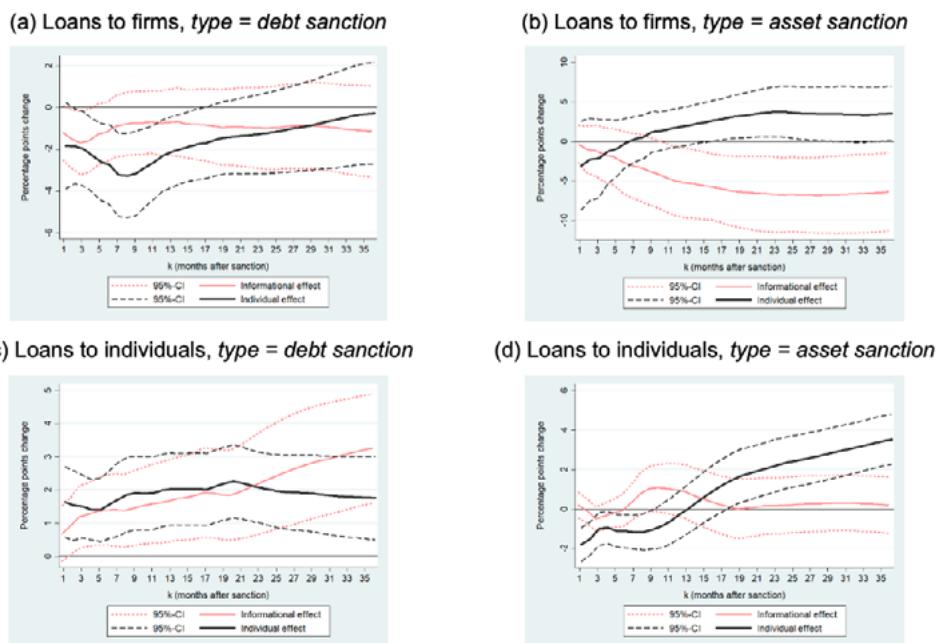
SECONDARY EFFECTS OF FINANCIAL SANCTIONS: DOMESTIC OPERATIONS

Regarding domestic borrowed funds, we find that neither private nor corporate depositors organised withdrawals on not yet sanctioned banks. However, when the sanctions arrived, the sanction-based withdrawals amounted to -2.2% and -10% of the debt- and asset-sanctioned banks' total assets, respectively, despite the fact that the

deposits insurance system was working perfectly well. The government worked fast. It stepped in and – either directly or indirectly (through inter-bank market) – supported the banks, thus preventing their disorderly failure.

Second, we reveal a 'credit reshuffling' effect. Both not yet debt- and asset-sanctioned banks turned to reducing loans to non-financial firms (Figures 3a and 3b) and raising loans to individuals (Figures 3c and 3d). The estimated size of this reshuffling is 4% of Russian GDP (average across 2014-2019). We interpret this result as the banks' forward-looking willingness to insure the profitability of their loan portfolios from a rising risk of sanctions against Russian firms per se.[4]

FIGURE 3 HOW BANKS ADJUSTED THEIR DOMESTIC LENDING AFTER SANCTIONS? (BY SANCTION TYPE, PERCENTAGE POINTS CHANGE IN TERMS OF TOTAL ASSETS)

Note: The figures report the difference-in-differences estimates of the informational and direct effects of the financial sanctions on the domestic loans to individuals and firms by Russian targeted banks. The estimates are obtained by running DiD on expanding windows [-k,k] with k=1,2… 36 months after either bank-specific sanction date (direct effects, black lines) or the date of sanctions against the bank Rossiya (informational effects, pale red lines).

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4   The firms themselves could face sanctions and stop repaying their debts while individuals (at least, those not in the OFAC's Specially Designated Nationals list) were free of such 'sudden' constraints. Our conclusion on reductions of loans to firms is consistent with the findings in Ahn and Ludema (2020), who document that the sanctions indeed had a negative effect on Russian firms.

HIDDEN CONTROL BY THE STATE AND TREATMENT DIFFUSION

The nearly 40 banks that were indirectly controlled by the government but were left uncovered by the sanctions (call them diffused banks) were in between the asset and debt-sanctioned banks in terms of size and had similar structure of their international operations. It is clear that the already sanctioned banks, if necessary, could transfer a part of their prohibited international operations to their unsanctioned subsidiaries, thus dampening the overall effects of sanctions.

We argue that the subjectively perceived probability of being sanctioned in the future crucially depends on the share of government-connected persons[5] on the board of directors of either diffused or not yet sanctioned banks – the greater the share, the easier the recognition by Western countries, and the higher the subjective probability of being sanctioned. To create the government share variable, we manually collect the data on each and every member of the board of directors for each and every state-controlled bank that had or had not eventually been sanctioned. We extract this information from several sources, starting from the banks' annual financial reports, the persons' CVs, and Google Search.

Our results suggest that a one standard deviation increase in the share of government-connected persons on the board of directors raises the probability of being debt-sanctioned by between 1% and 4%, depending on the month, whereas the effects are near zero for asset sanctions.[6]

We find that those banks with government-connected persons on the board of directors were likely to behave very similarly to those banks that were eventually sanctioned. First, those who could anticipate debt sanctions were raising international borrowings, especially if located in Moscow, and decreasing their foreign assets, especially if located farther from Moscow. Second, those who could anticipate asset sanctions were reducing international borrowings and selling foreign assets in advance.

We believe our results may have important policy implications for both the Russian government and Western countries. For the former, our estimates imply that, if the imposition of sanctions were not phased-in, the negative effect could have been larger, which is economically inefficient for a country with long-lasting recessions. For the latter, our results indicate that, despite the phasing-in, the sanctions still had a significant effect.

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5   For instance, federal or municipal ministers, senators, city mayors, or regional governors from the ruling political party Edinaya Rossiya (literally, "United Russia"), oligarch families with close ties to the Kremlin, governors of other recognised state-controlled entities, and so on.

6   However, in respective logit regressions, we control for many other observable characteristics such as international operations, the structure of domestic assets and liabilities, quality of loans, profitability, and so on, so that we still obtain enough variation in the predicted probabilities of asset sanctions.

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CHAPTER 5

The 'Global Sanctions Data Base': Mapping international sanction policies from 1950-2019

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18 May 2022

Historically, governments have relied on economic sanctions to defend their actual and/or perceived national interests in their dealings with foreign competitors or adversaries. But the form that international sanctions take, their frequency, and coverage vary substantially across time and across targeted countries and groups. Further, the motivation and objectives of sanction policies are fairly heterogenous. Finally, the efficacy of sanctions is a controversial topic that is discussed heatedly by policymakers and researchers alike (Crozet et al. 2021, Dizaji and van Bergeijk 2013).

Despite the controversy surrounding the success of sanction policies (van Bergeijk 2012), in recent years the world has experienced a strong rise in their use. Along with its protectionist trade policies, the Trump administration has accelerated the implementation of unilateral sanction policies against other countries (such as Venezuela, Iran, North Korea, and Russia). In fact, President Trump imposed sanctions at a record-shattering rate, more than any other president in US history. At the same time, other large countries (or groups of countries), such as China and the EU, have followed this policy trend.

Motivated by these developments, in 2016 we initiated the creation of the 'Global Sanctions Data Base' (GSDB 2021, Kirilakha et al. 2021). The first version of the database was published in 2020 (Felbermayr et al. 2020a, 2020b). In the initial setup phase, sanction cases were collected from a limited number of sources with a focus on the years 1950-2016. Multilateral sanctions, which were mostly based on the United Nations Security Council (UNSC) Resolutions, were collected from publicly available UN documents. For the US and the EU, policy orders and corresponding national sources were screened. Additionally, for each individual country in the database, national sources were searched to identify additional cases. Likewise, international newspapers and history books were

screened and keyword web searches in online search engines were consulted to identify country specific sanctions. With this procedure we were able to identify a total of 729 sanction cases.

The coverage of the recently updated database (version 2) has improved it in two ways. First, due to the discovery of new sources for sanctions and the improved listings in public databases, the Global Sanctions Data Base now identifies additional cases for the period 1950-2016. Second, the updated database covers an additional three years (i.e. from 2016-2019).

As a result, the new version lists a total of 1,101 publicly traceable, multilateral, plurilateral, and unilateral sanction cases over the period 1950-2019.

There are several reasons for the increase in the number of sanction cases in our first update of the database. First, we relied on additional new sources. Most notably, we utilised the 'Sanctions Alert' for new sanctions imposed between 2013 and 2017. Second, we managed to record additional sanction cases (primarily related to financial and military aid cuts, travel bans, and diplomatic sanctions) by relying on the 'Intrastate Dispute Narratives of the Dynamic Analysis of Dispute Management' (DADM) project, led by the political science department at the University of Central Arkansas. Third, we revisited existing sanction databases and, once again, cross-checked our cases against them. In particular, we studied in detail each sanction case in Hufbauer et al. (2007). Within a number of sanction policies, we identified additional cases. We also cross-checked with Morgan et al. (2014) for missing cases (mostly for the 1950-1990 period). Fourth, we compared the cases in the Global Sanctions Data Base with newly constructed datasets (i.e. the EUSANCT database by Weber and Schneider (2020)). Lastly, we included several cases per suggestions that we received from some users of the Global Sanctions Data Base.

In the update we discovered 306 additional cases that were imposed up to 2016, and 75 new cases imposed during 2016-2019.
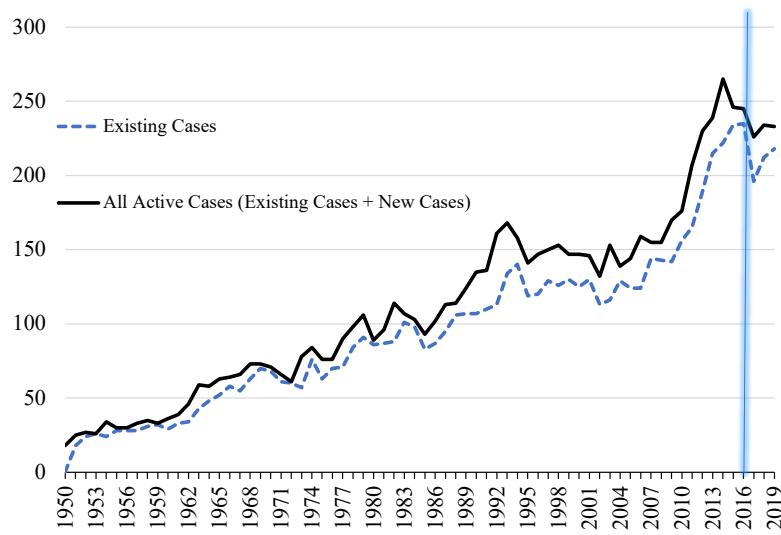
In the database, sanction cases are classified into distinct types, including trade sanctions, financial sanctions, travel restrictions, arms sanctions, military assistance sanctions, and other types of sanctions. For each case, the database identifies policy objectives that appear in official documents. Finally, the database assesses the success of each sanction case in four categories.

Panel (a) of Figure 1 illustrates the evolution of all identified sanctions between 1950 and 2019. For each year over this period, the total number of imposed sanctions for the different types of sanctions is identified. Panel (b) of Figure 1 depicts the number of new sanction cases in each year for the period 1950-2019. Two important developments can be observed. First, the number of new sanction cases has, on average, increased over the period under consideration. Second, while the number of new sanction impositions turns out to be volatile in the 2000s, their number has, on average, increased. This development
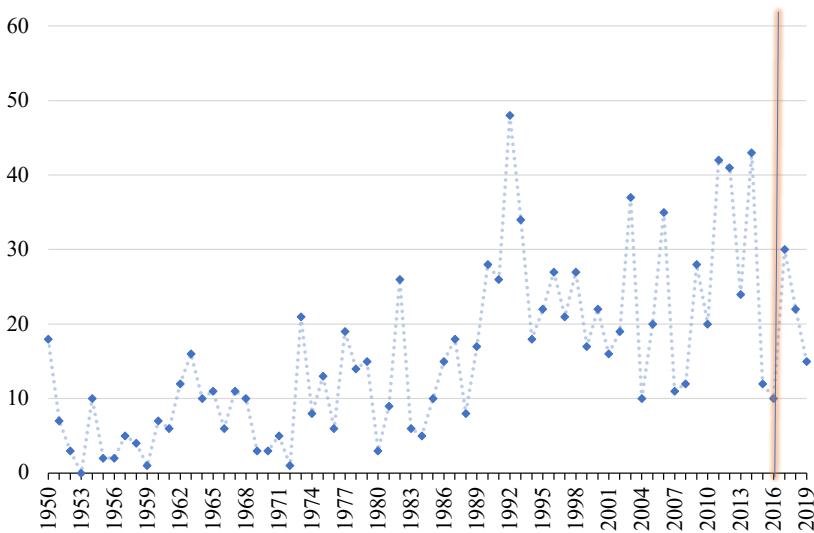
can be explained primarily by the more frequent adoption of so-called 'smart sanctions' (i.e. sanctions that typically target specific individuals, companies, or organisations with financial and/or travel restrictions).

FIGURE 1   EVOLUTION OF SANCTIONS

a) Exisiting cases vs all active cases

b) New cases

Note: This figure illustrates (a) the evolution of sanctions and (b) the yearly number of new sanctions impositions over the period 1950-2019.
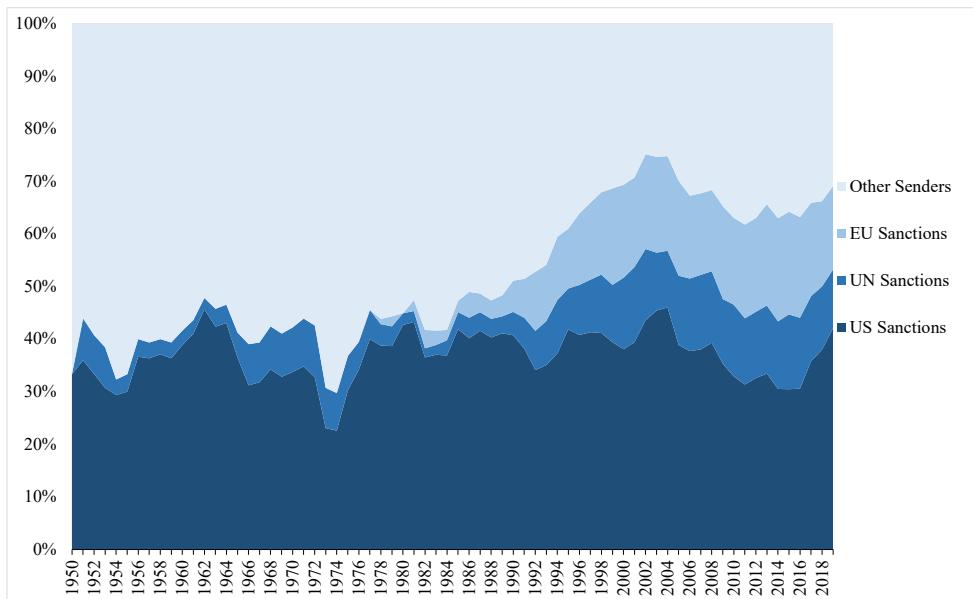
THE US AS A MAJOR DRIVER OF INTERNATIONAL SANCTIONS

The updated database allows for a detailed analysis of various policy and research questions. In what follows we briefly illustrate some new insights for the extended period. Our consideration of the 2016-2019 period is motivated by two ideas. First, because the original edition of the version of the database included sanctions up to the year 2016, all cases recorded during 2016-2019 constitute new additions and deserve some attention. The second idea is that these years coincided with most of Donald Trump's term in office.

The focus on US sanctions can be explained by the following reasons. First, it is widely believed that the Trump administration imposed more sanctions than any other US administration. Second, according to the database, since 1950 the US has been the most frequent user of international sanctions in the world (accounting for more than one third of all observed sanction cases). Third, for various reasons, the US sanctions have been of keen interest to scholars working on sanctions research (e.g. Kohl 2021).

Figure 2 illustrates the dominant utilisation of sanctions by the US since 1950 to achieve its foreign policy objectives, as well as the increase in the frequency of their usage by the Trump administration. The US has been the single most frequent user of sanctions throughout this period. On average, more than 35% of all sanctions during 1950-2019 were imposed by the US. A noteworthy exception appears in the early 1970s.

FIGURE 2   US VS. UN VS. EU SANCTIONS (% WORLDWIDE)

Note: This figure depicts the yearly % of the sanctions imposed by the US vs. the % of sanctions imposed by the UN, the EU, and the rest of the world. The US has been the most frequent imposer of unilateral sanctions throughout 1950-2019. The percentage of the US sanctions increases during the Trump administration.

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Second, a significant and steady rise in the EU and UN sanctions is observed since the early 1990s. Finally, the Global Sanctions Data Base documents a strong difference between the evolution of the fraction of US sanctions under the Obama and the Trump administrations. Specifically, at the end of the Obama presidency in 2016, US sanctions accounted for 30% of all sanctions in the world. In contrast, in 2019 this fraction rose to more than 40% under the Trump administration.
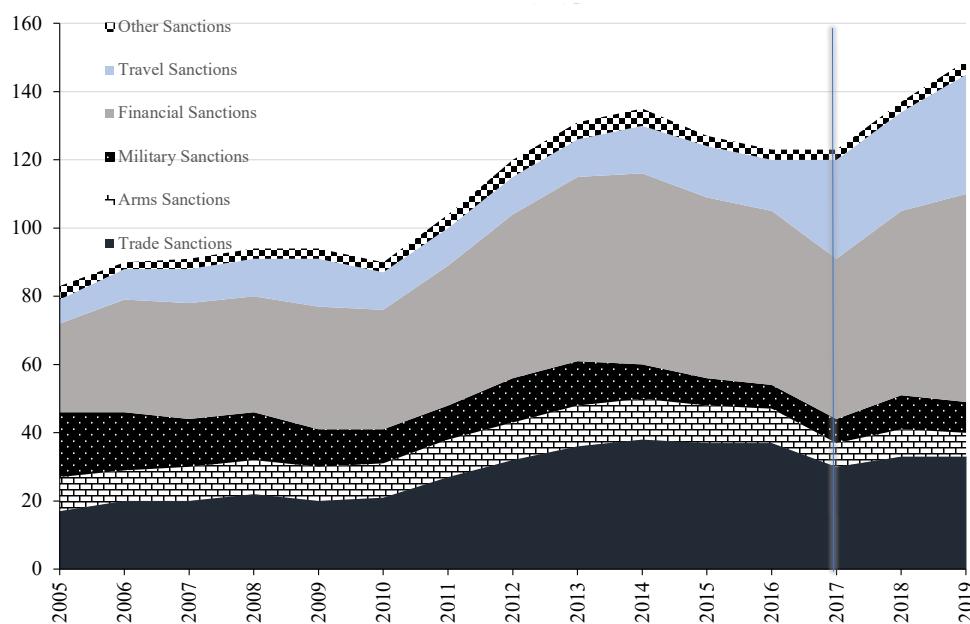
Figure 3 depicts the types of sanctions employed by the US. In addition to confirming the increase in the absolute number of sanctions imposed by the Trump administration, two important patterns can be discerned from panel (a).

First, while trade sanctions appear to have risen significantly during the Obama years, there is a strong decline in 2017 due to the abolition of many active Obama sanctions in 2016. In contrast, arms sanctions remained relatively steady during the Trump years between 2016 and 2019, and military sanctions increased marginally.
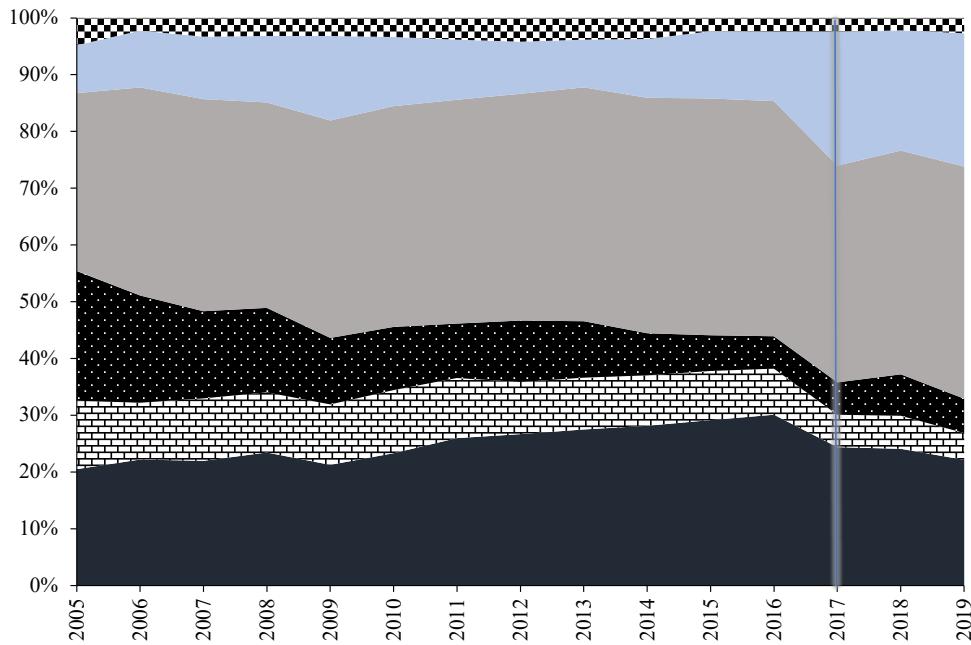
Second, the Trump and Obama administrations differ in their imposition of smart (i.e. travel and financial) sanctions. Specifically, we observe a significant rise in the number of smart sanctions under Trump's presidency. A possible explanation for this relative increase in the number of smart sanctions (which is consistent with a general worldwide trend) is that, by design, smart sanctions aim to influence policymakers in sanctioned countries by imposing economic pain on targeted individuals, companies, and/or economic sectors (in the hope of limiting the negative impact on ordinary people).

FIGURE 3   EVOLUTION OF US SANCTIONS BY TYPE, 1950-2019

a) US sanctions by type (number)

Note: This figure illustrates the evolution of US sanctions by type. Panel (a) depicts the number of imposed sanctions by type in each year for the period 2005-2019, and panel (b) illustrates the percentage share of sanctions by type in each year for the same period. To facilitate readability the order of different sanction types in the legend corresponds to the order of the shaded areas in the two panels. There has been a significant increase in financial and travel sanctions during the years of the Trump presidency (2017-2019), followed by a decrease in the share of arms sanctions during these years.

These stylised facts, which represent only a small fraction of possible additional insights that can be derived from the Global Sanctions Data Base, illustrate the increasing popularity of sanction policies. The update database offers a comprehensive collection of internationally observed sanction cases enabling researchers to analyse a large scope of important policy questions.

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CHAPTER 6

Sanctions and the exchange rate
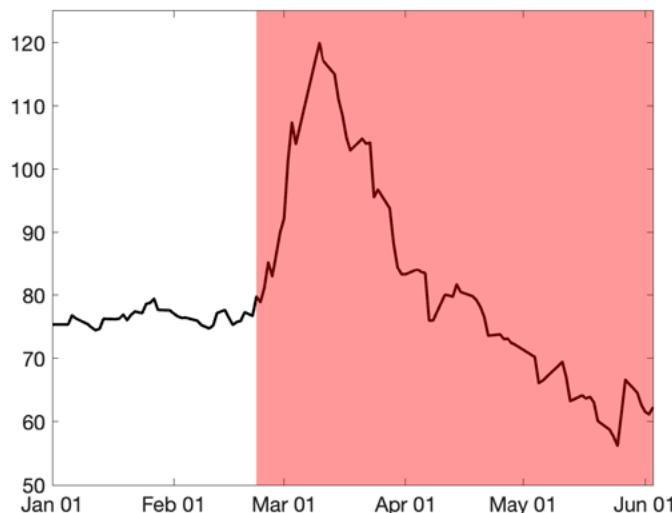
Oleg Itskhoki and Dmitry Mukhin

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16 May 2022

A record number of economic sanctions have been imposed on the Russian economy since the invasion of Ukraine in February 2022. Given that the impact of these restrictions on the real economy will be gradual, observed perhaps only after months or even years, many commentators and policymakers are attempting to infer the effects of sanctions from the short-term dynamics of the ruble exchange rate (see Pestova et al. 2022). In the immediate aftermath of the invasion and the imposition of sanctions, the Russian ruble quickly lost nearly half of its value (Figure 1). However, a few weeks later the value of the ruble started to appreciate and, at the beginning of May, was higher than before the war.

FIGURE 1   **DAILY RUBLE EXCHANGE RATE (PER US DOLLAR) IN 2022**

These puzzling dynamics lead to several contradictory and misleading interpretations. Some commentators conclude that the imposed sanctions are not working. Similarly, state media in Russia uses the reversion of the exchange rate as an indicator of the resilience of the economy and the short-lived effects of sanctions. Other commentators

went to a different extreme, suggesting that given all the policy measures and restrictions imposed to stabilise the exchange rate, it has lost its relevance as an allocative price and has become inconsequential from the perspective of welfare.

SWINGS IN THE EXCHANGE RATE

What explains the puzzling swings in the exchange rate over the last months? To answer this question, we first note that the value of the ruble is determined on the Moscow Exchange, which has become largely disconnected from international financial markets since the beginning of the war. Western sanctions constrain foreign banks from trading rubles and Russian capital controls limit access of Russian residents to foreign markets. As a result, the local supply of foreign currency comes from export revenues and government reserves, while local demand is shaped by import expenditure, foreign liabilities of Russian firms (to the limited extent they exist despite 2014 sanctions), and the use of foreign currency as a store of value. The equilibrium exchange rate equilibrates the local supply and demand of currency and also adjusts to monetary inflation.

In Itskhoki and Mukhin (2022b), we show that a simple equilibrium model of exchange rate determination can explain the ruble dynamics from Figure 1. The overnight freeze of a significant fraction of government foreign reserves, the exclusion of major banks and corporations from international borrowing markets, and a threat of blocking commodity exports led to a sharp depreciation of the ruble on impact. These factors were exacerbated by a sharp increase in the home precautionary demand for foreign currency driven by the rise in inflationary expectations and a collapse in the supply of alternative vehicles for savings.

The exchange rate reversed in mid-March and appreciated gradually over the next month to the pre-war level. First, tougher sanctions on Russia's imports than on its exports over this period led to a sizable current account surplus and an inflow of foreign currency into the economy (see also Lorenzoni and Werning 2022). Second, with limited access to foreign reserves, the central bank used extensive financial repression, which included strict limits on foreign currency deposit withdrawals, capital outflows, and a 12% tax on local currency conversion to dollars and euros. This constrained the domestic demand for foreign currency. Third, the record-high commodity export revenues allowed the Russian government to enjoy a considerable fiscal surplus, thus far avoiding the need to monetise its fiscal obligations and to induce a monetary-driven depreciation. These three factors are arguably more important in stabilising the exchange rate than conventional monetary tools such as the hike in the policy rate to 20%, which was mostly aimed at stopping a bank run on the ruble deposits and at preventing monetary inflation. Nonetheless, going forward, the prospect of export sanctions and fiscal problems driven by a domestic recession can result in both inflation and devaluation.

ARE SANCTIONS FAILING?

The appreciation of the ruble to the pre-war level has been widely interpreted as a sign that so far sanctions have had a limited effect on the Russian economy. As mentioned above, this argument misses the fact that most restrictions were imposed on Russia's imports, which lowered demand for foreign currency, thus creating a force for the ruble appreciation. This appreciation, however, cannot offset the increase in the effective costs of imports, particularly in view of their limited availability, or compensate the associated welfare losses and increased real costs of living.

More generally, there is no one-to-one relationship between the exchange rate and welfare, and hence the effectiveness of sanctions cannot be inferred from the exchange rate. On the one hand, sanctions on imports and exports are equivalent in terms of their effect on the consumption of foreign goods — the former increase their relative prices, while the latter lower the amount of resources available to purchase foreign goods — and thus have the same welfare implications. On the other hand, the effect on the exchange rate goes in opposite directions in the two cases — import sanctions decrease the demand for dollars and appreciate the ruble, while export sanctions lower the supply of dollars and depreciate the ruble.

Importantly, the equivalence extends to fiscal revenues: although import restrictions have no direct effect on government income, the associated change in the exchange rate lowers nominal and real fiscal revenues in the same way as export restrictions (Amiti et al. 2017). The fact that exports constitute an important source of government revenues does not change the result and thus cannot be used as an argument in favour of export over import sanctions. Instead, the use of export restrictions can be justified if import sanctions are considered insufficient, are limited by the trade share of sanctioning countries, or minimise the costs to sanctioning countries (Sturm 2022).

IS THE EXCHANGE RATE IRRELEVANT?

Equally misleading is the common view that the policy restrictions make the exchange rate irrelevant for the economy. Despite the large interventions of the government in the foreign exchange market, including multiple restrictions on purchasing and managing foreign currency, the value of the ruble affects the economy via two channels. First, the appreciation of the exchange rate increases the purchasing power of households and boosts consumption of foreign goods mitigating the negative effects of import sanctions. Importantly, this comes at the expense of the households that want to hold foreign currency as a safe asset and thus are subject to the measures of financial repression that are used to strengthen the ruble. In other words, the policy of financial repression creates redistributive effects from savers (who tend to be richer households) to consumers of foreign goods (many of whom are poorer 'hand-to-mouth' households).

Second, the nominal exchange rate is a signal about monetary policy, which is especially valuable in an environment with high uncertainty and low trust in policymakers. Budget deficit pushes the government to monetise its nominal liabilities. Even before this happens, uncertainty about the monetary policy can lower demand for local currency deposits, leading to higher inflation and a run on the banks. To regain credibility, anchor inflation expectations, and stabilise the financial system, the central bank can adopt a nominal peg to communicate its policy priorities (Athey et al. 2005, Itskhoki and Mukhin 2022a).

In sum, a strong appreciation of the ruble over the last two months was driven by import sanctions and the financial repression, both of which lowered demand for foreign currency. This does not mean that the sanctions are not working - in fact, there is an important equivalence between import and export restrictions in terms of welfare effects and government fiscal losses. Stabilising the exchange rate allows the Russian government to anchor inflation expectations and support consumption but comes at the cost of financial repression of domestic savers.

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CHAPTER 7

A principal, multi-agent model of sanctions

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Russia's invasion of Ukraine has been met with sanctions that target President Putin, his family, members of his inner circle, and oligarchs who control key Russian industries. Assets of the Russian elite, held in the form of property and financial holdings in the West, have been confiscated. In addition, the US, Europe and their allies have cut the Russian financial system off from international difficulties for the ruble to collapse and triggering bank runs. These sanctions affect the Russian population at large.

The US has frequently imposed comprehensive economic sanctions (e.g. trade embargoes) on countries that are perceived as threats against international peace and stability. More recently, there has been a push towards targeted sanctions (blocking the elite's financial assets and transactions, restricting their ability to travel and to consume luxury goods, etc.). The recent sanctions against Russia have both targeted and comprehensive components. Similar strategies have been pursued in the past against Iran and North Korea. By contrast, South Africa, Iraq, and Libya faced mainly comprehensive sanctions. After the collapse of the Soviet Union, Russia used comprehensive sanctions against the newly independent states which relied on Russia to export their products or import energy and other inputs.

In this chapter, I study the effectiveness of sanctions in changing the sanctioned country's behaviour. I will contrast measures that impose costs on the population as a whole (comprehensive sanctions) with measures that target the elite ('smart' or targeted sanctions). I will not discuss the costs on the sanctioner because we can rely on the analyses of others. Will sanctions unite or divide the population and the elite in the sanctioned country? What is the optimal mix of targeted and comprehensive sanctions? Do these different types of sanctions work with or against each other?

MODEL

A major power – the 'principal' (she) – uses targeted sanctions to incentivise the political elite – the 'agent' (he) – to change course by directly impacting their cost-benefit analysis. The principal imposes comprehensive sanctions on citizens for an indirect purpose: to cause social and popular unrest, which either destabilises the regime or forces it to change course.

The success of both types of sanctions depends on the agent's and citizens' beliefs about the preferences of the principal. Is the principal a 'dove' who will live in perhaps uneasy coexistence with the agent and citizens if there is cooperation? Or is the principal an imperialist who will use cooperation to further advance an even more coercive agenda?

This uncertainty is often ignored in policy circles, assuming it is common knowledge that the principal's motives are benign. But if the US and its allies are thought to be pushing for regime change, targeted sanctions will be ineffective as the elite face ejection from power or worse. If the allies are thought to be out to immiserate the country and extract its resources, comprehensive sanctions will be ineffective as citizens face economic catastrophe. In fact, if the principal is believed to be an imperialist because of sanctions, they cause a 'rally round the flag' effect, unifying citizens and the political elite.

Therefore, sanctions must satisfy three conditions. First, cooperation must be defined clearly. If cooperation is not clearly defined, the agent and citizens do not know what must be done to have sanctions removed. Second, the principal must commit to removing sanctions if this acceptable standard of behaviour is met. If sanctions are never removed, they do not create marginal incentives for the agent to cooperate or for citizens to impose political pressure on the agent. Third, the principal must signal that she is a dove not an imperialist to minimise the rally round the flag effect, though others will always have the suspicion that she is bluffing.

ANALYSIS

Comprehensive sanctions are more likely to work if citizens' social pressure has a significant impact on the agent's political future. Such pressure is more likely to operate in near democracies than in autocracies where there is a repressive security apparatus. But citizen unrest risks replacing the agent with another leader who cooperates but against an imperialist principal. Therefore, the optimal sanctions policy involves maximising comprehensive sanctions in near democracies when the probability that the principal is an imperialist is low (Baliga and Sjöström 2022).

Many years of comprehensive sanctions against South Africa did lead to the end of apartheid. The white electorate in South Africa could effectively exert pressure on politicians and democratisation opened up the possibility of a peace dividend, not foreign hegemony. But decades of comprehensive sanctions have not led to significant change

in Iran, Cuba, or North Korea. As for Russia, there is little chance popular that unrest will be successful and there is fear of what will happen if they do cooperate. Hence, comprehensive sanctions will not be effective in persuading Russia to end its invasion of Ukraine.

This means targeted sanctions are the optimal policy in the case of Russia (Baliga and Sjöström 2022). The West and its allies should maximise targeted sanctions to maximise the chance of compelling the agent to cooperate. The agent derives a private benefit from the 'strength' projected by non-cooperation. For example, Russia's president may take credit for restoring part of the Soviet empire. Because of the private benefit, the agent's incentives are not perfectly aligned with those of citizens or the principal. Maximising targeted sanctions carries the most hope for overcoming private benefits from non-cooperation. But recall the agent will never cooperate with a principal who is likely to be an imperialist. This means the principal has to make clear that regime change is not an objective.

Paradoxically, high targeted sanctions make comprehensive sanctions less effective by triggering a rally round the flag effect. If the agent does not capitulate to the demands of the principal, citizens deduce this might be because the principal is an imperialist, not a dove. So, they are even less likely to revolt. Since comprehensive sanctions are then even more unlikely to work, it is even more important to ensure targeted sanctions are aimed correctly.

Seizing the assets and curtailing the freedoms of Russian politicians in the Duma and in the Cabinet targets elite decision-makers. Sanctions that limit the financial transactions of President Putin's inner circle also targets the elite. There are a set of '*siloviki*', or 'hard men', who are at the centre of decision-making (Lieven 2022). Many of them have children who live or study in the West. One of them, Igor Sechin, is the head of Rosneft, an oil and gas exporter. This means targeted sanctions should focus on the Russian energy exports, as the associated companies are controlled by siloviki. Also, the profits from energy industries fuel the Russian state and its war.

My co-author's and my focus in Baliga and Sjöström (2022) is on how to maximise the benefits of sanctions to the principal. We argue that the principal (Europe, the US and their allies) should impose costs on the agent (the Russian elite) in the form of targeted sanctions as comprehensive sanctions are likely to be ineffective. The ideal targeted sanctions are on Russian exports of oil and gas. Unpalatable as it may be, for these sanctions to be successful, there must be a commitment to dropping them if Russia cooperates (where cooperation is clearly defined). But Berner et al. (2022) point out that Russian energy sector banks have not been sanctioned at all and trade in Russian oil and gas continues.

This is because such sanctions impose costs on the principal as well as the agent. But Bachmann et al. (2022) estimate the macroeconomic impact to Germany of cutting out Russian energy exports and show it is smaller than thought. Hosoi and Johnson

(2022) argue that transport of oil should be monitored, any Russian revenue should only be handed over only when the war ends, and trade should only be allowed with special permits. Sturm (2022) shows that tariff revenue can make up for some of the welfare losses and might even make Germany better off. Targeting fossil fuels helps the environment in the long run (Chepeliev et al. 2022).

To summarise, in an autocratic state, comprehensive sanctions are unlikely to work as the state can suppress citizen dissent. This makes targeted sanctions the main viable instrument and in Russia this implies sanctioning energy exports. This can be done in ways that minimises costs on the principal and even generates revenue (Gros 2022, Strum 2022).

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CHAPTER 8

Beyond macro: Firm-level effects of cutting off Russian energy

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Imports from Russia are largely made up of energy inputs, most notably oil, coal, and natural gas. The centrality of these inputs in production networks implies that shocks affecting the price of energy have the potential to propagate downstream, leading to sizeable amplification of the shock. However, recent estimates, recovered from calibrated multi-sector, multi-country models with input-output linkages (Bachmann et al. 2022, Baqaee et al. 2022), suggest that the effect of an import ban on Russian oil and gas would generate a relatively limited GDP contraction.[1] Even in a country like Germany, cutting Russian energy imports – which represent 30% of German energy consumption – would induce a 0.5-3% decline in GDP, a sizeable but manageable economic cost.

In sector-level models such as those used in Bachmann et al. (2022) or Baqaee et al. (2022), such a relatively small effect results from a non-zero elasticity of substitution among firms' inputs. If Russian oil and gas were perfect complements to other inputs (a zero elasticity), GDP would fall one-to-one with energy imports. Some of the firms in sectors dependent on Russian energy are assumed to be able to switch to other suppliers and the same is true of firms in downstream sectors, which need to cope with the reduced production of their suppliers. In particular, the open-economy structure of the model implies that some of the inputs that can no longer be produced domestically due to energy rationing can be substituted by foreign goods.[2]

The assumption that there exist some substitution opportunities in production networks may seem controversial, as they are typically thought to be rigid structures shaped by relationship-specific investments. Is it more appropriate to instead be conservative and assume a pure Leontief production structure? Addressing this question is tricky in the absence of direct evidence on how technologies adjust to energy shocks.

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1   Importantly, this result is recovered from a model in which the only source of such contraction is attributable to the propagation of the shock in production networks. Other negative consequences such as the detrimental effect of the wealth shock induced by raising energy prices are assumed to be neutralised.
2   Of course, substituting domestic production with foreign inputs has other consequences. Notably, higher imports imply more production abroad, and thus an increased energy demand.
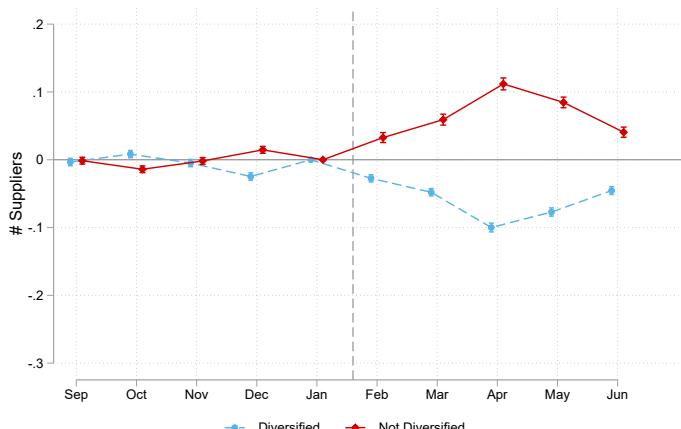
IS TECHNOLOGY LEONTIEF AT THE FIRM LEVEL?

In a recent paper (Lafrogne-Joussier et al. 2022), we tackle a related question using the early stage of the Covid crisis as a quasi-natural experiment. In this empirical study, we use monthly panel data on French firms and investigate the dynamics of their sales in the first semester of 2020. Our strategy exploits firms' early exposure to supply chain disruptions induced by the lockdown in China in January 2020. By comparing firms that were exposed to the productivity slowdown in China through their value chain with comparable firms that were not, we can quantify the extent of the propagation of shocks, at the root of the amplification formalised in models of production networks. By March 2020, when the virus was just beginning to spread in Europe and France, firms exposed to supply chain disruptions from China were already reporting 7% lower export sales than their unexposed counterparts.

The exercise also makes it possible to examine heterogeneous adjustments of exposed firms to input disruptions. A first finding is that exposed firms holding inventories managed to absorb the shock better. Whether managed at the firm level, as in our example, or by public authorities, strategic inventories (in particular of gas and oil) appear to be essential to help exposed firms mitigate the shock. A second, more surprising result is that firms that were most dependent on Chinese inputs absorbed some of the shock by diversifying their supply chain following the early lockdown. Among the treatment group, firms that had a non-diversified supply chain have a significantly higher probability of starting to import their inputs from elsewhere just after the disruption induced by the Chinese lockdown, in February and March 2020 (Figure 1).

FIGURE 1   IMPACT OF THE EARLY LOCKDOWN IN CHINA ON EXPOSED FIRMS' NUMBER OF FOREIGN PARTNERS.

Source: Lafrogne et al. (2022).

Notes: The figure shows the result of an event study design that compares firms exposed to Chinese inputs prior to the lockdown in China ("treated" firms) and firms that were not ("control" firms). The treatment group is further split into "diversified" firms that were connected with at least one other sourcing country for the input sourced in China and "non-diversified" firms that solely relied on China prior to the shock. The estimated equation explains the number of source countries, before and after January 2020, in the group of treated firms in comparison with control firms, using a Poisson estimator. The difference is normalised to zero in January 2020.
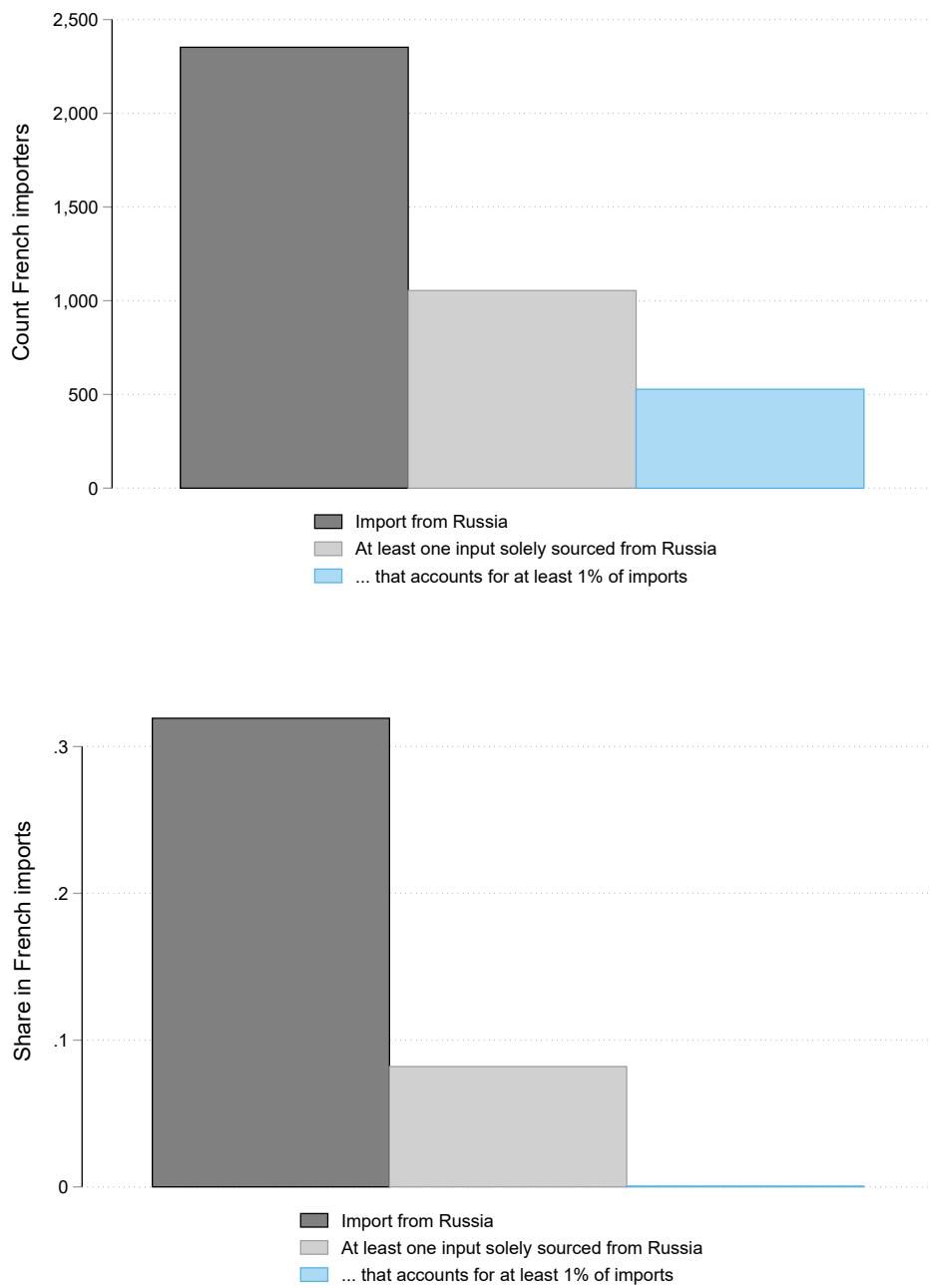
While such evidence does not directly address the question of the possibilities of substitution away from Russian gas, it does support the view that, even in the very short run, firms that face important disruptions in their input purchases do adjust.

DISTRIBUTIONAL EFFECTS OF THE SHOCK

Another margin of adjustment, which textbook sector-level models do not directly incorporate, is substitution within a sector across firms. Since firms in the same sector produce output that is probably more highly substitutable than inputs within the firm, heterogeneity in who uses Russian gas provides another shock attenuation mechanism (di Giovanni et al. 2020). As discussed in this paper, heterogeneity in exposure to a foreign shock has significant aggregate consequences on the overall impact of the shock. The heterogeneity in exposure to Russia from the import side is illustrated in Figure 2. Out of 150,000 French importers, less than 2,500 directly imported from Russia in 2019. However, these firms are substantially larger than the average and their total imports account for one-third of France's overall imports. Providing exposed firms are large and connected to other domestic producers, their sensitivity to the shock has aggregate consequences. But the heterogeneity also has distributional consequences: non-exposed firms gain market shares over exposed firms. To account for these substitution opportunities, the analysis in di Giovanni et al. (2020) maps firm-level data for France with the sector-level input-output data used in Bachmann et al. (2022) or Baqaee et al. (2022).

Figure 3 illustrates how heterogeneity in exposure and substitution opportunities affects the response of French firms to a 10% drop in Russian productivity. Under our baseline calibration, the aggregate impact of such shock is a 0.9% decrease in France's real GDP (the red line in Figure 3). Blue circles display the average firm-level responses depending on the firm's size. Whereas firms in the top two percentiles of the size distribution experience a sizeable 4% adjustment, some firms in lower percentiles expand as they gain market share over the most exposed firms. These substitution opportunities are not accounted for in textbook models with input-output linkages but they could be important in the context of a possible ban on Russian gas if there is heterogeneity across firms within a sector in their dependence on Russian gas.[3]
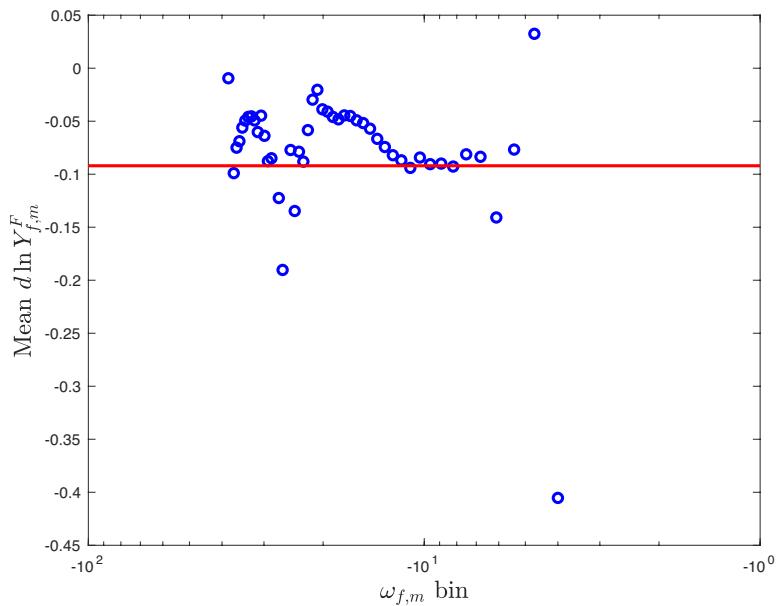
3   Whereas this substitution across firms within a sector is expected to help absorb the shock, quantifying the size of this attenuation mechanism is difficult as it varies depending on the elasticity of substitution between firms' output and the extent to which factors can reallocate across firms. In the baseline calibration, the elasticity of substitution is set to 3 and labour is assumed to reallocate across firms without frictions.

FIGURE 2   EXPOSURE OF FRENCH FIRMS TO RUSSIAN IMPORTS

Source: French customs data for 2019.

Notes: The figure shows the number (top panel) and share in aggregate imports (bottom panel) of firms that i) import from Russia (dark grey bar), ii) import one of their inputs solely from Russia (light grey bars) and iii) import one of their main inputs solely from Russia (blue bars). In the third case, statistics are based on the sub-sample of a firm's imports that account for at least 1% of the firm's overall imports in 2019.

FIGURE 3   HETEROGENEITY IN THE RESPONSE OF FIRMS TO A 10% PRODUCTIVITY DROP IN RUSSIA

Source: Authors' calculation using the model in di Giovanni et al. (2020).

Notes: The figure shows the mean elasticity of firms' real value added to a simulated 10% drop in the aggregate productivity of the Russian economy. Average elasticities are computed for 50 bins of individual firms, grouped by their (value added) size.

CONCLUDING REMARKS

Existing evidence recovered from detailed firm-level data thus supports the view that foreign shocks do diffuse in production networks. Despite the rigidity of modern production networks, some firms adjust their technology, even in the very short run, when confronted with a disruption in their value chain. Moreover, the heterogeneous exposure to the shock has distributional consequences: less exposed firms gain market shares over the more exposed ones. Assuming some substitution across inputs in models of production networks is consistent with this micro-level evidence. But what the discussion also shows is that a ban on Russian imports will have very heterogeneous consequences. Some well-known firms and some iconic products will be strongly affected by the sanctions. Beyond GDP figures, huge but concentrated losses may have a stronger impact on public opinion than small diffused losses.

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CHAPTER 9

Strength in unity: The economic cost of trade restrictions on Russia

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In the aftermath of the invasion of Ukraine by Russia, the first sanctions from the EU and the international community were diplomatic and financial. The continuation of the war has led a number of countries to broaden the scope of sanctions towards trade sanctions. While these sanctions are unprecedented, they are clearly insufficient insofar as the Russian economy continues to enjoy a steady stream of revenue from oil, gas, and coal sales. According to Eurostat, Russian energy imports by the EU were around €99 billion in 2021 and accounted for 62% of imports from Russia. With the war, the price of energy has soared. Today, the EU pays Russia about €640 million per day for oil and €360 million for piped natural gas. This should be compared to the cost to Russia of one day of war in Ukraine, estimated at $0.65 billion (Center for Economic Recovery 2022). Undoubtedly, the EU's energy dependence on Russia is its Achilles heel and is Russia's most powerful economic lever. This must stop.

Massive evidence of war crimes in northern and eastern Ukraine is reshuffling the deck and putting pressure on EU countries to wean themselves off Russian energy. On 8 April, the EU adopted its fifth package of sanctions against Russia including a ban on coal and solid fossil fuels. Should we go further in the embargo and extend it to Russian gas and oil? This issue is being debated as part of a new sanctions package that divides the EU27. The reluctance to impose an embargo on Russian energy is based on the idea that there would be no alternative to Russian energy for firms and households. This lack of substitution would result in a very high cost for the EU and potentially higher than that borne by Russia. This extreme view, which has already been criticised by Bachmann et al. (2022a, 2022b), neglects the possibilities of substitution at the different stages of economic activity, and would result in a decrease in production strictly equal to the amount of forgone energy. Fortunately, the reality is less simplistic: energy substitutes can be found by firms, or intermediate goods that do not use energy (or are less energy intensive) can also be offered by new suppliers. In addition, consumer demand can move towards other goods if this energy-based good becomes too expensive or no longer meets needs. History is full of examples in which such substitution mechanisms are put in place (Bachmann et al. 2022a, 2022b).

How can we assess the economic effects of the embargo taking into account all the possibilities of substitution and price adjustments on all markets? An inherent difficulty with this type of assessment is that an embargo policy changes the global production chain with cascading effects specific to each country. The model developed by Baqaee and Fahri (2021) proves to be of great relevance here. Based on this model, teams of researchers have recently tried to quantify the effects of an embargo on Russian imports at the EU level for Germany (Bachmann et al. 2022a, 2022b), France, and a broader set of countries (Baqaee et al. 2022, Langot and Tripier 2022). The average cost of the embargo in the EU is equivalent to a -0.7% reduction in gross national expenditure (GNE) (household consumption, investment, and public spending) per year and per capita, with a strong heterogeneity going from -5.3% for Lithuania to +0.2% for Luxembourg. Germany and France occupy intermediate positions with losses of around -0.3% and -0.2%, respectively. In concrete terms, the average cost per year and per capita would be about €535 for a Russian and €230 for a European.
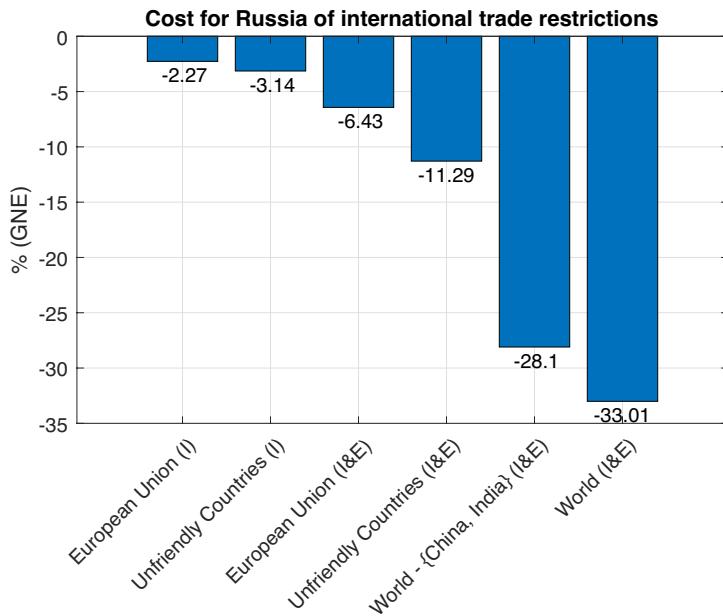
In what follows, we complement the previous contributions by studying the cost to Russia of trade sanctions according to their intensity. The intensity of sanctions varies according to the number of countries applying them and whether they affect imports only or both imports and exports. From a very short-term perspective, we assume that it is very difficult to substitute inputs with other inputs: the elasticity of substitutions retained being three times lower than the usual estimates, a very conservative assumption. We then consider six different scenarios. The first two concern only imports and focus on an embargo by the EU and countries 'unfriendly' to Russia.[1] In these first two scenarios, we assume a strict embargo on all imports from Russia (including energy). We retain this strategy because, in addition to energy (coal), the new EU sanctions ban imports of many other commodities and products such as wood, fertilisers, cement, rubber products, and so on.[2] This leads to an overestimation of the cost of an embargo against Russian energy in the strict sense, but is closer to the current state of the sanctions. The last four scenarios involve both imports and exports, i.e. a total exclusion from trade relations with Russia for the countries behind the sanctions. Compared to the first two scenarios, these are more realistic in that they also take into account the export restrictions that are part of the sanctions package. For example, the fifth set of restrictive measures against Russia prohibits the export of many high-tech products on which Russia is highly reliant, such as quantum computing, advanced semiconductors, or sensitive machinery.[3] Figure 1 represents the cost to Russia of trade restrictions for the six scenarios. The cost increases sharply with the extent of the restrictions.

FIGURE 1   COSTS FOR RUSSIA OF INTERNATIONAL TRADE RESTRICTIONS (AS A PERCENTAGE OF GNE)

Notes: This figure presents the cost for Russia of international trade restrictions under six different scenarios as a percentage of Gross National Expenditure (GNE). (I) trade restrictions are for imports only; (I&E) trade restrictions are for both imports and exports. For example, World - [China, India] (I&E) indicates that trade restrictions are taken at the world level excluding China and India and concern both imports and exports.

Thus, when the sanctions concern only imports and are taken at the level of the EU, the GNE decreases by 2.27%, whereas when they concern both imports and exports and when international coordination is perfect, national expenditure decreases by 33%. The cost for Russia is thus 14 times larger. This last scenario is obviously unrealistic but shows that international coordination is very important. In the more restricted and politically realistic framework where Russia is excluded from international trade with the exception of China and India, the drop in GNE is still of a considerable magnitude and would be about -28%. This shows that there is strength in unity. Finally, in the more realistic case where restrictions are coordinated at the level of unfriendly states, the loss is -11.29%, five times greater than when the EU acts in isolation.

The European Commission, which is in charge of drafting a new set of sanctions, is seeking to further restrict imports from Russia, especially for oil and gas. Some countries, including Germany and Austria, are opposed to this new round of sanctions on the grounds that they would be too costly because of their heavy dependence on Russian energy. Figure 2 represents the cost for the EU of trade restrictions for the six scenarios.

FIGURE 2   COSTS FOR THE EU OF INTERNATIONAL TRADE RESTRICTIONS (AS A PERCENTAGE OF GNE)

Cost for European Union of International trade restrictions

Notes: This figure presents cost for the EU of international trade restrictions as a percentage of Gross National Expenditure (GNE). (I) trade restrictions are for imports only; (I&E) trade restrictions are for both imports and exports. For example, World - [China, India] (I&E) indicates that trade restrictions are taken at the world level excluding China and India and concern both imports and exports.

It appears that the costs borne by the EU are significantly smaller than those borne by Russia, whatever the scenario. Moreover, these costs are globally stable and represent an average loss of 0.77% in GNE. Thus, the international coordination of sanctions implies a much higher cost for Russia, but more importantly, it implies almost the same (and affordable) cost for the EU. Table 1 summarises the results of our simulations.

The relative cost of sanctions increases significantly as international coordination strengthens. Bachman et al. (2022a, 2022b) correctly point out that the estimated costs of the embargo based on the Baqaee and Fahri (2021) methodology may be underestimated, in part because of price rigidity or the omission of some factor reallocation costs. However, to the extent that these additional costs are common to all countries, there is no reason to believe that they would substantially affect the relative costs of an embargo. In the most restrictive scenario, an embargo would cost Russia three times as much as it would cost the EU, while in the most extreme scenario it would cost Russia 41 times as much. Finally, in the more realistic case of coordination at the level of unfriendly states, the cost would be 13 times higher for Russia.

TABLE 1   COSTS FOR RUSSIA AND THE EU OF INTERNATIONAL TRADE RESTRICTIONS (AS A PERCENTAGE OF GNE)

Embargo from...	EU	UC	EU	UC	World w/o China and India	World
on...	imports	imports	imports and exports	imports and exports	imports and exports	imports and exports
Cost for Russia (% GNE)	2.27	3.14	6.43	11.29	28.10	33.01
Cost for EU (% GNE)	0.71	0.73	0.86	0.83	0.74	0.81
Ratio	3.19	4.29	7.52	13.62	37.97	40.99

Notes: This table presents costs for Russia and the EU of international trade restrictions as a percentage of Gross National Expenditure (GNE). EU and UC stand, respectively, for European Union and Unfriendly Countries.

As the European Commission discusses a sixth round of sanctions, will the democracies decide on an embargo on Russian oil and gas? While the US seems to favour this option, disagreements are more pronounced within the EU because of greater energy dependence. Based on the most recent developments in international macroeconomics, our evaluations show that the losses for Russia are more important and out of proportion to those for the EU, which remain manageable in relation to the stakes. More importantly, our results show that the effectiveness of sanctions depends crucially on international coordination. The adage that there is strength in unity has never been more relevant.

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CHAPTER 10

How to implement an EU embargo on Russian oil

Anette Hosoi and Simon Johnson

MIT School of Engineering; Sloan School of Management, MIT and CEPR
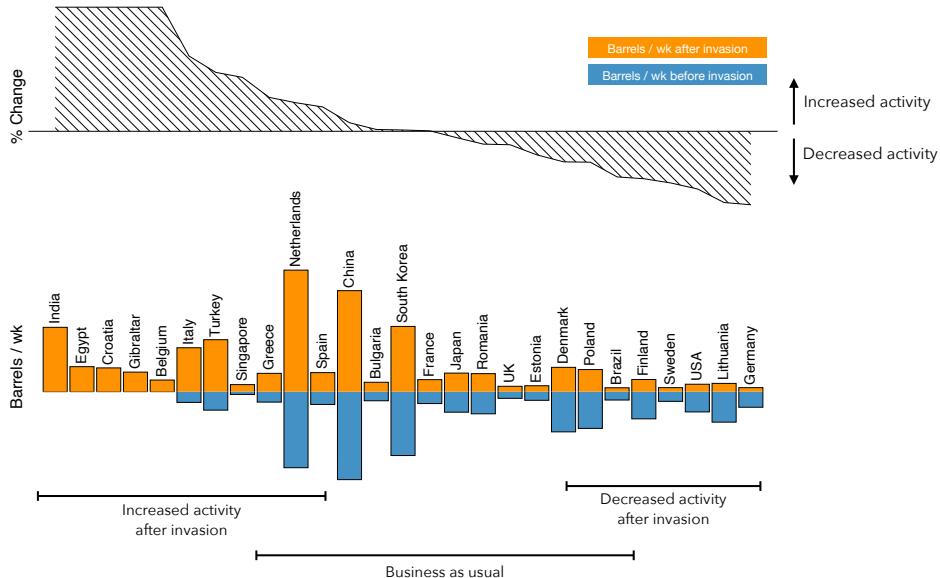
20 April 2022

The Russian war on Ukraine is financed in large part by the export of oil. The US, the EU, the UK, and other countries have intensified various sanctions on Putin's leadership group and their economy (Berner et al. 2022), but Russian export revenues since the invasion on 24 February have risen: the volume of oil exported has not fallen, and the world price of oil is up.

Most notably, the EU buys 2.2 million barrels of oil and 1.2 million barrels of petroleum product from Russia every day (IEA 2022). According to press reports, much of Russia's hard currency revenue is now being spent on re-equipping the Russian military and preparing for the next offensive.

There is also an unseemly and morally appalling scramble by some European and Asian countries to increase their purchases of Russian oil. According to publicly available data, as shown in Figure 1, some nations that claim to be fully in support of Ukrainians appear to have significantly increased their purchases of Russian oil since the invasion.

FIGURE 1   COUNTRIES IMPORTING RUSSIAN OIL

In a new CEPR Policy Insight (Hosoi and Johnson 2022), we argue that if our objective is to reduce Western financing of the Russian military effort, the only logical next step is for the US, the EU, the UK, and others to prohibit all Russian oil and oil product exports, and to make it illegal to carry such cargo in European-owned tankers. This blanket provision would trigger force majeure clauses in most contracts for vessel owners, oil traders, insurance companies, and other providers of financial services – allowing them to break existing contracts without penalty.

The key point is to avoid a situation in which the EU imposes an embargo on the import of Russian oil, resulting only in more of that oil flowing to Asian markets. Given the large market share of EU-owned tanker fleets, a prohibition on those vessels carrying Russian oil and oil products is essential for sanctions to be meaningful.

An EU embargo and associated system of sanctions could be combined with a tightly controlled and centralised system of waivers. These waivers would allow limited purchases of Russian oil by designated countries and in specified tankers. The prices charged should be monitored and preferably set below the world price for oil.

In addition, all payments for Russian oil under the waiver programme would go into supervised escrow accounts. The funds in these accounts should be available to Russia only once there is a ceasefire and, even in that case, should be used to buy food and medicine only – no weapons or industrial components that can be used to make weapons or military equipment of any kind.

As an additional safeguard, all approved imports into Russia would also need to be supervised carefully to ensure that only humanitarian supplies are getting through. In addition to all standard border controls, Ukrainian-appointed inspectors should participate in checking every shipment of freight to Belarus or Russia.

This would require hiring many inspectors, but there are currently more than two million adult Ukrainian refugees in European countries – so there is no shortage of people who need a job and who are willing to work. Their salaries should be paid from the Russian oil escrow accounts.

Any country that receives a permit to buy Russian oil should also publicly commit to reduce its consumption of fossil fuels over time. To facilitate these energy transitions, all forms of appropriate technology should be shared widely. As we discuss in the appendix to our Policy Insight, the development of offshore windfarms is among the most appealing ways to reduce oil consumption in the medium run.

Taking these factors and market conditions into consideration suggests the following general approach:

1. All Russian oil and oil products should be sanctioned by the US, the EU, the UK, and any other countries that are willing to stop Putin's war on Ukraine. (Similar sanctions should be applied to Belarus.)

2. The carrying of Russian-origin oil and oil products in any US, European, British, and other vessel should also be prohibited.

3. The provision of financial services in any form to any entity involved in the Russian oil and gas value chain should also be prohibited.

4. The combination of 1, 2, and 3 would trigger force majeure in all commercial contracts for the buying, transportation, and financing of Russian oil cargo.

5. The EU should declare a complete embargo on all Russian oil and seek alternative suppliers of crude oil and refined products. The available spare capacity in Saudi Arabia and the United Arab Emirates is roughly equal to the amount of crude oil that the EU currently buys from Russia dail.y

6. A system of waivers should be put in place to allow the controlled export of some Russian crude and refined products subject to centrally issued permits.

7. Administering this permit system will be costly, and appropriate fees should be charged. An initial user fee of $50 per barrel, paid for by Russia, seems plausible.

8. International permits would allow energy exports subject to the following conditions:
   a. a. All proceeds from these transactions go into escrow accounts.
   b. These accounts are frozen until Russian forces withdraw from Ukraine.
   c. Once unfrozen, these accounts can be used to buy food, medicine, and other humanitarian supplies only.
   d. The supplies purchased under license are shipped to Russia only through a few tightly controlled land crossings (vehicle and train), for example on the Poland-Belarus border and on the Finland-Russia border. In addition to local and EU border officials, there should also be Ukrainian inspectors present for every inspection of all cargo. All shipments need to be inspected, without exceptions.

9. Ukrainian refugees should be hired and trained as cargo inspectors. Their salaries should be paid out of the escrow accounts. In addition to assisting with the immediate task of ensuring no weapons or parts for weapons are smuggled into Russia, training these workers will help rebuild the Ukrainian customs service in line with EU best practices.

10. The central authority to provide licenses and authorise inspections could be administered by the International Energy Agency (IEA) acting under the authority of the governments involved.

11. To the extent that additional specialists are needed to staff any dimension of this effort, including monitoring tankers, determining whether sanctions are being violated, and assessing potentially questionable financial transaction, highly qualified Ukrainians are available. Given that the Russian invasion is estimated

to have caused a nearly 50% decline in Ukraine's GDP (Tsyrennikov 2022), employing these talented people in this fashion seems entirely appropriate. Again, their salaries can be paid from the escrow accounts.

12. In effect, the proposed structure would create an 'Inverse OPEC', comprised of countries that are willing to limit the ability of Russia to buy destructive weapons. This arrangement is obviously a violation of competitive market principles, but so is OPEC.

13. All participating countries should agree to taper their purchases of Russian fossil fuels as quickly as possible. Measures to reduce consumption of oil should be put in place everywhere, with sharing of all relevant technology. Industrial country governments should ensure that poorer countries have expedited access to any technology that would be helpful.

14. At the same time, all countries should work towards long-term solutions to reduce their dependence on oil (see the appendix in our Policy Insight). These efforts gain great urgency considering the national security implications that the Russian invasion of Ukraine highlights.

The current crisis emphasises that it is in the long-term interests of Europe to remove the vulnerability associated with energy production that EU countries cannot control. Although the EU, the US, and other countries have made great strides towards energy independence, Russia's invasion of Ukraine illustrates that we need more flexibility to absorb large shocks to the system.

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CHAPTER 11

The price of war: Macroeconomic effects of the 2022 sanctions on Russia

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15 April 2022

Following the Russian invasion of Ukraine in late February 2022, many countries imposed sanctions on Russian banks, entities, and individuals. The current sanctions are well described in Berner et al. (2022). Huang and Lu (2022) and Deng et al. (2022) deliver the first estimates of the sanctions impact on world financial markets. Ferrara et al. (2022), in turn, apply a high-frequency approach to connect the financial stress index and macroeconomic risks of the sanctions for the euro area. Brunnermeier et al. (2022) discuss the implications of the sanctions against the Central Bank of Russia for the architecture of the international monetary system. However, the current debate is missing a comprehensive set of model-based estimates of the macroeconomic effects of the sanctions.

We fill in this gap using a vector auto-regression (VAR) model of the Russian economy developed in Mamonov and Pestova (2021) specifically to capture the macroeconomic effects of sanctions.

The effects of the current sanctions could be roughly divided into (i) financial and demand-side effects and (ii) supply-side effects. Our model is able to capture the demand-side effects. The supply-side disruptions arising from technological bans and the breaking of supply chains are yet to be fully realised in the future and that requires a different modelling framework.

THE DEMAND-SIDE EFFECTS: BACK-OF-THE-ENVELOPE CALCULATIONS
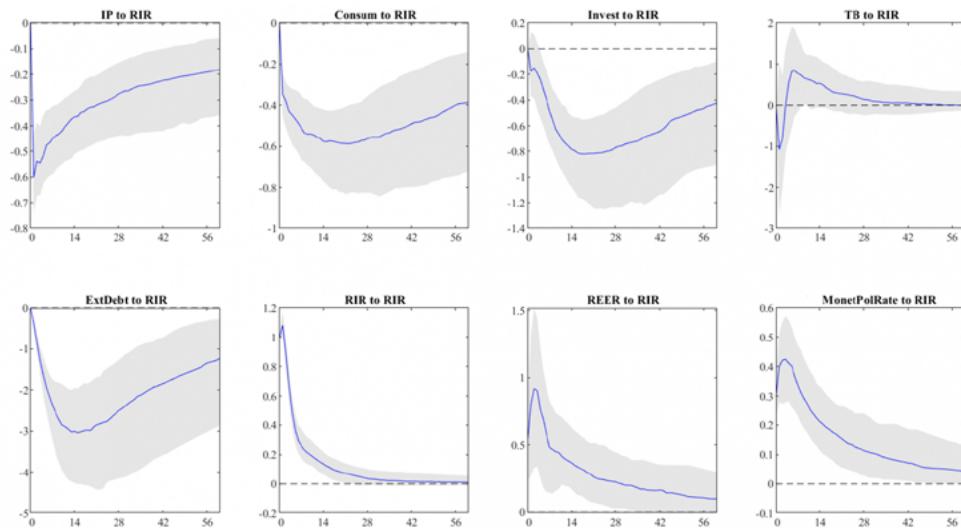
To estimate the demand-side effects of the sanctions, we build on our structural VAR (SVAR) model. In our analysis, we approximate the severity of sanctions by the sovereign international bond spread (over the US short rate). According to Mendoza and Yue (2012), this indicator summarises investors' expectations about the future path of the economy; in our case—under sanctions.[1]

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1   Of course, this indicator has limited ability to capture other aspects of sanctions including technological disruptions and particular asset freezes. However, it follows a long literature stressing the role of the country spread shocks in emerging economies' business cycles (Uribe and Yue 2006, Aguair and Gopinath 2006, Born et al. 2020, Monacelli et al. 2018).

We add the central bank's key interest rate as one of the endogenous variables in the structural VAR model. This flexibly accounts for monetary policy responses to rising currency risks during crisis times. In the structural identification (Cholesky ordering), we order monetary policy rate last among the eight endogenous variables in the model. By doing so, we assume that the international bond spread reacts faster to the sanction news than the central bank. The estimation period covers January 2000-December 2020.
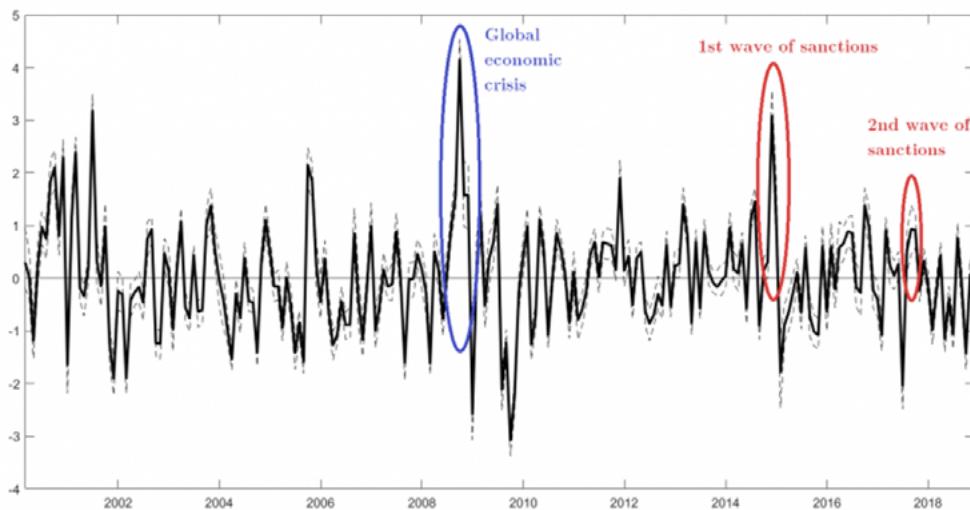
The estimated impulse response functions (IRFs) of the endogenous variables to a one percentage point international bond spread shock appear in Figure 1. All the responses, except for the trade balance (TB), are statistically significant and are in line with macro theory predictions: industrial production, consumption, investment, and foreign borrowings decline, whereas the real effective exchange rate and monetary policy rate rise. We will use the peaked levels of the estimated IRFs below.

FIGURE 1   IMPULSE RESPONSES OF KEY MACROECONOMIC VARIABLES TO THE COUNTRY REAL INTEREST RATE (RIR) SHOCK

Note: IP is industrial production, Consum is real consumption expenditures of the households, Invest is gross fixed capital formation, TB is trade balance, ExtDebt is corporate external debt, RIR is the real interest rate, MonetPolRate is the CBR's key interest rate. Source: The authors' estimates

Our model successfully identifies periods of the large positive country spread shocks over and above macroeconomic conditions. Among the identified periods, we observe spikes in the spread (or real interest rate, holding short-term US interest rate constant) during the Crimean 'first wave' and US/Syrian 'second wave' sanctions (Figure 2).

Note: The figure reports the time evolution of the *RIR* shock estimated with the BVAR model containing 10 variables. The Bayesian estimates are obtained with the flat (uninformative) prior. We set 10,000 draws from teh posterior distribution and we discard the first 5,000 draws. Conventional credible bands comprised of the 16th and 84th percentiles of the post-burned-in estimated IRFs are reported. Significant positive *RIR* shocks are identified for the first and second waves of sanctions in the end of 2014 and 2017, respectively. The positive *RIR* shoc occured during the global economic crisis is shown for comparison.
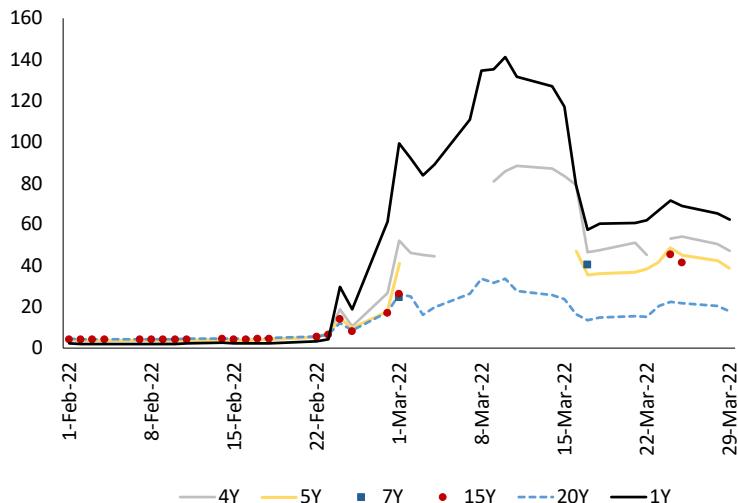
Source: Authors' estimates

We do not have a model-identified country spread shock now. However, information on spreads suggests that an exogenous—or clearly prior to the current macroeconomic worsening—rise of the spread has amounted to 35-45 percentage points, depending on whether the one-year yield is taken into account or not (Figure 3) and assuming constant international short-term rate (as average in March–February 2022). This increase in spreads could be partly explained by the heightened default risks of the Russian government. A full default, however, has not occurred. Still, even when the first payment on dollar-denominated Russian bonds was made following the invasion and panics were relieved, sovereign international bonds are traded with about 40% yield to maturity.[2]

With the estimated IRFs (Figure 1) and the size of the country spread shock that occurred during the first month of the war (+35-45 percentage points, Figure 3), we produce a set of out-of-sample forecasts. We predict that industrial production (IP) will decline by 21-27% per annum by the end of 2022. Given the 0.67 elasticity of GDP to IP, we further obtain that the GDP will fall by –12.5 to –16.5%, per annum. Regarding private consumption, we have a range of estimates: between –11 and –15%; a similarly obtained range of estimates for investment is bounded by –30% and –40%.

2   This means that even under no 'illiquidity-type' default (because of asset freeze), the country's medium- and long-run economic perspectives are perceived by investors as gloomy enough (low or negative future technological and economic growth).

FIGURE 3   YIELD TO MATURITY OF THE RUSSIAN US DOLLAR-DENOMINATED GOVERNMENT BONDS

Source: Bloomberg

Given the expected decline in imports, our model produces a sharp rise in the trade balance—by +40 to +60% in 2022. However, it does not—and cannot—account for problems with cargo deliveries and export embargo which jointly reduce exports. Overall, we expect the 2022 trade balance to stay at the levels of 2021.

Concerning corporate external debt, our out-of-sample forecasts imply a complete shutdown of firms' borrowing abroad, given the size of the country's spread shock.

Finally, we predict that the real effective exchange rate (REER) will rise by 40%, on average in 2022, given the country's spread shock. Assuming a 20% consumer price index (CPI) in Russia and 4% CPI abroad, we obtain that the growth of the nominal exchange rate (US dollar to ruble) may reach 63%, meaning that, absent capital controls, we may observe 122 rubles per one dollar, as an average in 2022.

DISCUSSION OF THE FORECASTS

Sanctions will no doubt generate a deep recession in the Russian economy. First, according to the Bloomberg forecast, the Russian GDP will fall by 9.6% in 2022 with a peak quarterly GDP decline reaching –15.7% of annual growth rates.[3] This survey-based forecast fairly accommodates our model's forecast. Russia's government bodies provide a less pessimistic forecast of a 6-8% decline.[4]

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3   See www.bloomberg.com/news/articles/2022-03-25/russia-seen-on-course-for-deep-two-year-recession-20-inflation.
4   See www.forecast.ru/_Archive/analitics/DB/foreparam2022.pdf%C2%A0and%C2%A0http://www.cbr.ru/statistics/ddkp/mo_br/.

The history of the last three decades shows that the Russian GDP was falling by up to 16% at the peak of the transformation crisis at the beginning of the 1990s, by 5% during the sovereign default crisis of 1998, by up to 9% during the global crisis in 2008, and by just 3% in the local crisis phase in 2014. Therefore, the currently predicted decline exceeds in magnitude all of those previously observed during normal crises and is comparable to the one during the most painful transformation crises.[5]

DEBATES ON THE EFFECTS OF POTENTIAL OIL (AND GAS) EMBARGO ON RUSSIA'S BALANCE OF PAYMENTS

Clearly, a potential embargo on oil and gas has not been 'priced' yet by the country's sovereign spread (Figure 3) and is thus not accounted for in our macroeconomic forecasts. In turn, Bachmann et al. (2022)'s estimates show that the German economy could lose only up to 3% of GDP in case of a full embargo on the import of Russian oil and gas. In turn, Chepeliev et al. (2022) argue that banning Russia's exports of fossil fuels will have overwhelming adverse impacts on the Russian economy. As Guriev and Itskhoki (2022) further suggest, this embargo could be "the fastest way to stop Putin's war in Ukraine." Although desirable, our draft calculations show that such an embargo would not necessarily undermine Russia's balance of payment because of the record-high prices on exported raw materials (even under discounts) and the imposed capital controls.

Let us clarify this important issue. In the pre-war year 2021, Russia enjoyed the current account surplus and record-high exports of $490 billion of which oil and gas products constitute only half, according to the official balance-of-payments data. In 2022, a potential oil embargo by the EU and US (50% of Russian oil export) and cutting of natural gas imports by the EU (70% of Russian exports) by two-thirds would decrease the exports by only one-fourth. The EU ban on imports of metals costs as little as €3 billion.[6] Restrictions on food, agricultural, and wood and paper exports implemented by Russia are of lower importance for the overall stability of external balance because they constitute less than 10% of total exports.[7] Under reasonable assumptions on import

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5   Of course, we need to treat the out-of-sample forecasting results obtained with our (S)VAR model with some caution because the size of the country spread shock is unprecedented and the model is simply not 'experienced' in this direction. A clear drawback in our forecasts is that corporate external debt is predicted to be completely shuttered by the beginning of the next year, which seems over-estimated. However, we stress that in the rest, the model delivers GDP forecasts that are fairly within the broader range of estimates born by economists around the world nowadays.
6   See https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1761
7   See https://rosstat.gov.ru/storage/mediabank/neW9Deg7/ts-exp.xls

dynamics,[8] which is expected to decline by almost two times, this yields around $200 billion of trade balance surplus in 2022,[9] roughly the same number as in 2021, i.e. before the war.[10,11]

OVERALL ASSESSMENT OF THE EFFECTS OF SANCTIONS

The war and the sanctions, even absent of a potential oil and gas embargo, are likely to produce one of the deepest economic crises in Russia over the last three decades, most comparable to the transformation crisis (1992) that followed the Soviet Union's collapse and possessing some features of the sovereign default crisis (1998). The Russian economy will nonetheless continue to rely on the existing export model which is hard to undermine. The population will struggle with the 'new poor' who will be appealing to the mechanisms of household adaptation to deep crises that had been widely employed in the 1990s (switching from to informal sector of the economy and turning to home production of food due to very high inflation, see Mamonov et al. 2021). As a negative unintended spillover effect, this will touch on not only the Russian population but, more broadly, a wide range of households in many developing countries across the globe (Artuc et al. 2022).

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8   See http://www.forecast.ru/_Archive/analitics/DB/foreparam2022.pdf
9   We do not know yet many parameters, for example how serious are the transportation problems of export deliveries, and by how much export prices will go up.
10 Recently, under the pre-war structure of export deliveries and world prices, for the two months of January and February 2022, Russia earned $39.2 billion in revenue on its current account
11 As of the current writing, we do not know yet the size of capital outflow in February and March 2022–probably, it was huge. Without the CBR's international reserves to sustain the balance of payments, the inflow of currency through the current account should exceed capital outflow through the financial account. Under no new debt issuances, capital outflow through the channel of Russia's net external debt payments in 2022 can be estimated as $70-80 billion. Of this, nonfinancial corporations amount to $25.6 billion per one-two quarters of 2022; roughly $50 billion per year plus $10 billion by banks and $10 billion by the government. Similar numbers are provided by CMASF (a pro-government think-tank in Moscow). Given the restrictions on ruble convertibility and cross-border money transfers and asset freezes, it is hard to expect further capital outflow through asset and foreign currency purchases. Therefore, capital outflow may be less than it would be without sanctions, and therefore under current regulation, the oil and gas embargo alone may be inefficient in stopping currency inflows and producing a balance of payment crisis in Russia.

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CHAPTER 12

The simple economics of a tariff on Russian energy imports

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13 April 2022

As Russia's invasion of Ukraine continues, EU policymakers are weighing more severe sanctions. At the centre of this debate is the question of whether to restrict imports of – or in the extreme case, embargo – Russian oil and gas. While many economists have focused on the effects of an embargo, Hausmann (2022) and others have argued that placing tariffs on imports from Russia instead may damage the Russian economy at much lower cost to the EU (Bachmann et al. 2022, Chaney et al. 2022, Chepeliev et al. 2022). However, the conversation about tariffs has not yet clarified a key question: Should the EU hold back from tariffs on Russian oil and gas because it depends on them?

A simple, supply-and-demand analysis of this question reveals a surprising answer. Unlike an embargo, tariffs can be designed without considering the EU's dependence on the goods in question. This is because (a) tariffs allow EU consumers to continue buying goods if they value them enough, and (b) while tariffs do raise costs for EU consumers, they also raise revenue for the EU central budget – which can be sent back to consumers.

What matters is therefore not how reliant the EU is on Russia, but rather how reliant Russia is on the EU, since this determines how much tariffs can move the pre-tariff price at which Russia sells to the EU. To the extent that Russia depends more on the EU as a buyer of, say, natural gas, than as a buyer of goods the EU has already embargoed, a gas tariff would make a more efficient sanction from the perspective of damaging the Russian economy at the least cost to the EU.

Below, I explain these ideas through a simple, two-country model of tariffs-as-sanctions based on Sturm (2022b). Although this basic model abstracts from many important features of the debate, its main lessons apply in general, as I will discuss.
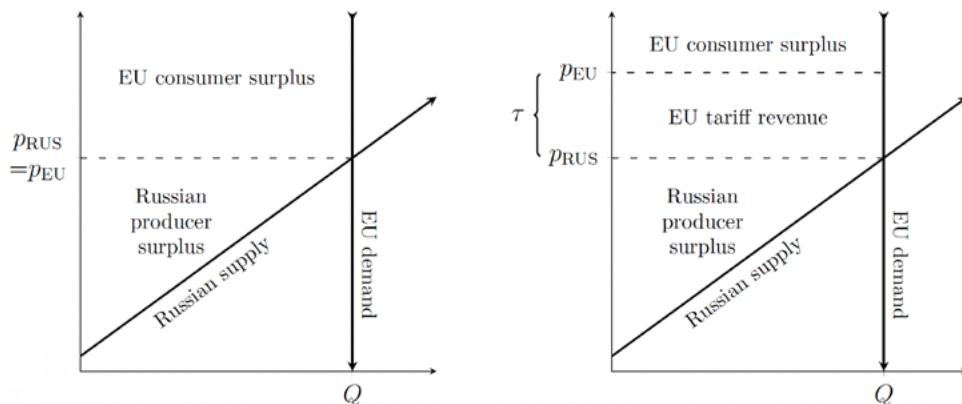
A SIMPLE MODEL OF TARIFF DESIGN

A helpful starting point is to consider the worst possible case for the EU: when EU consumers are so reliant on Russian imports that they are willing to buy them at any price. Intuitively, one might expect that tariffs are harmful to the EU in this case because EU consumers, unwilling to adjust the quantity they consume, will instead tolerate a large

price increase and pay the whole tariff. Figure 1 represents this case with a completely inelastic (vertical) demand curve. In the left panel, the EU engages in free trade, whereas in the right panel it imposes a tariff on Russian imports.

The diagram shows that, because EU demand is completely inelastic, Russian producers are paid the same price whether there is a tariff or not, while a tariff increase the price faced by EU consumers one for one. However, the EU consumer's loss is the EU central budget's gain: tariff revenues exactly offset the loss of consumer welfare from higher prices. To the extent the EU can redistribute these revenues back to consumers, it is equally well off with or without a tariff on Russian imports. Even in the worst case, a tariff on imports from Russia is therefore ineffective, but not harmful to the EU.

FIGURE 1   EU-RUSSIAN IMPORT MARKET IN THE CASE OF PERFECTLY INELASTIC EU DEMAND: TARIFF (LEFT PANEL AND NO TARIFF (RIGHT PANEL)
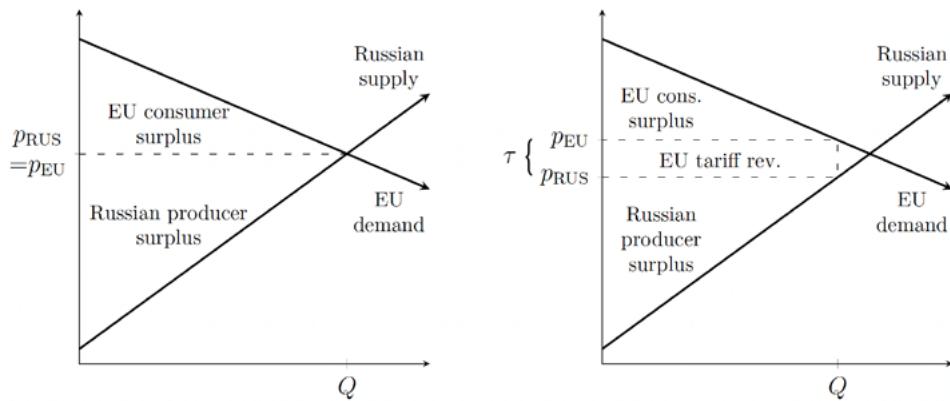
Away from the worst possible case for the EU, a tariff on imports from Russia can reduce Russian welfare while actually making the EU better off. To see why, suppose EU consumers are at least somewhat responsive to prices and consider a small increase in the EU's tariff starting from zero, shown in Figure 2. Although a tariff still increases the price paid by EU consumers, it now also pushes down the price received by Russian producers, who are willing to supply the smaller quantity that the EU demands under a tariff at a somewhat reduced price. Because the EU now trades with Russia at a lower pre-tariff price, the tax revenue collected from the tariff is *more than enough* to compensate consumers for higher prices, so the EU is better off than without a tariff.[1]

At the same time, Russia sells a lower quantity at a lower price, and so is unambiguously worse off.

1   An important practical consideration is how the EU can actually make these transfers. One approach would be to use temporary fiscal transfers to lower income households, who are more exposed to energy prices (Chaney et al. 2022).

**FIGURE 2   EU-RUSSIAN IMPORT MARKET IN THE CASE OF NON-EXTREME ELASTICITIES:
NO TARIFF (LEFT PANEL) AND SMALL TARIFF (RIGHT PANEL)**

SETTING THE 'OPTIMAL' TARIFF

A natural question is how far the EU should go in raising such tariffs. Should tariffs be just slightly above zero, large to the point where they effectively implement an embargo, or somewhere in between? In this simple model, the answer depends on one objective parameter – the shape of Russia's supply curve – and one political choice – the EU's willingness to trade off economic losses at home in exchange for dealing economic damage to Russia.

The shape of Russia's supply curve determines to what extent a tariff-induced reduction in EU demand for Russian imports pushes down the price Russian producers will accept, improving the EU's terms of trade. This effect is the most powerful when Russian supply is inelastic, for example because it struggles to find buyers on world markets.[2]

Meanwhile, the EU's 'willingness to pay' for economic damage to Russia determines whether it only values its own terms of trade appreciation or also values Russia's corresponding terms of trade depreciation. If this willingness to pay is high enough, then the EU's optimal tariff can be so large as to have the same effect as an embargo.

Notably, the EU's dependence on a good does not directly factor into the design of its optimal tariff (Johnson 1951, Sturm, 2022a).[3] This is because, unlike an embargo, a tariff does not actually prevent EU buyers from importing Russian goods, so those who depend on them can simply continue to buy them. It is true that EU buyers will face higher market prices, but higher prices for EU buyers also entail higher EU tariff revenues, which can be used to compensate the buyers. In contemplating tariffs on Russian

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2   Of course, our simple model does not have any 'world markets'. Sturm and Menzel (2022) consider tariffs as a sanction in a model where the 'rest of the world' is a third region trading with both the EU and Russia.
3   Technically, the EU's elasticity of demand can indirectly affect is optimal tariff if Russia's supply curve has a non-constant elasticity. In this case, the EU's elasticity of demand plays a role by determining at what point the supply curve is evaluated.

imports, policymakers should therefore shift their focus away from the EU's dependence on Russia as a seller, and instead target the goods for which Russia depends on the EU as a buyer. These are the goods whose Russian price the EU can most effectively depress by using tariffs to reduce its imports.

Oil and gas may well be such goods. In the case of oil, the current 30% spread between the prices of Urals (Russian) and Brent (North Sea) oil is direct evidence that trade reductions – in this case, embargoes of Russian tanker-based oil – can push down prices. In the case of gas, Russia may be even more dependent on the EU due to its reliance on pre-existing pipelines.

BEYOND THE COMPETITIVE, TWO-COUNTRY MODEL

Of course, the simple analysis above abstracts from many important features of the real world.For example, it is not only the EU who can impose trade taxes, but also Russia.[4]

Provided Russia does not adjust these taxes in retaliation for EU tariffs, they provide an additional motive for EU trade restrictions (Gros 2022, Sturm 2022b). However, the threat of Russian retaliation, if credible, serves as a disincentive to impose EU tariffs.

Another key factor is the role of world markets that the EU and Russia will turn to if tariffs restrict their bilateral trade. EU tariffs will shift the EU's demand towards other buyers, typically worsening the EU's terms of trade, but will also force Russia to incur similar costs. Unlike with Russia, the EU's reliance on a good can impact how changes in imports affect the EU's terms of trade on world markets, though only to the extent that EU demand moves world prices. Sturm and Menzel (2022) provide a simple test for when tariffs can still make the EU better off while hurting Russia.

Despite these complexities, the main message is clear. The EU's dependence on Russian energy imports is not an economically sound reason to hold back from imposing tariffs. Unlike a full energy embargo, small EU tariffs on Russian energy could weaken the Russian economy while at the same time making the EU better off. While larger tariffs will come at a cost to the EU, they are likely to be more efficient than other sanctions already in place.

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4   Indeed, Russia raises a substantial fraction of its federal budget through export taxes – for example, a 30% tax on gas exports – and the profits of state-owned energy companies.

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CHAPTER 13

Ukraine invasion: From oil sanctions to accelerating the energy transition

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1 April 2022

The war in Ukraine has triggered a debate in Europe and the US over the moral imperative to extend oil sanctions against Russia to help stop the invasion (van Bergeijk 2022, James et al. 2022). Estimates of the economic cost of oil sanctions on Europe are significant but appear manageable (Bachmann et al. 2022, Berner et al. 2022). Beyond their intended purpose to stop Putin's war of choice, oil sanctions provide a stepping stone to accelerate the energy transition. But for that, the focus should not just be on the supply side but also on the demand side of the energy transition.

In the short run, finding an alternative to Russia's oil and gas supplies is paramount for Europe. Prior to the start of the invasion, Russia, which controlled about 10% of global oil production, played an important role in the oil market including through its alignment with the Organization of Petroleum-Exporting Countries (OPEC). Following the invasion, the heightened geopolitical tensions from the war and talks about imposing sanctions on Russia's oil have sent prices to new highs. In turn, higher oil prices are negatively impacting the global economy.

To limit the increase in oil prices and fill the void that an interruption in energy supply from Russia could create, there have been insistent calls including by the G7 for OPEC and non-OPEC members to ramp up oil production. Specifically for natural gas, countries like Algeria, Qatar and Norway have been called to the rescue. While tapping into global supply of liquefied natural gas will help to alleviate the dependence of Europe on Russia's pipelined natural gas, issues related to the limited capacity to re-gasify natural gas have emerged.

Beside supply side considerations, the best way to respond to what are likely to be lasting sanctions is to reduce demand for oil and natural gas. That could be achieved by public campaigns to reduce consumption akin to the ones seen in Europe and the US during the energy crisis of the 1970s. To structurally reduce the demand for fossil fuels, Europe and the US must use the current crisis as an opportunity to accelerate the energy transition.

To date, however, most of the efforts toward the energy transition have relied on supply-side policies such as bans on investments in fossil fuels and the promotion of investments in renewable energies. These efforts toward the energy transition, as with the potential oil sanctions on Russia, could be derailed if not accompanied by commensurate efforts to stimulate demand for cleaner energies.

A one-sided approach relying on supply-side policies and occulting the demand-side lever is problematic. To see this, consider oil, which constitutes about a third of the global energy mix. The differential of price elasticity between supply and demand determines the relative effectiveness of policies targeting supply and demand. The supply of oil has become much more elastic. Indeed, the advent of shale oil production in the US has rendered the supply curve effectively flat. In contrast, demand for oil is rather inelastic at least in the short run. The long-run elasticity of oil supply could remain much greater than the elasticity of global demand, even when accounting for the advent of substitutes for oil in the transport sector. Without accompanying measure on the demand side, sanctioning Russia will result in higher prices which will stimulate oil production in other parts of the world much more than it will reduce oil consumption.

In this context, the most potent policies to achieve an accelerated but orderly energy transition will consist of policies to increase the elasticity of the demand side to accompany the shift in supply. Governments should thus pro-actively incentivise the switching of fuels including by subsidising the purchase of electric cars and supportive infrastructure such as charging stations. Protests and social tensions often flare up in the face of higher oil prices. The perceived political cost associated with higher energy prices has led politicians to often reverse their efforts, in turn favouring dirty fuels (Arezki et al. 2022). Without structurally enacting the demand-side lever, the energy transition will go through ebbs and flows, while the climate clock is ticking. Indeed, even as car manufacturers are producing more electric cars, they risk facing an abrupt demand slump on account of lack of available charging stations.

The absence of subsidies for modest households to acquire electric vehicles will limit the shift in demand and cultivate the perception that the transition is reserved for richer individuals. Norway has incentivised the purchase of electric cars by removing high taxes and fees that applies to conventional cars and has provided free and green charging infrastructure.[7] The Norwegian experience has been successful. In 2021, nine out of ten cars sold in Norway were electric ones. Norway remains a notable exception even so there are encouraging trends in China where two in ten cars sold were electric ones (Rystad Energy 2021).

Adjusting prices is necessary but will likely be insufficient to sustainably affect demand. The economists' solution to climate change is carbon pricing to account for the negative externality associated with the use of fossil fuels (van der Bremer and van der Ploeg 2021). But navigating the transition is complex and attention has shifted towards distributional issues (Klenert et al. 2020). While surveys point to a majority of citizens, especially in

advanced economies, supporting the struggle against climate change, there seems to be a sort of cognitive dissonance. Evidence also suggests that citizens are not ready to pay more for energy during the transition – at least in the short run (Bell et al. 2021). Revenues derived from carbon pricing could be redistributed to address distributional issues associated with carbon pricing. But it remains to be seen whether carbon pricing with redistribution will suffice to shape the demand side sustainably.

Subsidies for the purchase of electric cars will certainly be necessary as well as bold infrastructure investment to support the decarbonisation of transportation. Even if advances in technologies make the initial investment by households or firms profitable, that saving will not be felt immediately. That can create reluctance to purchase electric vehicles especially amongst the more modest households. Beyond electric vehicles, subsidies should support the purchase of energy saving devices such as heat pumps. These subsidies on the demand side would echo the effort on the supply side to promote decentralised power generation where users also become producers and more accepting of market-oriented solutions to the energy transition. For advanced economies, financing demand-side interventions in a progressive manner would surely lead to higher taxes. For households in developing countries including Africa, these interventions will require solidarity at the international level. Yet, if Europe and the US impose oil sanctions, accompanying measures on the demand side of the transition, not just on the supply side, must become central to any efforts to accelerate the energy transition.

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CHAPTER 14

How to solve Europe's Russian gas conundrum with a tariff

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30 March 2022

The search for additional sanctions is intensifying in view of the ongoing suffering of the civilian population in Ukraine under Russian bombardment of cities. One idea which is often discussed is for the EU, or individual Member States, to ban imports of Russian gas. The economic consequences of such a step would be very severe in the short run.[1] But there is another, more gradual way which would minimise economic disruptions and which would have a strong impact on the revenues flowing to Russia. The EU should simply impose a special import tariff on Russian gas.

Such a move would of course be against WTO rules. But under these special circumstances, it can be justified with the exemption under Article XXI for national security. Moreover, Russia has imposed for a long time an export tax of 30% on gas. The EU can claim that its import tariff just compensates for this distortion.[2]

The key point of departure is that Russian gas is provided to Europe by one supplier, Gazprom, with a near monopoly on exports of gas.[3] At the same time, the EU accounts for about 70 % of overall Russian pipeline gas exports (about 140 billion cubic metres). Other customers are unlikely to be able to compensate fully for the EU market. China takes already substantial amounts of gas from Russia and will not want to become dependent on Russia for its energy. As the biggest buyer, the EU has considerable 'monopsony power', but this has so far not been used.[4]

Standard economic analysis implies that Gazprom, as a monopolist, will not simply charge its marginal cost to European consumers, but will restrict its supplies to the point where its marginal cost equals the marginal revenue from the last cubic meter sold. This gives Gazprom a considerable monopoly rent (which flows ultimately into the coffers of the Russian government).

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1 For an estimate see Baqaee et al. (2022).
2 See Tarr (2004) for an economic analysis of Russia's dual pricing in the WTO context.
3 For Russian gas one thus cannot apply the usual models which assume that foreign supply is provided by competitive firms (e.g. Sturm 2022).
4 For the classic reference on monopsony power, see Johnson (1968) and Brander and Spencer (1984). Russia has some LNG export facilities, but they are close to being fully used and can thus not constitute a safety valve.

If the EU imposes a tariff, Gazprom will increase its price, but only by a fraction of the tariff because otherwise it would lose too much revenue. The tariff thus eats into the rent of Gazprom. Figure 1 in the annex shows the equilibrium resulting from a tariff. The welfare of European consumers thus suffers from higher prices, but the tariff revenue would be higher than their loss, at least up to a certain level of the tariff.

In Gros (2022b), I develop this standard formal analysis[5] further and show that there is a tariff rate which is optimal for the EU because it would maximise the difference between the tariff revenue and the losses of European consumers. In a simple linear model, the optimal tariff turns out to be roughly 30% (of today's price) – by chance equal to the Russian export tariff. Moreover, this tariff would cut Gazprom's revenues from sales to Europe by one half.

The optimal tariff argument thus implies that a tariff on imports of Russian gas would be appropriate even without having any intent to sanction. Such a tariff would thus have been appropriate already in the past. At present, the EU is searching for ways to reduce Russia's export revenues. This intent can be added to the analysis by assuming that the EU is willing to forego one euro of benefits for itself if this cuts Russia's export revenues by one euro. The result is then that the EU should impose a tariff of roughly 60% on imports of Russian gas.[6] This would then cut Gazprom's revenues to less than one fourth of today's level.

European consumers would of course suffer more under the higher, sanctioning tariff. But the model suggests that the tariff revenues would still be sufficient to compensate them because the higher tariff would also take away a larger proportion of the (remaining) rents of Gazprom.[7]

Sanctioning Russia via a high tariff on Gazprom's exports to the EU would thus represent the ultimate 'smart': it would severely diminish Russia's revenues and would impose no economic burden on the EU.

The political advantages of a tax on imports of gas from Russia are also clear.

First of all, it would counter, at least partly, the moral argument that, by importing gas from Russia, we are financing Russia's war of aggression. Those who still buy Russian gas would then also contribute to financing our reaction to this war and the tariff would provide them with a strong price signal to diversify over time. Those who have alternatives will do so immediately. The demand for Russian gas in Europe will fall, slowly at first, but at an accelerating rate.

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5   The model is based on Jones and Takemori (1989) who also discuss in detail what constellation of market segmentation would be required for a tariff to be possible.

6   This would be somewhat lower than the 'punitive' rate of 90 % suggested by Hausman (2022).

7   It is assumed here throughout that there is one integrated European market in this model. The price is the same for all countries, independently of whether they import their gas from Russia or sources (piped from Norway or Algeria, LNG from the Middle East). The impact of a higher gas price or a tariff on any individual member state thus does not depend on the amount of gas imported from Russia by that country, but only on its overall imports of gas.

Second, it would yield substantial revenues (which also play a key role in the economic analysis). At the present high global natural gas prices, a 30% tariff on the value of Russian gas could easily reach €30–50 billion (on an annual basis) at the level of the EU. This would allow the EU to provide assistance to vulnerable groups being hit by higher gas prices, further assistance to the Ukrainian government, and help to Member States to defray the costs of caring for the millions of refugees we must expect. If, as now unfortunately seems likely, 3–5 million Ukrainian have to seek shelter in the EU, the overall costs could also be in the order of dozens of billions of euros (counting over €10,000 per refugee for housing and living expenses).[8]

A further advantage of this approach is that it provides a strong long-term incentive for the private sector to seek other supplies. And these supplies would be forthcoming. If the EU makes it clear that the tariff is going to stay as long as Russia's aggression against Ukraine continues, other potential suppliers of gas around the world will take notice and start investing in finding new sources or exploit better existing ones. In Gros (2022b), I argue that in Asia there is considerable potential for energy savings and switching from gas to coal, thus liberating important quantities of LNG supplies for Europe.

One could of course object that Russia could react to the European import tariff by increasing its own export tariff. This might very well be the case. But Russia's export tariff is of little importance. It determines only the domestic price level for gas (see Tarr 2004 on the reasons why Russia wants to keep dual pricing). The lower that level, the more gas will be wasted inside Russia. Anyway, the domestic price level for gas inside Russia is fixed in roubles and has thus already gone down relative to the world market price level. The Russian export tariff has thus de facto already increased.

As an alternative to a tariff, it has been proposed to simply put a cap on the price European importers would be allowed to pay to Gazprom. But this would raise several issues.

First of all, it would not solve the problem that, for the European consumer, Russian gas should be more expensive than other gas. Moreover, even assuming that Russia accepts to deliver at a price fixed by the EU, at what price would/should the importers resell the gas to consumers?

Second, at what level should the price be fixed? At marginal cost, trying to appropriate the entire producer surplus? In this case, Russia would no longer have an incentive to deliver.

Third, if Russia continues to deliver (if the price has been fixed sufficiently above marginal cost), what quantity should the EU import?

A price cap does not solve the fundamental problem that Russian gas has become politically toxic in Europe; it should now also be made expensive.

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8   See OECD (2017) for estimates of the per capita cost of refugees in OECD countries between 10 and 20 thousand dollar.

Finally, one has to ask how Europe would achieve the aim of reducing gas imports from Russia without resorting to a tariff. The only alternative would be quantitative restrictions or outright orders to energy distribution companies not to buy Russian gas. The latter would be difficult to sustain from a legal point of view and the former would be equivalent to a tariff if the rights to import Russian gas are auctioned. If they are just distributed on political grounds this would result a massive distribution of rents. The European Commission has recently presented ideas how the EU could substitute about two-thirds of today's Russian gas imports 'well before 2030'. But the Commission document (European Commission 2022) describes only what sources could substitute Russian gas, not how or why private sector gas users should reduce their purchases of Russian gas.
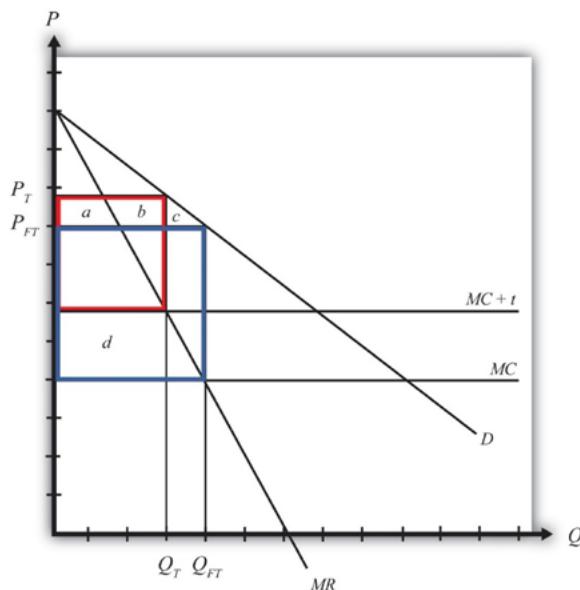
At any rate, one has to keep in mind that any reduction in Russian gas imports – whether achieved through quantitative restrictions, licensing or a tariff – implies the same increase in gas prices (unless gas is rationed). The main difference a tariff makes is that the link between the reduction of gas imports and higher prices becomes more transparent.

ANNEX

Diagrammatical textbook exposition

The figure below illustrates the linear case used in the text. MC denotes the marginal cost, D demand and MR is marginal revenue. QFT denotes the quantity imported under free trade, and QT the quantity imported with a tariff (or rate t).

FIGURE A1

Source: *International Trade: Theory and Policy*, section 9.6

Effect on importing country	
Consumer surplus	$-(a + b + c)$
Producer surplus	0
Govt. revenue	$+ d$
National welfare	$d - (a + b + c)$

The importing country gains if $d > a+b+c$, which will always be the case for a small tariff.

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CHAPTER 15

What if Germany is cut off from Russian energy?

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25 March 2022

How would the German economy cope with a sudden stop of energy imports from Russia, either triggered by a further tightening of the sanction regime or following a stop of energy deliveries by Russia? Germany imports about 60% of its energy (World Bank 2022), with import quotas of between 94% and 100% for oil, gas, and hard coal (Umweltbundesamt 2022). In 2021, the value of energy imports amounted to about €80 billion, or around 2% of GDP (Statistisches Bundesamt 2022b). About half of German imports of gas and hard coal, and about one-third of its oil imports, originate from Russia. Germany depends on Russia for about one-third of its total energy consumption (see Table 1).

In the German economy, gas is predominantly used by industry (36%), households (31%), and trade and commerce (13%) – in the case of the last two, predominantly for heating purposes (BDEW 2019, 2021). The usage of gas for electricity production is comparatively small. In manufacturing, about three-quarters of the gas is used for heating and cooling, as well as for material use. About one-third of industrial use comes from the chemical industry (Zukunft Gas 2022). About 75% of oil is used as gasoline and diesel fuel (Wissenschaftliche Dienste des Deutschen Bundestages 2019).

In a new paper (Bachmann et al. 2022), we combine the latest theoretical advances in multi-sectoral open-economy macroeconomics with an in-depth look at German energy usage and empirical estimates for elasticities of substitution to estimate the short-run costs. To estimate the macroeconomic effect, we build on a state-of-the-art multi-sector macro model with production networks based on work by Baqaae and Farhi (2021).

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TABLE 1   GERMAN PRIMARY ENERGY USAGE 2021

	Oil	Gas	Coal (lignite and hard coal)	Nuclear	Renewables	Other	Total
TWh	1077	905	606	209	545	45	3387
%	31.8	26.7	17.9	6.2	16.1	1.3	100
of which Russia	34%	55%[1]	26%	0%	0%	0%	30%

Notes: 1 in 2020 (already lower in 2021 and 2022).

Source: Agora Energiewende (2022); Eckert and Abnett (2022).

ENDING GERMAN DEPENDENCY ON RUSSIAN ENERGY

If Germany is cut off from Russian energy imports, it will need to compensate either through alternative supply sources, fuel shifting and economic reallocation, or demand reduction. The different channels are likely to be of different importance over the short and long term. In the short run, a stop of imports from Russia has to be compensated through alternative energy sources from other countries and domestic sources to meet electricity, transport, heating, and industrial demand, or through substituting energy-intense production of certain products by direct imports. In the medium and long term, increased use of renewable energy and energy efficiency improvements can contribute significantly to lowering fossil energy demand.

To start with, substituting Russian imports of oil and coal will likely not pose a major problem. Sufficient world market capacity exists from other oil- and coal-exporting countries to make up the shortfall. The greater challenge is to find short-run substitutes for Russian gas, which accounts for about 15% of Germany's total energy consumption. Owing to the existing pipeline network and limited terminal capacities, a short-term substitution via LNG is challenging, while raising pipeline imports from other countries is also subject to limitations.

Germany's imports of Russian gas already decreased substantially in the second half of 2021 and especially in the first months of 2022. In the EU, the share of Russian imports of gas fell from about 40% to 20–30% (McWilliams et al. 2021). LNG imports in Europe surpassed imports from Russia, although capacity for further increases of LNG imports is limited (Rashad and Binnie 2022). Taken together, the current available evidence suggests that other gas producers will only be partially able to make up the shortfall from Russia. Substitution and reallocation will thus be crucial.

To construct a plausible size for the shock to the German economy, we make the assumption that the result of a Russian energy embargo will be a reduction of gas deliveries of 30%, or about 8% of total German energy consumption. This will have to be borne by domestic industry, households, and services. While some part of this gap can potentially be closed by filling reserves over the summer when heating demand from households is low without hurting industrial usage, our baseline assumption is that in the short run the Germany economy would be forced to adjust to such a shock. What would be the economic effects?

MACROECONOMIC EFFECTS

As our workhouse model, we rely on a state-of-the-art multi-sector macro model with production networks based on Baqaae and Farhi (2021) to estimate the economic costs for the German economy of stopping Russian energy imports. The size of economic losses depends crucially on the time frame over which adjustments take place. It is implausible to assume that even in the short run the elasticity of substitution is zero. Producers and households will always be able to switch to other inputs to some extent, change their consumption baskets, or import energy, especially gas, or products with high energy content that can be transported in bulk. In the estimated model, for low elasticities of substitution, the Baqaee-Farhi multi-sector model predicts modest losses equivalent to 0.2–0.3% of German GDP (see Table 2).

TABLE 2

	Baqaee-Farhi (2021), full model	Simplified model, 10% oil, gas coal shock	Simplified model, 30% gas shock
GDP (%)	0.2-0.3	1.3	2.2
GNE (%)	0.2-0.3	1.5	2.3
Cost per citizen (€)	80-100	500-700	800-1000

The macroeconomic effects of cutting Germany off from Russian energy depend highly on the extent to which the production structure can adjust to the reduction of fossil energy and on how substitutable imports from Russia are by imports from other suppliers. In the very short run, this substitutability is of course limited. Electricity production can adjust quickly and at relatively low cost, while replacing the material use of gas, for instance, will be more difficult or even impossible.

We acknowledge that the uncertainty surrounding elasticities of substitution could be large. To derive a plausible upper bound of the costs, we complement our calculations from the rich multi-sector model with an analysis of a simpler model. We discipline these estimates with empirical elasticities found in the literature for industrial energy usage on
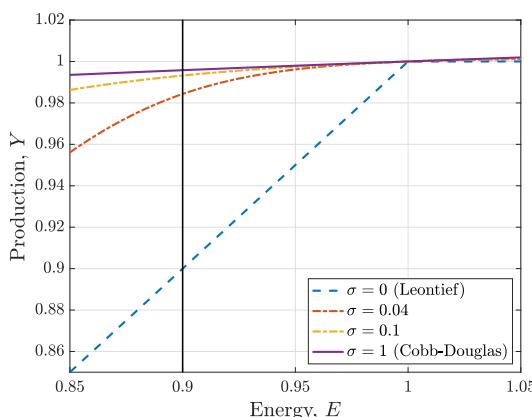
4-digit Standard Industrial Classification (SIC) level (Steinbuks 2012). Similar estimates are found for short-run residential demand for natural gas (Auffhammer and Rubin 2018) and they also lie in the middle of the estimates for short-run demand elasticities across a large set of studies (Labandeira et al. 2017).

In the first exercise, we calculate the effects of an 8% aggregate reduction in overall German energy use. In the second scenario, we model a 30% reduction in gas inputs as a shock to that specific energy source. Assuming very low short-run substitution elasticities, an 8% energy adjustment to oil, gas, and coal consumption leads to a 1.4% GDP loss, or costs of €500–700 per year per German citizen. In a last scenario where we model a more extreme 30% adjustment in gas usage, the economic losses rise to 2.2% of GDP (2.3% of GNE), equivalent to up to €1,000 per year per citizen – an order of magnitude higher than the 0.2–0.3% (or €80–120 per citizen) implied by the Baqaee-Farhi model.

It is important to stress that the model we use is a real model with no further business cycle amplification. Such amplifications are possible if monetary and fiscal policy do not counter the effects of nominal rigidities on the economy. On the monetary side, a firm commitment to stable prices can soften the potential trade-off between stabilising output and inflation. At the same time, fiscal policy needs to – and can, through insurance mechanisms like short-term work – take care of second-round demand effects. To account for potential amplification, as a pessimistic scenario we approximate a number of a 3% output shock, hence a rate of contraction that is 30% greater than in the estimated model.

The reason why the overall effects across different scenarios are substantial but remain in a manageable range and lower than the output drop during the Covid-19 pandemic (-4.5%) is that, even with low elasticities, the effects are buffered by some substitution. Put differently, only in a scenario where no substitution is possible at all will the output cost rise above the range described in our study. The empirical evidence on fuel switching in industry and household adjustment to higher fuel prices strongly argues against such a view of a Leontieff production function, as shown in Figure 1.

FIGURE 1 OUTPUT LOSSES FOLLOWING A FALL IN ENERGY SUPPLY FOR DIFFERENT ELASTICITIES OF SUBSTITUTION

POLICY IMPLICATIONS

The overall economic costs can be affected by targeted policy measures and their timing. Such policy measures should include:Incentives to substitute: Policy measures should aim at strategically increasing incentives to substitute and save fossil energies as soon as possible even if an embargo is not imminent. Taking action immediately would avoid even harsher adjustments later this year or in 2023 should push come to shove.

- **Insurance schemes delay adjustments**: Existing insurance schemes (e.g. emergency rationing plans for gas to favour households, expected bail outs for affected industries) tend to lull decision makers in industry and households into not fully internalising the potential costs of delaying their adjustments. They might be induced to gamble on a no-embargo scenario with a normalisation of energy prices. This, in turn, might severely limit political options to strengthen the sanctions regime down the road.

- **Early adjustments**: If an embargo of Russian energy turns into a political necessity in the short run, such action has the lowest economic costs if it is taken as early as possible. The main reason is the seasonality of gas demand. A cut-off from Russian gas over the summer months could be substituted from Norwegian and other sources, keeping industrial supply going. An early move would immediately trigger the substitution and reallocation dynamics that are central to reducing economic costs.

- **Commitment to extended periods of higher fossil prices**: Governments should commit to elevated fossil energy prices for an extended period even if no embargo is realised. This could include, for example, some sort of 'energy security levy' on natural gas. It also means that there should be a firm commitment to climate policy-driven increases in energy prices.

- **Better energy infrastructure**: Given the higher costs of adjustment in the short run compared to the long run, it makes a difference if an LNG terminal is ready by autumn 2023 or 2026. Government subsidies and contracts should therefore create clear incentives here as well, providing substantially higher payments for early completion. This includes encouraging private investors to privately assume risks, such as when Tesla builds a factory without all constructions being finally approved by the public authorities.

- **Buffering consequences for poor households**: A persistent increase in energy prices would have implications for households as well as industry. While power shortages or cold homes are highly unlikely, rising energy prices will be felt acutely. One concrete remedy would be to (artificially) rebate increased gas, oil, and electricity prices through lump-sum payments that could ease the adjustment burden for low-income households.

CONCLUSION

Contrary to fears frequently voiced in the German public debate, substitution and reallocation would likely keep the economic costs of a Russian energy embargo below 3% of GDP – probably closer to the 2% mark. There is no doubt that these are substantial economic costs, but at the same time, they are clearly manageable in the sense that the German economy has weathered deeper slumps in recent years and recovered quickly. Both after 2009 and 2020, the economy and the polity overcame larger GDP declines. Public fear-mongering about the catastrophic consequences of an energy embargo from lobby groups and affiliated think tanks does not hold up to academic standards.

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CHAPTER 16

Cutting Russia's fossil fuel exports: Short-term pain for long-term gain

**Maksym Chepeliev, Thomas Hertel and Dominique van der Mensbrugghe**
Purdue University
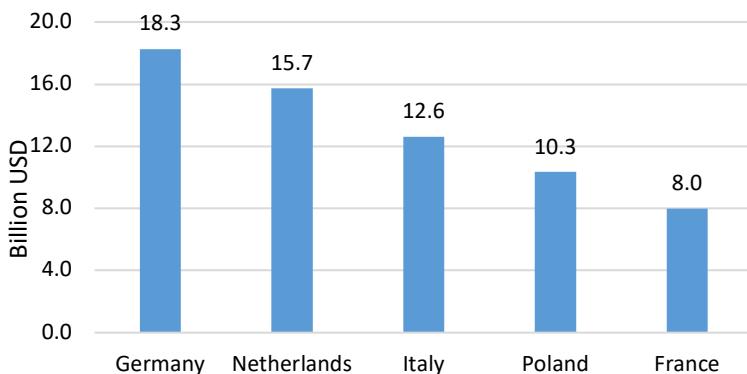
9 March 2022

On 24 February, Russia launched an unprovoked attack on Ukraine, invading its territory on multiple fronts, including from neighbouring Belarus. As the entire Ukrainian nation has entered a fight for democracy and the country's independence, most of the countries of the OECD, including the US, Australia, Canada, South Korea, Japan, the UK and the EU, have announced punishing sanctions against Russia. These include restrictions on financial transactions, freezing assets of Russia's major banks and selected individuals, banning exports of high-tech equipment to Russia, as well as closing the airspace for Russian flights. Notably absent at the time of writing this column is one of the most painful items for the Russian economy – restrictions on the export of fossil fuels. This is the country's primary source of foreign exchange.

This exception is hardly surprising. During 2019, the EU and UK imported over US$118 billion worth of fossil fuels from Russia, with Germany, Netherlands (largely re-exports), Italy, Poland and France among the top destinations (Figure 1). During earlier periods with higher energy prices, the corresponding import flow was even larger. Indeed, the value of this import flow exceeded $181 billion in 2014.

FIGURE 1   VALUE OF FOSSIL-FUEL IMPORTS FROM RUSSIA DURING 2019 (SELECTED COUNTRIES)

Note: Due to instability in the 2021 trade data, we have opted to report these data for 2019 instead.

Based on Eurostat data,[1] the share of EU's imports from Russia ranges from 26.9% for crude oil to 41.1% and 46.7% for natural gas and solid fuels, respectively.

The EU27 and UK together account for over 63% of Russia's fossil fuel exports and, when combined with selected other countries that have imposed sanctions against Russia, such as the US, Turkey and Japan, the share of Russia exports increases to 80%.

If these revenue flows were to be cut off, this could have a tremendous impact on the Russian economy, which relies heavily on energy exports for financing its government budget, as well as supporting its military operations. At the same time, such an embargo would also hurt the EU economy and other energy importers imposing import restrictions. Some believe that such adverse implications could be substantial, thus preventing policymakers from considering this step. But apart from the pure financial aspect there is another dimension at stake – environmental quality.

The recently announced the EU Green Deal sets ambitious mitigation goals and establishes a target of reducing greenhouse gas emissions by 55% by 2030 relative to the 1990 level. To reach this goal, a major reduction in fossil fuel consumption will need to take place in the coming years. This enhancement in mitigation ambition could be achieved through a mix of mechanisms and policy measures, including carbon pricing, energy taxes, energy efficiency improvements or changes in behavioural patterns. Restrictions on the imports of fossil fuels from Russia adds another option to this list, which could allow the EU to achieve additional reductions in greenhouse gas and air pollutant emissions, as well as reduce energy dependence. But the question is at what cost?

A POTENTIAL SCENARIO OF RAPID IMPORT REDUCTION

To answer this question, in a recent paper (Chepeliev et al 2022) we use a state-of-the-art global computable general equilibrium model – ENVISAGE (van der Mensbrugghe 2019).[2] We first develop a baseline scenario of macroeconomic, energy, and emission profiles that is based on the continuation of current trends until 2030.[3] We then simulate a scenario whereby the EU and other high-income countries[4] impose restrictions on imports of fossil fuels from Russia starting from 2022. These restrictions are implemented in a form of tariff barriers that increase over time and cover natural gas, crude oil, coal,

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1   https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-2c.html
2   The global economy in the model is represented by the following countries and regions: China, Indonesia, Philippines, India, Russia, Turkey, Egypt, Morocco, Brazil, United States, EU27, Rest of East Asia and Pacific, Rest of South Asia, Rest of Europe and Central Asia, Rest of Middle East and North Africa, Rest of Sub-Saharan Africa, Rest of Latin America and Caribbean, High-income Asia, Rest of High-income countries. A key data input to the model is the GTAP-Power 10 Data Base (Chepeliev 2020). The economy of each region is divided into 36 economic activities.
3   To represent GDP growth rates by countries we rely on the World Economic Outlook 2021 (IMF 2021) forecast to 2026 and the Shared Socioeconomic Pathways Database SSP2 scenario post-2026 (Riahi et al. 2017).
4   We assume that restrictions are imposed by the following countries and regions: EU27, United Kingdom, United States of America, Turkey, Canada, Japan, Australia, New Zealand, South Korea, Honk Kong, Taiwan, Singapore, Switzerland, Norway, Iceland, and Liechtenstein.
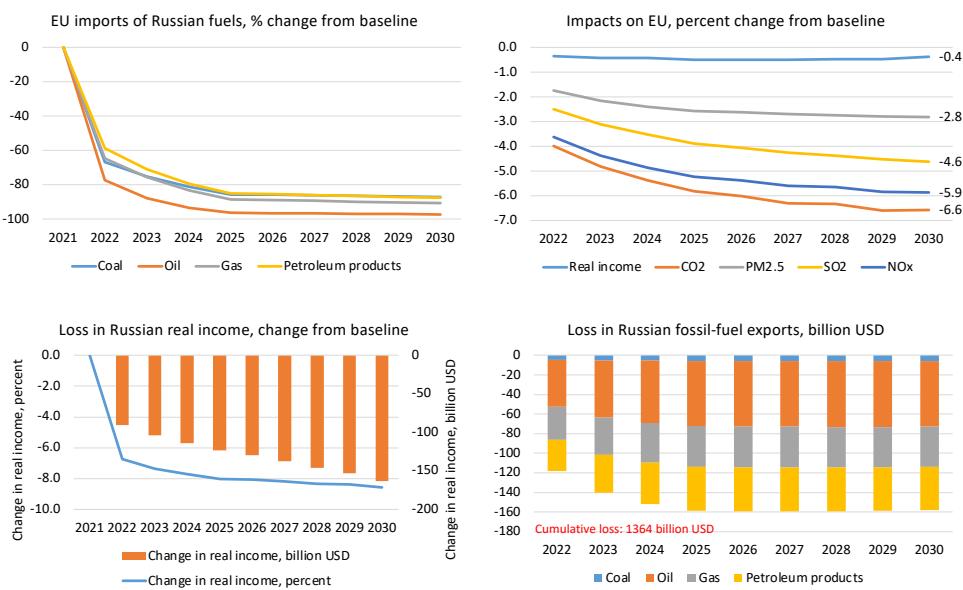
and petroleum products. While our model estimates the impacts for all represented countries and regions of the world, here we focus on the EU27, as this region accounts for over 54% of total Russian fossil fuel exports (UN 2022). The predicted reduction in imports of fossil fuels by the EU ranges from 59% to 77% in 2022 and reaches 80-90% in 2024 (relative to the baseline).

We find that such restrictions could come at a very modest long-run cost to the EU. The cumulative reduction in real income is less than 0.4% in 2030. This translates into a slowdown in the income growth rate of only 0.04% per year – instead of growing at 2.18% per year, the EU's real income would be growing at 2.14% per year over the period 2022-2030.

At the same time, we find substantial environmental co-benefits of such a move. CO_2 emissions drop by 4% in 2022 and the reduction reaches 6.6% in 2030 compared to the baseline. We also find major health co-benefits that come from reductions in the air pollutant emissions, such as fine particulate matter (PM2.5), sulphur dioxide (SO_2) and nitrous oxide (NO_X). The decline in emissions of these substances ranges from 2.4% to 4.9% in 2024. During 2019 alone, at least 178,000 premature deaths could have been avoided if all EU Member States had reached the World Health Organization's new air quality guideline (EEA 2022). Achieving such emission reductions would be a major contributor to reducing premature mortality in the region.

FIGURE 2   IMPACTS OF RESTRICTIONS OF RUSSIAN FOSSIL FUEL EXPORTS BY THE EU AND OTHER OECD COUNTRIES ON THE ECONOMIES OF RUSSIA AND THE EU

Notes: Estimated by authors using ENVISAGE model. All changes are reported relative to the baseline scenario.

By contrast, such a move would be a major burden on the Russian economy, slowing economic growth, reducing government budget revenues, and substantially decreasing the country's ability to finance military operations. The immediate reduction in real income would be almost 6.7% relative to baseline (in 2022) and would reach 8.6% percent by 2030.[5] Our estimates also suggest that by 2030 the cumulative loss in real income for Russia would exceed $1.1 trillion, while cumulative export revenue losses from reductions in fossil fuel exports would amount to almost $1.4 trillion.

SHORT-TERM RISKS FOR THE EU

The Russian invasion of Ukraine has already put significant pressure on global energy markets. Brent crude oil prices have been pushed well over $110 per barrel – levels that have not been seen since 2012.[6] To address these significant market and supply disruptions, International Energy Agency member countries have committed to release 60 billion barrels of crude oil from strategic reserves,[7] but the pressure on gasoline prices continues to mount. The natural gas price on the Dutch TTTF Gas Futures has increased by over 90% relative to pre-war levels,[8] adversely impacting the residential and industrial users in the EU. Further major restrictions on Russian energy exports, coupled with limited opportunities to switch energy suppliers in the short run, could place a further burden on consumers. In the results discussed so far, we have focused on the medium- and long-term impacts of fossil fuel import restrictions, but have not addressed the more immediate risks of such a move.

To account for the potential short-term implications of banning Russian fossil fuel imports, we explore a set of sensitivity scenarios, where we limit the trade substitution possibilities and impose more substantial restrictions on fossil fuel imports from Russia.[9] The predicted reduction in imports of fossil fuels by the EU ranges between 80% and 99%. Under such scenarios, real income in the EU decreases by 0.7-1.7% relative to the reference case, while energy prices for EU households on average increase by 8.3-11.1%.

The magnitude of the short-term impacts would largely depend on the reaction of OPEC, which could alter production plans to compensate for the lost Russian share of global supply. But even if OPEC and other energy exporters proceed with an output increase, it will likely take some time for EU to adjust the supply routes and substitute import sources.

5   Though it is still relatively early in the conflict, analysts are adjusting their 2022 forecasts for the Russian economy. For example, Oxford Economics has a scenario with a contraction of 3.1% in 2022 (https://blog.oxfordeconomics.com/content/a-darker-economic-scenario-from-russias-war). Goldman Sachs is projecting Russian GDP to decline by 7% in 2022 (https://www.ft.com/content/47121812-621a-404a-b60f-e2a7f62c5236).
6   https://www.cnbc.com/quotes/@LCO.1
7   https://www.iea.org/news/iea-member-countries-to-make-60-million-barrels-of-oil-available-following-russia-s-invasion-of-ukraine
8   https://www.theice.com/products/27996665/Dutch-TTF-Gas-Futures/data?marketId=5360399&span=1
9   To represent these scenarios, we use a static version of the ENVISAGE model with the trade elasticities reduced by half.

THE BOTTOM LINE

The immediate impacts (during the first few months) of restrictions on Russia's fossil fuel exports are likely to be non-trivial. EU households' real income could drop by 0.7-1.7% (relative to the reference case), with energy prices growing by 8.3-11.1%. On average, the poorest EU households spend 11.3% of their income on energy and transport fuels (European Commission 2020). This share substantially varies across countries, being as low as 6% in Sweden and exceeding 23% in Slovakia. Addressing the adverse impacts will require additional adaptation and diversification efforts from EU member states and implementing policies that reduce the economic burden on the most vulnerable. Note that we are focusing here on the markets for fossil fuels. However, the economic impacts of the conflict are likely to be more extensive – notably on the market for cereals and fertilizers, that will have ripple effects on global food security, as well as spillovers from the significant and multiple sanctions placed on the Russian economy.[10]

At the same time, in the medium and long run, such restrictions could come at a modest cost for the EU economy, resulting in substantial environmental co-benefits through reductions in CO_2 and air pollutant emissions. These mitigation costs are comparable to – and likely lower than – further increases in the EU Emissions Trading Scheme (ETS) carbon pricing.

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10 See for example Krugman in the *New York Times* (www.nytimes.com/2022/03/04/opinion/russia-ukraine-sanctions-economy.html?referringSource=articleShare).

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SECTION II: THE IMPACT OF THE WAR ON WORLD TRADE AND SUPPLY CHAINS

CHAPTER 17

Implications of Russia's invasion of Ukraine for its value chains

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11 May 2022

The war in Ukraine is having far-reaching economic consequences for the country's economy and human capital with spillovers of regional and global reach, notably through trade and finance links (Angris et al. 2022, Federle et al. 2022). Several researchers have begun to quantify the costs of trade restrictions vis-à-vis Russia for other countries (Langot et al. 2022, Chepeliev et al. 2022). In our recent analysis (Winkler et al. 2022), we study how Russia's invasion of Ukraine affects global value chain (GVC) risks related to trade disruptions and highlight the vulnerability of countries reliant on Russia as an exporter of commodity inputs.

WHAT IS RUSSIA'S ROLE IN GLOBAL VALUE CHAINS?

Russia's role as a major supplier of commodities places it at the foundation of a wide array of global production. Russia is especially important as an exporter of primary and intermediate goods and services used in other countries' exports at an early stage of production. This is indicated by Russia's position in global GVCs, which is marked by high forward GVC participation (or 'upstreamness'). The commodities that drive this upstream link into GVCs are energy (coke and petroleum), metals, and chemicals, as well as transport and certain business services (Figure 1, left panel). By contrast, Russia is far less important as a 'buyer' in GVCs, relying less on imported inputs to produce its exports (backward GVC participation).
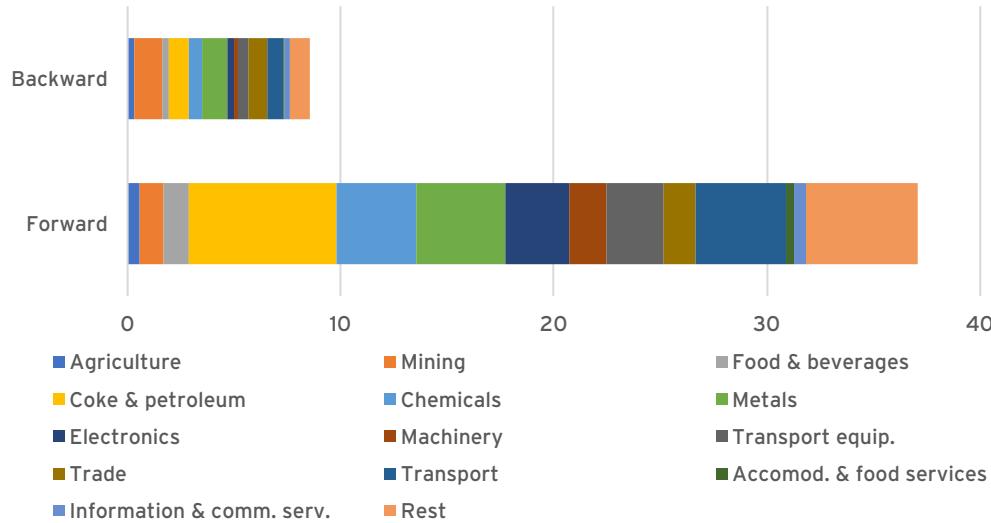
Disruptions of Russia's exports will feed into GVCs via major global production hubs for trade and will especially affect regional economies that are highly dependent on these supplies. While virtually all GVCs are affected by rising energy prices, GVCs that are especially reliant on metals and fertilizer inputs from Russia for their export production include transport equipment, machinery, electronics, and agribusiness, as well as supporting services including transport and business services (Figure 2). The GVC production hubs of China (and to a lesser extent Japan and South Korea), Germany

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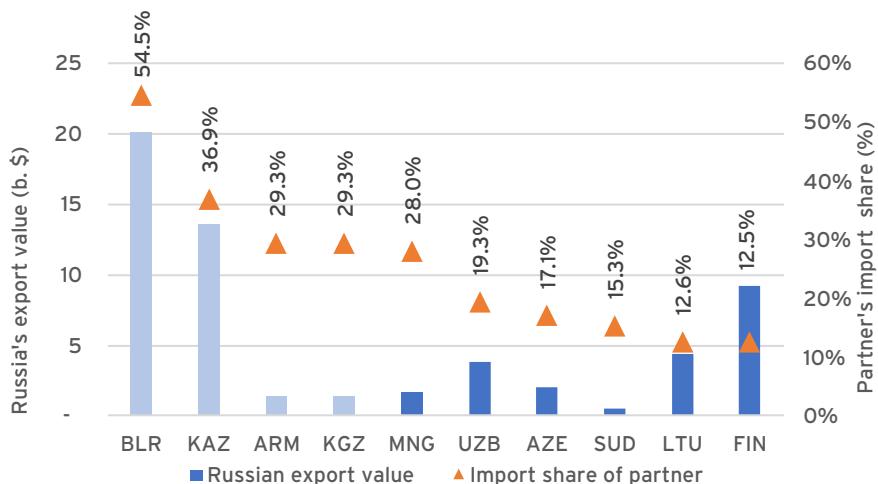
(and other Western European countries), and the US are among Russia's largest trade partners, both as importers of Russian commodity inputs and as exporters of GVC goods. However, the countries that are most dependent on exports from Russia, and thus particularly vulnerable to such trade disruption, are neighbouring and regional economies (Figure 1, right panel).

FIGURE 1   RUSSIA'S FORWARD AND BACKWARD GVC PARTICIPATION AND TEN MOST DEPENDENT MARKETS ON IMPORTS FROM RUSSIA

a) GVC participation 2018, sectoral decomposition

- Agriculture
- Mining
- Food & beverages
- Coke & petroleum
- Chemicals
- Metals
- Electronics
- Machinery
- Transport equip.
- Trade
- Transport
- Accomod. & food services
- Information & comm. serv.
- Rest

b) Ten most dependent markets on imports imports from Russia

Source: Own computations. Data: OECD-WTO TiVA 2021 release (left panel) and UN Comtrade (right panel).

Note: Forward GVC participation = Domestic value added embodied in third country exports (% of exports). Backward GVC participation = imported inputs in exports (% of exports). Mirror data for exports used. Bright blue bars = Eurasian Economic Union countries.

WHAT ARE THE GVC RISK FACTORS AND CHANNELS?

As a major commodity exporter, disruptions of trade with Russia have a global impact through price hikes, notably of energy goods, which affect transportation costs and virtually all GVCs. Globally, supply constraints and price hikes are being felt, notably for wheat, corn, and vegetable oils (which has led several countries to restrict their own exports of such goods), fertilizers, metals, and energy commodities (Ruta et al. 2022). Logistics disruptions, inflated freight prices, and longer delays affect trade and transit flows between Russia and Europe but also between East Asia and Europe (Arvis et al. 2022).

Power relations also matter, with certain GVCs consisting of many competing suppliers globally (e.g. apparel), while in others global suppliers have large market power (e.g. semiconductors). For example, pig iron exports are dominated by three countries (Russia, Brazil, and Ukraine), together accounting for over three-quarters of global exports. Hence, replacing pig iron imports from Russia will be more difficult than products for which the global market is less concentrated.

In essence, while a country's GVC risk depends largely on its direct trade links with Russia, GVCs reliant on products that have fewer substitutes will be affected more severely. The substitutability of inputs from Russia also depends on whether products are differentiated or homogeneous. Several of Russia's key export products (e.g. rare metals) are difficult to replace in the short run, suggesting a severe impact on GVCs.

WHICH COUNTRIES AND VALUE CHAINS ARE MOST DEPENDENT?

Russia is a key exporter of several goods with few substitutes, including metals (with dependence on direct trade links highest for countries in the Europe and Central Asia, or ECA, region) and fertilizers (with high dependence of both regional and global markets), and also extends to services supporting those exports. Regionally close countries are particularly dependent on Russia as a trade partner. Examples of high regional dependence include imports of cereals and fertilizer from Russia, metals (nickel and iron and steel), wood products, and mechanical goods and vehicles (especially to the Eurasian Economic Union countries).

FIGURE 2   RUSSIA AS A SELLER, KEY SECTORS AND PRODUCTS, AND IMPLICATIONS FOR GVCS AND TRADE PARTNERS

Russia as a seller				
Sector	Key Products	Key Global / Regional Value Chains	Largest direct partners	Most dependent partners
Metals	Palladium	Transp. equipment (catalytic converters)	USA, JPN, DEU, CHN, ITA	CAN, JPN, USA, ITA, KOR
	Iron and steel	Transport equipment, machinery	TUR, USA, BLR, ITA, BEL	KAZ, BLR, KGZ, AZE, UZB
	Copper, aluminum	Electronics, trans. equip, machinery	CHN, DEU, TUR, JPN, USA	BLR, KAZ, ARM, UZB, AZE
	Nickel	Metal (alloying), auto (batteries), electronic	CHN, FIN, DEU, NLD, USA	FIN, BLR, UKR, LVA, MDA
Chemicals	Fertilizers	Agribusiness	BRA, USA, CHN, IND, MEX	MNG, BLR, AZE, KAZ, MDA
Electronics	Cell phones, receivers, etc.	Electronics	BLR, KAZ, AZE, CHN, GEO	BLR, ARM, GEO, TJK, KAZ
Transport Equipment	Metal, auto parts	Transport equipment, machinery	CHN, FIN, DEU, NLD, USA	FIN, BLR, UKR, LVA, MDA
Services	Transport, business serv.	Business services, agribus., transport	DEU, NLD, JPN, AUT, USA, FIN	LIT, LVA, EST, SLV, FIN

Source: Own compilation.

Note: Based on analysis in Winkler et al. (2022).

A critical exporter of (rare) metals, several countries, especially in ECA, imported above 90% of certain iron and steel, aluminium, copper, nickel, and palladium goods from Russia. Over half of Russia's metal exports over the period 2018–20 were of iron and steel. For instance, Denmark and Belgium depend on Russia for over 80% of their imports of semi-finished iron and non-alloy steel. Exports of unwrought aluminium largely reach the Commonwealth of Independent States, with shares above 90%. Both products are used in a range of manufacturing activities, including power, construction, consumer electronics, and transportation/vehicles.

Russia's exports of fertilizers are important in both global and regional markets. Kazakhstan is the third largest buyer of Russia's chemical exports and eight of the top ten most dependent markets on Russian chemicals imports are ECA countries. Almost half of Russia's chemical exports consist of fertilizers. Belarus, Mongolia, and Moldova import over two-thirds of their fertilizers from Russia, while for Honduras and the Central African Republic the share is over half.

WHAT IS THE ROLE FOR POLICY?

The trade disruptions resulting from Russia's invasion of Ukraine have revealed the vulnerabilities of firms and countries relying on concentrated suppliers for their imports. Russia's upstream position as an exporter of energy, metals, chemicals, as well as transport and business services, most severely affects its regional neighbours as well as global trade partners with limited substitutes. New survey results show that German industrial firms

would find it difficult or not economically viable to replace their inputs sourced from Russia, Ukraine, or Belarus in the short term.[2] In the longer term, firms and government policies should focus on strengthening supply chain resilience to idiosyncratic shocks, for instance, by diversifying firms' global supplier base or by becoming less dependent on production processes using conventional energy sources.

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2   See https://www.ifo.de/en/node/69417

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CHAPTER 18

How the war in Ukraine may reshape globalisation

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5 May 2022

The war in Ukraine exposes once more the risks associated with the interconnected nature of global trade. The reliance on foreign input producers can lead to the disruption of production when source countries experience a negative shock, such as a war that leads to economic sanctions. Several observers argue that firms will respond to this shock – and the geopolitical tensions it triggered – by reconsidering the balance between efficiency and security, leading to long-term changes in the structure of global value chains (GVCs) in the form of reshoring or nearshoring (e.g. Posen 2022). Similar to the debate on the long-term consequences of Covid-19 (Javorcik 2020, Kilic and Marin 2020, Lund et al. 2020), the recurring question is whether these shocks will lead to the corrosion or even the end of globalisation.
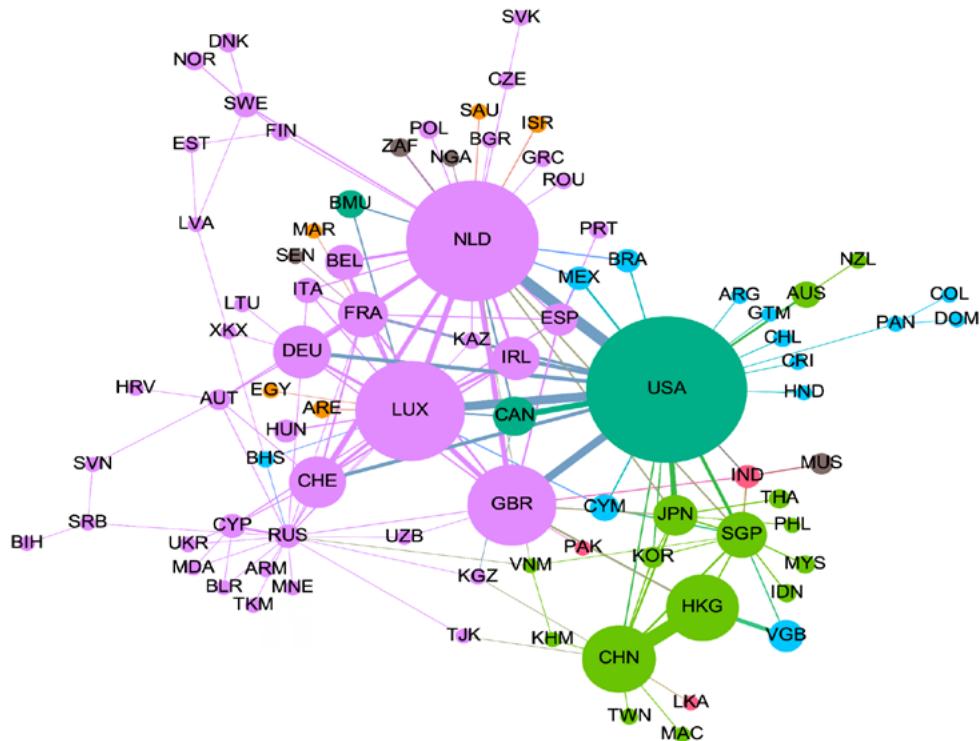
In recent work (Ruta 2022), I use a simple framework to gain some insights on the long-term effects of the war in Ukraine on global value chains. The upshot is twofold. As geopolitical risks have increased in several countries, firms may respond to the shock by revising the structure of their supply chains. This reorganisation away from countries perceived as riskier will affect different sectors and products differently. But the same technological and economic factors that have underpinned the international fragmentation of production in recent decades make a reversal of global value chains unlikely, unless policies radically change.

CHANGING GEOPOLITICAL RISKS

The war has direct effects on the firms operating in Russia and Ukraine and on firms relying on suppliers from those markets (Winkler et al. 2022). But the shock caused by the war goes well beyond these two countries, as geopolitical risks have increased globally. The global Geopolitical Risk Index[2] (Caldara and Iacoviello 2022) has more than doubled since the beginning of the year, reaching levels not seen since the outset of the

war in Iraq in March 2003. The data also show substantial changes in geopolitical risks in several economies that are more integrated than Russia and Ukraine in global value chains, including China, Finland, Sweden, Taiwan, among others, pointing to changing perceptions on the risks of future conflicts and sanctions (Figure 1).

FIGURE 1   THE GLOBAL NETWORK OF FOREIGN DIRECT INVESTMENT

Source: Liu (2022)

HOW DO FIRMS RESPOND TO HIGHER GEOPOLITICAL RISKS?
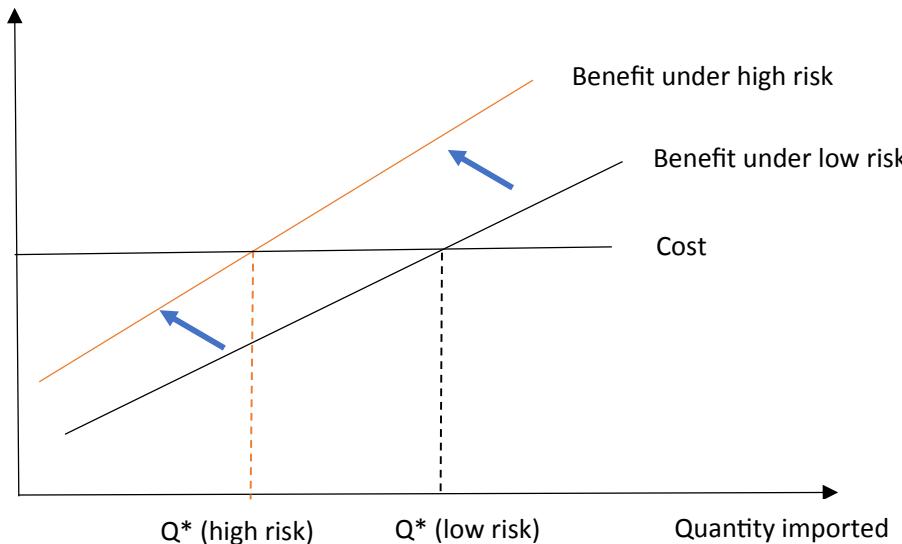
To fix ideas, Figure 2 (based on Freund et al. 2021) focuses on the relocation choice from the perspective of a multinational firm (but a similar logic applies to arm's length trade). Assume that the firm imports key inputs from a subsidiary in a foreign country and that a geopolitical shock creates security concerns in that country. Under what conditions does the new risk lead the multinational firm to move its subsidiary to a new location?

The firm's decision to relocate production is determined by a cost-benefit analysis. The benefit of relocation depends on the subsidiary's scale of production in the foreign country as more exposed firms will be more affected by production disruptions. Its inclination also depends on the per-unit cost difference, which captures factors like the wage differential between the different locations, and the per-unit insurance premium

difference, which captures the insurance cost that a firm must pay to cover the risk of production disruptions due to geopolitical or other shocks. The benefit of relocation is compared to the cost, as relocation would entail building a new factory and establishing new relationships in a different location.

A surge in geopolitical risk increases the per-unit insurance premium difference, making the benefit schedule steeper (implying that more exposed firms will have to pay more for insurance). As the old location is suddenly riskier, relocating to a new low-risk location becomes more attractive. The other factors, such as per-unit cost differences between locations and the relocation costs, are not affected by the shock. In the new equilibrium, where the security concern is high, more exposed multinational firms – i.e. those that source from the foreign country more than Q*(high risk) in Figure 2 – relocate their subsidiaries. Those that source less than Q*(high risk) have no incentive to leave even after the geopolitical shock.

FIGURE 2   BENEFITS AND COSTS OF SWITCHING IMPORT SOURCES INDUCED BY CHANGES IN GEOPOLITICAL RISKS

HOW THE WAR MAY RESHAPE GLOBAL VALUE CHAINS

This simple framework brings some insights on the current debate on the war and deglobalisation.

First, the war will reshape global value chains, particularly for firms that rely heavily on countries where geopolitical risks have surged, but this does not imply the end of globalisation. Higher geopolitical risk raises the insurance premium that firms need to pay to cover the risk of future production disruptions due to economic sanctions or

conflict. For a firm, the risk of disruption rises alongside its reliance on imports from the country at risk, so more exposed firms are more likely to leave. But several factors create inertia, suggesting that a reshaping of some global value chains does not imply sudden deglobalisation. Cost differentials between countries are not affected by geopolitical risk. This makes reshoring to high-cost countries unlikely. Relocating production is also expensive, due to the sunk cost of building new infrastructure and the search cost of establishing new relationships in a different country.

Second, the war-induced reshaping of global value chains will affect different sectors and products differently. Sectors with higher fixed costs and sophisticated intermediate products are less likely to relocate in response to higher geopolitical risks – unless policy intervenes. Firms in an industry like autos, which requires high upfront investment in infrastructure, and firms that rely on sophisticated intermediate products, which rely on relationship-specific investment, face higher costs of relocating production and are thus less likely to leave a country in presence of higher geopolitical risk. Even if the nature of the shock differs, this intuition is confirmed by evidence on the reconfiguration of global value chains in the aftermath of the 2011 Japan earthquake (Freund et al. 2021). Firms in those sectors and products may not reorganise production based only on market incentives, but rather if they expect a change in the policy stance that affects trade costs.

WHAT ROLE FOR POLICY?

The world economy will be hurt by the reshaping of global value chains induced by higher geopolitical risks, but some countries will gain and others lose. As firms adjust their production and trade structure to the new environment in the pursuit of economic efficiency, they may seek new suppliers in developing countries that have a latent comparative advantage and lower geopolitical risks. While the high-risk economies, and the global economy as a whole, are worse off in a more uncertain world, the new suppliers would benefit from the increased investment and trade opportunities. In this context, the true risk comes from measures that aim at reshoring, nearshoring, or fragmenting the trade system. Rather, government policies should focus on defusing tensions and strengthening global value chains against future disruptions.

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CHAPTER 19

Widespread food insecurity is not inevitable: Avoid escalating food export curbs

Alvaro Espitia, Simon Evenett, Nadia Rocha and Michele Ruta
World Bank; University of St. Gallen and CEPR; World Bank; World Bank

4 May 2022

Ukraine is the world's first, fourth, and fifth largest exporter of sunflower seeds, maize, and wheat, respectively. Combined with Russia, exports of products like wheat are roughly one quarter of world exports. The war has disrupted supplies in world markets, with large consequences for prices of food products (Glauber and Laborde 2022). Increased exports from other food producing countries can only in part compensate for this loss (Chepeliev et al. 2022). In this context, short-sighted government interventions can make a bad situation worse, adding to the severe economic fallout from Russia's invasion of Ukraine (Artuc et al. 2022, Federle et al. 2022, Langot et al. 2022).

This column, based on trade policy monitoring[1] by the World Bank and the Global Trade Alert and on our recent work (Ruta et al. 2022), documents the surge in trade policy activism, especially export restrictions, in food markets since the beginning of the war in Ukraine. It also provides a first assessment of how these measures are impacting food prices focusing on the case of wheat. Food insecurity globally can be at risk if governments indulge in a prisoner's dilemma over agricultural trade. A commitment by large food exporters to avoid escalating protectionism can help calm markets and avoid extreme outcomes.

RISING TRADE POLICY INTERVENTIONS IN FOOD MARKETS
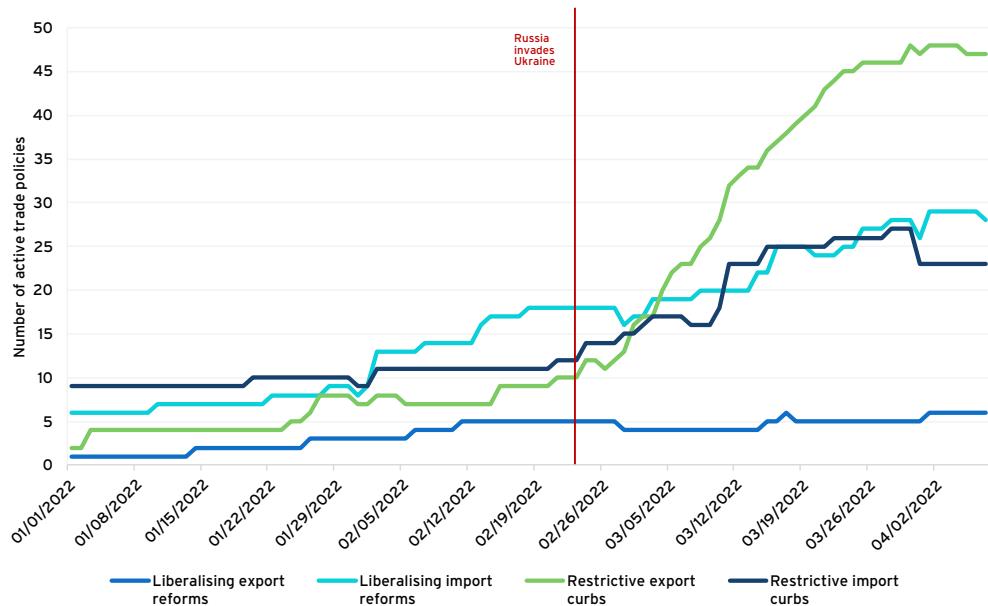
Rising global food prices have typically induced differential policy responses, as governments try to shield domestic markets from price surges. Some food-importing countries lower import restrictions or subsidise consumption, and some food-producing countries curb exports.

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1   www.worldbank.org/en/topic/trade/brief/coronavirus-covid-19-trade-policy-database-food-and-medical-products

In the early stages of the COVID-19 pandemic, many countries actively used trade policy to respond to domestic needs in the presence of potential shortages in food supplies. Despite the rapid surge in export and import measures in early 2020, mostly driven by fears of scarcity rather than actual conditions in food markets, the situation stabilised and trade measures levelled off. Policy activism resurfaced in the later part of 2021 and early 2022, driven by the upward pressures on food prices with a slow cumulation of measures.

The war in Ukraine has radically changed the situation (Figure 1). A total of 67 new trade policies (87 including subsidies) were imposed or announced between the beginning of the conflict on 23 February and 7 April 2022 (129 since the beginning of the year). This surge has been dominated by new export bans and export-licensing requirements (38 measures), followed by import bans and import quotas (13 measures) and liberalising import reforms such as tariff cuts (13 measures).

FIGURE 1   NUMBER OF ACTIVE TRADE POLICIES ON FOOD AND FERTILIZERS IN FORCE BETWEEN 1 JANUARY AND 7 APRIL 2022
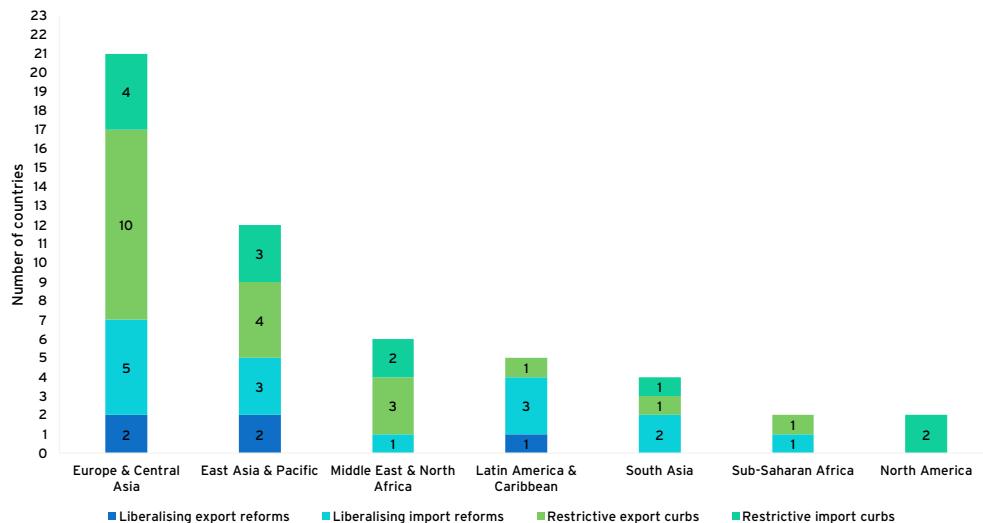
Source: Authors using World Bank and Global Trade Alert trade policy monitoring in essential goods.

Twenty nations are responsible for the increase in export controls since the beginning of the war, especially in Europe and Central Asia (Figure 2). Examples of measures implemented during this period include export bans on wheat, corn, and other grains imposed by Russia to countries outside the Eurasian Economic Union, bans of vegetable oils, maize, and wheat imposed by Serbia, and export licensing requirements for grains

imposed by Hungary. Export controls were also imposed by food-importing nations such as Algeria, which introduced a ban on consumer products such as sugar, pasta, oil, and semolina, and Egypt, which imposed a ban exports of cooking oil, corn, and wheat.

FIGURE 2   REGIONAL BREAKDOWN OF NEW TRADE POLICIES ON FOOD AND FERTILIZERS IMPOSED BETWEEN 23 FEBRUARY AND 7 APRIL 7

Source: World Bank and Global Trade Alert trade policy monitoring in essential goods.

Policymakers have taken measures to alleviate pressures in national food markets. Since the beginning of the war, 38 governments from every continent except North America have implemented support measures in favour of the agricultural sector, such as subsidies to farmers for fertiliser, and have subsidised food purchases by consumers. Azerbaijan, for instance, announced the allocation of up to US$44.1 million in subsidies to cover the difference in domestic and international prices of wheat and flour products.

Reductions of existing restrictions to food imports are also aimed at reducing pressures on domestic prices. Thirteen measures have been taken since the beginning of the war to reduce or remove import barriers on food and fertilisers. For instance, on 3 March, Colombia decreased to zero import duties on corn, seeds, and resinoid oils, among other food products. On 25 March, the government of the Philippines decreased the tariff on corn in-quota imports from 35% to 5%.
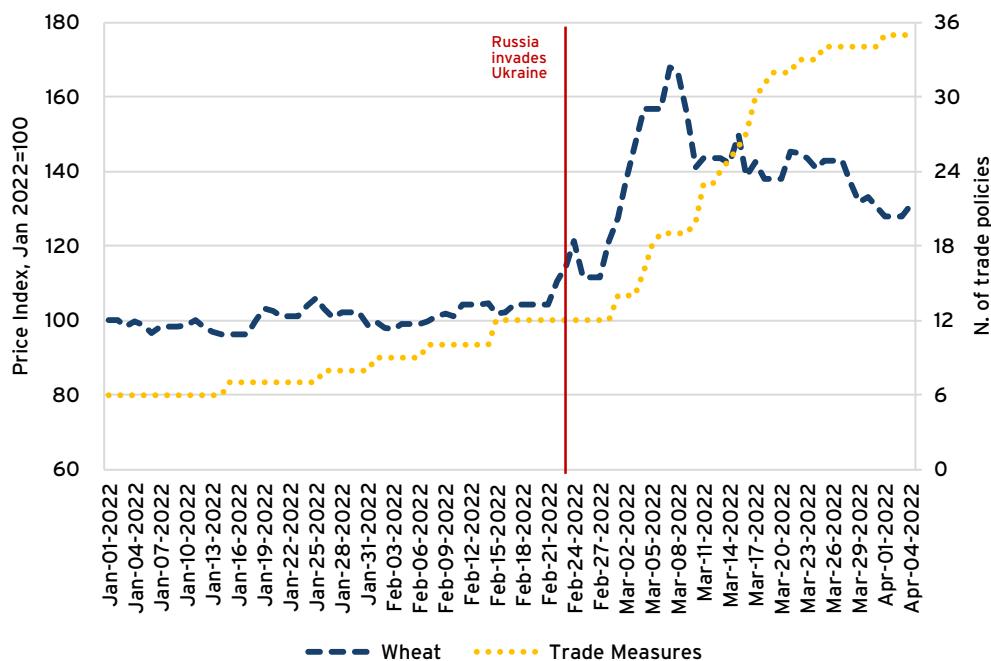
## ESCALATING TRADE MEASURES DRIVE UP FOOD PRICES

Increasing export restrictions on staples such as wheat and corn and on fertilisers are magnifying the surge in food prices caused by the war in Ukraine (Figure 3). The reason is that these policy interventions create a multiplier effect. Export restrictions mitigate pressures on domestic food markets by diverting supplies from the world market. The

surge in world prices that results from these measures leads other governments to retaliate by imposing new export restrictions, leading to a further surge in prices. As research shows (Giordani et al. 2016), trade interventions contributed to an increase in world food prices of 13% during the 2008-11 global food crisis, and of 30% for wheat.

FIGURE 3   INTERNATIONAL WHEAT PRICES AND TRADE POLICY MEASURES

Source: Capital IQ commodity price statistics and on World Bank and Global Trade Alert trade policy monitoring of essential goods.

A multiplier effect seems to be already in place, as shown in the sequence of policy responses in Europe and Central Asia. These trade measures are contributing to driving up world food prices. Bans on wheat exports imposed by Russia and smaller exporters like Serbia, North Macedonia, and others imposed between the beginning of the war and 7 April cover 16% of world trade and are responsible for a 7 percentage point increase in world wheat prices (i.e. roughly one-sixth of the observed price surge). The imposition of a quota on wheat exports announced by Kazakhstan, a large producer of this crop, would cut down its exports by 80% relative to 2019. The impact would be to drive the world price of wheat up by close to one additional percentage point.

This price effect is economically sizeable per se and can induce further policy activism and disruption ahead. If any of the top five exporters of wheat were to ban exports, the cumulative effect of these measures would be to increase the world price by at least 13%, and much more if others react. Price-insulating trade policies on the import side and consumption subsidies would further magnify world price effects. Moreover, the effects of export restrictions in one market spill over to other markets, propagating price surges.

The recent ban on exports of palm oil by Indonesia, the world's largest exporter of this product, follows export restrictions on sunflower oil – a palm oil substitute used for cooking – imposed by Russia, the second largest exporter of sunflower oil after Ukraine.

WIDESPREAD FOOD INSECURITY IS NOT INEVITABLE: CONFIDENCE-BUILDING MEASURES ARE NEEDED

While the consequences of the war on food markets will be difficult to manage, a more catastrophic scenario can be avoided. Large exporters of food products like the US, Canada, the EU, Australia, Argentina, Brazil – which together represent more than 50% of global exports of key staples like wheat, barley, and corn – could make a clear joint statement that they will not restrict their exports of staples (Malpass 2022). Securing these flows would allow markets for these critical commodities to continue working, helping to preserve the stability of global food markets – and well beyond these markets.

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CHAPTER 20

Russia's war against Ukraine might persistently shift global supply chains

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31 March 2022

The havoc brought upon countries by violent warfare causes, next to immeasurable personal pain, heavy economic disruptions. Destruction of production sites, disrupted supply chains, and the displacement of people often provoke a sudden and durable rupture of economic activity. While we do not have much generalisable empirical evidence on the economic costs of international wars, which used to be a rare phenomenon in recent decades, the literature on civil wars coined the term 'development in reverse' to describe the often persistent, negative economic effects of sustained episodes of warfare (Collier et al. 2003).

Currently, we see such a development in reverse unfolding in Ukraine. Only weeks after Russian forces commenced their invasion of Ukraine, millions of people have left the country, and formerly prosperous towns lie in ruins (Skok and de Groot 2022). At the same time, the international community punishes Russia with sanctions of an unprecedented scale, which have the potential to hurt the Russian economy significantly and end decades of economic collaboration (Berner et al. 2022, Felbermayr et al. 2019). Nonetheless, an embargo on oil and gas imports from Russia has not yet been implemented despite intensive public discussion, as several large European countries fear the economic consequences of forfeiting these hard-to-substitute imports (Bachmann et al. 2022) . Looking at how the international economy coped with prior disruptions to economic exchange caused by violent warfare helps us form expectations about the economic future of Ukraine, Russia, and the sanctioning countries.
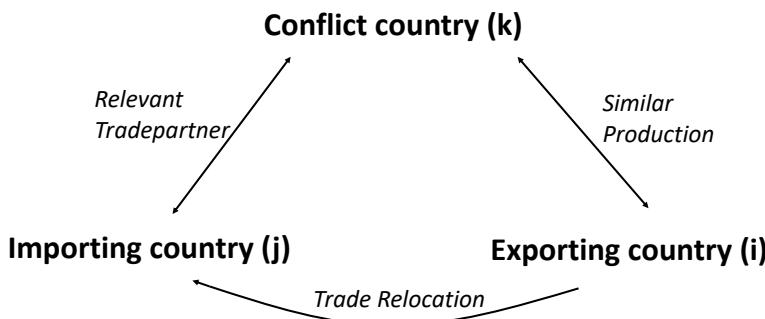
(HOW) DO SUPPLY CHAINS ADOPT TO ECONOMIC DISRUPTIONS?

In a recent study, we investigate how international trade flows respond to unilateral economic shocks (Korn and Stemmler 2022). For this, we focus on national civil wars, which have been found to cause significant disruptions to countries' production and export capabilities (Blattmann and Miguel 2010). Specifically, we ask whether and how importers adjust their trade flows if a civil war breaks out in one of their main trade

partners (see Arezki 2022 on the international spillovers of the war in Ukraine). To answer this question empirically, we use bilateral trade data that include over 150 countries for the period 1995 to 2014.

In this dataset, we first identify exporters that experience a civil war in a given year according to the civil war classification from the Uppsala Conflict Data Program (Sundberg and Melander 2013). Then, we code which trading dyads are most likely to be affected by trade relocation away from the conflict country. We base this coding on two characteristics, which we illustrate in Figure 1. First, we identify all countries for which the conflict country used to be a main trading partner (i.e. among the top seven exporters to this country).[1] Second, we identify all countries that offer a variety of goods similar to the conflict country. Using various classification algorithms, we sort countries into clusters with similar production portfolios based on production volumes across 61 SITC product lines. We combine these relevance and similarity conditions to code which importer-exporter dyads are likely to experience trade relocation effects, as the importing country substitutes its demand away from the conflict country towards another exporter who offers a similar variety of goods. Finally, we investigate empirically whether trade values increase between these 'relocation dyads' in response to a civil war.

FIGURE 1   ILLUSTRATION OF TRADE RELOCATION CODING
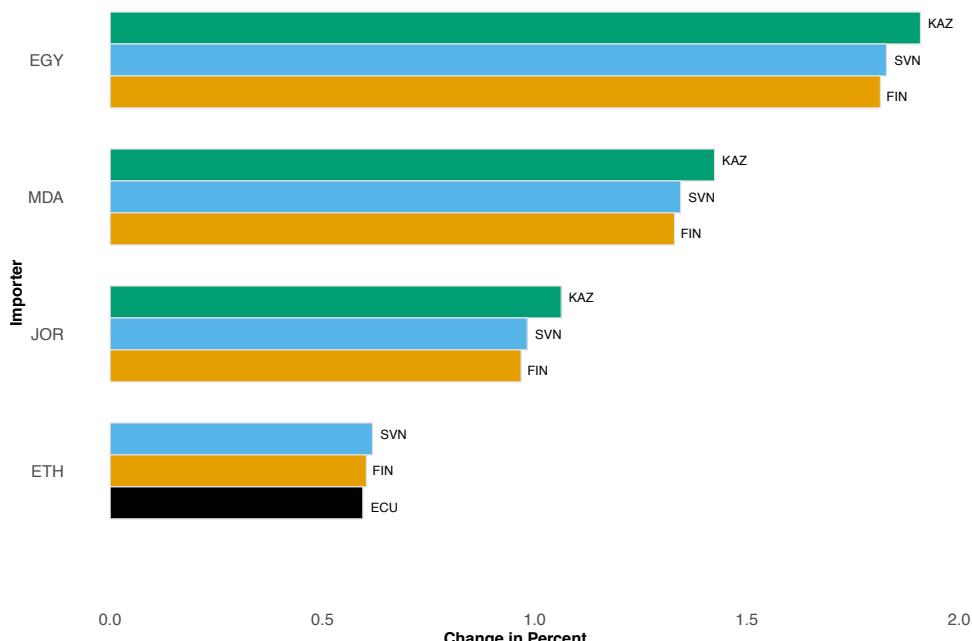
Notes: This figure illustrates our coding of relocation propensity. For each conflict country k in a given year, we identify its main trading partners as well as all countries that provide a similar production portfolio. For each dyad ij where both conditions overlap, i.e. where the importer j is a relevant trading partner of conflict country k, and the exporter i produces similar products to conflict country k, we expect a trade relocation effect to materialise.

We find robust evidence that global supply chains adapt relatively quickly to economic disruptions from civil conflicts, but that this trade relocation effect exhibits a fair amount of heterogeneity. First, the reactions of supply chains in agricultural goods and the mining sector are exceptionally strong. On average, trade volumes between such 'relocation dyads' increase by 12% and 13%, respectively, already one year after the start of a civil war. In the manufacturing sector, trade values increase by 7% on average, and only if conflicts last for several years. Hence, manufacturing supply chains seem to be

1   1 On average, the top seven exporters are responsible for the first quartile of a country's overall imports.

more hesitant to relocate compared to imports of primary goods. Interestingly, we find no evidence of supply chain adjustments in the fuels sector. If anything, importers cut back on fuel imports from alternative trading partners to maintain their current fuel imports of their main exporting partner who is now at conflict. This is a reaction we see again today, where countries highly dependent on Russian oil and gas struggle to scale back on these imports, even though they support various other sanctions. Our findings further add to the recent discussion in Kwon et al. (2022), who find evidence that sanctioning countries substitute for exports from third, non-sanctioned countries. If our results apply similarly to the economic effects of sanctions, and in light of the current debate on oil and gas embargos against Russia, we would not expect to find such a substitution effect for trade in fuels.

FIGURE 2   TRADE RELOCATION AFTER UKRAINE'S CIVIL WAR

Notes: This figure reports the changes in bilateral trade values in 2015 compared to a hypothetical counterfactual world where the 2014 civil war in Ukraine never took place. On the y-axis, we report the four importers that reported the largest trade relocation effects in response to Ukraine's civil war (Egypt, Moldova, Jordan, and Ethiopia). For each of these importers, we provide three bars, which indicate the size of the relative trade increase for the three main substitution partners (Kazakhstan, Slovenia, Finland, and Ecuador).

What do our findings imply for Ukraine's global supply chains? Here, we can draw on case study evidence from Russia's annexation of Crimea and the subsequent civil war that erupted in Ukraine's Donbas region. Applying a similar structural gravity-general equilibrium estimation technique as in Kwon et al. (2022), we estimate the reduction in Ukraine's exports following the outbreak of the civil war in 2014. We then use this estimate to compute hypothetical trade patterns and welfare levels of countries

worldwide if this conflict would never have happened. Comparing actual to hypothetical trade flows and welfare levels, we get an idea of how this conflict affected the global economy. While we can hardly compare the scale of violence during the civil war to today's situation, the qualitative tendencies are likely to be similar. We find that several dyads increase their bilateral shipments in response to the civil war. The countries most affected by the disruption of imports were Egypt, Moldova, Jordan, and Ethiopia. For most of them, Kazakhstan, Slovenia, and Finland resembled the main substitution partners, as they increased their imports from these countries by up to 2% in response to the civil war. Looking at welfare changes, however, we find that all countries are left worse off compared to the counterfactual where the civil war did not take place. While it is not surprising that Ukraine itself suffered the most, even those countries that benefit from trade relocation (e.g. Kazakhstan and Slovenia) become worse off overall from the civil war, as the increases in export demand do not compensate the loss relating to trade opportunities with Ukraine.

THE FUTURE OF THE GLOBAL ECONOMY

We conclude this column by looking ahead. How can the Ukrainian and Russian economies recover from the war once the violence ends and the sanctions are lifted? As far as international trade is concerned, it highly depends on how long the war and sanctions will go on, and on how the rest of the world reacts. In our study, we estimate how trade relationships behave after a civil war ends. Here, we find that the trade relocation effects we estimate during a civil war remain of almost the same magnitude up to nine years after a civil war ended. Our 20-year sample unfortunately does not allow us to look for much longer periods. Especially in the manufacturing sector, the relocation effects robustly remain unchanged after peace is established. That is, whereas manufacturing supply chains tend to remain intact during shorter periods of violence, they also stay relocated once a substitution took place. As a possible explanation of this persistence, we provide evidence that (sustained) periods of violence and the resulting trade relocation effects increase the likelihood that the substituting importers persistently decrease the bilateral trade costs with their substitution partners by signing Preferential Trade Agreements with them. Hence, relocation persists because the world economy reaches a new equilibrium, in which the (former) conflict countries' relative trade costs have increased compared to the pre-war situation.

This has implications should the war in Ukraine continue for so long that the relocation of supply chains and the subsequent conclusion of new international cooperation agreements cement a new structure of the world economy. In that situation, our analysis suggests that both Ukraine and Russia would find it hard to recover their international economic standing from before the conflict (Chepeliev et al. 2022). The recent visit of Germany's Secretary of Economic Affairs to Qatar and negotiations on better trade relationships may be one of the first steps in this direction. Nevertheless, current considerations to

foster economic and political relations with Ukraine, and even to initiate the process of Ukraine joining the EU, can be a valid measure to counteract the loss in trade access brought upon them by Russia's declaration of war.

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SECTION III: THE IMPACT OF THE WAR ON DEVELOPING COUNTRIES

CHAPTER 21

War in Ukraine, world food prices, and conflict in Africa
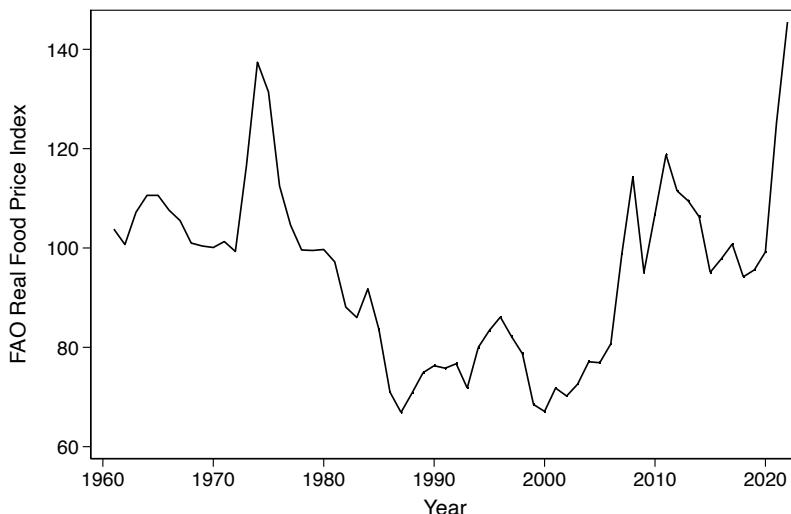
**Eoin McGuirk and Marshall Burke**
Tufts University; Stanford University

26 May 2022

Together, Russia and Ukraine supply almost 30% of global wheat and barley exports. Ukraine also accounts for 14% of globally traded corn and 75% of globally traded sunflower oil, a key cooking fuel. The supply of these commodities has been severely impeded by the ongoing conflict. In Ukraine's case, this is due in part to the disruption of Black Sea shipping routes. In Russia's case, it is due to the effect of sanctions along the agricultural supply chain. Together with extreme weather patterns worldwide (e.g. heat in parts of India, the US, and France; historic droughts in East Africa; and flooding in China) and rising protectionism, this has led to sharp increases in staple food prices that confer significant welfare losses on poor households in developing countries (Arezki 2022, Artuc et al. 2022, Porto and Rijkers 2022).

To put these recent changes into historical context, in Figure 1 we plot the FAO Food Price Index in real terms from 1961 to 2022. The current figure of 145.5 is a record high, easily surpassing previous spikes in the 1970s and early 2010s. The recent growth is driven mostly by cereals and vegetable oils.

FIGURE 1   FAO REAL FOOD PRICE INDEX, 1961-2022

FROM CONFLICT IN EUROPE TO CONFLICT IN AFRICA

Understanding the downstream effects of these food price shocks on conflict in Africa is imperative. State fragility and recurrent civil wars are costly impediments to economic development in many African countries. Identifying how and why economic fluctuations affect civil conflict can help to inform policies that promote peace.

One mechanism predicts that higher commodity prices will *reduce* conflict in areas that produce the given commodity. This is because rising productivity in the affected sector ought to increase wages and thus increase the opportunity cost for the marginal worker of participating in illicit or risky economic activities, such as joining armed groups (Dal Bo and Dal Bo 2011). This prediction is therefore particularly relevant to labour-intensive sectors, such as coffee production in Colombia and crop agriculture more generally in Africa (Dube and Vargas 2013, Berman and Couttenier 2015, McGuirk and Burke 2020).

However, as we document in McGuirk and Burke (2020), there are also countervailing mechanisms through which higher staple food prices can *increase* conflict. Since food occupies a large share of household expenditure in Africa (around 40% on average), the net effect of food price shocks for a given individual will depend critically on whether one is a net producer or a net consumer of the relevant commodities. Sufficiently high food prices could conceivably force a net consumer to turn to risky economic coping strategies in order to maintain a necessary caloric intake, especially in the absence of conventional financial smoothing mechanisms. Thus, just as rising prices may induce marginal workers to *avoid* participating in armed groups in areas where crops are produced, they may also induce marginal workers to *join* armed groups in areas where crops are consumed.

We find evidence of these countervailing effects in our paper. We examine the impact of rising food prices on the incidence of inter-group conflict battles in Africa at the level of a 0.5-degree grid cell (an area of 55km x 55km at the equator). We create two shift-share instruments to distinguish between the channels: a 'producer price index' (PPI) that combines temporal variation in world food prices with cross-sectional variation in crop production across cells; and a 'consumer price index' (CPI) that instead uses cross-sectional variation in crop consumption across countries. We estimate that a one standard deviation rise in the PPI *reduces* conflict in a cell by 17.2% of the mean, while a one standard deviation rise in the CPI *increases* conflict in a cell by 8.6%. Our estimates indicate that the countries most at risk of conflict through the CPI effect are Rwanda, The Gambia, Sierra Leone, Somalia, Swaziland/Eswatini, Central African Republic, Djibouti, Mozambique, South Africa, Zimbabwe, Ghana, Niger, and Mali.
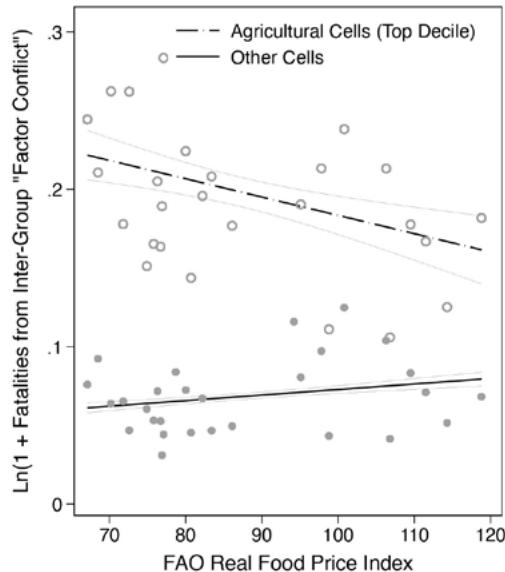
We can use these estimates to predict the specific effect of increases in wheat and maize prices from January to April 2022, which we assume to be due primarily to the war in Ukraine. Through the PPI effect, conflict falls by 1.7%. Through the CPI effect, conflict

increases by 6.17%. Since the PPI effect is only relevant in areas where crops are produced, we estimate the weighted average effect of the Russian invasion to be an increase in inter-group conflict in Africa of 5.3%.

We illustrate these relationships graphically using updated raw data in Figure 2. For simplicity, we use the FAO Food Price Index (again in real terms), which is publicly available and easy to track over time. We simply plot the relationship between the food price index on the x-axis and the natural log of inter-group conflict event fatalities in a cell-year on the y-axis.[1] We label these events 'factor conflict', as they typically capture conflict between organised armed groups contesting the control of territory.

To distinguish between the countervailing effects, we split the sample into two groups of cells. 'Agricultural cells' are defined as those in the top decile for harvested area, which implies that at least 22% of a cell's land area is used for crop production (Monfreda et al. 2008). These cells contain around 42% of Africa's population. 'Other cells' are the rest. The plots in Figure 2 imply that a 50-point price spike – a magnitude similar to the change between 2019 and 2022 – is associated with a 5.8% decrease in fatalities in agricultural cells and a 1.8% increase in fatalities in other cells.

FIGURE 2   RELATIONSHIP BETWEEN FAO REAL FOOD PRICE INDEX AND FATALITIES FROM INTER-GROUP 'FACTOR CONFLICT' IN AGRICULTURAL VERSUS OTHER CELLS
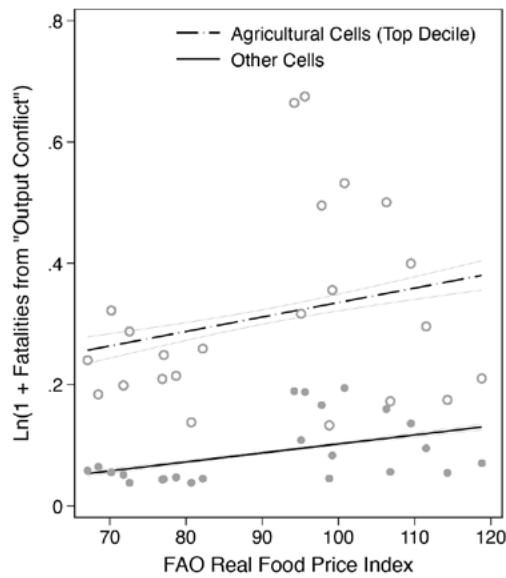
A second countervailing effect relates to what are commonly termed 'food riots'. Scholars have long documented the role of rapidly rising staple food prices in the outbreak of riots, demonstrations, looting, and even peasant rebellions throughout history (Bellemere 2015, Ubilava 2022). These actions differ from inter-group factor conflict in that they are typically more atomistic and uncoordinated decisions executed with a view to influencing policy (through demonstrations), obtaining output (through looting), or otherwise expressing grievances due to an acute shock to inequality that often accompanies food price spikes. These events can arise in both agricultural and non-agricultural cells due to the presence of net consumers in both. We label them as 'output conflict' events, measured as riots, demonstrations, or other violence against civilians in the ACLED dataset.[2]

We estimate that a one standard deviation increase in the PPI and in the CPI respectively raise the probability of output conflict by 18.9% and 14.4%. Unlike the case of factor conflict, here the price shock leads to more conflict in both agricultural and non-agricultural areas.

We again illustrate this relationship graphically using updated data on the FAO Food Price Index in Figure 3. We show that in both types of cells, higher prices lead to more output conflict deaths. The overall effect is thus unambiguous.

FIGURE 3   RELATIONSHIP BETWEEN FAO REAL FOOD PRICE INDEX AND FATALITIES FROM 'OUTPUT CONFLICT' IN AGRICULTURAL VERSUS OTHER CELLS

CONCLUSION

In summary, Russia's invasion in Ukraine has led to historically sharp increases in staple food items. These in turn are likely to affect the spatial distribution of conflict events in Africa over the coming year. We predict that inter-group 'factor conflict' events will be driven away from the most productive agricultural areas and towards areas with less crop production. Our estimates suggest that rising prices will also contribute to the higher likelihood of 'output conflict' – smaller-scale riots, demonstrations and/or civilian violence in both food-producing and food-consuming areas. Policies that improve the productivity of agriculture in Africa could potentially protect both producers and consumers from the harmful effects of international price volatility in future.

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CHAPTER 22

Agricultural and energy importers in the developing world are hit hardest by the Ukraine war's economic fallout
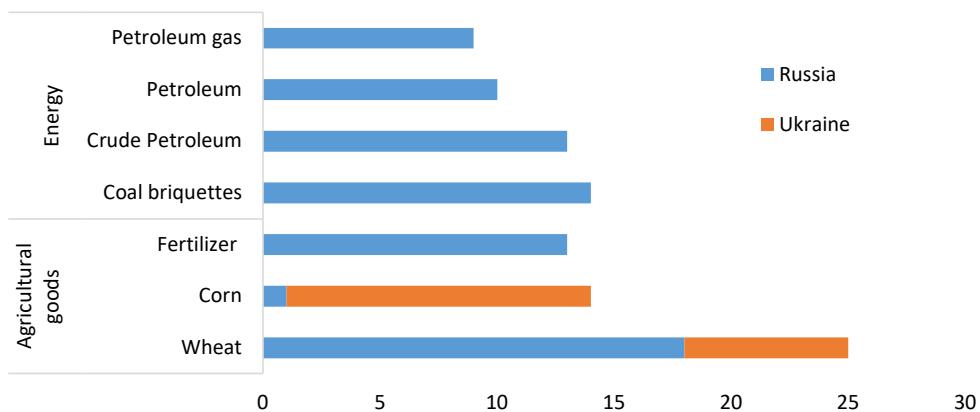
Maksym Chepeliev, Maryla Maliszewska and Maria Filipa Seara e Pereira[1]
Purdue University; World Bank; Purdue University

6 May 2022

The Russian invasion of Ukraine is disrupting global supplies of essential commodities, pushing prices higher, slowing trade, and driving down incomes. Russia and Ukraine together account for about a quarter of global wheat exports and 14% of corn shipments (Figure 1). Ukraine produces half of the world's sunflower oil, while Russia is one of the world's foremost energy suppliers. As the Black Sea region is also a large exporter of fertilisers, the resulting shortages and price increases could translate into negative impacts on crop yields in many regions (FAO 2022).

FIGURE 1   RUSSIA AND UKRAINE'S GLOBAL SHARES OF KEY COMMODITY EXPORTS IN 2019 (%)

Source: UN Comtrade database (https://comtrade.un.org/).

Developing countries that are highly dependent on food and energy imports are the most vulnerable. Nicaragua, for example, buys 89% of its wheat from Russia and Ukraine; the figure for the Republic of Congo is 67%; and for Egypt it is 46%. Russia supplies 94% of Algeria's coal and the same share of Kyrgyzstan's natural gas.

Large energy and agricultural exporters could benefit from commodity supply disruptions, partially replacing lower exports from Ukraine and Russia. The conflict would also lead to a reshaping of global value chains (GVCs). But what countries would be impacted the most? Who would gain from the conflict and how would Russian invasion of Ukraine impact global trade and production around the world?
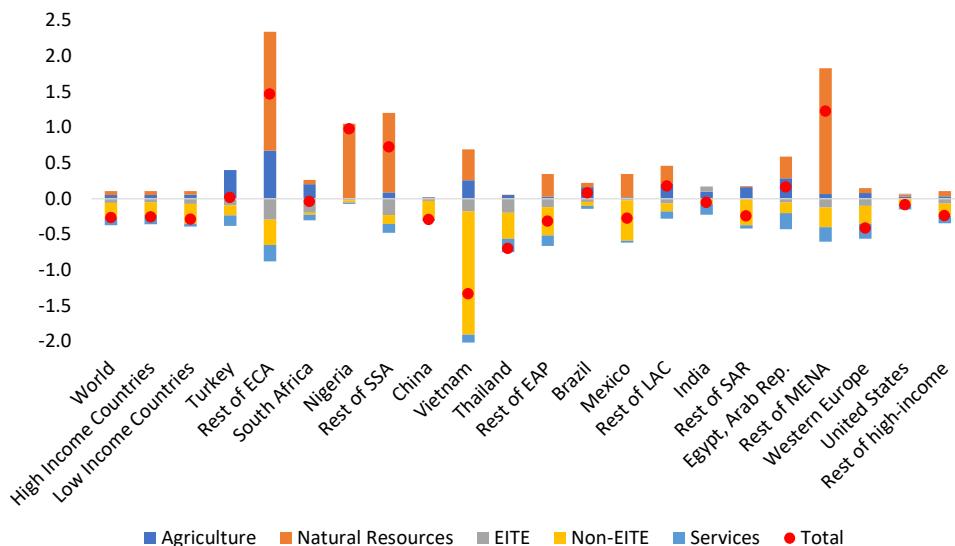
In a new paper (Chepeliev et al. 2022a), we attempt to answer these questions. Following an approach outlined in Chepeliev et al. (2022b), we combine a state-of-the-art global model, ENVISAGE (van der Mensbrugghe 2019), with the GTAP multi-region input-output database (Carrico et al. 2020). We further simulate the impact of disruptions to agricultural and energy markets caused by the conflict and resulting selected sanctions against Russia.

FOOD AND ENERGY PRICE SHOCKS REDUCE GLOBAL TRADE, BUT BENEFIT SELECTED EXPORTERS

While modelled disruptions reduce volumes of global trade by around 1% or 0.3% as a share of GDP, higher commodity prices create incentives for selected exporters to expand production and partially replace exports from the Black Sea region (Figure 2). Wheat exports from Western Europe, the Europe and Central Asia (ECA) region, the US, and India expand the most. Exports of other crops (close substitutes of wheat) from Turkey, China, Brazil, India, and the US also increase. An even larger expansion in exports is observed for large fossil fuel producers in the Middle East and North Africa (MENA), ECA, sub-Saharan Africa (SSA), and Latin America and Caribbean (LAC) regions (Figure 2).

With higher energy prices, production of energy-intensive and trade-exposed (EITE)[2] goods becomes much more expensive, leading to a global decline in exports of around 1%. Exports of non-energy intensive manufacturing sectors and services also fall as consumption shifts towards food, energy, and transport, for which demand is quite inelastic (Figure 2).

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2 EITE sectors include the following: Wood and paper products; Refined oil; Chemical products; Non-metallic minerals; Metals; Electricity and heat generation.
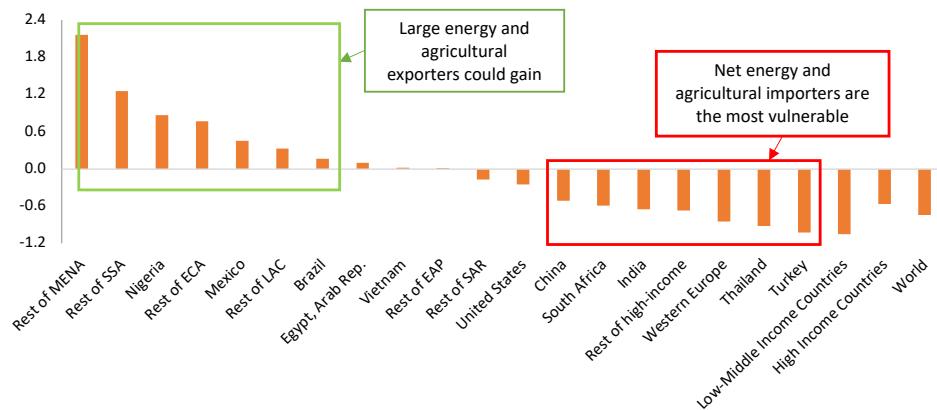
FIGURE 2   CHANGE IN EXPORTS AS A SHARE OF REAL GDP IN THE REFERENCE YEAR (%)

Source: Estimated using ENVISAGE model.

THERE ARE WINNERS AND LOSERS

With supply disruptions and increasing commodity prices, global income falls by 0.7%, with low- and middle-income countries losing 1% and high-income countries seeing a 0.6% decline (Figure 3). On average, half of the reduction in income comes from increasing energy prices, while the other half is driven by sanctions and disruptions to agricultural supply. The contribution of these two channels varies across regions. In high-income countries, income reductions are largely driven by rising energy prices, while for low- and middle-income countries the major part of the shock is associated with spikes in food prices.

Results also suggest that net importers of energy and agricultural commodities suffer the most, with real incomes in Turkey dropping by 1%, in Thailand by 0.9% percent, and in India and South Africa by 0.6% (Figure 3). Large energy and agricultural producers could benefit from terms of trade gains and see their incomes expanding, with MENA being at the top of this list (Figure 3). This is the result of a combination of rising energy prices and substitution of supply from the Black Sea region. The first channel is of particular importance as, at the time of writing this column, OPEC countries have not announced any plans to expand supply and continue to benefit from rising oil rents. Other net energy exporters, such as Nigeria and Mexico, also see their real income increase (Figure 3).

FIGURE 3   CHANGE IN REAL INCOME IN SELECTED COUNTRIES AND REGIONS (%)

Source: Estimated using ENVISAGE model.

Increasing costs of crops and energy coming on top of the already elevated commodity prices will add additional strain especially on the poorest households in developing countries (Artuc et al. 2022). The lowest-income households spend on average 54% of their consumption expenditures on food, 7% on energy, and 4% on transport.[3]

HIGH VALUE-ADDED MANUFACTURED GOODS BECOME LESS INTEGRATED INTO GVCS
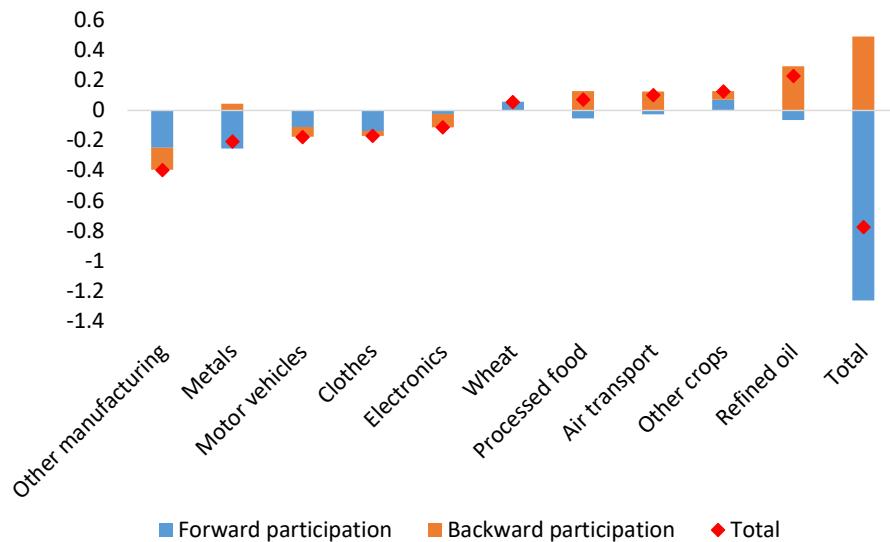
Rising agriculture and fossil fuel prices could lead to major restructuring of GVCs (Korn and Stemmler 2022). Consumers now spend more money on food and energy, while the demand for less essential, higher-value manufactured goods decreases. This trend is also reflected in the restructuring of trade flows – in value terms, the share of agriculture and energy commodities in global trade increases, while the share of light manufacturing falls. This composition effect implies that producers of computers, electronics, and transport equipment are less integrated into GVCs, in many cases leading to an overall reduction in those countries' GVC participation rates.

The latter trend is observed even in some commodity-rich exporters, such as Europe and Central Asia (Figure 4). While exports of agricultural and energy commodities from the region expand and corresponding sectors become more involved in GVCs, their initial participation rates are relatively low compared to high-valued manufacturing goods. A reduction in the GVC participation rates for higher-value and more GVC-integrated goods outweighs the impacts of expanding energy and agricultural trade, meaning the region is

3   Source: World Bank Global Consumption Database (https://datatopics.worldbank.org/consumption/).

less integrated in GVCs (Figure 4). Whether a robust estimated trade reallocation effect will remain after the end of the conflict largely depends on the duration of distortion (Korn and Stemmler 2022).

FIGURE 4   CHANGE IN GVC PARTICIPATION IN FOR EUROPE AND CENTRAL ASIA, SELECTED SECTORS (PERCENTAGE POINTS)

Notes: Forward GVC participation = Domestic value added embodied in third country exports (% of exports). Backward GVC participation = imported inputs in exports (% of exports). Source: Authors' estimates using Envisage model.

POLICY IMPLICATIONS

The war in Ukraine is a dire human tragedy for the people of Ukraine. It also has major implications for the world economy. In this column, we show that due to sharply rising commodity prices, net agricultural and energy importers in the developing world are particularly vulnerable. To mitigate the potential longer-term consequences of the war, several policy steps should be considered.

First, the magnitude of adverse socioeconomic impacts of the war largely depend on the future dynamics and duration of the conflict. Broadening sanctions would help to increase the economic pressure on Russia. Introducing a ban on energy imports (Chepeliev et al. 2022c) and an embargo on Russian capital goods (van Bergeijk 2022) could serve such a purpose.

Second, even if an embargo on energy imports is not imminent, the demand-side policy measures aimed at reducing fossil fuel use and promoting substitution toward alternative energy sources should be implemented (Bachmann et al. 2022). One example of such proactive policies is incentives to switch to electric vehicles through subsidies (Arezki and Nysveen 2022).

Third, with rapidly increasing food prices, some countries might consider imposing agricultural trade restrictions to protect domestic consumers. Such actions should be avoided as they are likely to further jeopardise global food security (Ruta et al. 2022).

Finally, the consequences of the war in Ukraine have already put a disproportionate pressure on lower-income households in developing countries, who spend a large share of their budget on food and energy. Buffering the impacts on poor households via targeted support measures, such as direct lump-sum payments, is a crucial step to ease the burden on the most vulnerable.

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CHAPTER 23

China's overseas lending and the war in Ukraine

Sebastian Horn, Carmen Reinhart and Christoph Trebesch[1]

World Bank; Harvard Kennedy School; Kiel Institute for the World Economy and CEPR

8 April 2022

Russia's attack of Ukraine is causing staggering human suffering and destruction. The impacts on global commodity markets are being acutely felt, as oil and wheat prices have soared, and volatility has increased markedly (e.g. Balma et al. 2022). The broader economic implications are only beginning to be understood (e.g. Danielsson et al. 2022, Bachmann et al. 2022, Korn and Stemmler 2022).

Looking ahead, a central question is the role of China and the Chinese–Russian relationship. So far, the public debate has mainly focused on China's potential support for Russia as well as the long-term effects for trade between the two countries (e.g. Palmer 2022). What is less understood is just how financially interconnected the two countries already are.[2] Russia is the largest foreign debtor to Chinese state-owned banks, accounting for more than 15% of Belt and Road lending between 2013 and 2017 (Custer et al. 2021). This column summarises the debtor-creditor relationship between Russia and China and discusses potential spillover effects to the rest of the world, particularly emerging markets and developing countries (EMDEs).

CHINA'S OVERSEAS LENDING PORTFOLIO AND THE ROLE OF RUSSIA
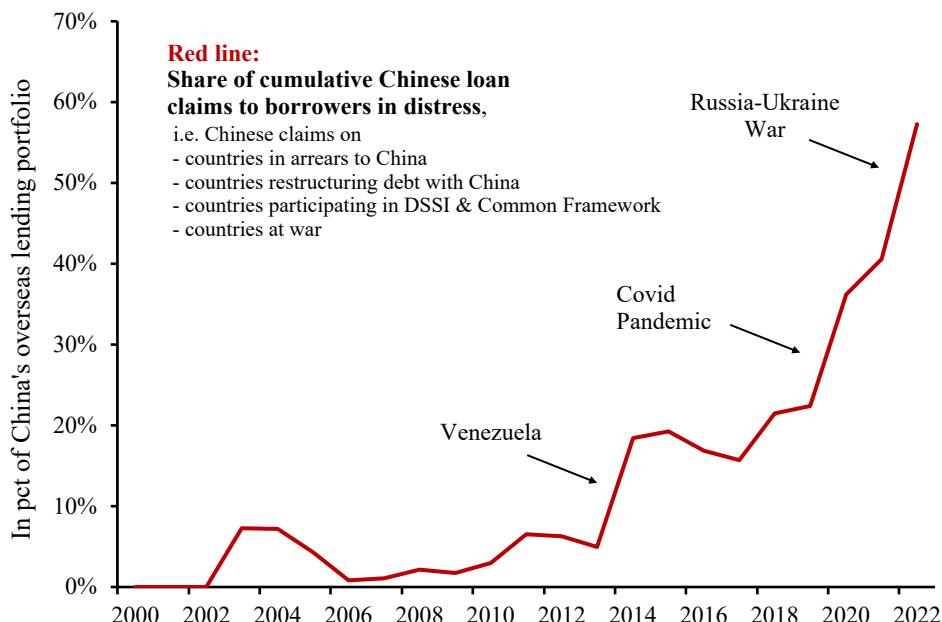
China's state-owned banks and enterprises have invested in and lent heavily to Russia, Ukraine, and Belarus. Cumulative Chinese lending to Russia since 2000 exceeds $125 billion and has mostly financed Russian state-owned enterprises in the energy sector. Total Chinese lending commitments to Ukraine are estimated at $7 billion and have largely supported projects in agriculture and infrastructure. In addition, Chinese banks also have considerable exposure towards Belarus, with around $8 billion in cumulative lending since 2000. Taken together, the three countries account for close to 20% of China's overseas lending during the past two decades.

For China, the war implies yet another increase in the exposure of its overseas loan portfolio towards debtor countries at risk of default. China's exposure towards distressed debtors had started its upward march as early as the mid-2010s, when Venezuela defaulted on its debts. Default risks intensified and spread geographically with the pandemic, when more and more developing economies entered distress; almost 60% of low-income countries are now in debt distress or at high risk.[3] As a result, China's state banks now hold a large amount of potentially 'distressed' debt. Figure 1 shows the share of China's total credit portfolio to borrowing countries in distress, which has increased from about 5% in 2010 to 60% at present. The figure traces the share of cumulative overseas lending that has been extended to countries currently in debt distress or involved in a war.

FIGURE 1   SHARE OF CHINESE LOAN CLAIMS TO BORROWERS IN DISTRESS
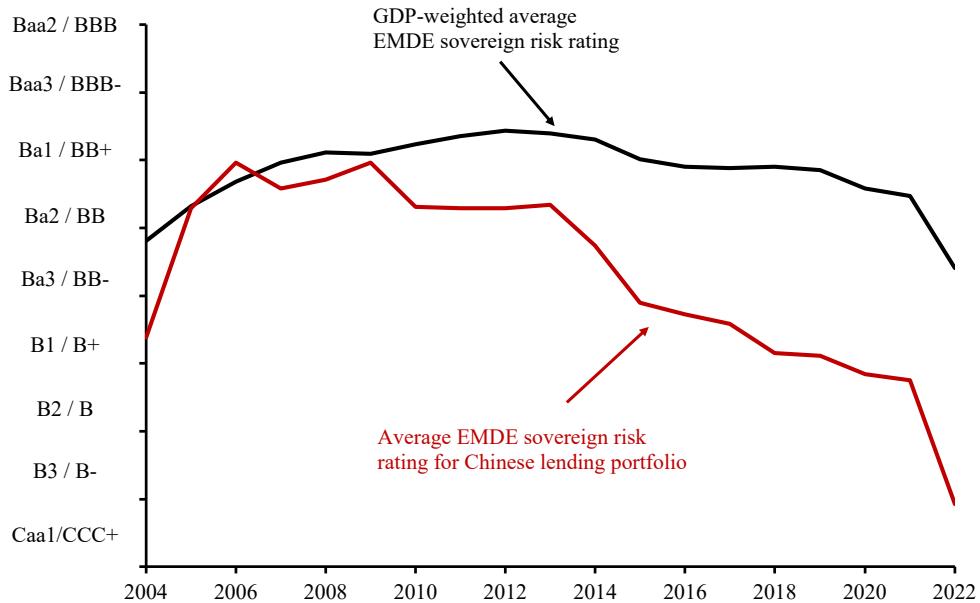
Note: This figure shows the share of cumulative Chinese lending to developing countries that are in distress. The line counts all recipient countries that are in arrears to China, that have restructured debt with China (bilateral or under the DSSI) or that are at war. Data is from Horn et al. (2021, 2022), Custer et al. (202) and the World Bank International Debt Statistics.

Figure 2, which takes a different angle focusing on sovereign risk ratings, arrives at a similar conclusion. The average credit quality of China's lending portfolio has deteriorated considerably in the past ten years. On average, recipients of Chinese loans were downgraded by five rating brackets, compared to an average downgrade of two brackets in a GDP-weighted benchmark portfolio of EMDE debt.

FIGURE 2   **SOVEREIGN CREDIT RISK IN EMDES: CHINA'S LENDING PORTFOLIO VERSUS BENCHMARK**

Note: This figure shows the average sovereign credit risk ratings for 108 developing and emerging market countries, for which data is available. The credit risk rating is an average across ratings by Moody's, Fitch and S&P. The black line shows a GDP-weighted average (with GDP measured on a PPP basis), while the red line shows the average rating of China's overseas lending portfolio, which was obtained by weighing ratings with cumulative lending commitments. Data is from Horn et al. (2021), Custer et al. (2021), Reinhart et al. (2017) and the World Bank World Development Indicators.
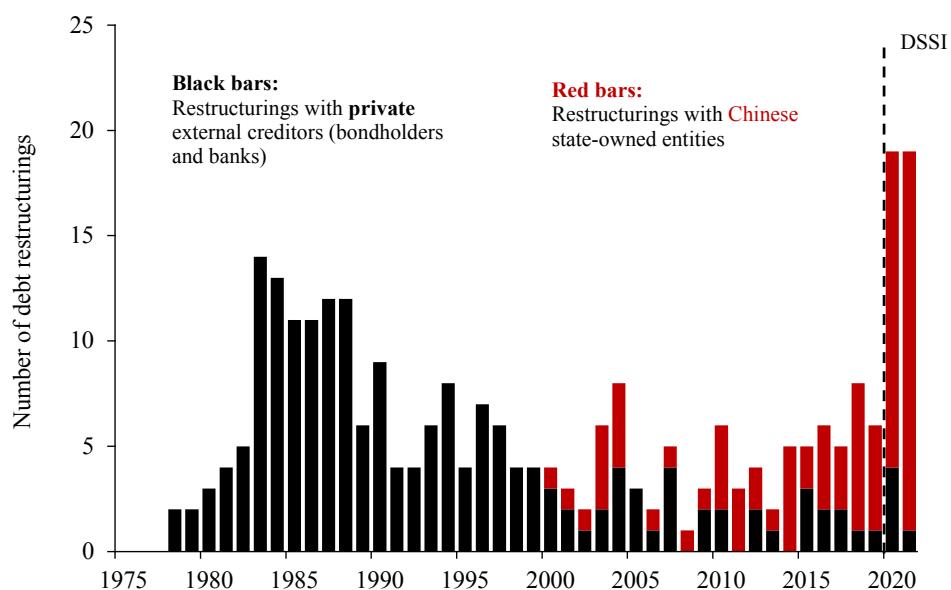
DISTRESSED CHINESE LOANS AND THE 'HIDDEN DEFAULTS'

China's overseas lending and credit relationships remain exceptionally opaque. Chinese lenders require strict confidentiality from their debtors and do not release a granular breakdown of their lending (Horn et al. 2021, World Bank 2021). Moreover, Chinese official loans and related credit events are not on the radar screen of major international credit rating agencies and no systematic data on related defaults are collected by international organisations such as the OECD, the IMF, or the Paris Club. Most Chinese debt-restructuring deals are arranged bilaterally and with little or no publicly available information. As a result, there is a substantial knowledge gap on what happens to Chinese claims in situations of debt distress and default.

In a new paper (Horn et al. 2022), we help to fill this knowledge gap by assembling an encompassing dataset of sovereign debt restructurings with Chinese lenders from a variety of sources. Since 2008, Chinese creditors arranged at least 71 distressed debt restructurings – more than three times the number of sovereign restructurings with private creditors (we record 21 bond and bank debt restructurings) and higher than the total number of Paris Club restructurings with distressed debtors (68 cases) during the same period. As our earlier work documents, China has become the most important

official player in international sovereign debt renegotiations. Moreover, Chinese lenders follow a crisis resolution approach reminiscent to Western lenders in the 1980s and 1990s. Except for symbolic, debt cancelations of small zero-interest loans, Chinese lenders almost never provide deep debt relief with face value reduction. Like their predecessors, they arrange reschedulings that offer some grace period, or short-term cash flow relief. Nominal debt write-downs are extremely rare as are reductions in the interest rates charged. The result is often serial debt restructurings. It remains to be seen whether Russia's substantive debts to China will follow this set pattern, as has been the case for other oil producers (Angola, Ecuador, and Venezuela, among others).

FIGURE 3   HIDDEN DEFAULTS: RESTRUCTURINGS WITH CHINA AND WITH PRIVATE EXTERNAL CREDITORS

Source: Horn et al. (2022).

Note: This figure combines data on distressed debt restructurings on private external creditors (bondholders and banks) from Asonuma and Trebesch (2016) with those on Chinese creditors from Horn et al. (2022). The Chinese cases include 33 debt reschedulings with countries in high risk of or at debt distress in the wake of the DSSI over 2020-21. To avoid bias, 149 "symbolic" restructurings of minor, zero-interest loans are excluded.

Against this backdrop, it is no surprise that comparatively little is known about the financial link between China and Russia (or China and other countries, for that matter). Data on defaults and arrears are not publicly available. In fact, since 2008, the only 'truly' reliable data on sovereign defaults are for sovereign bonds, which are tracked meticulously by rating agencies and the global press.

COLLATERAL AND IN-KIND REPAYMENTS

We do know that China's state banks use innovative contractual designs with elaborate safeguards against financial and political risk. In this sense, they are better poised to deal with the financial fallout they are now facing. Gelpern et al. (2021) show that a significant share of China's lending is collateralised, especially to commodity exporting countries. This implies that Chinese lending to distressed countries is not necessarily in default or non-performing but might be serviced through the proceeds of commodity exports. Russia is a case in point: an important share of Chinese lending took the form of advance payments for oil deliveries. Under a 2013 agreement, the state-owned China National Petroleum Corporation (CNCP) made advance payments of at least $30 billion to Rosneft in exchange for long-term oil deliveries through the Russia China oil pipeline. It is highly probable that Russia may continue to service the loans in kind, even if it were to default on other creditors (as was the case with Venezuela) and despite the sanctions imposed by Western governments.
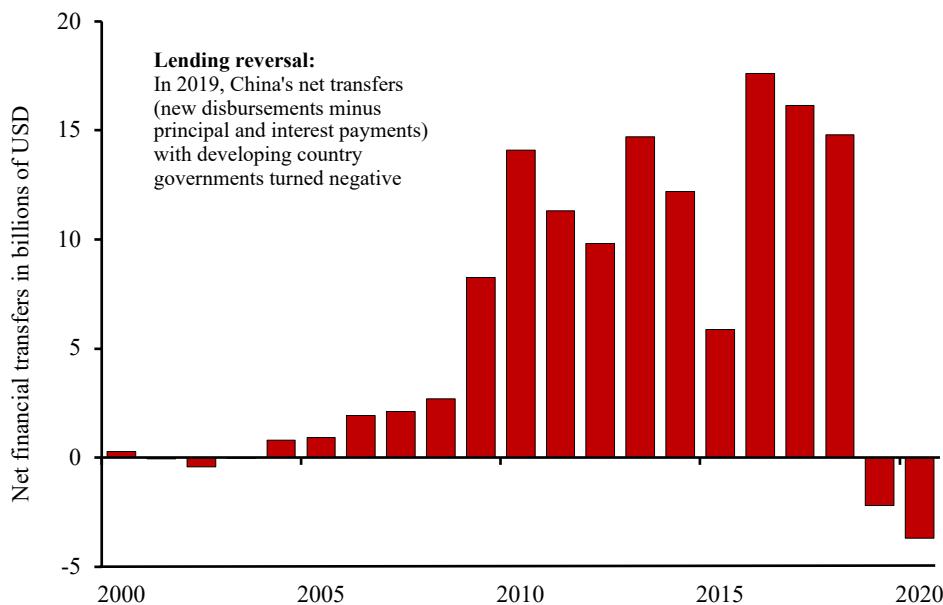
GLOBAL IMPLICATIONS: ROADBLOCKS IN THE BELT AND ROAD?

What are the broader global implications of these developments? Kaminsky and Reinhart (2000) stressed that cross-border financial contagion often arises in the context a 'common creditor' (in this case China). When a portion of the loan portfolio becomes impaired, the common lender rebalances risks by lending less to other potentially risky borrowers. The result is less or no new lending and a reduced appetite for rolling over pre-existing debts of other (sovereign) borrowers. This web of cross-border lending sets the stage for a *sudden stop* – including to borrowers that have no other bilateral trade or finance connections with the borrower(s) in distress (see also Kaminsky et al. 2003, Kalemli-Ozcan et al. 2013, Morelli et al. 2022).

The available evidence suggests that China's multi-year overseas lending boom had already largely ended and is hitting fresh roadblocks with the Russia-Ukraine war. This is especially bad news for EMDEs, at a time when global financial conditions are poised to tighten as major central banks attempt to rein in rapidly rising inflation. Such a sudden stop impacts much of the developing world who owe large amounts of debt to China. Net transfers from Chinese bilateral creditors to developing country public sector recipients have turned negative in 2019 and 2020 after peaking in 2016 (Figure 4). This means that principal and interest repayments to China now exceed fresh disbursements.[4] Chinese policy banks have turned from a source of developing country growth (Müller 2021) into net 'global debt collectors'. The Russia risks could amplify that trend.

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4   Figure 4 uses the latest data from the World Bank's International Debt Statistics (IDS). Coverage of Chinese lending has increased substantially across the latest vintages of the IDS (Horn et al. 2022b), but the data does not capture possibly large amounts of Chinese lending to special-purpose vehicles (Malik et al. 2021). Also see Mihalyi and Morris (2021).

FIGURE 4   SUDDEN STOP? CHINESE NET FINANCIAL TRANSFERS TO DEVELOPING COUNTRIES

Note: This figure shows net transfers (new disbursements minus principal and interest payments) from Chinese bilateral creditors to public sector recipients in developing and emerging market countries. Data is from the World Bank's International Debt Statistics.

The Global South faces new risks of a 'sudden stop' in Chinese lending and ripple effects may be substantial. As Chinese banks face pressure both at home (Rogoff 2021) and abroad, their appetite to provide fresh financing and meaningful debt relief to developing countries is poised to decrease. Moreover, it may become more challenging to refinance existing debts that are coming due.[5] Chinese loans have comparatively short maturities (Horn et al. 2021) and need to be rolled over frequently. For many poor and highly indebted countries this implies a growing dependence on Chinese debt 'evergreening', because alternative sources of (re-)financing may be unavailable or prohibitive in cost.

In sum, the Russia-Ukraine war is likely to have significant financial implications not just for China and the countries in Central Asia that are closely linked with Russia, but also for capital flows and debt restructurings in dozens of developing countries spanning nearly all regions. Many of these same countries will also be impacted by the rising cost of food and energy, yet another by-product of the war.

5   As was the case with US banks, the common lender in the early 1980s developing country crisis, and Japanese banks, the common lender during the Asian crisis of 1997-1998 (Kaminsky and Reinhart 2000).

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CHAPTER 24

War-induced food price inflation imperils the poor

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1 April 2022

The war in the Ukraine has led to a surge in global food prices (Arezki 2022) that threatens to push millions into poverty. This column presents estimates of the impact that the conflict-induced surge in wheat and corn prices is likely to have on low and lower middle-income countries. To this end, we use the Household Impacts of Tariffs (HIT) database and a new toolkit specifically designed for simulating the poverty and inequality impacts of the Ukraine war on low-income countries (Artuc et al. 2021, 2022). The HIT dataset contains household survey data from 53 low- and lower-middle-income countries, representing 1.6 billion people. The toolkit (which is available for download) has been specifically designed for the purpose of modelling the welfare impacts of food price inflation.[1]

FIGURE 1   WHEAT AND CORN PRICES SURGE IN RESPONSE TO THE CONFLICT

Source: S&P Global Market Intelligence

1   https://www.worldbank.org/en/research/brief/hit

Ukraine and Russia combined supply over a quarter of global wheat exports. Ukraine also accounts for 14% of global corn exports. Prices for these cereals have already soared and are expected to remain high in the foreseeable future (Selier 2022, Vaitilingam 2022). The average daily price of wheat was 53% higher during the first week of March than it was during January, while the price of corn was 23% higher. Future contracts suggest wheat prices in April will be approximately 40% higher than in January, with corn prices projected to be 24% above their January levels.
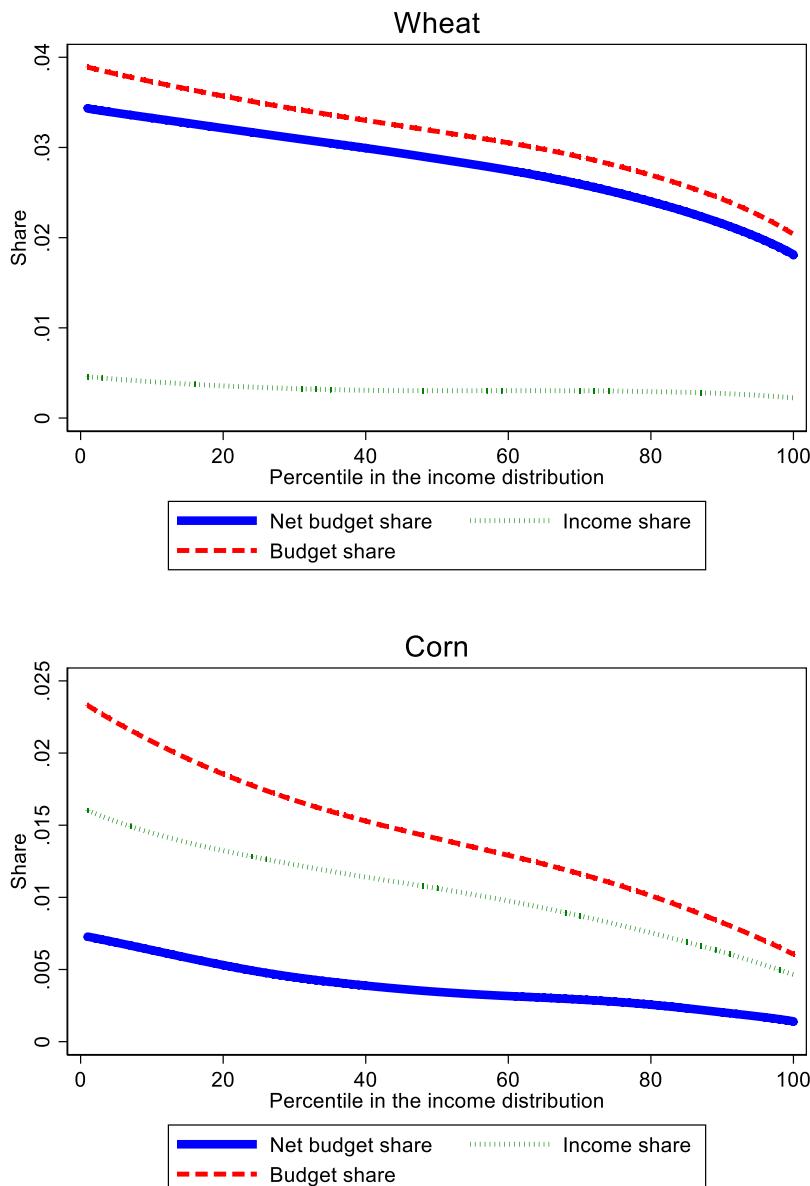
How will these food price increases impact households in developing countries? Consumers will be hurt due to higher prices, but wheat and corn sellers will benefit. The end result depends on whether the household is a net buyer or a net seller of these food items: net consumers will lose while net producers will gain. The overwhelming majority of households (79.1%) in developing countries are net buyers of both wheat and corn. On average, across the 53 countries in the HIT dataset households spend 3.1% of their income on wheat but earn only 0.4% from wheat sales. The average corn expenditure share is 1.4%, while the average corn income share is about 1.0%. This pattern is exacerbated at the left tail of the income distribution: poorer households tend to spend a larger share of their budget on wheat and corn. This is shown in Figure 2, which plots the average share of income spent on – and derived from – wheat and corn, respectively, against households' rank in their national income distribution. Poorer households are thus systematically more exposed to food price inflation.

We utilise our simulation toolkit to quantify the welfare impacts of the war-induced food price changes. For the purposes of this column, the household welfare metric is household real income (Deaton 1989, Artuc et al. 2019). The estimates presented here assume that the price increases observed between January and the first week of March can be fully attributed to the Ukraine war and, also, that these price hikes are fully transmitted onto domestic prices. We begin with a short-run analysis that exploits corn and wheat expenditure and income shares to calculate household real income changes. This short-run analysis assumes away any adjustment to consumption and income generating behaviours and thus provides an on-impact quantification of the real income effects of the conflict.

The resulting estimates for all 53 countries are presented in Table 1. Average household welfare decreases in 43 countries out of 53 in the sample due to higher wheat and corn prices. The average loss in household real income is -1.5%, but there is enormous worldwide heterogeneity. Countries with the largest losses are Armenia, Georgia, Kyrgyzstan, and Tajikistan, where real household incomes could fall by over 5% on average. A few countries that are not highly reliant on wheat and corn imports are hardly affected or may even gain if they are net suppliers of these commodities.

FIGURE 2   POORER HOUSEHOLDS SPEND A GREATER SHARE OF THEIR (NET) BUDGET ON FOOD ITEMS

TABLE 1   ESTIMATED IMPACTS OF WHEAT AND CORN PRICE INFLATION ON REAL HOUSEHOLD INCOME

	Impact on real household income (%)				
	Average	Bottom 40%	Top 60%	Budget share	Income share
Armenia	-7.71	-9.57	-6.47	15.34	0.73
Azerbaijan	-4.16	-5.45	-3.30	8.19	0.45
Bangladesh	-0.16	-0.11	-0.19	0.82	0.56
Benin	-0.64	-0.05	-1.03	5.03	2.37
Bhutan	-0.78	-0.88	-0.71	2.15	0.84
Bolivia	-3.34	-4.31	-2.69	7.32	0.78
Burkina Faso	-0.27	-0.34	-0.22	1.82	0.61
Burundi	0.00	-0.07	0.05	0.63	0.55
Cambodia	0.07	0.08	0.06	0.00	0.30
Cameroon	-0.31	-0.41	-0.25	2.83	1.52
Central African	-0.84	-0.57	-1.01	5.00	5.87
Comoros	0.46	1.02	0.08	2.34	4.45
Cote d'Ivoire	0.14	0.25	0.06	0.31	0.94
Ecuador	-1.35	-1.66	-1.15	3.19	0.64
Egypt, Arab Rep.	-3.54	-4.16	-3.13	6.99	0.39
Ethiopia	-1.59	-1.81	-1.45	4.76	0.15
Gambia, The	-0.01	-0.01	-0.01	0.10	0.06
Georgia	-5.53	-6.82	-4.67	10.70	0.32
Ghana	0.43	0.51	0.37	1.06	3.48
Guatemala	-2.93	-3.39	-2.63	9.46	0.86
Guinea	-1.15	-1.06	-1.20	2.99	0.81
Guinea-Bissau	-1.40	-1.36	-1.43	2.98	0.34
Indonesia	0.10	0.16	0.06	0.17	0.63
Iraq	1.04	1.54	0.70	0.76	2.77
Jordan	-1.36	-1.87	-1.03	2.64	0.04
Kenya	-0.84	-0.43	-1.12	8.48	7.50
Kyrgyz Republic	-5.23	-5.96	-4.75	10.55	0.94
Liberia	-0.80	-0.56	-0.96	1.96	0.41
Madagascar	0.11	0.11	0.10	0.45	0.93
Malawi	-1.22	-0.99	-1.38	8.07	4.14
Mali	-0.66	-0.94	-0.48	1.87	0.67
Mauritania	-4.31	-5.31	-3.63	8.30	0.13
Moldova	-0.97	-1.24	-0.79	2.05	0.27
Mongolia	-4.29	-5.62	-3.41	8.17	0.03
Mozambique	-2.40	-0.29	-3.82	7.95	3.08
Nepal	-0.60	-0.99	-0.34	1.94	0.58
Nicaragua	-1.94	-2.17	-1.78	5.24	2.01
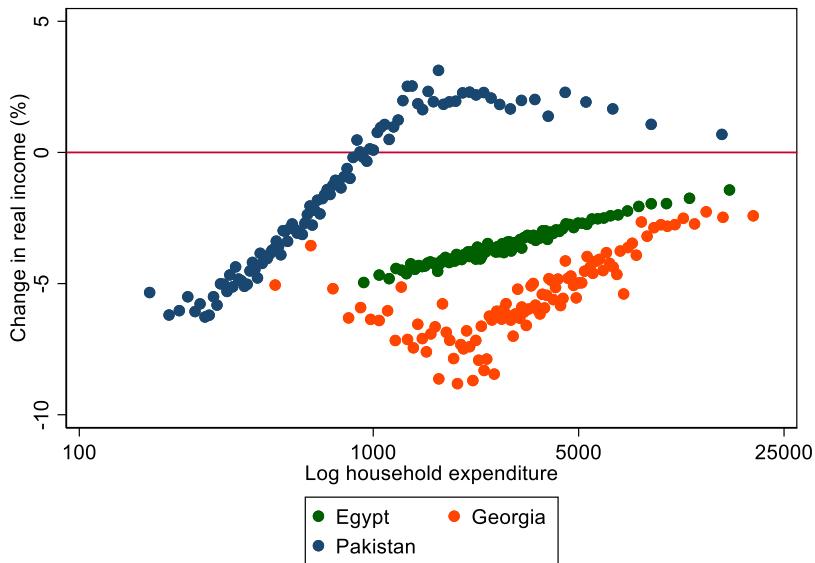
	Impact on real household income (%)				
	Average	Bottom 40%	Top 60%	Budget share	Income share
Niger	-0.54	-0.29	-0.71	2.32	0.02
Nigeria	-0.85	-0.76	-0.91	4.47	3.98
Pakistan	-1.65	-4.56	0.29	5.74	2.69
Papua New Guinea	-2.01	-2.00	-2.02	5.12	1.27
Rwanda	-0.43	-0.56	-0.34	1.92	0.37
Sierra Leone	-0.39	-0.06	-0.61	1.08	0.73
South Africa	-3.39	-5.32	-2.11	9.63	0.04
Sri Lanka	0.22	0.32	0.16	0.01	0.60
Tajikistan	-4.87	-4.19	-5.33	9.34	0.10
Tanzania	-1.03	-1.71	-0.59	6.17	1.56
Togo	-0.98	-0.98	-0.98	5.24	2.00
Uganda	-0.60	-0.88	-0.41	4.01	2.20
Uzbekistan	-2.40	-2.41	-2.39	7.10	2.38
Vietnam	0.13	0.31	0.00	0.22	1.01
Yemen, Rep.	-3.12	-4.52	-2.20	6.42	0.21
Zambia	-3.31	-3.60	-3.12	9.84	1.72
Average	-1.57	-1.81	-1.41	4.55	1.36

Importantly, there is a lot of heterogeneity in impacts within countries, with poor households typically bearing the brunt of the shock. Figure 3 shows how the estimated real income effects vary across the status quo income distribution in Egypt, Georgia, and Pakistan. Each dot represents a percentile of the income distribution. In Egypt, it is the poor who suffer the largest losses. In Georgia, it is the middle-income households who do. In Pakistan, poor households suffer while relatively richer households are projected to enjoy real income gains. In all three countries, food price increases are likely to exacerbate inequality, with the bottom 40% suffering systematically higher losses. Impact heterogeneity is prevalent in our sample.
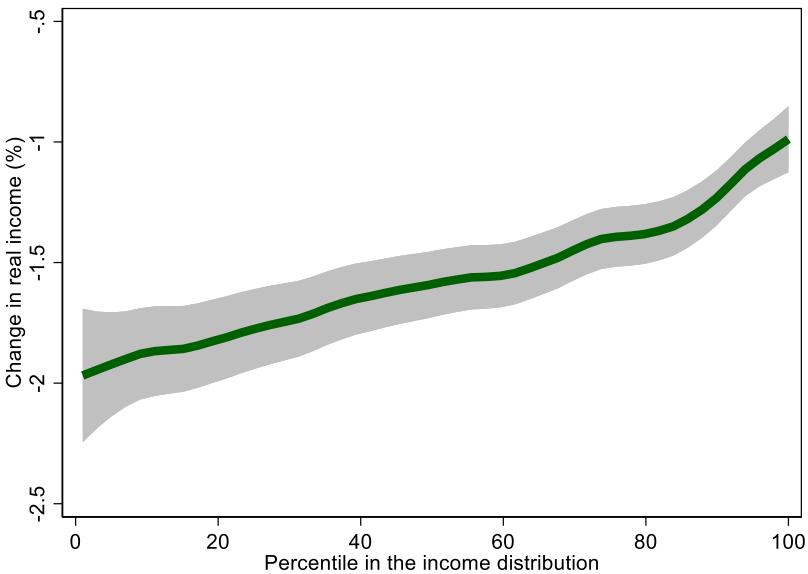
This pattern of income dis-equalising food price inflation applies more generally. When we pool all countries and then average across percentiles, as is done in Figure 4, we can see that real income losses are larger for poorer households – which is a consequence of them spending a greater share of their incomes on food items (as was shown in Figure 2). On average, the bottom 40% on average lose -1.8% of their incomes whereas households in the top 60% are expected to see their incomes reduced by -1.4%. Again, there is heterogeneity across countries, with 23 countries experiencing a reduction in the real income gap between the top 60% and the bottom 40%. By contrast, Pakistan, South Africa, and Armenia experience the greatest increases in inequality (see Table 1);

in these countries the real income discrepancy between the bottom 40% and the top 60% increases by more than 3%. Poverty rates, measured at using national poverty lines, go up by one percentage point on average across countries.

FIGURE 3   WELFARE IMPACTS IN SELECTED COUNTRIES

FIGURE 4   WELFARE IMPACTS ACROSS 53 DEVELOPING COUNTRIES

To explore longer-run impacts, we assume that the price changes persist and we take into consideration that households are likely to adjust their consumption patterns as well as income-generating activities in response to changing prices. The long-run analysis conducted with our simulation tool shows that the welfare losses will persist in 31 countries, even after taking these household responses into account. Simulations also reveal that the deterioration in shared prosperity will be protracted in 29 countries if the price increase of wheat and corn persist.

The estimated welfare impacts of food price inflation are large, especially given that we have only studied two commodities – wheat and corn. But the war has also led to an increase in the costs of other food items, such as oilseeds, and energy which is likely to aggravate the burden on the poor. Direct spending on energy alone accounts for 5.4% of household expenditure in the 53 countries in our sample. Our estimates thus almost surely underestimate the aggregate welfare effects of the conflict. At the same time, we have assumed perfect pass-through of international prices to consumers and no remedial action by governments to soften the shock.

Although the exact magnitude of the impacts of the war remains uncertain, it is clear that the Ukraine war is already having significant adverse spillovers on developing countries, the burden of which is predominantly shouldered by the poor.

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SECTION IV: THE IMPACT OF THE WAR ON UKRAINE

CHAPTER 25

Ukraine's recovery challenge

Oleksiy Blinov and Simeon Djankov
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31 May 2022

Military conflicts are associated with profound economic and human capital losses (Harrison 2022, Akbulut-Yuksel 2022). The economic impact depends on several factors: area occupied by enemy forces, bombing intensity, and the destruction of human capital and physical infrastructure. These losses are multiplied by the length of war activities and can have long-term effects. Ichino and Winter-Ebmer (2004), for example, find that Austrian and German children who were ten years old during WWII, or were involved in the war through their parents, received less education than comparable individuals from non-war countries such as Switzerland and Sweden. These individuals experienced a sizable earnings loss of between 3% and 4% a year some 40 years after the war.

Russia's invasion of Ukraine is unprecedented in recent times, as all military conflicts in the 21st century had taken place in countries with less developed human capital and physical infrastructure. Thanks to its educated labour force and good trade infrastructure, prior to the war Ukraine was among largest grain exporters in the world, dominating the global sunflower oil market, and was also ranked among the largest producers of steel. The deluge of over 6.5 million refugees to neighbouring countries and estimated eight million internally displaced people implies that the disruption is tremendous, even before one can have reliable accounts of the loss in physical capital.
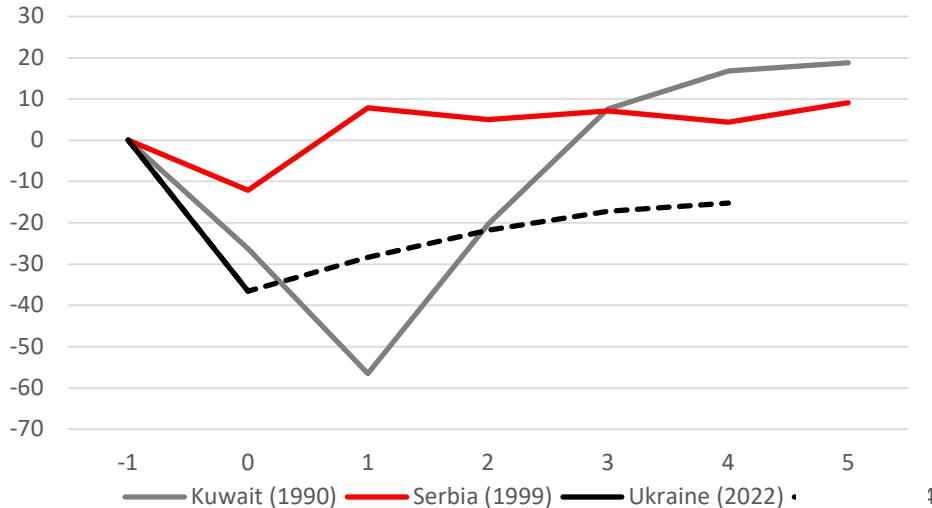
We estimate the likely economic loss in 2022, while spelling out the challenges in doing this estimation. First, war presents a statistical challenge. As some territory falls into enemy hands, local businesses and citizens stop reporting to the statistical agency, even if their economic life is uninterrupted. Ukraine has already fallen victim to this challenge: economic output data, including the GDP flash estimate for the first quarter of 2022, have not been produced as of the time of writing this column.

Second, the nature of Russia's all-out invasion makes comparisons to previous military conflicts difficult. We use Iraq's invasion of Kuwait in 1990 – where the Iraqi army badly damaged much of Kuwait's oil infrastructure – and NATO's intervention in Serbia in 1999 – where air raids were the main feature of the war, inflicting damage to select infrastructure – as imprecise proxies. The war in Kuwait had a heavy toll on the economy, with the country's GDP more than halved as this oil-dependent country saw its wells set on fire by the retreating Iraqi army. The rebound, however, was swift and the Kuwaiti

economy fully recovered in another two years (Figure 1). In the case of Serbia, the air attack did not damage the economic infrastructure as badly. The economy rebounded the next year, though a prolonged period of stagnation followed.

FIGURE 1   REAL GDP CHANGE IN SELECTED WARS (PERCENT)

(Year 0 is the first active year of a military conflict)

Sources: IMF, authors' own calculations based on May 2022 consensus forecast for Ukraine.

THE FORECAST IS FOR SLOW RECOVERY

According to the baseline scenario compiled by a consensus forecast as of May 2022 (FocusEconomics 2022), Ukraine's real GDP is expected to fall 36.5% in 2022 (Figure 1). That includes a 39% plunge in private consumption, caused by supply shocks, depressed real disposable income and consumer confidence, and by over six million refugees fleeing the country. Investment has collapsed to less than half of where it was in 2021, limited mostly to replacement of capital goods in areas of the country where that is still possible. Government consumption is expected to fall by 7% in real terms, despite a massive fiscal deficit above 15% of GDP.

On the external side, Ukraine's GDP is expected to face a strong 50% plunge in exports, mostly because of seaports being shut down by Russia's naval blockade. Stocks of agricultural commodities unable to be shipped abroad are likely to provide some temporary support for GDP via increased inventories. Imports are expected to fall 45% in real terms, softening the decline in GDP.

The most worrying feature of the consensus forecast is that economists do not expect a fast recovery, as it took place in preceding wars. Ukraine's real GDP growth should average 7.5% during 2023 to 2026, meaning that the economy remains 15% below its

pre-war level five years after the Russian invasion (FocusEconomics 2022). That is a pessimistic prediction when one compares this path with after-war recovery in Kuwait or Serbia (Figure 1). The main reason for this forecast is the uncertainty around the end of the war in Ukraine, as hostilities are still taking place in many parts of the country.

Some forecasts are even more pessimistic. In particular, there are forecasts for economic activities almost halved in 2022, including the 45% real GDP decline forecast made by the World Bank,[1] which includes expectations for private consumption losing as much as 50% and exports reduced to just a fifth of their 2021 amount (World Bank 2022). The World Bank expects slow recovery in the near term, with GDP growing just 2% in 2023 and less than 6% in 2024. That would imply that the Ukrainian economy would still be around 60% of its pre-war level by 2025.

RECOVERY CHALLENGES

As the war goes on, physical infrastructure suffers further damage and over a third of the Ukrainian population remains displaced from their homes for a fourth month. Estimates for losses of physical capital have already came close to $100 billion,[2] or half of Ukraine's pre-war GDP. For instance, the biggest steel mill in Ukraine (in Mariupol) has already been destroyed, while the second largest steel mill was under heavy bombardment and now is occupied by invaders. These two mills accounted for half of Ukraine's pig iron output in 2021. This means that Ukraine's sector is likely to gravitate upstream (iron ore), which implies less value added for national GDP and some additional logistical challenges on top of those that the country is facing now.

To make matters worse, prior to the war, Ukraine had already been a country with worrying demographic trends: aging population and dramatically falling birth rate. The war has deepened these challenges, with five million women and children escaping to higher-income countries, where Ukrainians have been allowed to get local work permits. As the war drags on, some of these refugees will find jobs and decide to settle abroad.

On top of quantitative human capital losses, there is a huge risk for qualitative degradation in human capital. Learning losses by Ukrainian children are a particular worry: Ukraine will end up in lower quality additions to its workforce due to war-caused (and prior to that, Covid-caused) disruptions in the learning process. These losses are estimated to be in the order of $90 billion (Angrist et al. 2022), or almost as much as the losses in physical capital to-date.

Akbulut-Yuksel et al. (2022a) demonstrate that early childhood exposure to war negatively affects not only cognitive ability but also long-term mental health. An increase of one standard deviation in the destruction caused by war during a person's first five

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years of life is associated with about a 10% decline in standardised mental health scores when they are in their 60s and 70s. This also translates into an increase of 3.3 percentage points in the likelihood of being diagnosed with clinical depression. Similar evidence of the adverse mental health effects of war on children has also been found among survivors of the Vietnam War. Vietnamese wartime children, especially girls, who were exposed to war before their teen years are significantly more likely to have functional limitations as adults in their daily activities (Akbulut-Yuksel et al. 2022b).

The recovery in human and physical capital lost in the war requires nearly $200 billion, assuming that the war ends now and that no further damage to infrastructure takes place. This amount is equivalent to Ukraine's pre-war annual GDP and can only be financed with external aid. Post-war Ukrainian and international institutions need to address the economic recovery as well as human capital recovery at the same time and with the same urgency.

The EU accession process would play a central role in the recovery. There is a need for a strong EU-driven post-war recovery effort, similar to the one that allowed most Western European economies to recover after WWII (Vonyo 2019). The outline of a possible recovery programme is given in Becker et al. (2022) in a recent VoxEU e-book. The programme can be structured in two phases: rapid restoration of critical infrastructure and services to revive the basic functions of the economy and the government; and re-establishing the foundations for sustained growth. The latter includes significant focus on human capital accumulation. These phases have different demands. For example, the first phase should include robust macroeconomic stabilisation to ensure that market-based mechanisms can start to allocate resources in the post-war economy.

The local banking sector is to play a significant role in Ukraine's recovery. Comprehensive banking sector reform has been a prominent success in Ukraine, with its outcomes demonstrating themselves well in times of the pandemic and war challenges. The post-war recovery is a good opportunity to attract international investors into the banking sector as a part of the greater challenge of rebuilding the country.

The second phase would focus on upgrading the institutional environment for growth. The most obvious possibility is to create a carbon-free economy, both as a way to coordinate on investments for the future but also to show how to reduce reliance on fossil fuels. Whole cities – including Kharkiv, Mariupol, and Chernihiv – will need to be rebuilt, and this represents an opportunity to utilise energy efficient building designs and urban planning.

Should the war continue in the coming months, the cost of reconstruction will jump tremendously, as a third of the Ukrainian population spends more time away from their homes, children fall behind in their learning, and businesses cease to operate. The financing needs would be much greater too, requiring new approaches to aid the recovery.

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CHAPTER 26

The loss of human capital in Ukraine

Noam Angrist, Simeon Djankov, Pinelopi Goldberg and Harry Patrinos
University of Oxford; London School of Economics; Yale University; World Bank

27 April 2022

Studies on war or civil conflicts can be used to gauge the human capital losses from the Russian invasion in Ukraine. Ichino and Winter-Ebmer (2004) find that Austrian and German children who were ten years old during WWII, or were involved in the war through their parents, received less education than comparable individuals from non-war countries such as Switzerland and Sweden. These individuals experienced a sizable earnings loss of between 3% and 4% a year some 40 years after the war, which can be attributed to the educational loss caused by the conflict. Using data on learning in the former Yugoslavia, Lai and Thyne (2007) and Eder (2014) argue that children born into or growing up in conflict become permanently less productive.

Even smaller disruptions to schooling than wars have large negative effects on learning. The effect may differ between girls and boys. Girls who were of school age during the 1992-98 Tajik civil war and lived in affected regions were less likely to complete their mandatory schooling than girls of the same age who lived in the regions relatively unaffected by conflict (Shemyakina 2011). A study on the effects of the Ebola crisis in Sierra Leone shows that girls experience a persistent 16 percentage points drop in school enrolment post-crisis (Bandiera et al. 2019). As another example, in 2005 a large earthquake struck northern Pakistan. Four years later, children under the age of three at the time of the earthquake had accumulated large height deficits and children aged 3–11 scored significantly worse on academic tests (Andrabi et al. 2021).
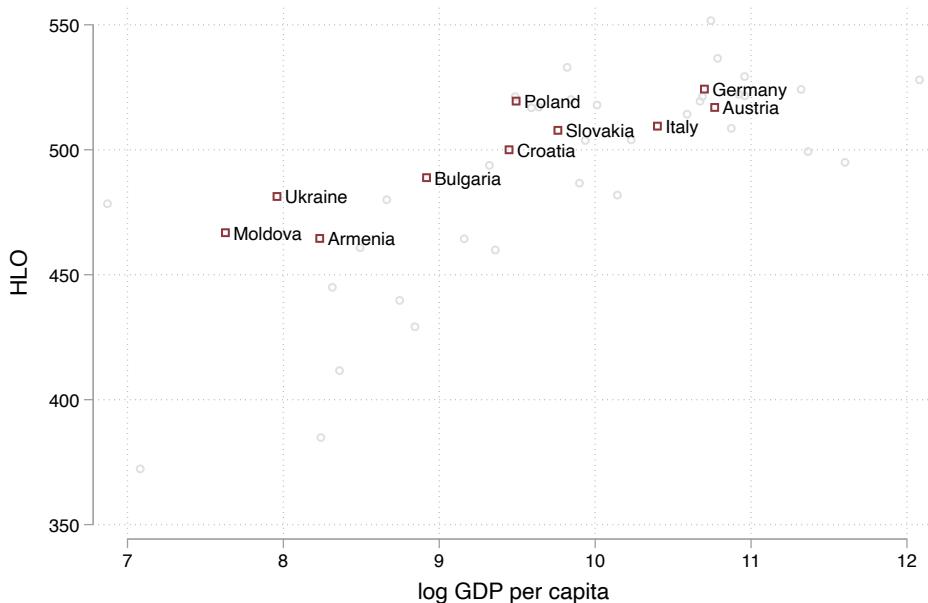
The Covid-19 pandemic created a worldwide disruption that can be used to measure the effect of school closures on learning. One study comes from the Netherlands, which features an equitable system of school funding as well as the world's highest rate of broadband access and as a result underwent only a short lockdown (eight weeks). Still, Engzell et al. (2021) reveal a learning loss of about three percentile points. The effect is equivalent to one-fifth of a school year, the same period that schools remained closed. Losses are up to 60% larger among students from less-educated homes, confirming worries about the uneven toll of the pandemic on children and families.

Estimates from other school disruptions due to Covid-19, show that on average, losses in Europe have amounted to about one-third of a year's worth of learning (Donnelly and Patrinos 2021). In countries with longer closure periods, such as Poland, learning losses imply a loss of the equivalent of a year in school (Jakubowski et al. 2022).

LEARNING LOSSES IN UKRAINE

We estimate the learning losses due to the Russian invasion of Ukraine. Data from the Harmonized Learning Outcomes database (Angrist et al. 2021), recently published in Nature, show that Ukraine performs at par with its regional neighbours in eastern Europe, including Bulgaria and Croatia, prior to the Covid-19 pandemic and the Russian invasion (Figure 1).

FIGURE 1   UKRAINE PERFORMED AT PAR WITH ITS PEERS ON LEARNING IN 2019
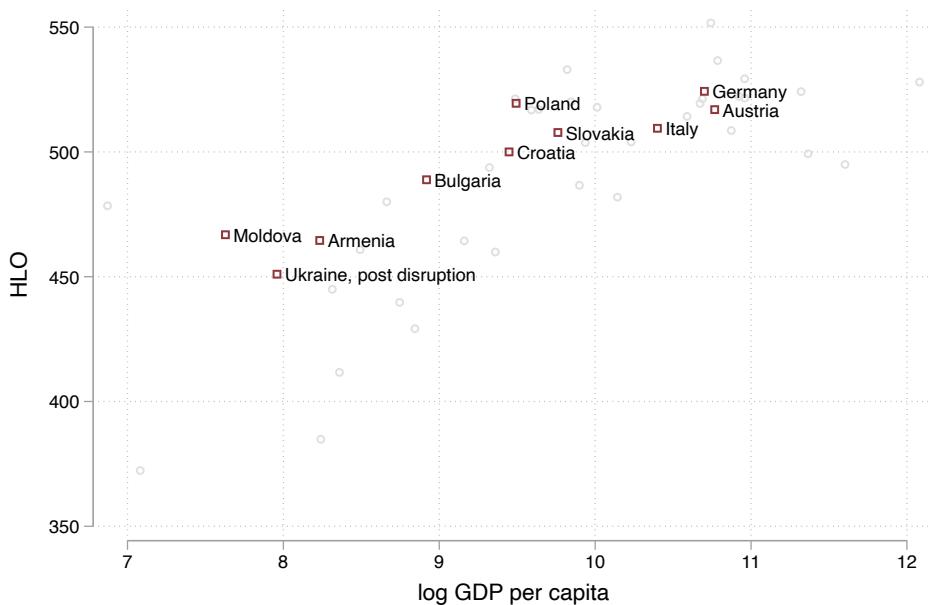
Source: Estimates using data from Angrist et al. (2021).

Continued school closures only exacerbate learning losses in Ukraine. Schools were closed or disrupted due to Covid-19 for 31 weeks in Ukraine, or about 7.75 months. The learning loss associated with school closures of this length are estimated to be around 20 points, based on OECD averages of learning per year. We add another two months due to the war to-date. Many Ukrainian children will take a lot longer to come back to the classroom. The war in Ukraine has resulted in more than 5.2 million Ukrainians fleeing

to neighbouring countries.[1] The refugees include primarily children, women, and older people, as all men below the age of 60 have been conscripted in the army. The number of internally displaced persons – those who have been forced from their homes but are still in Ukraine – exceed seven million. These children will likely not go back to school before the fall, losing at least five additional months of school time.

This simple calculation suggests that learning losses in Ukraine can amount to over one year, due to a combination of extended pandemic-related closures and the war. Estimates of harmonized Learning Outcomes due to this length of school closure could fall from 481 to about 451 points, below the lowest performing countries in Europe, Moldova, and Armenia (Figure 2). The long-term effect could be substantial, with future earnings losses of more than 10% a year per student.

FIGURE 2   ESTIMATES OF UKRAINE LEARNING LEVELS POST COVID-19 AND WAR-RELATED SCHOOL DISRUPTIONS

Source: Estimates using data from Angrist et al. (2021).

POLICY IMPLICATIONS: PROVIDING EDUCATION FOR TEMPORARILY DISPLACED CHILDREN

The experience of Ukrainian children who have been displaced from their homes is hugely disruptive. The uncertainty of when and where their families will be reunited will surely delay any school decisions. While providing education during war is difficult, evidence suggests several policies that make it possible. First, opening classes for Ukrainian refugees in selected schools in neighbouring countries can be a temporary answer, as well as expanding schools in parts of Ukraine where many internally displaced families have moved.

Second, online, by-phone, or in-person tutoring can happen anywhere and bring positive results. During Covid-19 school closures, online tutoring provided by university volunteers for secondary school students proved effective in Italy, with increases in learning of 0.26 standard deviations (Carlana and La Ferrara 2021) and a unit cost of €50; similar positive results for an online experiment were found in the case of online tutoring in Spain (Gortazar et al. 2022) and a cost-effective online tutoring program in the US was recently evaluated (Kraft et al. 2022).

In settings with limited internet access during school disruption, phone call tutorials were highly cost-effective with up to a full year of high-quality instruction gained per $100 spent (Angrist et al. 2020a). This approach has been tested in multiple countries with similarly large and cost-effective learning gains. In some neighbouring countries like Poland, in-person tutoring can also be organised. This effort would be complementary to the online education system that Ukraine has just launched: the All-Ukrainian Online School platform.

Third, adapting curricula – including printing textbooks in Ukrainian – in countries receiving refugees so that a large number of refugee children can regain access to standard schooling is a way forward. Such progress is already being made in Hungary and Poland, while Bulgaria is falling behind. This step suggests a longer-term stay of Ukrainian families abroad, at least for families from the worst-affected regions.

Some of these policies and interventions have effects on par with the most cost-effective and largest gains in the education literature (Angrist et al. 2020b), likely since the counterfactual is so dire. Education provision during war is daunting yet finding a way to provide educational instruction is possible and stems human capital losses which would otherwise compound long after the war.

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CHAPTER 27

Learning the hard way: The effect of conflict on education

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19 April 2022

The new conflict in the heart of Europe highlights the importance of understanding how conflict impacts human development. There is a relatively recent yet rapidly growing literature documenting that the economic consequences of conflict are devastating and often long-lasting (Verwimp et al. 2019, de Groot et al. 2022).[1] Among the most pervasive of these effects are those affecting individual-level education outcomes for children and adolescents (UNESCO 2011).

The importance of education for economic development and individual wellbeing cannot be overemphasised, both from a historical perspective (Becker 2022) and considering its role as an engine of long-term growth (Porzio and Rossi 2022).

The existing empirical evidence indicates that the effects of violent conflict on education are highly heterogeneous. The sign and magnitude of the effects depend, among other elements, on the type of conflict (i.e. civil conflict, inter-state war, terrorism, etc.) and the type of violent events (killings, abduction, etc.), on the gender, as well as on the education outcome considered (school enrolment, attendance, attainment, etc.) (Chamarbagwala and Moran 2010, Shemyakina 2011, Leon 2012, Di Maio and Nandi 2013;, Valente 2013, Akbulut-Yuksel 2014, Justino et al. 2014, Monterio and Rocha 2017, Bertoni et al. 2019, Michaelsen and Salardi 2020, Miaari and Lee 2022).

One aspect that has received little attention so far is the effect of conflict on academic achievement for high school students and the mechanisms underlying such effects. Answering these questions is important because academic achievement is a predictor of future earnings, especially when admission to university is determined by high school final exam performance. Moreover, learning about the effects of conflict on high school students is crucial for a better understanding of the impact of violent conflict on the development prospects of an economy, given that these students will make up a large part of the country's high-skilled workforce in the future. Finally, it particularly matters

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1   For preliminary analyses and estimates of the direct and indirect effects of the war in Ukraine, see Arezki (2022) and Vaitilingam (2022).

in the case of Ukraine as practically all its children attend high school and many continue to university. Hence if conflict impedes secondary school outcomes, its development impacts will be particularly relevant.

THE EFFECT OF CONFLICT ON ACADEMIC ACHIEVEMENT

In our paper (Brück et al. 2019) we document the effects of violent conflict on high school education in the context of the West Bank during the Second Intifada, a period of intense violence between Israelis and Palestinians. Taking advantage of unique micro-level data, we provide the first empirical analysis of the effects of conflict on academic achievement for high school students. Specifically, we study the effect of conflict on individual results at the final high-school exam (the Tawjihi General Examination) for the population of high school Palestinian students in the West Bank during the period 2000-2005.

The West Bank, sadly, is an ideal setting to study the effect of conflict on education, and in particular on the academic achievement of high school students, for two main reasons. First, high school enrolment in the West Bank has always been high by international standards. Second, the Palestinian education system continued operating even during the Second Intifada.

Our empirical analysis proceeds in two steps. First, we estimate the effect of conflict on individual academic achievement. We use spatial and time variation in conflict intensity – as measured by the locality-level number of Palestinians killed by Israeli Defense Forces (IDF) during the academic year – to identify the effect of the Israeli–Palestinian conflict on individual exam results. By exploiting the within-school variation in the number of fatalities over time, we find that conflict reduces the probability of passing the exam, the total test score at the exam, and the probability of achieving the minimum test score needed for admission to university. We also document that the effect of conflict is not significant for students in the upper tail of the test score distribution, suggesting that the effect is more negative for less able students.

HOW DOES CONFLICT WORSEN ACADEMIC ACHIEVEMENT?

The finding that conflict has a negative impact on academic achievement in high schools is hardly surprising; less obvious are the specific mechanisms through which this effect materialises. Understanding this is an important task considering that this is needed to design effective policies to mitigate the negative effect of conflict on education outcomes.

We document the existence of two distinct transmission mechanisms from violent conflict to reduced academic achievement.

As a first mechanism, we show that conflict negatively affects the quality of the learning environment at school. In particular, conflict increases overcrowding in the classroom which, in turn, correlates with a lower probability of passing the final exam.[2] Interestingly, we also find that the negative effect of higher overcrowding in the classroom on the test scores is significant only for students in the lower tail of the test score distribution. This suggests that those are the students for whom the quality of the learning environment at school is likely to be more important and who will thus suffer more from the impact of the conflict-induced destruction of on school infrastructures.

The second mechanism is the worsening of students' psychological wellbeing due to exposure to conflict-related violence. Direct exposure to conflict – as proxied by the per-capita number of fatalities occurred in the locality of the school – has a large negative impact on the student's probability of passing the exam and this is effect is larger when the killed is young (suggesting a mechanism of self-identification). Finally, we show that the negative effect of direct exposure to conflict-related violence is largest for conflict events occurring shortly before the exam date – specifically, one month before – providing support for a psychological mechanism being at work.[3]

CONCLUDING REMARKS

Each conflict is somehow unique. Yet, unfortunately, almost all conflicts have similar negative impacts on education.

Focusing on the period of the Second Intifada in the West Bank, our study documents that conflict events reduce Palestinian high-school students' probability of passing the final exam, the total test score at the exam, and thus the probability of being admitted to university.

Moreover, our findings indicate that the negative effect of conflict on academic achievement may also have long-lasting consequences. By reducing the probability of a student completing high school and of being admitted to university, conflict events significantly hinder human capital accumulation and economic development. We have shown that this holds disproportionately more for lower-ability students, which may

2   There are two main reasons for the conflict-induced increase in classroom overcrowding. First, military attacks and school occupations by Israel Defense Forces damaged and – in some cases – destroyed premises and properties of Palestinian schools resulting in a shortage of classrooms. Second, the conflict situation made it more difficult for the Palestinian authorities to expand the number of classroom to meet the growing number of school-aged Palestinians.

3   We also consider other mechanisms. We find that conflict intensity is associated with more school closures and more student and teacher absenteeism. Yet, due to severe data limitations on these variables, we cautiously interpret the overall empirical evidence on these mechanisms as being inconclusive.

imply that conflict worsens inequality through its adverse impacts on learning and education.[4] This represents a potential long-term cost to be added to the several other already documented negative consequences of conflict on education.

These negative effects are due to the conflict-induced worsening in both the quality of the school learning environment and in the psychological well-being of students. Our results thus suggest that any policy intervention to mitigate the negative effects of conflict on education outcomes should account for both of these aspects.

These findings have several implications for other countries suffering the burdens of conflict, like Ukraine in these weeks. First, the conflict-induced destruction of school infrastructure (or even the inability to maintain the existing infrastructure) may have large long-term social and economic costs. Second, it is important to acknowledge that – unfortunately – the immediate suffering caused by the fighting are only one part of the emotional burden to which individuals are exposed during a war. In fact, short-term exposure to individual violent events may have additional effects which will shape the lives and the performance of children and youth permanently. Governments of conflict-affected countries like Ukraine, their allies and donors should protect children not only from the direct effects of violent conflict but also from the indirect ones by maintaining as much as possible appropriate social infrastructures and by trying to counteract the psychological burden of experiencing violent events. These secondary prevention measures can work to alleviate some of the suffering and adverse consequences of conflict on the youngest. Even more effective would be primary prevention, of course – the prevention of war itself.

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4 The findings are in line with those on effects of the COVID-19 pandemic on education. The pandemic-induced negative shocks to the supply of education has been shown to be likely to reduce the economic opportunities of youths in the long term (Engzell et al. 2020, Fuchs-Schündeln et al. 2020). These effects are expected to be particularly negative for low-achieving students with a disadvantaged socio-economic background (Aucejo et al. 2020, Burgess and Sievertsen 2020, Grewenig et al. 2020).

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CHAPTER 28

Lessons from history for our response to Ukrainian refugees

Sascha O. Becker
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29 March 2022

More than three million people have now fled Ukraine as a result of Russia's invasion, according to the UN.[1] This massive refugee flow resulting from Putin's unprovoked attack on Ukraine requires a policy response from all European countries, including the UK.

The UK was at the forefront of helping those fleeing from Nazi Germany. It also has a moral obligation to help those fleeing the atrocities of Putin's army today. Some countries – for example, Poland, Moldova, and Romania – have given amazing welcomes to Ukrainians. It is estimated that over 1.7 million Ukrainian refugees have fled to Poland alone.[2]

The initial response of the UK government has been slow and extremely bureaucratic, but the UK now must do more to help refugees of all ages. The recently launched 'Homes for Ukraine' scheme, which offers £350 a week to households to house refugees, is a step in the right direction.[3]

REFUGEE EXPERIENCE AND NEEDS

The UN's refugee agency (UNHCR) estimates that around 70 million people are forcefully displaced around the world. The war in Ukraine is adding several million more refugees to this number.While the humanitarian rationale for helping refugees is obvious, it is also important to understand the needs of refugees beyond their mere survival, shelter, and food. Refugees are not just another group of immigrants. They did not have months or even years to plan a move across international borders, as economic migrants might have. Instead, the trauma of forced displacement comes with a series of additional experiences and needs (Becker and Ferrara 2019):

- First, refugees have undergone and still undergo physical or psychological pain to an extent not experienced by voluntary migrants.

1   Source: UNHCR Operational Data Portal on Ukraine Refugee Situation.
2   Ibid.
3   See https://www.gov.uk/government/news/homes-for-ukraine-scheme-launches

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LESSONS FROM HISTORY FOR OUR RESPONSE TO UKRAINIAN REFUGEES | BECKER

- Second, refugees have lost their assets as a result of destruction or because they had to leave their home – often quickly – without much hope of returning.

- Third, refugees often end up in sub-optimal locations; their first concern is to 'get out' and their choices over where to go are often limited. Just think of the UK's focus on giving visas to those Ukrainians who have family connections in the UK. How about those without family connections who, for whatever reason, want to make the UK their new home?

- Fourth, refugees often have no control over whether their new location is temporary or permanent, which makes planning one's future harder. In the case of Ukraine, many may wish to return but will be unable to do so until it is safe – and it is unclear when that will be.In these circumstances, one important aspect is education. This is because refugees who have lost all their physical belongings and have been uprooted from their homeland may wish to invest in the one (portable) asset that no one can take away from them: education (Becker et al. 2020a).

This applies to both adults and children. Adult Ukrainians are likely to want to learn the language of their new home country, as well as invest in developing vocational skills that will allow them to make the most of their new environment.

One group that deserves particular attention is refugee children. Around the world, the educational needs of refugee children are often overlooked as politicians in host countries focus on giving refugees food and shelter.

The UNHCR estimates that among the 20.7 million refugees under their immediate care, many in less developed areas of the world, 7.9 million are refugee children of school age.[4] Their access to education is limited, with almost half of them unable to attend school at all.
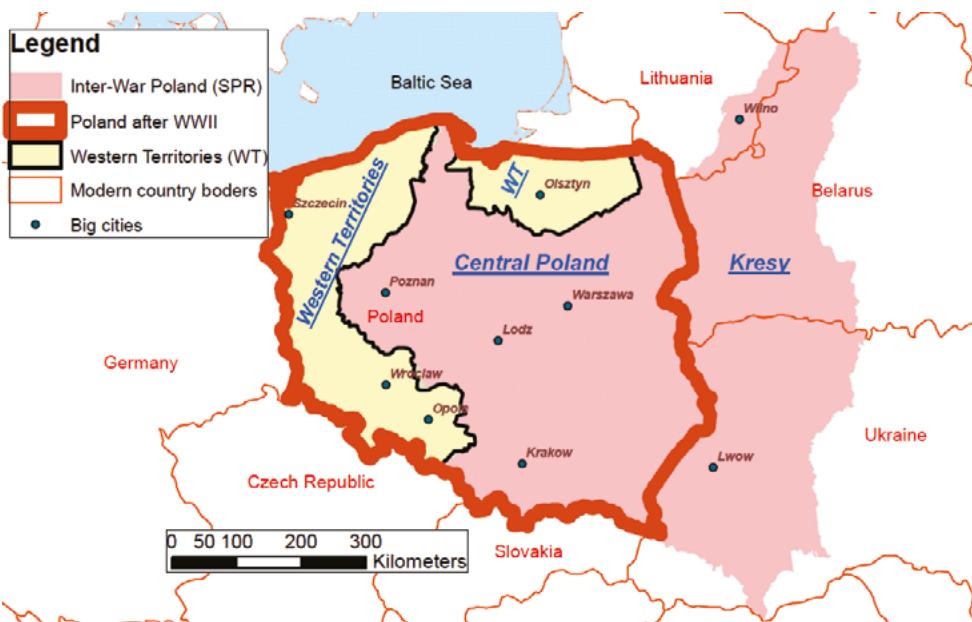
Even in Europe, immediate and full access to education for refugee children is by no means a given. In Germany, which welcomed more than one million Syrian refugees after Angela Merkel's famous "We can do it!" ("*Wir schaffen das!*"), state governments struggled to provide access to education for all refugee children. Some waited for nearly a year to go to school (Rod 2019).

4   Source: https://www.unhcr.org/uk/education.html

WHAT DOES HISTORY TEACH US ABOUT THE IMPORTANCE OF FULL AND IMMEDIATE ACCESS TO EDUCATION FOR REFUGEE CHILDREN?

During and after WWII, millions of Europeans were displaced and forcefully resettled hundreds, if not thousands, of kilometres from their homes as a result of massive border changes. In the aftermath of the war, over two million Poles were expelled from their homes when Polish frontiers were moved westward. Figure 1 illustrates Poland's redrawn borders.

FIGURE 1   MAP OF POLAND DURING WWII

Source: Becker et al. (2020a)

Poland's Eastern territories (Kresy) became part of the Union of Soviet Socialist Republics (USSR), concretely the Ukrainian, Belarussian, and Lithuanian Soviet Socialist Republics – the same part of the world that is now again at the centre of a massive war.

At the same time, former German areas (the Western Territories) became Polish. Before WWII, the Western Territories were home to about eight million Germans, who were forced to resettle after the war, leaving land and capital stock behind. In the east, Poles were forced to leave Kresy and the vast majority resettled in the now sparsely populated (formerly German) Western Territories.

Can the experience of being uprooted by force encourage people to invest in portable assets such as education? Economic researchers have long entertained the idea that being uprooted by force or expropriated increases the subjective value of investing in portable assets, in particular in education (e.g. Brenner and Kiefer 1981).

This notion is also popular outside academic spheres. In his bestselling autobiographical novel, *A Tale of Love and Darkness*, Amos Oz gives a testimony of how a history of forced migration has made Jewish families put a lot of emphasis on education as the "only thing that no one can ever take away from your children, even if, Heaven forbid, there's another war, another revolution, more discriminatory laws."

The Polish experience of forced migration after WWII shows strong evidence for the 'uprootedness hypothesis'. Polish people with a family history of forced migration as a result of the war are significantly more educated today than any comparison group.

This result suggests a shift in preferences toward investment in human capital rather than physical capital, and it implies that the benefits of providing schooling for forced migrants and their children may be even greater – and more persistent – than previously thought.

What is the lesson for the UK today? Above and beyond the moral imperative to help all refugees fleeing from an evil war, it is of paramount importance to give refugees immediate and unhindered access to schooling.

Every week that refugees spend in temporary shelters may lead to hesitancy by education authorities to provide places at school until there is more clarity about the long-term living arrangements and address. But every week is a week lost.

If a history of mass displacement in Europe carries any lessons for today (Becker 2022), refugees, and by extension their children, will be keen to make the most of a traumatic experience. Access to education can be a silver lining of forced migration (Becker et al. 2020b), allowing refugee children to invest in a brighter future.

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SECTION V: THE LONG-RUN IMPACT ON MULTILATERALISM AND THE INTERNATIONAL SYSTEM

CHAPTER 29

External military threats help to create a stronger European identity and cooperation

Kai Gehring

University of Bern

29 May 2022

The ongoing war in Ukraine has challenged European citizens and decision-makers. Will the EU, together with its allies, be able to provide a strong and uniform response? Or will it fracture into different groups that cannot manage to cooperate?

The EU is a particularly interesting case of a political union, because of its historical importance, its grand ambition, and the scale of the challenges for successful cooperation. Composed of member states that differ tremendously in language, culture, and history, it is quite remarkable how much has been achieved over the last decades.

However, many struggles remain, in particular in times of crisis. One key issue for more – and successful – cooperation is the question of a common European identity. Currently much of EU politics is still guided by national considerations (Gehring and Schneider 2018). The European debt crisis, for instance, revealed the challenge of establishing insurance mechanisms and redistribution. A stronger joint identity helps to establish trust and compassion within a group – a key condition for successful cooperation – and the willingness to share risks and support each other.

The determinants of identity have recently become a popular topic of economics research. In the EU context, Dehdari and Gehring (2022) show that negative historical experiences, including interstate war and tensions with the central state, are a key factor influencing the strength of regional identities. Gehring (2021) shows that support for the EU, both in surveys and actual voting, can also be explained by these negative experiences and the role of the EU in mitigating tensions between regions and central states. For Eastern EU members, their membership and support are also crucially related to historical experiences with the Soviet Union.[1]

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1   Current events can activate or strengthen such dependencies, as shown by Ochsner and Roesel (2017).

THREATS, IDENTITY, AND COOPERATION

The full-scale Russian invasion of Ukraine has also suddenly increased the perceived threat posed by a potential invasion of Russia for EU member states. Whether such outside threats lead to a stronger common identity of a group, and more cooperation, has been a crucial question for a long time.

Anecdotally, the foundation of many nations was fostered by an outside threat. Think about the American War of Independence against the British Empire or the foundation of a united Germany after a war against France. The EU itself and its predecessors were developed at least partly as a response to the military threat posed by the Soviet Union, and the Cold War is supposed to have had a unifying effect (Bordalo et al. 2021).

However, there has been no causal evidence to support the claim so far outside a laboratory setting. There were two main challenges to answer this question causally using real world examples. The first concerns the ability to distinguish the effect of an increased threat from other shocks. For instance, increased threats are often accompanied by direct conflict, destruction, or actual cooperation, making it hard to know whether any effect is due to the conflict or the threat (Todo and Kashiwagi 2021).

Second, relying purely on comparisons of before and after the threat runs into the risk of identifying a spurious correlation, but not necessarily a causal relationship. Hence, despite the popularity of the threat-identity-hypothesis, there was no causal evidence for it to be a real phenomenon and not just an ex post historical narrative.

## QUASI-EXPERIMENTAL EVIDENCE FROM THE RUSSIAN INVASION OF UKRAINE 2014
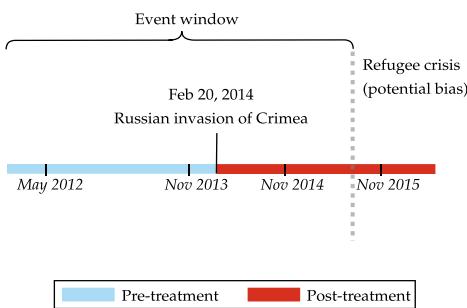
In a recent paper (Gehring 2022), I use the Russian invasion of Crimea and parts of the Donbas region in 2014 as a natural experiment to provide such evidence. Three features allow this.

First, while the invasion was in Ukraine, it clearly affected the perceived threat posed by Russia to EU member states as well. Second, the invasion itself and, in particular its precise timing, were unexpected at the time and can thus be considered as an exogenous shock (Gorodnichenko and Roland 2014, Gylfason and Wijkman 2014, Gylfason et al. 2014).
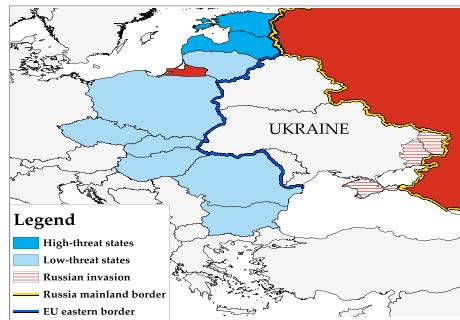
Third, there were clear differences in the intensity of the threat between EU member states, generating cross-sectional differences in the intensity of that shock. I argue that the shock was largest for Estonia and Latvia, as these two states have both a direct land border with Russia and a sizeable Russian minority population (used to justify invasions by Russia).

FIGURE 1   QUASI-EXPERIMENTAL DESIGN
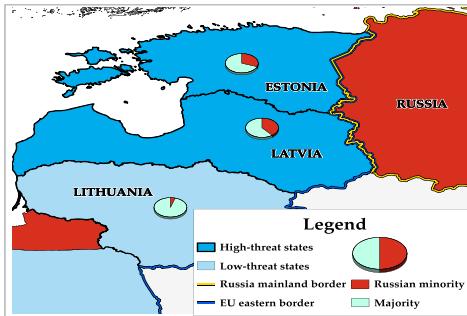
(a) Short main event window to reduce impact of other potentially biasing events
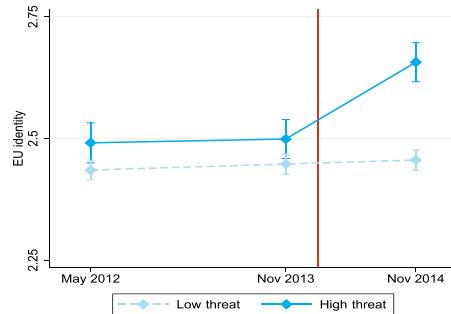
(b) Classification in high threat and low threat EU member states

(c) Higher threat intensity with large Russian minorities and mainland–Russia border

(d) Raw change in EU identity for high versus low threat states based on Eurobarometer
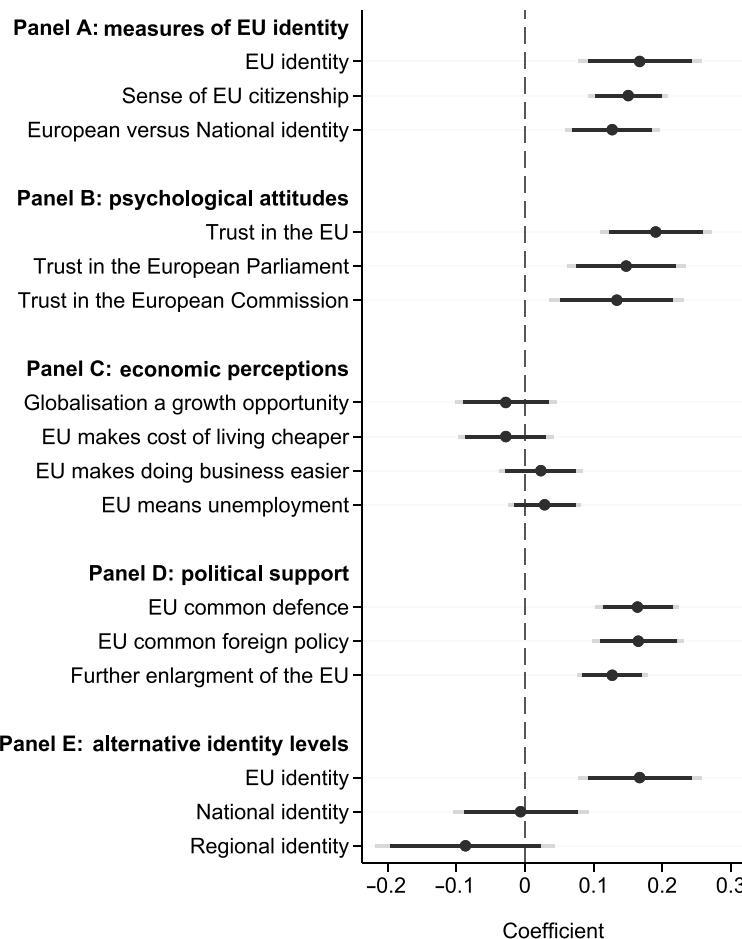
Notes: Figure 1(a) reports a timeline for our analysis. Figure 1(b) shows the treatment and control groups. Maps are based on Eurostat (2016). Minority shares in Figure 1(c) are identified based on language. Figure 1(d) shows a simple average difference in our main variable. Figures show 95% confidence intervals of averages.

Using both qualitative and quantitative evidence based on text analysis of newspaper articles and internet searches, I validate these assumptions. Citizens everywhere in the EU feel more threatened, but the intensity varies in line with this expectation.

With data from the bi-yearly Eurobarometer survey, I then examine empirically using a difference-in-differences framework whether there is a causal effect of the increased threat on EU identity, in-group trust, and willingness to cooperate. The outcomes are based on a representative sample of EU citizens for each member state.

The results clearly indicate a qualitatively and quantitatively significant increase in a common EU identity. To put things into perspective, the increase due to the increased Russian threat is of equal size to the initial difference between Poland (strong EU identity before) and Hungary (weaker EU identity). It is more than twice the initial difference between Germany (strong initial identity) and France (weaker initial identity).

FIGURE 2   MAIN RESULTS

Notes: Figure displays difference-in-difference coefficients measuring the impact of the increased Russian threat, with corresponding 90% and 95% confidence intervals (95% in lighter grey). All outcomes are standardised. All regressions control for individual characteristics including gender, age, education level, labour market status, urban versus rural area, marital status and the presence of children, time fixed effects, and member state fixed effects. Standard errors are clustered at the regional level. The number of pre-treatment measurements is between two and five, the number of post-treatment observations is between one and three, depending on the availability of variables. The number of observations for EU identity is 24,885. For the other outcomes, it ranges from 25,569 to 68,408.

Further estimations highlight that the effect is persistent over time. It is stronger for age cohorts that had personal experiences with the Soviet Union, and for those who have personal or indirect experiences with state persecution during the Soviet era.

As predicted by social psychological theories, the increased identity translates into higher trust in EU institutions, as well as higher support for cooperation at the EU level. This willingness to cooperate is not limited to defence policy, rather it extends to areas like a common foreign policy, taxes, and regulation.

ASSESSING THE IMPACT OF THE RUSSIAN INVASION OF UKRAINE 2022

How can we assess the ongoing full-scale invasion by Russia? Given the extent of the operation, the threat should be at least as large and trigger a sizeable response. Eurobarometer survey results are not yet available for a quantitative evaluation. However, a preliminary ('flash') Eurobarometer indicates a response in line with the results in my paper.

Politically, Eastern Europeans are more united than ever before. Even states with a strong prior affiliation to Russia, like Bulgaria, took a clear stance. Western states like Italy and Germany were initially hesitant but, backed by public opinion, both governments did finally align with other members for a joint response.

Of course, there can be incentives against common action that might not be overcome by a strengthened joint identity. Hungary provides a sad example in this regard. State-controlled media giving a biased perspective of the actual events also have the potential to moderate the response. However, unlike in earlier times as part of the Visegrád Group, Hungary is now at least clearly the outcast also among eastern EU member states.

The uniting effect of facing an outside threat thus seems to be clearly visible, even without additional quantitative evidence. Finland and Sweden are bound to give up their neutrality and join NATO. Denmark is likely to overturn its opt-out from EU defence policy in an upcoming referendum. The future will show whether a stronger European identity will also help to foster cooperation is areas going beyond defence and foreign policy.

There may be hope. Many studies indicate that a common identity is a prerequisite to overcome collective action problems and provide, for instance, a common social security system (Bagues and Roth 2021) Higher trust can lead to a positive feedback loop of more successful cooperation and policies (De Grauwe 2012). But in the end, it is up to the EU Commission and member state governments to turn this support into functioning institutions and policies that justify the trust of its citizens.

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CHAPTER 30

Sanctions and the international monetary system

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5 April 2022

Following the invasion of Ukraine, the sanctions taken against Russia have been unprecedented in scale and, above all, in scope. For the first time in recent history, the foreign exchange reserves held by a major central bank have been frozen. Reactions by Russian authorities show that this was totally unexpected on their part (Berner et al. 2022). This column presents some preliminary thoughts on the potential long-term and systemic consequences in a context of geopolitical rivalry and increasing 'deglobalisation', at least in respect to financial transactions.

SANCTIONS AND THE DOLLAR

A first question to consider is whether the status of the dollar as the dominant international currency could be put in doubt or risk. Our answer is negative for three reasons.

- The freeze is taking place in a situation that may be perceived as truly exceptional: an armed conflict triggered by the invasion carried out by a major country. No one would expect standard financial relations and arrangements to hold in those circumstances. In comparable situations, such as Japan's war in Asia from 1937, cross-border payments were eventually blocked. Gold owned by countries occupied or in war was not handed over to the aggressor by the central banks that held it. Thus, France and Britain refused to hand over the reserves of the Baltic countries annexed by the Soviet Union in 1940. These are extreme and rare circumstances.

- All actions taken by the US authorities over the last decades demonstrate their commitment to promote and preserve the dollar as a safe asset. Numerous facilities have been deployed by the Federal Reserve to ensure the liquidity of the Treasury market – some of them specially designed for official foreign holders. The implicit government guarantee benefitting Fanny Mae and Freddie Mac (which serve as a major instrument of foreign exchange reserves) has been reaffirmed when necessary. With the possible exception of the Trump administration, successive US Treasury secretaries have been adamant that "a strong dollar is in the interest of the United States".

- Finally, attractive alternatives to the US dollar do not exist and hence no realistic diversification instrument is available. The power of the US to impose sanctions derives directly from the central role of the dollar. For any international corporation or financial institution, life without the dollar is currently impossible. Therefore, any of their operation falls potentially under US jurisdiction. All will remain under the reach of sanctions so long as the dollar remains essential. Avoiding and resisting sanctions means finding alternatives to the dollar. We are therefore drawn back to an old, and still very acute question: are there such alternatives?

INTERNATIONAL MONEY, OLD AND NEW

Money is about scale and externalities. They come in two forms: network externalities – the more people accept a currency the better it is as a medium of exchange; and liquidity externalities – a true store of value remains tradable and valuable in times of need (Brunnermeier et al. 2022). In the current world economy, a crucial question concerns the causality between those two functions.

The dominant currency paradigm (Gopinath and Stein 2021) mainly attributes the essentiality of the dollar to its role in global payments and finance – emphasising the medium of exchange role and its function as a vehicle currency for international financial flows. In the same vein, Eichengreen (2010), based on his analysis of history of the interwar period, sees a logical sequencing in the emergence of a global currency: (1) invoicing and settling trade, (2) use in private financial transactions (vehicle currency), (3) use by central banks as reserves.

If that sequence is still valid, there are real prospects of alternative reserve currencies emerging. China is the world's major trading power. It has leverage to push for the use of its currency as a medium of exchange and unit of account. It could exploit its advance in the development of digital currencies. A possible scenario would see both Alipay and Tencent expand their international operations, progressively shifting their denomination from local currencies to the renminbi. China is the most advanced in developing a central bank digital currency. The introduction of the e-yuan, already past its pilot phase, is often interpreted as an offensive move to promote the RMB internationalisation.

Another, somehow opposite, approach attributes the dollar dominance to its unique role as a store of value, being the ultimate safe asset. There is nowhere else to park several hundred billion with almost total security and liquidity. That function is central in a financially globalised world where both private and public entities must protect their liquidity. From that role as a store of value, other functions derive, reversing the causality that may have prevailed in other periods. Because it is a reserve asset, it is convenient to also use the dollar for invoicing and payments. It serves as a global unit of account. Significantly, even China overseas lending by official entities is still 70% denominated in dollars and only 10% in renminbi.

If, as we think, that second approach is correct, no other money is positioned to dislodge the dollar in the foreseeable future. Being a reserve currency certainly brings privileges and power. It is also very demanding. Two major requirements must be met, which no other country can do: a large and liquid Treasury bond market (which Europe does not currently have) and a fully and unconditionally open capital account (which China will not have). Localised swap and barter agreements, such as developed by China, can help but will not dispense of those two basic requirements. (A columnist recently remarked that a credit line in renminbi is financially equivalent to being fluent in Esperanto).

A quick look at other possible mentioned alternatives confirms that diagnosis:

- Currencies such as the Australian dollar are mentioned as possible reserve instruments.[1] While fully open and accessible, the size of the Australian Treasury Bond market is only 2.5% of the US.

- There have been recurrent attempts to make the Special Drawing Rights into a genuine alternative to reserves – a course actively promoted by China in the aftermath of the Global Crisis (Zhou 2009). They have largely stalled, for reasons of size and accessibility (the possible use of Special Drawing Rights is closely restricted by design).

- Some observers stress the potentialities of cryptocurrencies, pointing to their role to channel funds to Ukraine after the Russian invasion (Danielsson 2022). However, they have no ability to process transactions on a large scale (daily amounts mentioned in relation with Ukraine are in the tens of millions of dollars). Despite some fascinating technological features, cryptocurrencies are even further from having any significant role as reserves. Managers are aware of the peculiarities of these money systems. Their day-to-day functioning relies on the initiatives and incentives of private operators, whose activity is purely voluntary and profit-motivated. It is doubtful that they would entrust public reserves to groups of 'miners' scattered all over the world, with a non-negligible proportion having migrated to Kazakhstan after having been prohibited to operate in China.

GLOBALISATION AND THE DEMAND FOR RESERVES

Sanctions may still have significant longer-term effects – not on the composition, but on the demand for reserves. The international monetary system may ultimately adjust by moving to a new architecture, where financial integration is reduced and, consequently, the need for reserves is smaller.

1   Gita Gopinath quoted in the Financial Times (2022).
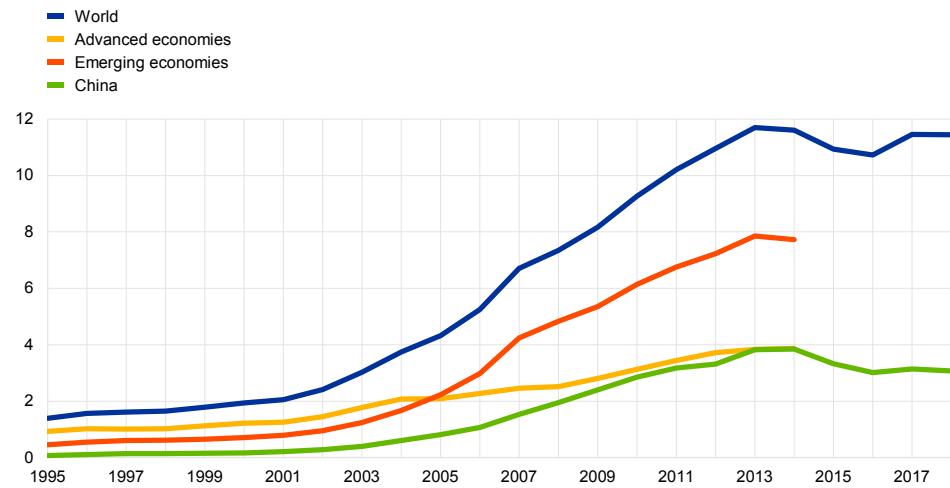
Leaving aside the reciprocal relation between the US and China – famously qualified by Larry Summers as a "financial balance of terror" – it is useful to consider the situation of other emerging countries. Around twenty countries have foreign exchange reserves above $100 billion, most of them emerging economies. Borrowing from the finance and climate literature, those countries clearly face a new 'tail risk' of sanctions, with a very low probability but very high impact. The same climate literature tells us that one cannot diversify against those risks. The only way to buy insurance is to reduce one's exposure. In climate, it means bringing down CO_2 emissions and concentrations to low levels. For emerging economies, it means reducing the need for (and dependence upon) foreign exchange reserves.

There has been a constant increase in foreign exchange reserves until 2015 and a plateauing since then. That evolution almost mirrors (with a lag of a few years) the trends in gross cross-border capital flows and international exposures, which expanded until 2010 and then stabilised as a consequence of the Global Crisis.
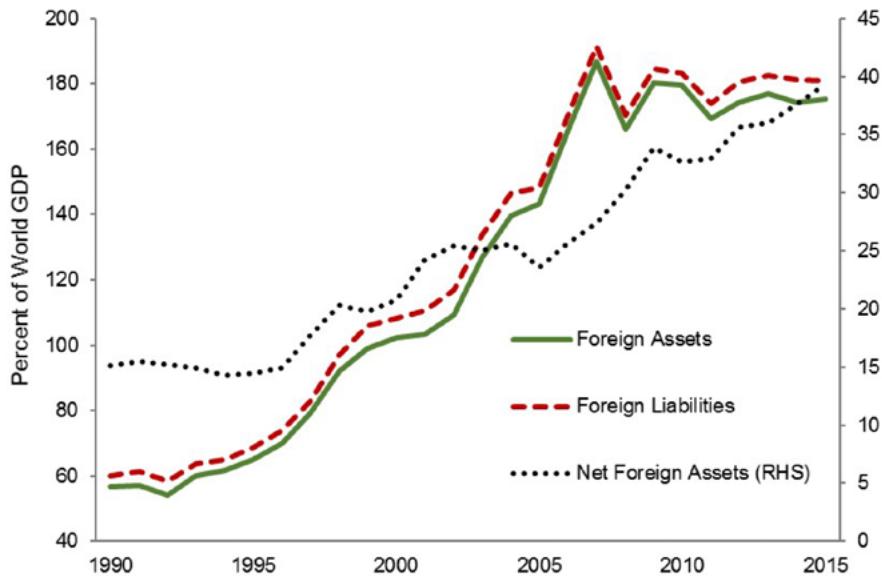
This is not a coincidence. With the exception of China, countries' demand for reserves is a direct result of their financial integration with the world. Reserves are traditionally viewed as a tool for exchange rate management. But they play a broader role. In many emerging economies, the productive and financial sector is partially 'dollarised'. As a consequence of capital account liberalisation, both corporate and financial institutions are able to borrow and lend in foreign currency. Consequently, they may be facing maturity and liquidity mismatch in dollars. Foreign reserves allow central banks in those countries to act as lenders of last resort in foreign currency and protect domestic, as well as external, financial stability. This is the fundamental reason why reserves have, over the two last decades, expanded to levels that are impossible to explain and rationalise by traditional metrics of trade and financial openness.

Those policy choices may well be reversed if and when reserves are carrying new risks. Financial globalisation had essentially come to a halt well before the invasion of Ukraine.

New forms of sanctions, even if very rare, may lead to a further retreat and segmentation of the world financial system (Harding 2022).

FIGURE 1

a) Foreign exchange reserves

Source: ECB Economic Bulletin issue 7/2019.

b) Gross international assets and liabilities

Source: Adler and Garcia-Macia (2018).

Ultimately, sanctions, and their implications, reveal a basic, and forgotten, truth: the movement towards greater financial globalisation has been underpinned by a long-term commonality of purposes, standards and understanding between countries. By supplying a reserve currency (and benefiting from it), by augmenting it in crisis moments such as 2008 or 2020 by swap lines, the US has provided the world with a global public good

(Wolf 2022): widespread access to a safe asset, which can be used as a buffer against financial shocks. Whether that equilibrium can be preserved in a geopolitically divided world is a major question for the future.

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CHAPTER 31

The impact of geopolitical conflicts on trade, growth, and innovation: An illustrative simulation study

Eddy Bekkers and Carlos Góes[1]

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29 March 2022

Open markets and free trade have been a basic tenet of the international order emerging out of WWII. Over that period, a large consensus on the benefits of lower trade costs and prioritising gains from trade led to a continuous deepening of the international trade regime. With the end of the Cold War, that consensus moved eastwards. The EU enlarged to the east and many countries joined the WTO, including Russia and China.

However, the last decade has witnessed the beginning of a backlash against global trade integration. Political scientists conjecture that the emergence of China as a new superpower against the incumbent US might lead to strategic competition between these countries, one in which geopolitical forces and the desire to limit interdependence take primacy over win-win international cooperation.[2]

The Russian invasion of Ukraine led to sanctions imposed by a group of Western economies and has reinforced the debate on decoupling between blocs of regions. Although the sanctions are so far focused on Russia and Belarus, there is a risk that the conflict could widen and reinforce support for a policy driven by geopolitical considerations.[3] This raises the question of how much real income might be lost if win-win international trade cooperation were given up and the global economy were to decouple, disintegrating into an Eastern bloc and a Western bloc.

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1   The opinions expressed in this column should be attributed to its authors. They are not meant to represent the positions or opinions of the WTO and its members and are without prejudice to members' rights and obligations under the WTO. We were encouraged by Robert Koopman to undertake the research project on decoupling

2   See Wei (2019) and Wyne (2020) for reviews of the debate among respectively Chinese and American scholars about the shift in foreign policies towards each other.

3   See Rachman (2022) for an analysis of the risk that the conflict between Russia and the West extends to China.

Canonical models capture static welfare losses of increased trade barriers by foregoing the classical gains from trade (international labour division, scale effects, and reallocation effects between firms; see Arkolakis et al. 2012). However, some of the main concerns of policymakers and practitioners regarding the potentially detrimental effects of trade conflicts are abstracted away in standard models. For instance, these models typically assume a fixed technology distribution for domestic firms, thereby limiting gains from trade to static gains. This assumption renders it impossible to address some of the most important questions regarding the long-term consequences of continued trade conflict or receding globalisation – namely, reduced technology and knowhow spillovers that happen through trade.

Our new paper (Góes and Bekkers 2022) explores the potential impact of increased and persistent large-scale geopolitical conflicts between an Eastern and Western bloc on economic growth and technological innovation, building a multi-sector multi-region general equilibrium model of Bertrand competition with dynamic sector-specific knowledge diffusion. Following Buera and Oberfield (2020), who generalised the approach of Alvarez and Lucas (2013), the arrival of new ideas is modelled as a learning process from suppliers to a given sector in one country. Through engaging in international markets, domestic innovators have access to new sources of ideas, whose quality depends on the productivity of the source country-sector pair. Idea diffusion is mediated by the input-output structure of production, such that both sectoral intermediate input cost shares and import trade shares characterise the source distribution of ideas.[4]
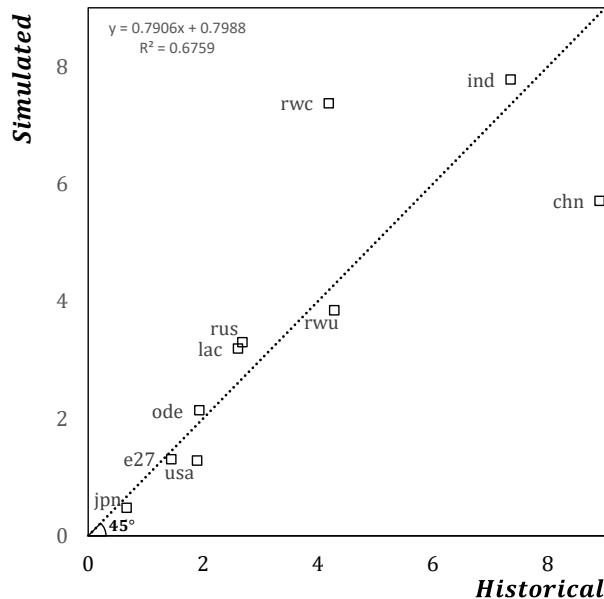
CALIBRATION

The strength of ideas diffusion in the model is controlled by a parameter that determines the speed of diffusion of ideas.[5] We calibrate this parameter using a simulated method of moments approach, minimizing the difference between historical growth rates and simulated growth rates from 2004 to 2019. We show that the model can well replicate historical GDP growth rates (Figure 1).[6]

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4 Productivity in different sectors evolves according to a trade-share weighted-average of trade-partners sectoral productivities. Productivity thus evolves endogenously as a by-product to micro-founded market decisions – i.e. an externality that market agents affect with their behaviour but do not take into account when making decisions.

5 Initial productivity at the sector-country level is proportional to PPP-adjusted sectoral labour productivity combining two sources: the World Input-Output Database and the World Bank's Global Productivity Database.

6 Figure 1 indicates that China has been growing more than the model projects, whereas Rest of the Eastern bloc (rwc) has been growing less, which could be due to additional policies not captured by the model such as industrial policy, the level of education, and quality of institutions.

FIGURE 1   HISTORICAL AND SIMULATED GDP GROWTH RATES, AVERAGE 2004-2019

Note: Country codes: chn, China; ind, India; rus, Russia; rwc, Rest of the Eastern bloc; rwu, Rest of the Western bloc; lac, Latin America and Caribbean; e27, EU; jpn, Japan; ode, Other developed; usa, US.

COUNTERFACTUAL EXPERIMENTS
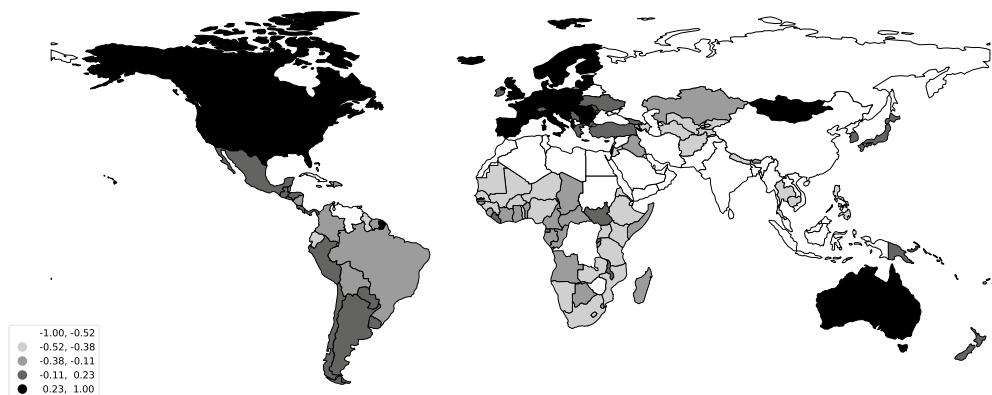
To explore the potential impact of a decoupling of the global economy, we classify different regions as belonging to either the US-centric or the Chinese-centric bloc, based on the Foreign Policy Similarity Database (FPSD). The database uses the United Nations General Assembly voting for a large set of countries to calculate foreign policy similarity indices for each country pair (Häge, 2011).[7] Intuitively, the index takes countries who vote similarly in the United Nations as being similar in their foreign policy. We ranked country groups in terms of their foreign policy similarity with China and the US in order to place the ten regions of the model either in a Western or an Eastern bloc.[8] The classifications do not reflect any value judgements by the authors on the various geopolitical views of the groups but do reflect the FPSD similarities and, of course, the core economic circumstances and relationships found in the model data.

7   Initially our work was inspired by the possible "technological fragmentation" that could occur due to deep philosophical differences in approaches to cybersecurity and online privacy – particularly security discussions around the technology for 5G.

8   Results are essentially the same if we were to use Russia instead of China as the geopolitical centre of gravity of the Eastern bloc.

Figure 2 shows that Europe, Canada, Australia, Japan, South Korea would fall in the Western bloc. Latin America and sub-Saharan Africa fall somewhere in between, with the former being closer to the US than the latter. India, Russia, and most of North Africa and Southeast Asia fall closer to China.[9]

FIGURE 2   DIFFERENTIAL FOREIGN POLICY SIMILARITY INDEX

Notes: The map shows the difference between pairwise foreign policy similarity indices of the US and China, based on vote similarity in the United Nations General Assembly. More details of foreign policy similarity are in Häge (2011).

After classifying the regions into Eastern or Western influence blocs, two different policy experiments are designed: a full decouple scenario in which iceberg trade costs between different blocs rise to prohibitive levels (160%), and a tariff decouple scenario with tariffs increasing on average by 32% from the current cooperative to a non-cooperative level based on the work by Nicita et al. (2018).
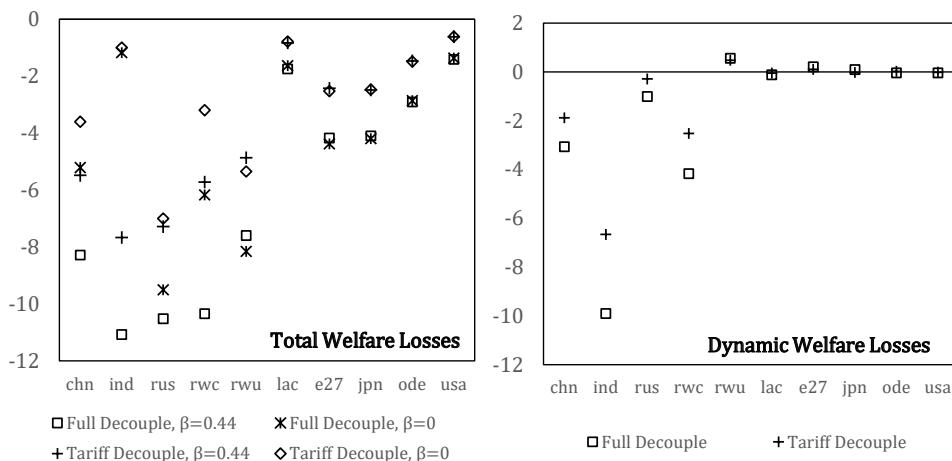
The welfare costs of global decouplingAs expected, under all scenarios cross-bloc trade would fall dramatically after the introduction of the policy intervention, in the full decouple scenario by 98%. Figure 3 shows that both the increases in iceberg trade costs (full decouple) and retaliatory tariff hikes (tariff decouple) induce substantial welfare decreases for all countries. The effects, however, are asymmetric. While welfare losses relative to a baseline without decoupling in the Western bloc range between -1% and -8% (median: -4%), in the Eastern bloc they are in the -8% to -11% range (median: -10.5%) with a global projected real income loss of about 5%.

The underlying factor driving the divergence in results between the two blocs is a difference in the evolution of productivity. Losing access to high-quality designs not only leads to static losses but also to a lower level of future innovation, which implies larger dynamic losses. Hence, countries in the Eastern bloc that currently have a lower level of productivity and have greater ties with innovative countries have larger losses. There is

9   The similarity index with Russia as the central country of the Eastern bloc is very close to the similarity index with China as the central country of the Eastern bloc.
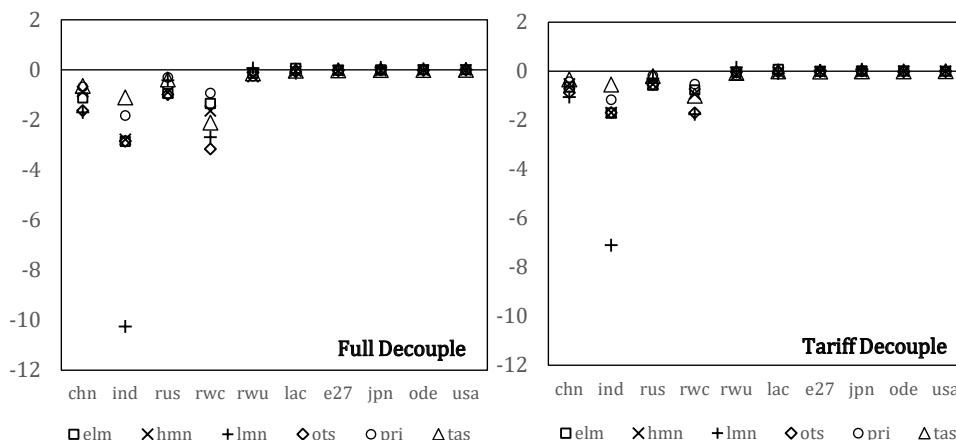
a stark contrast between the different evolution of the (Fréchet Distribution) location parameter of productivity in the regions in the two blocs (Figure 4). By cutting ties with richer and innovative markets, destination countries in the east shift their supply chains towards lower quality inputs, which, in turn, induce less innovation. By contrast, while countries in the Western bloc also suffer welfare losses, their innovation paths appear virtually unchanged after decoupling, suggesting that nearly all of their losses are static rather than dynamic. In the right panel of Figure 3, this is illustrated for the two poorer regions of the Eastern bloc with dynamic losses far outsizing static losses.

FIGURE 3   CUMULATIVE PERCENTAGE CHANGE IN REAL INCOME AFTER THE POLICY CHANGE, BY 2040

Notes: Full decouple increases iceberg trade costs by 160% between blocs. Tariff decouple increases bilateral tariffs by 32% between blocs. β is a parameter controlling the diffusion of ideas.

FIGURE 4   CUMULATIVE PERCENTAGE CHANGE IN THE FRÉCHET DISTRIBUTION LOCATION PARAMETER AFTER POLICY CHANGE, BY 2040
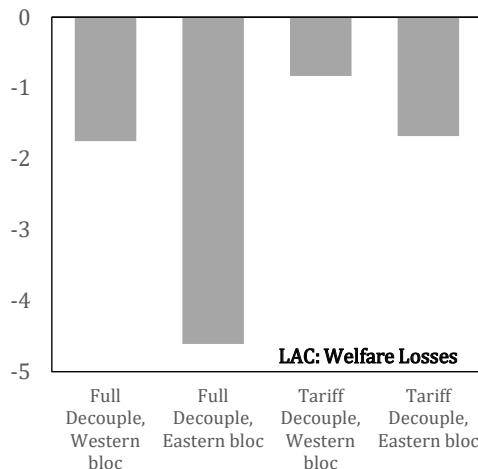

Notes: sector codes: elm, Electronic Equipment; hmn, Heavy manufacturing; lmn, Light manufacturing; ots, Other Services; pri, Primary Sector; tas, Business services.

CONSEQUENCES OF BLOC MEMBERSHIP

An interesting question is what the implications are of bloc membership. We evaluate the implications of membership by comparing the effects of decoupling for one of the regions when switching blocs. We choose, solely to illustrate this point, a hypothetical switch for the LAC region. Figure 5 compares the results of identical decoupling scenarios for LAC, showing that welfare losses of decoupling in LAC are about 100-150% larger when it is included in the Eastern bloc. The domestic trade share in LAC is virtually identical under both settings (with LAC in the Western or the Eastern bloc), implying similar static welfare losses. This suggests that the increased losses from switching blocs stem almost entirely from dynamic losses.

FIGURE 5   ILLUSTRATIVE IMPACTS ON THE CUMULATIVE PERCENTAGE CHANGE IN REAL INCOME IN THE LAC REGION BY SCENARIO

CONCLUDING REMARKS

We have shown that a disintegration of the global trading system into blocs driven by a shift in trade policies due to geopolitical considerations would be costly. And it would be much more costly than what conventional trade models omitting technology spillovers from trade would project. Furthermore, a scenario where all regions would have to choose between one of the two blocs as in the presented simulations (because of geopolitical reasons or because of incompatibility of technological systems) would be particularly costly for the lowest-income regions because they would have to forego beneficial spillovers from one of the two blocs.

There are two implications for the crucial role of the multilateral trading system. First, the current system with global trade rules guaranteeing open and free trade between all major players is of paramount importance, especially for the lowest-income regions.

Second, if geopolitical considerations were to lead to a split of the big players into two blocs, it would be important that an institutional framework remains in place for smaller countries to keep open trade relations with both blocs, particularly in the case of the lowest income regions.

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SECTION VI: CONCLUSION

CHAPTER 32

A silver lining: Increased urgency for the green transition in Europe

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4 August 2022

War and climate change are existential threats to humanity. Misfortunes never come alone, and these two uber-threats are connected and intertwined since a fossil fuel-driven economy results in global warming, which is a key factor in exacerbating conflict risks. However, the energy crisis that has ensued from the war in the Ukraine has a silver lining. It represents an opportunity to reduce our addiction to fossil fuels and speed up the green transition. Future historians looking back at the tragedy of this war may find that this was the time dependence on fossil fuels became, finally, unacceptable. The unprecedented heat waves experienced in the summer of 2022 in the Northern hemisphere brought home the emergency that is global warming. The war made clear, further, that dependence on fossil fuels entails condoning human rights abuses and supporting dictators and authoritarian regimes around the world.[1]

The last global crisis, Covid-19, also holds lessons. One could have hoped that a behavioural change would lock-in some of the reduced pollution levels after the lockdown (Arora et al. 2020, Venter et al. 2020, Bonardi et al. 2021), yet the sharp rise in mobility since the end of lockdowns in many countries is ground for scepticism. The lesson is that policy action is needed to lead the green transition since personal idealism will not suffice to achieve sufficient behaviour change. Instead, policies have to provide incentives to curb energy consumption and to boost green energy production.

The war in the Ukraine has been bad news for the climate in the short run, but it may still turn out to be good news for a faster European energy transition in the longer run. It is also a formidable test of European unity. The short-run effect is a sharp increase in the prices of oil and gas and an acute sense of insecurity and of being at the mercy of Russia. Pipeline gas prices in Europe for years had hovered below the €20/MWh mark, and increased to almost €200/MWh by the end of July 2022.[2] Russia used its gas supplies strategically during the spring, cutting off some countries and not others. By the

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1   While of course some fossil fuel producer countries are democracies, their production alone would not suffice to quench the current thirst for fossil fuels.

2   See, for example, https://tradingeconomics.com/commodity/eu-natural-gas

summer it had also reduced gas supply to Germany, the main consumer of Russian gas. The European electricity market is integrated, and this has meant that even countries that do not depend on Russian gas (like Spain, for example) have been affected by higher electricity prices. This differential exposure to energy suppliers and sources is proving to be a test of European unity even ahead of the next winter. So far, Europe has not been able to unite behind a single buyer of pipeline gas, which would be able to counter the market power of Russia. The proposal by the European Commission that all countries should reduce their energy use by 15% to be able to face the higher demand in winter met with resistance and was eventually agreed only with large concessions. European countries have been struggling to fill up storages ahead of winter, to diversify energy suppliers, and to secure contracts anywhere in the rest of the world. Some (like Germany) have also decided to reactivate coal mines, the most CO_2 emissions-intensive form of electricity production. And many countries have been attempting to cushion the blow to households by regulating of subsidising retail electricity and gasoline prices.

The green transition will be an enormous task which will take decades to complete. In this contribution, we focus on policy reactions to the extraordinary situation for the short and medium run in European economies. This does not mean that advanced technological and long-run measures are less relevant – they are equally important but simply beyond the scope of the current chapter. Below we first establish the link between global warming and conflict.

WHY GLOBAL WARMING MAKES CONFLICT MORE LIKELY

As discussed in the introductory chapter of this eBook, the presence of natural resources such as oil, gas and minerals has been found to exacerbate conflict risk (Ross 2012, Dube and Vargas 2013, Caselli et al. 2015, Berman et al. 2017). This direct detrimental effect has been detected for the local environments where extraction takes place. However, there are further, indirect pitfalls of a fossil fuel-dependent economy. Beyond the short-run direct effect of resource depletion, there is a medium- and long-run harmful impact through greater global warming. Among many others, Hsiang et al. (2013) and Burke et al. (2015) have shown that temperature spikes have a causal impact on increasing the risk of armed violence. Recent related work has found that – beyond the lower opportunity cost of fighting due to lower yields – one of the key channels through which heat waves trigger additional conflict episodes is greater resource competition, among others between nomadic and sedentary groups (Eberle et al. 2020, McGuirk and Nunn 2020).

The war in Ukraine illustrates a global version of the conflict–climate nexus. European and other democracies' current dependence on fossil fuel puts several autocratic leaders in a position to benefit directly from a surge in gas and oil prices triggered by a conflict. When the leader of a petrostate invades a neighbouring country, energy price spikes may be so substantial that additional revenues more than compensate for the direct costs of the war. Consumers around the world unwillingly end up financing the war.

Being addicted to fossil fuel means that resource wars are de facto subsidised – hardly a promising avenue for peace. Moreover, high fossil fuel prices may eventually reduce consumption, but they also increase the profitability of exploration and exploitation of oil and gas and coal in the ground.

REDUCING FOSSIL FUEL DEPENDENCE I: CURBING ENERGY DEMAND FOR HEATING

A first domain in which large energy savings could be realised is household heating. In Europe, heating is a large contributor to electricity and gas use (though increasingly, cooling is also becoming important). There are basically two ways in which one can rapidly reduce heating consumption. First, many houses and offices are over-heated, which is not only bad for the environment (in terms of CO_2 emissions), but also bad for health (e.g. Ponsonby et al. 1992). Reducing room temperature by 2°C in the winter would, according to estimates, reduce heating consumption by a very sizeable 26% (Palmer et al. 2012). Second, many houses are under-insulated. A representative, cross-European study found that in the leading country, Norway, the heat loss through the house envelope was more than three times smaller than in the laggard countries like the UK, and that old houses can feature heat losses that are five time as large as new dwellings.[3]

The reason why market forces fail and there is under-insulation and over-heating is obvious. There is a clear externality, as the house occupiers only pay the private monetary cost of heating gas or fuel, without considering the large social costs in terms of pollution and CO_2 emissions. Admittedly, some countries have put in place a Pigovian tax on heating gas and fuel that reduces the wedge between private and social costs of heating, but in most cases the tax is way too low to lead to a full internalisation of the social heating costs (Caselli et al. 2021). One challenge for increasing levies on fuels and CO_2 emissions is popular acceptance. As shown in Douenne and Fabre (2022), in France a revenue-neutral levy would be harshly rejected, and respondents vastly overestimate their net monetary losses. While the authors find that information campaigns can help, an important limit is distrust in authorities. Still, while challenging, several feasible policy measures seem promising, as discussed below.

Policy recommendation #1: Use targeted transfers to compensate the rise in prices of fuel, gas and electricity. Do not use retail price regulation or blanket subsidies.
Several European governments have been reluctant to pass on higher wholesale gas and electricity prices to households. This is partly understandable since an outsized sudden jump in prices would not only have reduced household income sharply but also affected some parts of the population severely and not allowed time to adjust. Thus, Germany has subsidised gasoline at the pump, while France, Italy and Spain have used a mixture

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3   See www.tado.com/de-de/presse/deutsche-haeuser-sind-besser-isoliert-als-die-der-meisten-europaeischen-nachbarn (in German).

of price regulation and tax rebates to order to attenuate rising prices. Not passing on increasing wholesale prices to the retail sector means that either energy providers or the budget are bearing the cost. The measures are fiscally unsustainable, and they send the wrong signal to households. The right signal should consist of two parts: first, poor and severely affected households will be protected temporarily from the consequences of the war through targeted transfers; second, higher prices for brown energy are here to stay, so adaptation investment in clean electricity and insulation should be accelerated.

Policy recommendation #2: Announce a post-war brown energy, heating gas and fuel levy. Tax revenues to be fully distributed to citizens, typically in a progressive way.
While emissions trading and Pigovian CO_2 taxes could all work to internalise externalities, a key issue is social acceptance. One way to administer this would be to have, at the end of the year, a bonus-malus invoice for each household, where either they have to pay or they receive a transfer, depending on their consumption. To boost social acceptance of such a levy, it could be made revenue neutral, labelled a 'climate dividend' and designed in a progressive, redistributive way to ensure that the policy is not perceived as 'another tax burden' and that no situation arises where 'only the rich can afford heating'. A crucial aspect is explaining that a well-designed green levy can be progressive (rather than regressive) in terms of inequality and leaves most citizens financially better off. As found in the survey evidence in Carattini et al. (2019), the devil lies in the detail and well-designed and communicated levies can gain popular support.

Policy recommendation #3: Subsidising renovation and envelope isolation.
Due to the externality, houses tend to be under-insulated. And additional externalities arise when the person paying the heating costs is not the one deciding on renovation. For example, owner-occupied dwellings are a fifth more likely to be better insulated (Gillingham et al. 2012). Subsidising envelope renovation can reduce these externalities and biases.

REDUCING FOSSIL FUEL DEPENDENCE II: REINVENTING MOBILITY

To reduce the carbon footprint from mobility, there are two options: travel less and travel greener. Concerning the first option, the Covid-19 pandemic has shown that many – though not all – meetings can be organised efficiently through online services such as Zoom. Hence, a simple policy angle could be the following:

Policy recommendation #4: Install a high-level working group to set recommendations and benchmarks for business travel, including the use of offsets.
A high-level working group composed of the representatives of the private sector, the public sector and international organisations could start the conversation about appropriate benchmarks and standards for business travel. It could create incentives to hold online meetings whenever feasible and efficient. The war in the Ukraine may

accelerate this since it puts additional stress not only on the environment but also on budgets. This working group would also need to address the question of quality offsets and their pricing, which in turn could be the basis for pricing of leisure travel.

Travelling greener also implies substituting plane and car travel whenever possible by trains and other non-fossil fuel-driven forms of mobility (for example, within-city travelling by bike). Total emissions per person for a kilometre travelled are more than 40 times larger when travelled by plane than in a (modern) train.[4] While of course air travel has fewer substitutes for long-haul, inter-continental trips, within Europe most – if not all – international travel could be carried out by train if sufficient investments in modern high-speed and overnight trains were made.

Policy recommendation #5: Stop subsidising planes, start investing massively in trains. At present, planes are implicitly heavily subsidised, as kerosene to a large extent escapes taxation, and environmental externalities are (almost) not internalised. The result is that often it is much cheaper to travel from A to B by plane than train – which completely distorts incentives. As discussed in Thalmann et al. (2021), this must not be the case, as already modest taxes on air travelling lead to sharp reductions in demand, and better train offers – especially high-speed and overnight trains – result in a reshuffling of short-haul travel demand away from plane to train.

Similarly, daily commuting can be made much greener.

Policy recommendation #6: Reduce the relative costs of electric cars with respect to fossil fuel based ones.
While most countries have some taxes on gasoline, they do not (in most cases) fully take into account the negative environmental externality of combustion engines. This again creates distortions in favour of gasoline cars with respect to tramways or electric cars. This can be rectified by higher fuel taxes and/or subsidising of greener means of transport.

REDUCING FOSSIL FUEL DEPENDENCE III: NUDGING ENERGY SAVINGS IN VARIOUS HOUSEHOLD DECISIONS

As stressed by Gowdy (2008), behavioural nudging strategies may be important to consider. Information provision may matter. There is substantial evidence that consumers do filter in local energy prices and lifetime energy costs when making purchasing decisions, and that a key element for energy saving is hence correct information (Houde and Myers 2021). For example, in a field experiment it was found that real-time feedback on resource consumption during showering reduced consumption by 22% (Tiefenbeck et al. 2018). This leads to the following policy recommendation:

4   See www.bbc.com/news/science-environment-49349566

Policy recommendation #7: Stepping up information provision about resource emissions and CO2 emissions per activity.

FOSTERING GREEN ENERGY SUPPLY

The threat of being cut off from Russian gas has led to some paradoxical decisions. For instance, the German Minister of Energy, a member of the Green Party, had to propose emergency legislation to reactivate mothballed coal (lignite) plants – coal being the biggest contributor to global warming per unit of electricity produced.

Policymakers must work hard to convert this step in the wrong direction into an opportunity eventually. Whenever such backward steps must be taken, governments must make it clear that the reintroduction of highly polluting fossil fuels is temporary – end dates must be set in advance. Moreover, there must be a quid pro quo negotiated with the industry and with other political forces to ensure that the short-term loss is always smaller than the long-term gain for our planet – this closed plant will be reopened but, in exchange, 'not in my backyard' regulations stopping wind and solar energy installations must be eliminated.

Policy recommendation #8: Any short-run reintroduction of highly polluting energy sources to replace Russian oil and gas must be (1) explicitly temporary and (2) conditional – in exchange for clear commitments from the broad spectrum of industry and other interests on the elimination of obstacles to the installation of wind and solar energy plants.

An alternative – the elephant in the room in some countries – exists, at the very least for electricity generation, in for form of nuclear. Nuclear energy does not contribute to global warming but it is not risk free; it entails a small risk of nuclear accidents and creates radioactive waste. The International Energy Agency (2022) has estimated that the 413 GW of nuclear energy that are in operation today contribute to the elimination of 1.5 gigatonnes of global emissions and 180 billion cubic metres of gas. This industry, with suitable regulatory changes, may make (in the short run) a sizeable contribution to solving the two key crises the world is confronting: the war (and its associated energy crisis) and climate change. Without nuclear power, achieving our green ambitions will be significantly harder: the 'low nuclear' scenario requires $500 billion more investment for net zero and $20 billion higher annual electricity bills for consumers.

The first avenue recommended by a recent IEA (2022) report is extending the life of nuclear plants. Around one-third of existing capacity in advanced economies is scheduled to close by 2030. The IEA estimates that life extension allows electricity to be produced safely at a cost of well below $40 per MWh. This suggests that closing down nuclear plants as quickly as possible is not the right response at this stage.

Policy recommendation #9: Extend plant lifetimes when safely possible, and limited to the short run, to navigate through the current crisis.

Finally, Europe must be able to deal with this crisis together. One of the largest risks Europe faces over the next months and years is a breakdown in solidarity, as Russian gas supplies run out and oil sanctions are implemented. Whereas strong ECB action, large fiscal immediate (SURE) and medium-term (NextGenerationEU) responses and joint purchases of vaccines were decided and implemented soon after the Covid crisis, the "joint purchasing platform" agreed by the Council on 25 March has not yet been put in place and the crucial REPower EU instrument announced on 8 March by the European Commission is bogged down in Council and Parliament and appears unlike to be approved in time to help with the current stage of the crisis. This crisis is no less existential than the pandemic, and we must be able to deal with it in a similar manner.

In the pipeline gas market there is market power, in principle, at both ends of the pipeline. Russia has been fully exercising its market power, arbitrarily reducing gas supplies and driving up prices. European buyers have been competing to secure storages and have been driving up wholesale prices (of gas and electricity). Europe should unite behind a single buyer for pipeline gas, which could exercise own market power by controlling an offer price (say, €100/MWh). This wholesale price cap would be significantly lower than the current market price but would still imply significant profits for Russia and other gas producers like Norway or Algeria and it would hence still be effective in incentivising a transition to clean, renewable energy sources.

Policy recommendation #10: The EU must recover the urgency of the initial post-pandemic period to ensure a truly European response to the energy crisis, so far absent, including (1) investing in emergency interconnections of gas and electricity; (2) joint purchase and storage of gas; and (3) a fiscal solidarity mechanism able to cushion the blow of the crisis to the most vulnerable countries and citizens.

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CENTRE FOR ECONOMIC POLICY RESEARCH

Will the war in the Ukraine radically reshuffle the global economic, financial and political order? Half a year after the Russian invasion, it has become increasingly clear that some of the changes will be far-reaching and are likely to be persistent. This eBook draws on a selection of VoxEU columns that were published in the debate channel on Ukraine that we opened four months ago. This representative collection spans topics such as the design and consequences of energy sanctions; the impact of the war on trade and global supply chains; the effects on food security; particularly in developing countries; the challenges faced by the Ukrainian economy and the threats to schooling and education; and finally how the war is reshaping multilateralism, the European Union and energy policies. Attempting a synthesis of these early insights, we take stock of key lessons and policy recommendations. While the uncertainties are enormous and the risks are strongly biased to the downside, we should not forget that we are at a critical juncture and that we face crucial policy choices. Among others, the current tragedy unfolding in front of our eyes raises awareness of the urgency of a green energy transition. As detailed in our concluding chapter, ten specific policy measures can help in curing the world's addiction to fossil fuels. This has the potential to both attenuate political and security risks and at the same time combat global warming.