Rapport CEPR

33 Great Sutton Street | LONDON EC1V 0DX | UK 187 boulevard Saint-Germain | 75007 Paris | FranceTEL: +44 (0)20 7183 8801 | EMAIL: CEPR@CEPR.ORGWWW.CEPR.ORGISBN: 978-1-912179-64-0 9781912 179640ISBN 978-1-912179-64-0Global Economic Consequences of the War in Ukraine: Sanctions, Supply Chains and Sustainability Global Economic Consequences of the War in Ukraine Sanctions, Supply Chains and Sustainability CEPR PRESS Centre for Economic Policy Research 33 Great Sutton StreetLondon, EC1V 0DX, UK 187 boulevard Saint-Germain 75007, Paris, France Tel: +44 (0)20 7183 8801 Email: cepr@cepr.orgWeb: www.cepr.org ISBN: 978-1-912179-64-0Copyright © CEPR Press, 2022.

Chair of the Board S ir Charlie Bean Founder and Honorary President R ichard Portes President B eatrice Weder di Mauro Vice Presidents M aristella Botticini Ug o Panizza P hilippe Martin Hé lène Rey Chief Executive Officer T essa Ogden Contents Foreword viii Introduction 1 Luis Garicano, Dominic Rohner and Beatrice Weder di Mauro Section I: The Impact of energy sanctions 1 Winter is coming: Energy policy towards Russia 1 3 Philippe Martin and Beatrice Weder di Mauro 2 Ruble payments: Shielding the ruble from financial sanctions 1 8 Michele Savini Zangrandi3 Western sanctions on Russia are working, an energy embargo now is a costly distraction 23 Mark Harrison 4 “Crime and Punishment”: How Russian banks anticipated and dealt with global financial sanctions 2 8 Mikhail Mamonov, Anna Pestova and Steven Ongena 5 The ‘Global Sanctions Data Base’: Mapping international sanction policies from 1950-2019 3 6 Gabriel Felbermayr, Aleksandra Kirilakha, Constantinos Syropoulos, Erdal Yalcin and Yoto Yotov 6 Sanctions and the exchange rate 4 4 Oleg Itskhoki and Dmitry Mukhin7 A principal, multi-agent model of sanctions 4 9 Sandeep Baliga8 Beyond macro: Firm-level effects of cutting off Russian energy 5 4 Raphaël Lafrogne-Joussier, Andrei Levchenko, Julien Martin and Isabelle Mejean9 Strength in unity: The economic cost of trade restrictions on Russia 6 0 François Langot, Franck Malherbet, Riccardo Norbiato and Fabien Tripier10 How to implement an EU embargo on Russian oil 6 6 Anette Hosoi and Simon Johnson11 The price of war: Macroeconomic effects of the 2022 sanctions on Russia 7 1 Anna Pestova, Mikhail Mamonov and Steven Ongena12 The simple economics of a tariff on Russian energy imports 7 9 John Sturm 13 Ukraine invasion: From oil sanctions to accelerating the energy transition 8 4 Rabah Arezki and Per Magnus Nysveen 14 How to solve Europe’s Russian gas conundrum with a tariff 8 8 Daniel Gros15 What if Germany is cut off from Russian energy?

9 4 Rüdiger Bachmann, David Baqaee, Christian Bayer, Moritz Kuhn, Andreas Löschel, Benjamin Moll, Andreas Peichl, Karen Pittel and Moritz Schularick 16 Cutting Russia’s fossil fuel exports: Short-term pain for long-term gain 1 02 Maksym Chepeliev, Thomas Hertel and Dominique van der Mensbrugghe Section II: The Impact of the war on world trade and supply chains 17 Implications of Russia’s invasion of Ukraine for its value chains 1 09 Deborah Winkler and Lucie Wuester 18 How the war in Ukraine may reshape globalisation 1 15 Michele Ruta19 Widespread food insecurity is not inevitable: Avoid escalating food export curbs 120 Alvaro Espitia, Simon Evenett, Nadia Rocha and Michele Ruta 20 Russia’s war against Ukraine might persistently shift global supply chains 1 26 Tobias Korn and Henry Stemmler Section III: The Impact of the war on developing countries 21 War in Ukraine, world food prices, and conflict in Africa 1 33 Eoin McGuirk and Marshall Burke22 Agricultural and energy importers in the developing world are hit hardest by the Ukraine war’s economic fallout 1 39 Maksym Chepeliev, Maryla Maliszewska and Maria Filipa Seara e Pereira 23 China’s overseas lending and the war in Ukraine 14 7 Sebastian Horn, Carmen Reinhart and Christoph Trebesch24 War-induced food price inflation imperils the poor 1 55 Erhan Artuc, Guillermo Falcone, Guido Port and Bob Rijkers Section IV: The Impact of the war on Ukraine 25 Ukraine’s recovery challenge 1 64 Oleksiy Blinov and Simeon Djankov26 The loss of human capital in Ukraine 1 69 Noam Angrist, Simeon Djankov, Pinelopi Goldberg and Harry Patrinos 27 Learning the hard way: The effect of conflict on education 1 75 Tilman Brück, Michele Di Maio and Sami Miaari 28 Lessons from history for our response to Ukrainian refugees 1 81 Sascha O. Becker Section V: The long-run Impact on multilateralism and the international system 29 External military threats help to create a stronger European identity and cooperation 187 Kai Gehring 30 Sanctions and the international monetary system 1 93 Markus K Brunnermeier, Harold James and Jean-Pierre Landau31 The impact of geopolitical conflicts on trade, growth, and innovation: An illustrative simulation study 2 00 Eddy Bekkers and Carlos Góes Section VI: Conclusion 32 A silver lining: Increased urgency for the green transition in Europe 2 08 Luis Garicano, Dominic Rohner, Beatrice Weder di Mauro 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.

36 GLOBAL ECONOMIC CONSEQUENCES OF THE WAR IN UKRAINE: SANCTIONS, SUPPLY CHAINS AND SUSTAINABILITYCHAPTER 5 The ‘Global Sanctions Data Base’: Mapping international sanction policies from 1950-2019 Gabriel Felbermayr, Aleksandra Kirilakha, Constantinos Syropoulos, Erdal Yalcin and Yoto Yotov Kiel Institute for World Economics; Drexel University; Drexel University; HTW Berlin - University of Applied Sciences; Drexel University 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.

54 GLOBAL ECONOMIC CONSEQUENCES OF THE WAR IN UKRAINE: SANCTIONS, SUPPLY CHAINS AND SUSTAINABILITYCHAPTER 8 Beyond macro: Firm-level effects of cutting off Russian energy Raphaël Lafrogne-Joussier, Andrei Levchenko, Julien Martin and Isabelle Mejean CREST-Ecole Polytechnique and INSEE; University of Michigan and CEPR; Université du Québec à Montréal and CEPR; Sciences Po and CEPR 24 April 2022 Imports from Russia are largely made up of energy inputs, most notably oil, coal, and natural gas.

Rüdiger Bachmann, David Baqaee, Christian Bayer, Moritz Kuhn, Andreas Löschel, Benjamin Moll, Andreas Peichl, Karen Pittel and Moritz Schularick University of Notre Dame and CEPR; UCLA and CEPR; University of Bonn and CEPR; University of Bonn; Ruhr University Bochum; LSE and CEPR; University of Munich; University of Munich; University of Bonn and CEPR 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?

These restrictions are implemented in a form of tariff barriers that increase over time and cover natural gas, crude oil, coal, 1 https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-2c.html 2 T he 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.

FIGURE 2 I MPACTS OF RESTRICTIONS OF RUSSIAN FOSSIL FUEL EXPORTS BY THE EU AND OTHER OECD COUNTRIES ON THE ECONOMIES OF RUSSIA AND THE EU -100-80-60-40-200 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030EU imports of Russian fuels, % change from baseline Co al Oil Gas Petroleum products-0.4 -6.6-2.8 -4.6 -5.9 -7.0-6.0-5.0-4.0-3.0-2.0-1.00.0 2022 2023 2024 2025 2026 2027 2028 2029 2030Impacts on EU, percent change from baseline Real income CO2 PM2.5 S O2 NOx -200-150-100-500 -10.0-8.0-6.0-4.0-2.00.0 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 Change in real income, billion USDChange in real income, percentLoss in Russian real income, change from baseline Change in real income, billion USD Change in real income, percent-180-160-140-120-100-80-60-40-200 2022 2023 2024 2025 2026 2027 2028 2029 2030Loss in Russian fossil -fuel exports, billion USD Co al Oil Gas Petroleum productsCumulative loss: 1364 billion USD Notes: Estimated by authors using ENVISAGE model.

157 WAR-INDUCED FOOD PRICE INFLATION IMPERILS THE POOR | ARTUC, FALCONE, PORTO AND RIJKERSFIGURE 2 P OORER HOUSEHOLDS SPEND A GREATER SHARE OF THEIR (NET) BUDGET ON FOOD ITEMS 158 GLOBAL ECONOMIC CONSEQUENCES OF THE WAR IN UKRAINE: SANCTIONS, SUPPLY CHAINS AND SUSTAINABILITYTABLE 1 E STIMATED 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 2.01 159 WAR-INDUCED FOOD PRICE INFLATION IMPERILS THE POOR | ARTUC, FALCONE, PORTO AND RIJKERSImpact 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 C UMULATIVE PERCENTAGE CHANGE IN REAL INCOME AFTER THE POLICY CHANGE, BY 2040 -12-10-8-6-4-20 chn ind rus rwc rwu lac e27 jpn ode usa Full Decouple, β=0.44 Full Decouple, β=0 Tariff Decouple, β=0.44 Tariff Decouple, β=0-12-10-8-6-4-202 chn ind rus rwc rwu lac e27 jpn ode usa Full Decouple Tariff DecoupleDDyynnaammiicc WWeellffaarree LLoosssseess TToottaall WWeellffaarree LLoosssseess Notes: Full decouple increases iceberg trade costs by 160% between blocs.

FIGURE 4 C UMULATIVE PERCENTAGE CHANGE IN THE FRÉCHET DISTRIBUTION LOCATION PARAMETER AFTER POLICY CHANGE, BY 2040 -12-10-8-6-4-202 chn ind rus rwc rwu lac e27 jpn ode usa elm hmn lmn otspritas-12-10-8-6-4-202 chn ind rus rwc rwu lac e27 jpn ode usa elm hmn lmn otspritasTTaarriiffffDDeeccoouuppllee FFuullllDDeeccoouuppllee Notes: sector codes: elm, Electronic Equipment; hmn, Heavy manufacturing; lmn, Light manufacturing; ots, Other Services; pri, Primary Sector; tas, Business services.

FIGURE 5 I LLUSTRATIVE IMPACTS ON THE CUMULATIVE PERCENTAGE CHANGE IN REAL INCOME IN THE LAC REGION BY SCENARIO -5-4-3-2-10 Full Decouple, Western blocFull Decouple, Eastern blocTariff Decouple, Western blocTariff Decouple, Eastern bloc-2.0-1.00.01.0 elm hmn lmn ots pri tas Full Decouple, Western bloc Full Decouple, Eastern bloc Tariff Decouple, Western bloc Tariff Decouple, Eastern blocLLAACC:: PPrroodduuccttiivviittyy CChhaannggeess LLAACC:: WWeellffaarree LLoosssseess 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.