

# New Normal, New Technologies, New Financing

Edited by Lili Yan Ing and Dani Rodrik





# New Normal, New Technologies, New Financing

Edited by Lili Yan Ing and Dani Rodrik

## **New Normal, New Technologies, New Financing**

National Library of Indonesia Cataloguing-in-Publication Data  
ISBN: 978-602-5460-41-8

Published by  
Economic Research Institute for ASEAN and East Asia (ERIA)  
Sentral Senayan II, 6th floor, Jalan Asia Afrika No.8  
Jakarta 10270, Indonesia  
[www.eria.org](http://www.eria.org)

International Economic Association (IEA)  
London  
[www.iea-world.org](http://www.iea-world.org)

© Economic Research Institute for ASEAN and East Asia  
Published in June 2022

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means electronic or mechanical without prior written notice to and permission from ERIA.

The findings, interpretations, and conclusions expressed herein do not necessarily reflect the views and policies of the Economic Research Institute for ASEAN and East Asia, its Governing Board, Academic Advisory Council, or the institutions and governments they represent.

The views expressed in this publication are personal and do not represent any commitment or official statement of the G20 Member Countries or the Government of Indonesia as the President of the G20 in 2022.

Material in this publication may be freely quoted or reprinted with proper acknowledgement.

Cover Art and Book Design by Lili Yan Ing and M. Raihan Ramadhan  
Layout by Fadriani Trianingsih and Ivana Markus

# Foreword

The ongoing coronavirus disease (COVID-19) pandemic and economic recovery efforts have forced the world to face the need for a new framework for achieving better economic conditions. Economic recovery amidst global uncertainty and limited liquidity raises the need for G20 collaboration to create a new normal situation.

Economic Research Institute for ASEAN and East Asia (ERIA) and the International Economic Association (IEA) have the honour to respond to the request of the Government of Indonesia to support its G20 Presidency in 2022. Together with the Government of Indonesia and respected academics from the G20 countries, the G20 expert team examines the global economic situation and the priority issues of the G20 Presidency of Indonesia. The report focuses on three main areas for the G20 sherpa and finance tracks: (i) economic recovery, (ii) digital transformation, and (iii) inclusive growth and sustainable development.

We believe this report will provide insights that will contribute to the success of Indonesia's G20 Presidency and improvement of the world economy. ERIA and IEA are committed to supporting the success of Indonesia's G20 Presidency and will continue their support to the upcoming G20 in the future.

Hidetoshi Nishimura



President  
Economic Research Institute for ASEAN and  
East Asia (ERIA)

Dani Rodrik



President  
International Economic Association (IEA)

# Acknowledgements

This report was prepared in close collaboration between the Economic Research Institute for ASEAN and East Asia (ERIA) and the International Economic Association (IEA) with G20 Working Groups, Think20 (T20), and Business20 (B20). The report consists of three main sections based on Indonesia's three priority areas: economic recovery, digital transformation, and sustainable development.

We would like to specially thank Joseph Stiglitz and Jeffrey Sachs for our discussion on the root of inequality and world order. We are grateful to Daron Acemoglu, Shiro Armstrong, Bambang Brodjonegoro, Peter Drysdale, Jayati Ghosh, Fukunari Kimura, Murray Leibbrandt, Albert Park, Han Phoumin, Alloysius Joko Purwanto, Vera Songwe, Shujiro Urata, Fauziah Zen, and ERIA, IEA, OECD, World Bank, WTO, UNCTAD, UNESCAP, and UNIDO colleagues for sharing their insights on the three key issues.

The report could not have been published without valuable inputs from our discussions with G20 officials, T20, and B20, and particularly significant support from Indonesian G20 officials – Suahasil Nazara, Riyatno, Indra Darmawan, Djatmiko Bris Witjaksono, Eko Cahyanto, Wempi Saputra, Kasan Muhri, Edi Pambudi, Rizal Lukman, Reza Pahlevi, Megawati, and Yessi Vadilla – as well as ERIA and IEA management teams – Koji Hachiyama, Taizo Hara, and Andrea Cavallo. We also thank Ivana Markus, Edo Setyadi, Michelle Chandra Kasih, Ria Fortuna Wijaya, Catherin Nur Safitri, and Muhammad Raihan Ramadhan for providing outstanding research assistance, and editorial team – Stefan Wesiak, Oonagh Duffy, and Fadriani Trianingsih – for their excellent work.

We hope this publication can provide a solid basis for Leaders and Ministers to establish and deliver G20 commitments for a better world economy. The support from the Government of Indonesia and strong engagement with G20 officials are greatly acknowledged.

The support from the Government of Indonesia is greatly acknowledged:



# Table of Contents

	List of Figures	vii
	List of Tables	ix
	List of Boxes	ix
	List of Editors and Contributors	x
<b>Chapter 1</b>	<b>Introduction</b> Lili Yan Ing and Dani Rodrik	1
<b>Chapter 2</b>	<b>Economic Recovery Requires Global Efforts</b> M. Chatib Basri, Lili Yan Ing, and Günther G. Schulze	8
<b>Chapter 3</b>	<b>Global Economic Recovery in the Face of COVID-19</b> Maurice Obstfeld	22
<b>Chapter 4</b>	<b>Ensuring Global Financial Stability</b> José Antonio Ocampo	38
<b>Chapter 5</b>	<b>The G20's Roles in Improving Resilient Supply Chain</b> Tajji Furusawa and Lili Yan Ing	51
<b>Chapter 6</b>	<b>The G20's Role in Fostering Trade and Investment</b> Gordon Hanson	64
<b>Chapter 7</b>	<b>Digital Transformation: 'Development for All'?</b> Lili Yan Ing, Gene Grossman, and David Christian	76
<b>Chapter 8</b>	<b>The Technology Gap in the Developing World and the G20: An Empirical Profile</b> Haroon Bhorat, Caitlin Allen Whitehead, and David de Villiers	89
<b>Chapter 9</b>	<b>Inclusive Growth: What Key Specific Actions that are Feasible for the G20 Acting in Concert Would Help the Poorest Countries Escape from Mass Poverty?</b> Paul Collier	101
<b>Chapter 10</b>	<b>Financing Infrastructure</b> Justin Yifu Lin and Yan Wang	114

<b>Chapter 11</b>	<b>Green Finance – The Road from Billions to Trillions</b> Ishac Diwan and Homi Kharas	130
<b>Chapter 12</b>	<b>Strengthening the Multilateral Trading System: The ‘WTO Rising’ Imperative</b> Richard Baldwin and Dmitry Grozoubinski	141

# List of Figures

Figure 2.1	Total Debt as Share of the GDP of G20 Countries (%)	11
Figure 2.2	Central Bank Policy Rates, 2019-2021	13
Figure 3.1	Real GDP of Major Countries and Regions Compared with Pre-COVID-19 Trends	30
Figure 3.2	Downward Trend in Pre-Pandemic EMDE Growth Rates, Even Excluding China	32
Figure 3.3	Public Debt Ratios to GDP Rose Sharply in 2020	33
Figure 3.4	Share of Business Establishments in Arrears or Anticipating Arrears within 6 Months, May–September 2020	33
Figure 3.5	CPI Inflation Levels since 2005	34
Figure 4.1	US Interest Rates (%)	39
Figure 4.2	Stock Market Prices	40
Figure 4.3	Central Government Gross Debt	41
Figure 4.4	Capital Flows Towards Emerging Economies, 2018–2022	43
Figure 4.5	Yields of Emerging Banking Bonds (JPMorgan EMBI)	44
Figure 4.6	Debt Ratios of Emerging and Developing Countries	46
Figure 5.1	Value of Exports by Major Trading Countries, 2000–2021 (%)	53
Figure 5.2	GDP Growth of Five Countries, 2000–2020 (%)	53
Figure 6.1	Revealed Comparative Advantage in Manufacturing and Non-Manufacturing, China Relative to the United States	66
Figure 6.2	Real Wages by Municipality in Mexico, 1990 and 2015	67
Figure 6.3	Change in the US Employment–Population Ratio, 2000-2019	69
Figure 7.1	Global Retail E-Commerce Sales, 2014–2025	78
Figure 8.1	Average Tertiary Education Gross Enrolment Ratios by Country Income Classification, 2000–2020	93
Figure 8.2	Average Contribution by Indicator to the Technology Gap Index, 2000–2020	97
Figure 9.1	Finance and Uncertainty	105
Figure 10.1	Global Infrastructure Needs, 2007–2040	116
Figure 10.2	Expanding the Definition of Development Finance	119
Figure 10.3	Taxonomy of the Financial Instruments Required for Infrastructure Finance and Patient Capital	121



Figure 10.A1	Infrastructure Bottlenecks – The G20 and Asian Developing Countries, Excluding China, 2000–2017	125
Figure 12.1	Export Growth in Goods and Services Trade, 2011–2019, and 2019 Export Shares	145

# List of Tables

Table 2.1	Current Account/GDP (%), GFCF/GDP (%), and Private Savings/GDP (%)	15
Table 8.1	Average Technology Adoption Rates by Country Income Classification and in the G20, 2000–2020	90
Table 8.2	Average Technology Production Rates by Country Income Classification and in the G20, 2000–2020	91
Table 8.3	Gini Coefficient of Technology Adoption and Production Rates, World and G20	92
Table 8.4	Top 500 Educational Institutions by Subject and Country Income Classification, 2021	94
Table 8.5	Gini Coefficient of Human Capital Accumulation, Tertiary GERs, and STEM Field Rankings: The World and the G20	95
Table 8.6	An Alkire-Foster Global Technology Gap Index, 2000–2020	96
Table 9.1	Average GDP per Capita Annual Growth, by Group and Period (%)	103
Table 9.2	Average Annual Growth in Total Wealth per Capita, by Group and Period (%)	103
Table 9.3	Annual Percentage Change in Renewable Natural Capital per Capita During Each Period	104
Table 10.1	Infrastructure Investment Gap, 2016–2040	116
Table 10.2	G20 Outflows to EMDC for Sustainable Infrastructure, 2011–2017	120
Table 10.A1	Sectors and Indicators for Bottleneck Identification	124
Table 10.A2	G20 and Asian Developing Countries, By Income Group	126
Table 12.1	Importance of Business Service Exports in Overall Job Creation, 2011–2018	146

# List of Boxes

Box 2.1	Worldwide Access to Vaccines	9
Box 2.2	Economic Consequences of the War in Ukraine	12

# Editors

Lili Yan Ing, Lead Advisor for Southeast Asia Region at Economics Research Institute for ASEAN and East Asia (ERIA)

Dani Rodrik, Professor of Political Economy at Harvard University and President of International Economic Association (IEA)

# List of Contributors

Richard Baldwin, Professor of International Economics at Graduate Institute Geneva

M. Chatib Basri, Professor of Economics at University of Indonesia

Haroon Borat, Professor of Economics at University of Cape Town

David Christian, Research Associate at Economic Research Institute for ASEAN and East Asia (ERIA)

Paul Collier, Professor of Economics and Public Policy at Blavatnik School of Government University of Oxford

Ishac Diwan, Professor of Economics at Paris School of Economics

Taiji Furusawa, Professor of Economics at University of Tokyo

Gene Grossman, Professor of Economics at Princeton University

Dmitry Grozoubski, Executive Director at Geneva Trade Platform

Gordon Hanson, Professor of Economics at Harvard Kennedy School, Harvard University

Homi Kharas, Senior Fellow at Global Economy and Development Center for Sustainable Development Brookings

Justin Yifu Lin, Professor of Economics at Peking University

Maurice Obstfeld, Professor of Economics at University of California, Berkeley

José Antonio Ocampo, Professor of Professional Practice in International and Public Affairs at Columbia University

Günther G. Schulze, Professor of Economics at University of Freiburg

David de Villiers, Junior Research Fellow at Development Policy Research Unit, University of Cape Town

Yan Wang, Senior Academic Researcher at Global Development Policy Center, Boston University

Caitlin Allen Whitehead, Junior Researcher at Development Policy Research, Unit University of Cape Town

# Chapter 1

## Introduction

Lili Yan Ing and Dani Rodrik

While the coronavirus disease (COVID-19) seems to be behind us now, the scarring effects on employment, poverty, and education will last forever. The unemployment rate reached 6.3% in 2021, with 33 million more people unemployed worldwide than before the pandemic. Women, youth, and less educated groups of the population have been disproportionately affected. Poverty incidence has also increased, with extreme poverty rising by 0.9% in 34 mostly low-income and lower middle-income countries. By the end of 2022, 860 million people could be living in extreme poverty, while simultaneously the world's poorest countries must repay US\$43 billion in debt this year.

Moreover, the current war in Ukraine and rising global tensions have placed additional pressures on the world economy. The supply shortage will magnify inflationary pressures through increases in the price of energy, food, and metals. Inflation is expected to remain elevated for much longer, both in advanced and emerging market and developing economies (EMDEs). The fact that now, countries, particularly low- and middle-income countries, have limited fiscal space, has worsened the inequality and the recovery process.

We believe the G20 could be an effective international forum to foster a coordinated global response to establish and deliver commitments for resilient, sustainable, and inclusive growth. This report consists of three main sections: economic recovery, digital transformation, and sustainable development.

**Chapter 2**, written by Chatib Basri, Lili Yan Ing, and Günther Schulze, discusses the urgency of global efforts in mitigating the scarring effects of the pandemic. It starts with an explanation of how the prolonged COVID-19 pandemic has increased uncertainties in various domains, including health, economy, and social aspects. Governments around the world have strived to optimise the use of fiscal and monetary measures to mitigate the effects of the pandemic. The fiscal interventions have helped countries to survive during the pandemic but have increased debt burdens significantly. Monetary interventions have also been implemented since 2020 by lowering interest rates and providing additional liquidity. While the pandemic is not over yet, the war in Ukraine has escalated major economic shocks and affected the world's recovery path. It is even more challenging because of the fact that the economic recovery is uneven.

The authors propose three main policy recommendations. First, it is crucial for the G20 to reinforce its commitment to provide vaccines and medical supplies to low-income countries. Second, the G20 needs to take steps to mitigate the risk of debt distress by implementing the

Debt Service Suspension Initiative (DSSI) as well as ensuring that the Common Framework for Debt Treatments (CFDT) works effectively. For most developing countries with limited fiscal capacity, efforts are needed to improve tax revenue through reforms to tax administration as well as improving the quality of spending. Third, while developed countries have started to tighten their liquidity, low- and middle-income countries still need stimulus to grow. It is important that the exit strategy chosen in developed countries does not cause instability for emerging and developing economies. The G20 forum is an avenue for developing and developed nations to exchange information on policy in an honest and transparent manner that will create greater certainty in the market.

**Chapter 3**, by Maurice Obstfeld, highlights specifically the role of monetary policy in the post-pandemic strategy. Obstfeld provides evidence that the world economy has yet to return to pre-pandemic growth paths, and that the repercussions due to the war in Ukraine are an additional drag on the global recovery. Emerging and developing economies are generally projected to stay farther from pre-pandemic growth paths for longer than the advanced economies. At the same time, inflationary pressures are worryingly strong throughout the world. Without appropriate economic policies and more effective multilateral cooperation on global public health in particular, the scarring effects of COVID-19 may result in permanently lower levels and long-run growth rates of real gross domestic product (GDP) than those expected in January 2020, especially for EMDEs.

Fiscal policy must ensure public solvency over time without a premature withdrawal of macroeconomic support or harm to the most vulnerable, already battered by the pandemic. Monetary policy must keep inflation expectations well anchored while stopping short of inducing deep recessions. With all countries facing pressures of fiscal and monetary credibility, they must coordinate policy responses to avoid a jointly excessive response to their shared challenges, with due regard to national conditions. That effort must include rejecting food export restrictions despite high food prices. Spillovers from tighter monetary policy could impact EMDEs most powerfully, especially frontier markets with high debts. To help, the G20 should endorse enhancements to the global financial safety net, EMDE policy approaches that reduce the impact of the global financial cycle, and, in cases of likely insolvency, enhancements to the current haphazard landscape of sovereign debt restructuring. Directed evolution of the G20 Common Framework for Debt Treatments beyond the Debt Service Suspension Initiative could produce less costly ways of handling future sovereign debt problems.

**Chapter 4**, by José Antonio Ocampo, points out the importance of ensuring global financial stability. The current financial stability issues facing the global economy are the result of the high public sector debt levels inherited from the COVID-19 crisis, and of the rising inflation and slower economic growth that has been evident since late 2021 but aggravated by the economic effects of the Russian invasion of Ukraine. The major challenges are associated with the increase in interest rates, which is already under way. Despite high debt ratios, the risks are not severe for advanced economies, where public sector debt ratios are expected to decrease moderately in the next few years but are important for emerging and developing countries, which will have to confront not only the rising costs of financing but also a possible reduction in international private capital flows.

Capitalising and increasing financing from multilateral development banks (MDBs) and official development assistance, as well as a new allocation of special drawing rights (SDRs), could mitigate these problems. Debt relief and better debt workout mechanisms should also play a role for countries facing high debt ratios. Existing mechanisms for low-income countries should be maintained and strengthened, and new ones should be put in place for middle-income countries facing severe debt problems. Stock market corrections may also generate financial stability issues in advanced economies, but they are less important than those faced by emerging and developing countries. The liabilities of private sector firms that were strongly affected by the COVID-19 crisis also generate problems and may require improvements in restructuring and solvency systems in some countries, but there is no evidence of risks of significant banking crises. Finally, action is needed to manage the risks associated with the growth and high volatility of crypto assets, and the financial risk that climate change is generating.

**Chapter 5**, by Taiji Furusawa and Lili Yan Ing, highlights the importance of maintaining resilient global supply chains. The pandemic and current geopolitical tensions have put supply chains under pressure, resulting in increased onshoring. More than two-thirds of all international trade flows involve trade in global value chains (GVCs), and the value of worldwide intermediate goods trade has risen to more than US\$10 trillion annually in the past 2 decades. However, the pandemic and its measures, such as lockdowns and limited economic activities, caused global demand and supply shocks and halted production and trade. The pandemic did not only disrupt firms' direct intermediate supplies, but also about 40% of their tier 2 suppliers and beyond.

The authors discuss five types of shocks in this chapter and argue that the heavy reliance on sole suppliers for a variety of critical inputs and products might not be the optimal solution. The pandemic showed firms that their just-in-time strategy is highly prone to disruptions affecting the suppliers. In parallel, the pandemic and current geopolitical tensions increased the use of export restraints as many countries struggled to secure their domestic supply. The world needs to restructure GVCs and there are two broad policy suggestions to increase GVC resilience: reshoring/nearshoring or diversification of suppliers and markets. The G20 needs to play a key role in the effort to improve GVC resilience as well as ensuring the stockpiling of essential goods and critical inputs to mitigate other shocks or disruptions in the future.

**Chapter 6**, prepared by Gordon Hanson, emphasises the importance of the G20 in fostering trade and investment in the economic recovery agenda. The uneven globalisation has left many countries riven by regional economic disparities, especially in the developing economies. Workers in low-wage and low-employment rate regions are not leaving in sufficient numbers to improve the large difference in earnings and living standards across regions. The ongoing trade war between China and the United States has increased global geopolitical tensions, and the ongoing pandemic has severely disrupted both global supply chains and the movement of people across borders. Moreover, as the ability of the World Trade Organization (WTO) in resolving disputes has eroded, countries have increasingly turned to bilateral or regional solutions, making it more complicated to revive multilateral cooperation on trade. G20 members must find ways to foster trade and investment as many countries have grown increasingly sceptical about globalisation.

The chapter provides three principles that policymakers should keep in mind: focus on helping displaced workers regain employment, policy needs attuned to change and helping workers move across sectors, and better cooperation amongst governments to avoid tax and subsidy competition. Restoring global trade will require global efforts and coordination amongst countries, especially within G20 members.

**Chapter 7**, by Lili Yan Ing, Gene Grossman, and David Christian, brings to the fore one of the most crucial changes of our time – digital transformation (DX) – that massively reduces the cost of sharing information. The pandemic has accelerated the development of DX, including digital trade. Despite the fact that DX helps businesses to improve productivity and drive economic growth, it has consequences for employment and wages, particularly for less skilled workers. DX potentially raises labour market polarisation and inequality between countries. Moreover, the key challenges embedded in DX and digital trade include privacy, cybersecurity, competition, and digital divide.

The G20 must play a leading role in overcoming these challenges and ensure DX ‘development for all’. First, the G20 needs to implement what it has already committed to in the fields of industrial robots, automation, and artificial intelligence (AI). This includes (i) cooperation and support for digitalisation enablers, comprising the development of digital infrastructure and connectivity; (ii) protection of data privacy and the mitigation of digitalisation risks from a consumer protection standpoint; and (iii) the development of mapping and statistical measurement of the digital economy. Second, to reduce the adoption costs of industrial robots, automation, and AI for businesses and make them commercially viable, G20 members should cooperate and promote incentives for technological adoption by developing countries. Third, the G20 should improve the quality of key digital enablers for the adoption of industrial robots, automation, and AI. This includes digital infrastructure and the necessary technologies. Last, the work of implementing and adapting to the massive changes that go along with DX falls on *human capital*. DX is ultimately a people issue. The G20 should continue to promote efforts to improve preparedness for digital and AI technologies, both amongst the workforce and firms (especially micro, small, and medium-sized enterprises; women; and youth) to reduce the digital divide and ensure more inclusive digital participation. It is crucial for the G20 to further facilitate partnership between the private and public sectors to raise the pool of funds that can be used to reduce digital gaps and improve digital skills worldwide to ensure ‘development for all’.

**Chapter 8**, by Haroon Borat, Caitlin Allen Whitehead, and David de Villiers, focuses on technology gaps in developing countries. They propose three key measures to assess technology gaps across countries: technology adoption, technology production, and human capital accumulation. Using individual indicators for each of the measures, ranging from internet usage rates and patent applications to the quality of science, technology, engineering, and mathematics (STEM) tertiary institutions, the chapter presents empirical evidence on the technology gap in the world economy during 2000–2020. They provide estimates of the rates of change in the technology gap and the growing global inequality of technology adoption, production, and human capital accumulation. They synthesise these measures into a single Alkire-Foster technology gap index, which yields evidence on the incidence of the technology gap and the evolving nature of technology gaps in the regions of the world.

To close the technology gaps, Borat et al. propose improving internet usage, closing patent gaps, and developing strategies for higher education in technology adoption. Improving internet usage requires a pricing strategy to attract private investment rather than just developing infrastructure, especially in low-income countries. Governments need to focus on pricing of the internet from the providers to offer cheaper packages for poor households. To close the patent gap and increase patent applications, governments can also introduce an innovation policy package and focus on higher education institutions, microenterprises, small and medium-sized enterprises (SMEs), and high-productivity export-oriented firms. Finally, for higher education institutions, this chapter points out that expenditure on research and development (R&D) should be extended to universities for research and innovative ideas in STEM fields. As a support, governments can build well-funded technology and innovation centres, particularly in developing countries. To reduce the cost of technology adoption, governments should consider giving subsidies to microenterprises and SMEs, while large and export-oriented firms need more nuanced support from governments.

**Chapter 9**, written by Paul Collier, emphasises the importance of inclusive growth. To illustrate the distribution of poverty, this chapter classifies countries into three groups: the bottom billion (poor countries), the advanced countries (Organisation for Economic Co-operation and Development (OECD) countries), and the emerging market economies. Recent evidence shows that the growth rates of GDP per capita for the bottom billion are less than those of the emerging market countries, and that they diverge from the rest of humanity. To escape from mass poverty, countries will depend on the generation of productive jobs that directly raise workers' incomes and opportunities for society to get access to health, education, and public services. However, the poorest countries cannot provide a good environment for business, thus have a low number of formal firms. With high uncertainty in these countries, they also face problems financing their businesses.

Collier argues that the G20 can be a promising international cooperation mechanism for achieving inclusive growth in the world. G20 members can show leadership in facing the challenges of the poorest countries. Collier proposes five practical new mechanisms for what the G20 can and should do: (i) a public commitment to reverse the divergence of the poorest countries, (ii) a debt moratorium, (iii) pioneering investments by the development finance institutions of the G20 and G20 aid agencies, (iv) responding to the African COVID-19 crisis, and (v) closing safe havens for corrupt fortunes.

**Chapter 10**, by Justin Yifu Lin and Yan Wang, assesses the overall need for investing in infrastructure bottlenecks and offers a strategy for financing the infrastructure. They begin with the argument that economic development is a process of 'continuous structural transformation' in an economy. Infrastructure is essential for making this transformation feasible and sustainable. It is also critical for people's livelihood and a country's survival. The G20's Global Infrastructure Hub projects that US\$97 trillion will be needed in infrastructure investment globally by 2040 to support economic development and the achievement of the United Nations Sustainable Development Goals (SDGs), leaving a financing gap of US\$18 trillion or 3.7% of global GDP. The gap has widened due to the war in Ukraine and the fragmentation of global supply chains.



Given this huge financing gap, the G20 should encourage countries and international development finance institutions to prioritise infrastructure investment that addresses country-specific structural transformation bottlenecks and that is consistent with the nationally determined contributions (NDCs) for reducing carbon emissions in the Paris Agreement and plans to achieve the SDGs. The G20 should play a leadership role in proposing new initiatives and coordinating global efforts, including the use of part of the US\$650 billion in special drawing rights (SDRs) to establish a global green finance fund for green infrastructure; strengthening G20 support for multilateralism – including multilateral development banks and funds, as well as newly established development finance institutions (DFIs); and encouraging innovations in both debt relief and green transformation, e.g., debt-for-bond swaps and debt-for-nature swaps, as well as asset+ based refinancing.

**Chapter 11**, by Ishac Diwan and Homi Kharas, argues that sustainable development requires countries to prioritise green finance. They recommend that the G20 enhance green finance along two parallel tracks: a short-term track that underlines the urgency of the situation and the need to accelerate now, and a medium-term track that recognises that green finance must be sustained over decades and therefore requires reform in the international financial architecture. There are many promising evolving innovations in green finance, some of which are highlighted in this chapter. At this stage, they recommend that the G20 develop a process for advancing green finance that is credible and consistent with the scale and urgency of the challenge.

On the short-term track, the G20 should (i) monitor progress towards the US\$100 billion climate finance pledge in the G20 Sustainable Finance Working Group annual report and bring to leaders' attention any gaps, including in disaggregated areas such as adaptation; (ii) encourage dialogue amongst advanced economy members on a sub-target for additional concessional finance for climate by 2025; and (iii) reallocate, on a voluntary basis, surplus special drawing rights (SDRs) in a way that permits countries to expand the fiscal space for the implementation of nationally determined contributions (NDCs) in a leveraged way.

On the medium-term track of reforming the international financial architecture, the G20 could (i) encourage MDBs to scale up their contributions to NDCs, including by helping to scale up country-owned, country-led green country platforms; (ii) establish a long-term, forward-looking strategy of MDB capital adequacy, and encourage innovations to free up capital, such as backstop credit facilities, guarantees to reduce single borrower risks, and asset sales, along with a process for considering paid-in capital increments; (iii) review the principles of debt restructurings, so that official and mobilised private green finance are not bound by the same comparable treatment rules as other forms of debt; (iv) assess ways of de-risking privately mobilised green finance, including through the use of guarantees; (v) review the regular issuance of SDRs to expand the fiscal space for NDC implementation; and (vi) review the potential for expanding and integrating carbon offset markets.

The last chapter, **Chapter 12** written by Richard Baldwin and Dmitry Grozoubski, closes our report by urging the G20 to strengthen the multilateral trading system in the face of 21st century challenges of climate change, the pandemic, and persistent economic and social inequalities, which threaten untold millions of lives. The World Trade Organization (WTO) deserves top-of-mind attention from G20 leaders, as it is hobbled by entrenched disagreements and a lack of resources. While trade alone cannot solve these threats, this chapter argues that viable solutions require more trade as well as stronger multilateral trade governance. Therefore, G20 leaders must reimagine the WTO as critical to saving lives, not just livelihoods – a vital tool in the struggle against humanity’s existential threats – and grant it the status and resources it needs to rise to the challenges.

They recommend that the G20, together with WTO leadership, prepare the ground for climate-related disputes and ultimately develop a new infrastructure for mediating, negotiating, discussing, and adjudicating them, breaking down the walls between global trade policy discussions and global climate discussions. A concrete step would be to create a meeting – co-chaired by the WTO Director-General and the United Nations Framework Convention on Climate Change (UNFCCC) Executive Secretary – aimed at coordinating trade and climate efforts; and to establish a diverse and inclusive ‘eminent persons’ group to think ahead about trade and development in a world where services trade is growing much faster than goods trade, especially for developing and emerging economies, and a world where service-led development is increasingly the pathway to prosperity for many developing nations.

# Chapter 2

## Economic Recovery Requires Global Efforts

M. Chatib Basri, Lili Yan Ing, and Günther G. Schulze

### 1. Introduction

The coronavirus disease (COVID-19) is a wake-up call for the world. From its emergence in December 2019 to mid-February 2022, almost 500 million COVID-19 cases and 5.8 million deaths worldwide had been confirmed. The pandemic and prolonged uncertainties have increased unemployment, poverty, and inequality. The worldwide unemployment rate has risen from 5.43% to 6.37%, disproportionately affecting lower middle-income countries, women, youth, and less educated groups of the population (ILO, 2021). The pandemic is estimated to have pushed about half a billion people or 8% of the world's population into poverty (Summer, Joy, and Ortiz-Juarez, 2020), including 88 –115 million who have been sent into extreme poverty (World Bank, 2021). COVID-19 exacerbates pre-existing inequalities, as the poverty impacts of the pandemic have been distributed very unequally. This will be amplified in the near future due to food price inflation and pandemic-related disruptions to education, which disproportionately affect the poor.

COVID-19 is also expected to create long-term impacts (*scarring effects*) on human capital and productivity due to learning losses. Increased unemployment and poverty may persist in the long term as it will be very difficult to reintegrate currently unemployed people in the labour market since their skills will have become obsolete and they will be crowded out by fresh graduates (Ing and Basri, 2022). To mitigate the effects of the pandemic, governments around the world have launched major fiscal and monetary stimulus measures. Yet, individual country efforts will be nothing without global coordination, commitments, and enforcement. Moreover, the war in Ukraine will have major economic repercussions worldwide that will aggravate the post-pandemic recovery.

Section 2 describes government interventions in the health sector, as well as fiscal and monetary stimuli. Section 3 presents fiscal and monetary stimulus exit strategy scenarios. Section 4 draws policy recommendations.

## 2. Government Interventions

The economic crisis triggered by COVID-19 forced governments and central banks all over the world to implement fiscal and monetary stimulus policies and programmes. The global economic policy theme quickly became ‘do whatever it takes’ (Blanchard, 2020). Most central banks engaged in large-scale market purchases of government debt, thereby easing the financial terms on which governments could borrow. Most governments have issued new public debt to fund fiscal stimulus programmes, which have focused on the healthcare sector, social welfare programmes, and assistance for small and medium-sized enterprises (SMEs).

### 2.1. Health Sector Interventions

Economic and health conditions are strongly interdependent – hence, a global economic recovery entails a global health recovery. Box 2.1 highlights one of the issues in combating the COVID-19 pandemic, i.e., access to vaccines (which may also occur in future pandemics).

#### Box 2.1: Worldwide Access to Vaccines

- **COVID-19 vaccine production:** Vaccine manufacturing and R&D are highly concentrated in 13 HICs and UMICs. Raw material production and manufacturing supply chains for vaccines are also dominated by a few countries, mostly HICs and UMICs. Bottlenecks to increased global vaccine production include inadequate investment in R&D, vaccine manufacturing, technology, logistics, human capital, and lack of an enabling environment for innovation. Global coordination is required to remove the bottlenecks and create a global conducive environment to enabling substantial technology transfer to support recent attempts at promoting regional manufacturing hubs in LMICs.
- **Worldwide allocation of vaccines:** HICs absorb 7.3 billion or 42% of confirmed COVID-19 vaccine purchases but are only home to 15% of the world population. LICs and LMICs, where 52% of the world population lives, have only been able to procure 25% of the total vaccine production. This vaccine imbalance is exacerbated by the failure of (mostly) HICs and UMICs to meet their vaccine donation pledges. By 7 February 2022, only 921 million of the pledged 2.2 billion doses of vaccines had been delivered (Duke Global Health Innovation Center, 2022a). Global coordination is needed in terms of distribution to ensure that all vaccines and life-saving medicines for contagious diseases are available and can be accessed worldwide.
- **IPR of vaccines:** More than 100 countries (including the United States) have supported a waiver of the WTO TRIPS agreement on patents to ensure universal and affordable access to COVID-19 vaccines and worldwide production. Yet, some countries (mostly European Union member states) oppose this proposal (EESC, 2021) as it perceived that it may undermine the incentives to produce medicines or vaccines. Global commitments and enforcement are needed for vaccine producers to use voluntary licensing, contracted production, and proactive technology transfer to diversify manufacturing across the globe.
- **Financing:** The total financing required by LICs and LMICs to vaccinate 70% of their populations is estimated to be US\$ 55 billion (WHO, 2021). For LICs and LMICs with limited fiscal space and increased indebtedness, this financing gap needs to be covered by government financing or external sources through grants or concessional loans from multilateral development banks. It is important not only to secure the pledged funds, but also to ensure that the disbursement goes to the ones who need it most.

To achieve the WHO goal of vaccinating at least 70% of the population in all countries by mid-2022, one key policy measure that the G20 can adopt is to facilitate access to vaccines (alongside medical supplies and equipment) – particularly to LMICs, which still have very low vaccination rates – through verifiable and enforceable commitments from developed countries.

Note: HIC = high-income country, IPR = intellectual property rights, LIC = low-income country, LMICs = low- and middle-income countries, R&D = research and development, TRIPS = Trade-Related Aspects of Intellectual Property Rights, UMIC = upper middle-income country, WHO = World Health Organization, WTO = World Trade Organization.

Source: Authors' compilation.

## 2.2. Fiscal Interventions

Fiscal responses to COVID-19 have relied on built-in stabilisers; fiscal support of the health system; direct transfers to businesses (capital injections and/or subsidies); direct support to individuals; tax cuts (deferrals, credits, and rate cuts); loans; and guarantee schemes. While the mix of these measures has been very country-specific, two patterns are visible. First, built-in stabilisers are much more important in advanced countries as they have more progressive tax structures and larger transfer schemes. Second, advanced economies have significantly larger fiscal interventions than emerging or developing economies. This section discusses the interventions of selected major economies: China, the United States (US), and the European Union (EU).

In responding to COVID-19 in 2020, China implemented a fiscal package worth almost CNY5 trillion or 4.7% of gross domestic product (GDP), as well as a bundle of off-budget measures totalling 1.3% of GDP in credit guarantees to SMEs and in fee reductions (on roads, port usage, and for electricity tariffs). Fiscal expenditure measures were geared towards prevention and containment of the pandemic, to support SMEs and secure employment. In addition, unemployment benefits were extended to include migrant workers.

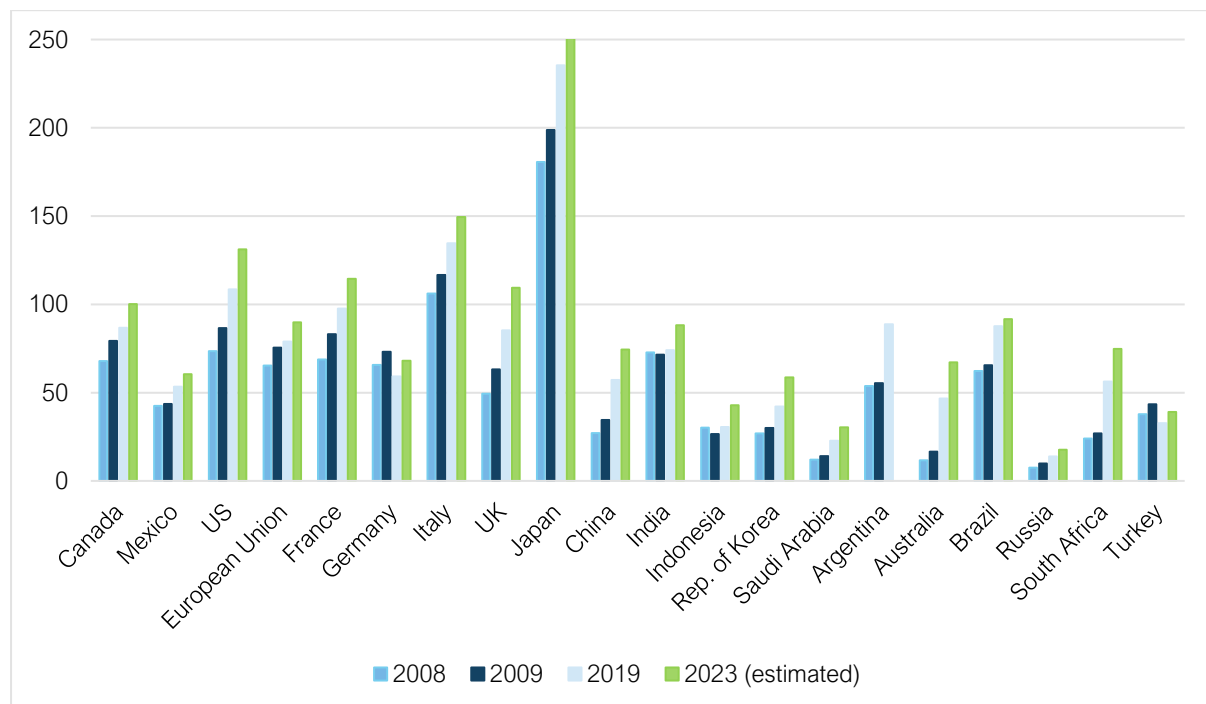
The US passed the Coronavirus Preparedness and Response Supplemental Appropriations Act and the Families First Coronavirus Response Act in March 2020, which allocated US\$ 8.7 billion to fight the pandemic, including extended loan facilities for small businesses. In addition, it provided US\$ 2.2 trillion (almost 10% of US GDP) under the Coronavirus Aid, Relief, and Economic Security Act (March 2020). The American Rescue Plan Act of 2021 (March 2021) provided almost US\$ 1.9 trillion (8.8% of GDP) for a third stimulus check to eligible US citizens and residents, increased child tax credits, provided direct aid to states, expanded unemployment benefits, and delivered other support measures for households. It is part of the larger spending framework of the Biden administration, which includes US\$ 1.2 trillion under the bipartisan Infrastructure Investment and Jobs Act (November 2021) to expand and rejuvenate ailing infrastructure.

The EU passed its 7-year budget of €1.074 billion on 21 July 2020. At the same time, EU member states created a recovery fund of €750 billion – NextGenerationEU – which is financed for the first time in any significant manner by EU bonds for which member states are liable. The

NextGenerationEU scheme *could* mark a watershed event that introduces common EU debt and paves the way for a transfer union, with all the severe moral hazards that this involves for financial solidity due to eroded incentives for fiscal discipline (Schulze, 2022). If member states expect to be supported by richer, more financially disciplined member states in the future through non-refundable transfers, the financial discipline incentive for potential donor and recipient countries is severely compromised.<sup>1</sup>

Figure 2.1 shows that fiscal interventions have increased the debt burdens of countries significantly, but very differently and starting from very different levels. Countries like Canada, the US, France, Italy, and Japan are projected to have debt levels of 100% or more of their GDP next year. Other countries like Indonesia, the Republic of Korea, and Russia have debt levels below 50%, and for these countries an increase in indebtedness is not a reason for major concern. Of course, the currency denomination of debt is crucially important – Japan is indebted mostly to its own people while US debt is dollar-denominated so that inflation tax is ultimately an option to finance the debt. For other highly indebted countries, notably Italy, this is not an option.

Figure 2.1: Total Debt as Share of the GDP of G20 Countries (%)



EU = European Union, GDP = gross domestic product, UK = United Kingdom, US = United States.

Source: IMF (2021), *World Economic Outlook: Recovery During a Pandemic – Health Concerns, Supply Disruptions, and Price Pressures*. Washington, DC: International Monetary Fund.

Debt levels can either be reduced by increasing growth rates or by retiring outstanding debt through higher taxes or lower spending. Figure 2.1 shows to what extent this has happened since the global financial crisis: the first two bars show the increase in debt levels due to the fiscal packages from 2008 to 2009. The third bar shows the pre-pandemic level in 2019. The most

<sup>1</sup> In addition to the EU scheme, EU members have implemented national support packages. For Germany, see Schulze (2022).

highly indebted countries in 2009 did not use the following decade to consolidate their debt levels; instead, they increased them further – notably the US, Italy, and Japan. Less indebted countries such as the UK, China, Argentina, Brazil, and South Africa also increased their debt levels. Counter-examples are Germany, Indonesia, and India, which saw stationary or even declining debt levels. Restarting growth will be a particular challenge for countries that became highly indebted prior to the pandemic.

Growth is projected to be modest for most countries – notably, Italy, France, Japan, Russia, Brazil, South Africa, and the US – and for several Latin American and African countries and the euro area (IMF, 2022). Some countries, such as Indonesia, may need to increase their fiscal capacity. Fiscal consolidation needs to be measured, pre-announced, credible, and continued – especially as interest rates are set to increase. It should not be too rapid considering the ongoing pandemic and intensified international conflicts, but it should not be procrastinated either. Moreover, the current geopolitical tensions put more pressures on fiscal policy, as explained in Box 2.2.

### Box 2.2: Economic Consequences of the War in Ukraine

The war in Ukraine will have major economic repercussions worldwide that will aggravate the post-pandemic recovery (depending on how the war ends and what the post-war order will look like). Crucial elements are outlined below.

- **Relocation of fiscal expenditures:** The war entails huge costs for the warring nations, Russia and Ukraine, and beyond. It will increase the defence spending of NATO countries in response to the heightened threat of military confrontation. The war also requires substantial emergency aid, spending on integrating refugees in the host countries, and ultimately will require massive reconstruction expenditure.
- **Inflation:** While the effects of discontinued trade are relatively limited, except for Russia, Ukraine, and some Eastern European countries (Felbermayr, Mahlkow, and Sandkamp, 2022), the war has had very significant repercussions on the energy and food markets, which has fuelled inflation and may create energy and food shortages, particularly countries who rely on imports from Ukraine, Russia, and Eastern European countries.
- **Cost of economic sanctions:** Western countries have imposed sweeping sanctions on Russia, including freezing Russian assets in foreign jurisdictions; an export ban on dual-use goods; a ban on all Russian flights from European Union, United States, United Kingdom, and Canadian airspace; the removal of major Russian banks from the SWIFT financial messaging system; and sanctions against members of the Russian elite and their foreign-held assets.

All in all, the fiscal pressures induced by the war in Ukraine will increase the budget deficits and public debts of countries involved and to some extent will affect other countries, as the current situation has limited countries' abilities to manage their fiscal and monetary stability. The war in Ukraine will also worsen disrupted supply chains and increase business risks in Europe and worldwide. All these factors will make recovery from the pandemic even more challenging.

NATO = North Atlantic Treaty Organization.

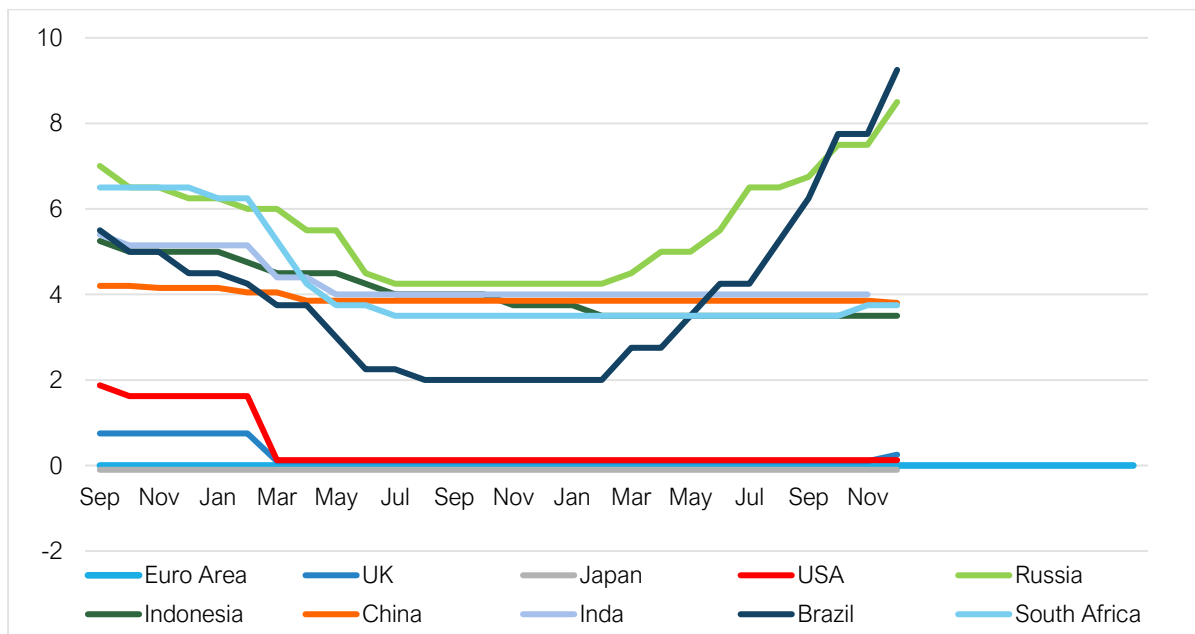
Source: Authors.

## 2.2. Monetary Interventions

Monetary interventions were geared towards easing money supply, stabilising markets, and providing additional liquidity. Figure 2.2 illustrates central bank policy rates from 2019 to 2021. Central bank policy rates were lowered at the onset of the pandemic (if there were still spaces to do so) and either remained low throughout the period (as in most cases) or rebounded in mid-2020 as in the case of Russia or Brazil, which experience high inflation rates. More importantly, central banks provided additional liquidity through bond purchasing programmes.

The US Federal Reserve (the Fed) cut its federal funds rate in March 2020 by 1.5 percentage points and provided forward guidance that the rate would stay low until labour market and inflation targets were reached. On 15 March 2020, it started and subsequently expanded a large asset purchasing programme: from June 2020 to October 2021, it purchased US\$ 80 billion in Treasury securities and US\$ 40 billion of agency mortgage-backed securities every month (*quantitative easing*) with the goal of reducing long-term interest rates. In November 2021, the Fed started tapering the programme. It also initiated various other lending programmes to financial intermediaries, businesses, households, and US states. In total, the Fed purchased more than US\$ 4.5 trillion in Treasury and mortgage-backed securities in the 2 years following the start of the pandemic (Milstein, Powell, and Wessel, 2021). On 16 March 2022, the Federal Open Market Committee decided to raise the funds rate by 25 basis points and expressed the intention to raise it further to almost 2% by the end of 2022 and to reduce holdings of Treasury securities as inflation is on the rise (Cox, 2022).

Figure 2.2: Central Bank Policy Rates, 2019-2021 (%)



UK = United Kingdom, US = United States.

Source: Bank of International Settlements (n.d.), BIS Statistics. <https://stats.bis.org/> (accessed 10 January 2022).



The main policy rate of the European Central Bank (ECB) on the main refinancing operations was already zero at the onset of the pandemic. The ECB launched a €750 billion Pandemic Emergency Purchase Programme (PEPP) in March 2020, which was later expanded to €1.85 trillion. Under this scheme, the ECB purchased predominantly government debt but also corporate debt across the eurozone. It was successful in reducing stress, stabilising markets, providing liquidity, reducing sovereign bond yields, and signalling monetary policy intentions. The PEPP has complemented existing programmes under the Asset Purchase Programme. The PEPP will be phased out in three steps from July 2022 to March 2024 considering an increasing inflation rate (ECB, 2022).

### 3. Fiscal and Monetary Stimulus Exit Strategy Scenarios

Fiscal and monetary stimulus programmes have played an important role in the economic recovery, but they cannot last forever. They heighten the risk of inflation and increase government deficits. The crucial question is: when should they end and what is the strategy to ensure that there are no (or little) negative impacts on the economy?

Economic recovery depends heavily on the health situation and the size of the economic stimulus (World Bank, 2021; IMF, 2021b). Countries with good access to vaccines and other health supplies and the ability to finance significant fiscal stimulus programmes, i.e., advanced economies, can recover faster than countries with limited access to vaccines and smaller fiscal stimulus programmes. This leads to asynchronous recoveries and different policy recommendations: countries with recovering economies should scale back their stimulus programmes while countries with weak economic recoveries need to continue them.<sup>2</sup>

This could lead to a situation for developing economies comparable to the 2013 ‘taper tantrum’, which taught us a valuable lesson. When the Fed chose to end quantitative easing in 2013, panic ensued, resulting in the taper tantrum in which capital flowed back to the US, badly hitting emerging economies such as Indonesia, India, South Africa, Turkey, and Brazil (known at the time as the ‘Fragile Five’ due to their relatively high current account deficits).

Interestingly, Indonesia and India were able to handle the problem in the shortest time (about 7 months) by increasing interest rates, decreasing budget deficits, and allowing the exchange rate to depreciate. This ‘stabilisation overgrowth’ policy succeeded in lowering the current account deficit and stabilising the financial sector and the economy in general. Yet, such a ‘stabilisation overgrowth’ policy recipe is no longer applicable in the face of the current taper tantrum. The reason is that developing countries need fiscal and monetary expansion to recover, not stabilisation. A drastic withdrawal of stimulus programmes could lead to economic contractions. As a result, the debt-to-equity ratios would increase, mostly caused by lower GDP growth.

---

<sup>2</sup> The poor have been the hardest hit. This implies that the post-pandemic recovery must be more inclusive, and fiscal policy must focus more on equity, e.g., by prioritising investing in education, improving access to healthcare, and providing social welfare. As the necessary resources are limited in many developing nations, there is a greater risk for these countries if they end the stimulus programmes prematurely.

As discussed earlier, the Russia–Ukraine conflict is increasing energy, commodity, and food prices. On the one hand, rising energy and commodity prices are beneficial to resource-rich Emerging Market and Developing Economies (EMDEs). Food price increases, on the other hand, have a negative impact on vulnerable groups. Food inflation is closely related to poverty in developing countries. Food price increases may push more people into poverty. As a result, the EMDE governments must devote a greater portion of their budgets to social protection. This implies that EMDEs must maintain fiscal expansion. This will make the situation even more complicated. On the one hand, there is a need to withdraw stimulus in advanced economies, while on the other hand, an expansive fiscal policy is still required in EMDEs, particularly to protect vulnerable groups in EMDEs from the negative impact of rising food prices. The G20 has made synchronisation of these two things a priority.

For developing countries, the risk of a recurring taper tantrum is not as great as it was in 2013. First, capital outflow occurred at the start of the pandemic in April 2020, and this capital has not fully returned to emerging markets, including Indonesia. The share of foreign holders of government bonds in Indonesia decreased from 32% in April 2020 to 19% at the end of 2021. This lower reliance on external financing makes Indonesia less vulnerable than in 2013. Second, the economic contraction has already decreased production and investment. For instance, Indonesia’s imports have fallen sharply, so Indonesia’s current account deficit is smaller than in 2012–2013 even though the budget deficit has increased. Most G20 countries have relatively low current account surpluses or deficits.

Table 2.1 shows that some countries’ current account balances improved because of increased savings stemming from the pandemic (as people reduced consumption due to mobility restrictions).

**Table 2.1: Current Account/GDP (%), GFCF/GDP (%), and Private Savings/GDP (%)**

Country		CA	PS	I	Country		CA	PS	I
Argentina	2015	-2.7	16.8	15.6	Indonesia	2015	-2.0	31.8	32.8
	2016	-2.7	17.1	14.3		2016	-1.8	31.8	32.6
	2017	-4.8	16.8	15.1		2017	-1.6	32.8	32.2
	2018	-5.2	14.4	15.4		2018	-2.9	32.8	32.3
	2019	-0.8	17.8	14.1		2019	-2.7	32.3	32.4
	2020	0.9	19.5	13.7		2020	-0.4	32.7	31.8
	2021	1.0				2021	0.3	35.2	30.8
Brazil	2015	-3.0	20.9	18.2	South Africa	2015	-4.2	13.9	18.0
	2016	-1.4	20.9	15.6		2016	-2.6	13.9	17.4
	2017	-1.1	21.2	14.6		2017	-2.3	14.5	16.4
	2018	-2.7	20.3	15.1		2018	-3.2	13.3	15.9
	2019	-3.5	19.9	15.5		2019	-2.7	13.3	15.3

Country		CA	PS	I	Country		CA	PS	I
Brazil	2020	-1.7	22.4	16.7	South Africa	2020	2.0	16.2	13.7
	2021	-1.7	22.9	19.2		2021		15.5	13.1
China	2015	2.6	44.1	42.1	Rep. of Korea	2015	7.2	38.3	29.0
	2016	1.7	43.9	41.6		2016	6.5	38.1	29.7
	2017	1.5	44.1	41.9		2017	4.6	38.0	31.5
	2018	0.2	44.5	42.8		2018	4.5	36.5	30.4
	2019	0.7	44.7	42.8		2019	3.6	36.1	30.1
	2020	1.9	46.6	42.5		2020	4.6	38.8	31.1
	2021	1.8				2021	4.9	37.0	31.4
India	2015	-1.1	32.6	29.7	Turkey	2015	-3.2	22.5	29.5
	2016	-0.6	29.8	30.0		2016	-3.1	23.1	29.1
	2017	-1.8	27.2	30.9		2017	-4.8	24.3	29.9
	2018	-2.1	32.7	30.0		2018	-2.8	27.1	29.9
	2019	-0.9	30.2	30.1		2019	0.9	27.5	25.9
	2020	0.9	36.9	23.9		2020	-5.2	26.7	27.3
	2021		22.4	32.9		2021		28.5	28.0

Note: CA = current account, GDP = gross domestic product, GFCF = gross fixed capital formation, I = investment, PS = private savings.

Source: CEIC Database (accessed February–April 2022).

As for monetary policy, quantitative easing did not cause inflation in the majority of G20 countries at first, when demand was relatively weak. Money financing is the correct step if it is done for a limited time and in a limited amount. However, when demand recovers, central banks will have to consolidate their balance sheets and pursue a more normal, tighter monetary policy to keep inflation in check. If this happens at the same time as the budget deficit is reduced, the economy will be hit hard just as it is recovering.

The pandemic has also increased the risk of non-performing loans (NPLs). So far, it has been managed by regulatory forbearance undertaken by several countries, including Indonesia, but the normalisation of banking policy will lead to rises in NPLs. A significant hike in the Fed's funds rate will create a real dilemma for many central banks in developing countries: if they do not raise their rates in line with the Fed, there is a risk of exchange rate depreciation due to capital outflows, but if rates are increased, the risk of NPLs will also increase and disrupt economic recovery.<sup>3</sup> Given this context, a good policy mix targeting interest rates, exchange rates, and macro-prudential policy is key.

We can learn from previous experience. In 2009, quantitative easing induced capital inflows into emerging markets, including Indonesia. Strong capital inflows led to a sharp appreciation in the exchange rate, as predicted by the Unholy Trinity of monetary policy, under the central bank's commitment to maintain free capital flows and its independent monetary policy. As a result, the

<sup>3</sup> The normalisation of monetary policy in the US will also increase the risk of highly leveraged companies. The combination of COVID-19, tightening liquidity from the normalisation of monetary policy in the US, and weakening exchange rates will limit the ability of businesses and the private sector in general to expand.

current account deficits worsened, exposing the country's balance of payments position to the risks associated with portfolio investment. This is exactly what occurred in the case of Indonesia. When Bank Indonesia attempted to restrain the rupiah's appreciation, the cost of borrowing increased in tandem with the widening spread between the Fed funds rate and the Bank Indonesia rate. Perhaps the government should have tightened its fiscal policy to reduce the need for financing and thus the pressure on the rupiah. However, enforcing strict fiscal policy during economic boom times is politically difficult.

The opposite occurred during the 2013 taper tantrum, which saw capital outflows from emerging economies such as Indonesia, India, South Africa, Brazil, and Turkey. As a result, stock markets plummeted, bond yields skyrocketed, and currency values plunged. In the cases of Indonesia and India, the strategy adopted was a combination of expenditure-reducing policies such as raising interest rates and lowering the budget deficit and expenditure-switching policies such as allowing the exchange rate to depreciate to a certain extent, while maintaining macro-prudential policies. Both Indonesia and India were successful in dealing with the taper tantrum. Using the exchange rate as a shock absorber can be very costly, especially for a country like Indonesia, which was traumatised by the exchange rate devaluation caused by the 1998 Asian financial crisis, as it can instil panic. Financial stability can be maintained by combining interest rate, exchange rate, fiscal, and macro-prudential policies.

#### 4. Policy Recommendations

First, it is crucial for the G20 to reinforce the commitment to supply/donate vaccine doses and medical supplies, expand production, and improve logistics, since the raging pandemic in low-income countries will ultimately hinder the economic recovery even of the developed world. Furthermore, this year's G20 should coordinate international travel protocols in a way that both respects health concerns and provides transparency and predictability to ensure smoother cross-border movement of goods and people.

Low-income and developing countries in particular need access to more financial resources to fund their increased health spending needs during the pandemic. Therefore, it is crucial that the G20, together with multilateral development funds and organisations, continue and expand the various support and relief schemes to combat the liquidity problems and increase the fiscal space of vulnerable countries. This support may come in various forms, such as special drawing rights (SDRs) or improved mechanisms for debt relief or standstill. For instance, until December 2021, the G20's Debt Service Suspension Initiative (DSSI) had contributed less than US\$ 10 billion worth of debt service deferral (World Bank, 2022), in contrast to almost US\$ 28 trillion of new debt raised globally in 2020 alone (IMF, 2021a). The G20 should also develop the work of the G20 Joint Finance-Health Task Force to include actions for preparing modalities to establish a financial facility for low- and middle-income countries (LMICs) and non-G20 members to access pandemic-related funding (in prevention, preparedness, and response), as well as the G20 Common Framework for Debt Treatments.

Second, discussing both timing and exit strategies for fiscal stimuli is vital. Fiscal policies should remain stimulative until GDP returns to pre-pandemic levels. Fiscal expansion raises the risk of rising foreign debt in many developing and emerging economies as domestic resources are insufficient. The G20 has taken steps to mitigate the risk of debt distress by establishing the DSSI. The G20 also introduced the Common Framework for Debt Treatments Beyond the DSSI (applying to International Development Association countries) in November 2021. Unfortunately, this facility is rarely used since nations requesting it must have an International Monetary Fund (IMF) programme that is backed up by policy promises to restore sustainability. The G20 needs to discuss how to ensure that this facility is effective, e.g., by expanding the eligibility criteria.

For most developing countries with limited fiscal capacity, efforts are needed to improve tax revenue, through reforms to tax administration as well as improving the quality of spending. Priorities and spending quality must be reviewed again in terms of expenditure. The allocation of state funds should be directed towards inclusive, green development. Other sectors can wait and be allocated in stages as fiscal space becomes available.

Third, the 2013 taper tantrum example demonstrates that the volatility of capital flows to emerging markets needs to be addressed, as economic recovery and therefore normalisation of monetary policy are asynchronous, which poses risks for macroeconomic stability. The G20 countries should think about the importance of a policy mix of currency rates, interest rates, and capital flow management. Independent monetary policies create harsher policy trade-offs when the capital account is open. An increase in interest rates raises the risk of NPLs. Consequently, regulatory forbearance adjustments must be made with caution, gradually, and must be well communicated.

Fourth, we see the need for developed countries to reduce economic stimulus due to the risk of inflation, but we also see the need for developing and emerging economies to maintain economic stimulus. The key question is how the G20 meeting in Indonesia can synchronise these conditions so that the exit strategy chosen does not cause instability for emerging and developing economies. The exit strategy must be communicated well – both between nations and to market players. The G20 forum is an avenue for developing and developed nations to exchange information on policy in an honest and transparent manner that will create certainty in the market.

Last, economic recovery will be much more effective and sustainable if it is conducted in a peaceful environment characterised by cooperation and peaceful exchanges.

## References

- Ahnert, V., A. Dhulesia, and S. Roper (2021), 'COVID-19 Vaccine Manufacturing: Challenges, Solutions and Implications for the Pharma Industry', *Executive Insights*, XXIII(36), L.E.K. Consulting.
- Blanchard, O. (2020), "Whatever It Takes." Getting into the Specifics of Fiscal Policy to Fight COVID-19', Peterson Institute for International Economics Realtime Economics Issues Watch, Blog, 30 March.
- Cox, J. (2022), 'Federal Reserve Approves First Interest Rate Hike in More Than Three Years, Sees Six More Ahead', *CNBC*, 16 March.
- Dolls, M., C. Fuest, and A. Peichl (2012), 'Automatic Stabilizers and Economic Crisis: US vs. Europe', *Journal of Public Economics*, 96(3–4), pp.279–94.
- Dorn, F. and C. Fuest (2021), 'Next Generation EU: Chancen und Risiken des europäischen Fonds für die wirtschaftliche Erholung nach der Corona-Krise' (Next generation EU: chances and risks of the European fund for recovery after the Corona crisis), *Wirtschaftsdienst*, 101(2), pp.78–81.
- Duke Global Health Innovation Center (2022a), 'COVID-19 Vaccine Data by 11 February 2022', Launch and Scale Speedometer. <https://launchandscalefaster.org/covid-19/vaccinepurchases> (accessed 15 February 2022).
- Duke Global Health Innovation Center (2022b), 'Tracking COVID-19 Vaccine Purchases Across the Globe', Launch and Scale Speedometer. [https://launchandscalefaster.org/COVID-19#:~:text=Download%20our%20latest%20vaccine%20data%20update%20from%20February%2011%202022%20\(.xlsx\)](https://launchandscalefaster.org/COVID-19#:~:text=Download%20our%20latest%20vaccine%20data%20update%20from%20February%2011%202022%20(.xlsx)) (accessed 15 February 2022).
- ECB (2022), 'ECB Announces Timeline to Gradually Phase Out Temporary Pandemic Collateral Easing Measures', Press Release, 24 March.
- EESC (2021), 'TRIPS Waiver: End the Deadlock to the COVID-19 Vaccine Patents – Workers' Group Statement', European Economic and Social Committee, News, 9 December.
- Evenett, S.J., B. Hoekman, N. Rocha, and M. Ruta (2021), 'The Covid-19 Vaccine Production Club: Will Value Chains Temper Nationalism?', *Policy Research Working Paper*, No. 9565. Washington, DC: World Bank.
- Felbermayr, G., H. Mahlkow, and A. Sandkamp (2022), 'Cutting Through the Value Chain: The Long-Run Effects of Decoupling the East from the West', *Kiel Working Paper*, No. 2210. Kiel: Kiel Institute for the World Economy.

- Gaspar, V., P. Medas, and R. Perrelli (2021), 'Global Debt Reaches a Record \$226 Trillion', *IMF Blog*. <https://blogs.imf.org/2021/12/15/global-debt-reaches-a-record-226-trillion/> (accessed 15 December 2021).
- Hale, T. et al. (2021), 'A Global Panel Database of Pandemic Policies (Oxford COVID-19 Government Response Tracker)', *Nature Human Behaviour*, 5, pp.529–38.
- ILO (2021), Data on Unemployment by Sex, Age 15+. ILOSTAT. [https://www.ilo.org/shinyapps/bulkexplorer24/?lang=en&segment=indicator&id=UNE\\_2E\\_AP\\_SEX\\_AGE\\_RT\\_A](https://www.ilo.org/shinyapps/bulkexplorer24/?lang=en&segment=indicator&id=UNE_2E_AP_SEX_AGE_RT_A) (accessed 11 February 2022).
- IMF (2021a), 'Global Debt Reaches a Record \$226 Trillion', IMF Blog, 15 December. <https://blogs.imf.org/2021/12/15/global-debt-reaches-a-record-226-trillion/> (accessed 10 January 2022).
- IMF (2021b), Policy Responses to COVID-19. <https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19> (accessed 10 January 2022).
- IMF (2022), *World Economic Outlook Update 2022: Rising Caseloads, a Disrupted Recovery, and Higher Inflation*. Washington, DC: International Monetary Fund.
- Ing, L.Y. and M. Chatib Basri, eds. (2022), *COVID-19 in Indonesia: Impacts on the Economy and Ways to Recovery*. London: Routledge.
- Lacey, E., J. Massad, and R. Utz (2021), *A Review of Fiscal Policy Responses to COVID-19. Equitable Growth, Finance, and Institutions Insight*. Washington, DC: World Bank.
- Milstein, E., T. Powell, and D. Wessel (2021), 'What Does the Federal Reserve Mean When It Talks About Tapering?', Brookings Up Front, Blog, 15 July.
- Nweneka, C.V. and T. Disu (2022), 'The Future of Vaccine Manufacturing in Africa', Brookings Africa in Focus, Blog, 14 February.
- OECD (2022), 'First Lessons from Government Evaluations of COVID-19 Responses: A Synthesis', Tackling Coronavirus (COVID-19), 24 January. Paris: Organisation for Economic Co-operation and Development.
- Schulze, G. (2022), 'Policy Responses to the COVID-19 Pandemic – The Case of Germany', in L.Y. Ing and M. Chatib Basri (eds.) *COVID-19 in Indonesia: Impacts on the Economy and Way to Recovery*. London: Routledge, pp. 181-204.
- Summer, A., C. Joy, and E. Ortiz-Juarez (2020), 'Will COVID-19 Lead to Half a Billion More People Living in Poverty in Developing Countries?', United Nations University World Institute for Development Economics Research (UNU-WIDER), Blog, April.

UNHCR (2022), Operational Data Portal, Ukrainian Refugee Situation. <https://data2.unhcr.org/en/situations/ukraine> (accessed 20 April 2022).

US House of Representatives Committee on Financial Services (2022), 'The Role of International Monetary Fund in a Changing Global Landscape', Memorandum, 14 February.

WHO (2021), 'Strategy to Achieve Global Covid-19 Vaccination by Mid-2022', *COVID-19 Scientific Brief*, 6 October. Geneva: World Health Organization.

World Bank (2021), 'Long COVID', *East Asia and Pacific Economic Update* (October). Washington, DC: World Bank.

World Bank (2022), 'Debt Service Suspension Initiative', Brief, 10 March. <https://www.worldbank.org/en/topic/debt/brief/covid-19-debt-service-suspension-initiative> (accessed 10 January 2022).



# Chapter 3

## Global Economic Recovery in the Face of COVID-19

Maurice Obstfeld

### 1. Introduction

After a sharp contraction early in 2020 as the coronavirus disease (COVID-19) spread across the globe, the world economy staged a quick return to economic growth. Two years later, however, the recovery remains incomplete, especially in emerging market and developing economies (EMDEs); the pandemic continues; and the prospects for shared, inclusive prosperity are cloudy. Russia's invasion of Ukraine in February 2022 and the international response will deliver a further setback to global economic prospects (OECD, 2022). By promoting effective multilateral cooperation on a range of global challenges, the G20 can strengthen the current recovery and mitigate future threats.

An effective response requires participation by all G20 countries, but the resulting efforts should particularly aim to build up the resilience of EMDEs. These countries account for about 58% of global gross domestic product (GDP) at purchasing power parity, making their economic health macro-critical for the world at large. But they also comprise more than 80% of the global population, with many more of their residents having fallen into poverty owing to the pandemic. Lower-income countries in particular have been at the back of the queue for vaccinations, and many have weak domestic health infrastructures, raising questions of basic justice but also putting high-income countries at risk for new variants of SARS-CoV-2 as well as newer emergent pathogens. In our pandemic age – with its threats accentuated by climate degradation – EMDEs are on the front line.

This chapter starts with a brief overview of the global output recovery and inflation threats. A more robust and durable recovery demands stronger efforts within the G20 to surge the supply of COVID-19 vaccines to countries where vaccination rates are low and to aid those countries in getting jabs into arms. But SARS-CoV-2 will not be the last pathogenic threat; and the G20 must draw lessons from the failures of the last 2 years and consider concrete initiatives to create a more robust framework for international health cooperation. To that end, a promising step was the collaboration of the G20 finance and health ministers in October 2021 to create the Joint Finance–Health Task Force. Upgrading the global health infrastructure as well as ensuring investment initiatives geared towards a green transition are key priorities that will require financial support from high-income countries and that will impact the macroeconomic recovery prospects of EMDEs in the coming years. The current situation is not encouraging, though: even the Access

to COVID-19 Tools Accelerator (ACT-Accelerator), the main locus for multilateral cooperation in countering the current pandemic, remains woefully underfunded.<sup>1</sup>

Another legacy of the pandemic is a more forbidding public and private debt landscape. And debts must be financed within a context of increasingly volatile global capital flows. This chapter therefore turns to the challenges of international financial architecture, liquidity, and debt restructuring.

Public and private debts had been rising at worrying rates even before 2020, but with possibly lower future growth, they occupy levels that pose even greater risks to financial and macroeconomic stability. Avoiding debt-fuelled instability is in the collective interest and requires collective action. Regarding higher public debts, the G20 has already warned against the premature withdrawal of macroeconomic policy support. But with interest rates beginning to rise throughout the world, the question of public debt sustainability is becoming more urgent. Countries must devise credible plans to ensure public solvency over the longer term and carefully monitor private sector financial markets, as well as potential repercussions of debt distress amongst businesses. The recent easy financial conditions have played a key stabilisation role but also created vulnerabilities for the recovery period. A generalised rush to excessive fiscal austerity and regulatory stringency, however, if pursued by all countries simultaneously, would likely be counterproductive – a deflationary coordination failure, which would be exacerbated by monetary stringency as central banks respond to high inflation. G20 collaboration on fiscal and financial policies thus would be beneficial. Yet, a measured response to current debt-related vulnerabilities (one that is tailored to national circumstances and shields society's most disadvantaged households) does not mean the vulnerabilities should not begin to be addressed.

Debt vulnerabilities are most acute for governments and firms in EMDEs, where the risk of public-enterprise-banking debt doom loops is greatest (World Bank, 2022b). International capital flows to emerging borrowers have been volatile during the recent crisis. An environment of global financial tightening could tip some EMDE borrowers into liquidity crunches and in some cases public insolvency, requiring debt restructuring. The G20 recognised the potential difficulties of some low-income sovereign debtors through the Debt Service Suspension Initiative (DSSI), followed by the Common Framework for Debt Treatments beyond the DSSI. However, there is a need to prepare for potential difficulties of a broader set of EMDEs within a framework that promotes debt transparency and regularises the participation of the entire spectrum of creditors, including private creditors. The G20 can and must play a central role.

## 2. The Current Growth Conjuncture, Debt, and Inflation

Figure 3.1 illustrates the comparative pace of global recovery across the world. Amongst advanced economies, the United States (US) has returned to its pre-pandemic growth path; others remain somewhat more distant. In emerging Asia outside China, and in the Middle

---

<sup>1</sup> The World Health Organization (WHO) has outlined 'fair share' asks for 2022 rich-country contributions, as well as the countries' actual contributions compared with 2020/2021 asks. See WHO (2022).

East/Africa aggregate, growth seems to have stalled after an initial bounce-back from the first quarter of 2020, and in Japan even gone into reverse. The global recovery is two-speed. For the EMDEs as a group, it is unclear whether growth *levels* will return to pre-pandemic trends anytime soon, or indeed, even if pre-pandemic growth-rate *trends* will be regained. They have been less able than advanced economies to provide fiscal support, and that has harmed growth. Recent years have had long-term scarring effects, not least due to depressed physical investment and disrupted primary and secondary education. Fallout from the war in Ukraine will add to these headwinds.

Indeed, as Figure 3.2 shows, even in the decade before the pandemic, EMDE growth rates were trending downward (certainly compared with the 2000–2008 period of the credit and commodity boom). Nonetheless, during the 2010s many EMDEs took on higher public debt burdens, despite falling growth, encouraged by abundant global liquidity and low global interest rates as advanced economies struggled with forces of ‘secular stagnation’.<sup>2</sup> Those forces still underlie the current turbulent macroeconomic landscape, and there is a danger now that they will spread more strongly to EMDEs. Even though lower risk-free real interest rates could result over the longer term, lower real growth rates could pose a more potent challenge to debt sustainability, as these will affect default perceptions and borrowing costs, possibly with abrupt adverse effects on sovereign bond spreads.

Figure 3.3 shows public debt ratios to GDP. While generally lower than in advanced economies, debt levels in EMDEs are high relative to historical norms and fiscal capacities. Even after the Heavily Indebted Poor Countries Initiative of 1996 and the Multilateral Debt Relief Initiative of 2005, the public debts of some low-income and lower middle-income countries have returned to very high levels. Amongst EMDEs, the frontier economies that now borrow from an array of private lenders appear most vulnerable to sudden stops of capital inflows. But more highly indebted middle-income countries could be at risk. Risks are accentuated by financial weaknesses in the enterprise sector (see Figure 3.4, from World Bank, 2022b) and large bank holdings of sovereign debt (Obstfeld, 2021).

Recent meetings of G20 finance ministers and central bank governors have acknowledged the inflationary pressures owing to economic reopening. While many of these are common to all countries – e.g., due to supply chain pressures, elevated energy prices, and climate-driven impacts on food prices – country-specific factors also are at work. Three facts stand out from the recent inflation data in Figure 3.5:

- For EMDEs as a group other than emerging Asia, inflation has risen above recent average pre-pandemic levels with economic reopening and recovery. Pre-pandemic inflation rates were somewhat higher than those of high-income economies.

---

<sup>2</sup> In his 1938 presidential address to the American Economic Association, Alvin Hansen of Harvard hypothesised that declining population growth would lead to chronically weak aggregate demand and unemployment, or as he put it, ‘sick recoveries which die in their infancy and depressions which feed on themselves and leave a hard and seemingly immovable core of unemployment’ (Hansen, 1939: 4). Economists have revived the hypothesis to describe the global environment of slower growth and low real interest rates following the global financial crisis (GFC) of 2007–2008.

- In advanced economies generally, inflation is now substantially higher than before the pandemic.
- The notably high inflation in the US reflects exceptional fiscal stimulus, its approach to supporting labour markets during the pandemic, and a sharp and likely persistent fall in labour force participation. The gap between headline and core inflation is especially high for the US, indicating the broad scope of domestic inflationary pressures.

Everywhere, the Ukraine crisis is making things worse. The inflation challenge is driven partly by exceptional food price inflation, where food is a bigger proportion of EMDE budgets (and those of the poor in advanced economies). The resulting risks of social disruption are elevated. A major cooperative challenge for the G20 is to forswear food export restrictions, which have already begun to proliferate even amongst G20 members, and which will have the collective effect of raising world food prices further. For the world, avoidance of trade disputes and rollbacks of existing protection can ease supply chain disruptions as well as exerting some beneficial downward pressure on inflation (see Hufbauer, Hogan, and Wang, 2022 on the US case). A cessation of attacks on Ukraine, and a resulting easing of economic sanctions on Russia, would also benefit global food prices, inflation, supply chains, and growth.

The US situation is especially consequential for the world economy. Recent research on the global financial cycle (e.g., Miranda-Agrippino and Rey, 2020; Obstfeld, 2021) has indicated the role of US Federal Reserve (Fed) policy and nominal US dollar appreciation in driving not only global asset prices, capital flows, and leverage, but also EMDE growth, world trade, and world commodity prices. Such developments, given their more fragile fiscal position, could lead to a sudden stop in capital flows to a range of EMDEs, to sovereign debt problems, and to broader financial difficulties.

True, higher inflation is eating away at nominal debts, but nominal interest rates will rise and in order to maintain the gains in inflation credibility of the past decades, central banks will need to hike them enough also to raise *real* interest rates. Challenges to fiscal sustainability and firms' solvency will result, likely much more seriously in the EMDEs.

### 3. Strengthening the International Financial Architecture

Reforms in several directions could strengthen the global financial system. Most of these proposals reflect long-standing needs, although the experience in the recent COVID-19 crisis underscores the urgency of action.

In early 2020, banks avoided the widespread distress of the Global Financial Crisis (GFC). In large part, this success owed to the origin of the COVID-19 shock being *outside* the banking sector. However, some credit is also due to the national and international banking sector reforms that followed the 2007–2008 crisis and the euro area crisis, which augmented bank capital, enhanced the liquidity of balance sheets, and upgraded prudential regulatory frameworks globally and in many countries.

A predictable side effect, however, has been the migration of financial activity from the more constrained banking sector to unregulated or loosely regulated non-bank financial institutions. In a recent report, the Committee on the Global Financial System (CGFS) of the Bank for International Settlements stressed the growing share of market-based capital flows (CGFS, 2021). Since 2007, the share of bank loans in the external debt of advanced economies has shrunk from about 35% to about 22%, whereas the share of portfolio debt has risen from about 43% to 50%. At the same time, the share of bank loans in the external debt of emerging market borrowers has fallen from around 52% to 45%, and the share of portfolio debt has risen from around 24% to nearly 40%. Advanced economy cross-border bank claims (which include debt securities, not just loans) declined from about 70% of home-country GDP at the time of the GFC to around 50% in 2019 (CGFS, 2021: Graph 1.2).

At the same time, and as noted earlier, the cross-border activity of emerging market banks has risen – according to CGFS (2021), from about 7% to 9% of home-country GDP between 2008 and 2019. However, it remains small in scale compared with advanced economies' international bank activity.

From a policy perspective, these evolutions point to the need for more thinking about financial stability risks coming from the non-bank sector, e.g., through increasingly complex intermediation chains that may ultimately also impinge on the banks. The spread of innovative fintech platforms only increases the risks, including from cybersecurity breaches, and may render prudential oversight more difficult. All along, climate-related risks are only rising. The challenges that the international dimension raises are particularly big, owing to the seams between national regulatory systems. The Financial Stability Board (FSB) has outlined an extensive programme to assess the risks from non-bank financial institutions considering the COVID-19 market turmoil of early 2020 (FSB, 2020). However, it seems fair to say that even bank regulation now needs to encompass an even broader set of potential systemic risks than were envisioned in the immediate post-GFC reforms. The trend of emerging market banks increasingly venturing abroad into other emerging markets only raises the stakes for those countries (Broner et al., 2020). In general, the G20 should underline that management of the risks from volatile capital flows requires policy adjustments not only by the recipients of flows but also by the *sources*: both sets of actors share an interest in preserving global financial stability. In particular, the G20 should strongly endorse enhanced regulatory scrutiny, within a multilateral regulatory framework, of the cross-border activities of non-bank financial institutions, as well as national action to address related financial stability threats.

Another incomplete part of the financial market infrastructure is the global financial safety net (GFSN). Bilateral swap lines have become increasingly important in the GFSN (CGFS, 2020). Fed swap lines were essential in stabilising global markets in early 2020 in light of the US dollar's continuing dominance as a funding and investment currency.

The need to extend central bank swap lines further multilaterally, especially the Fed's, has long been apparent. Amid the market disruption in April 2020, the Executive Board of the International Monetary Fund (IMF) approved a Short-term Liquidity Line (SLL) facility intended to address some of the gaps in the network of bilateral swaps. Unfortunately, potential beneficiaries seem not to

view the SLL (or the IMF's two other precautionary credit lines originating in the GFC period) as equivalent to central bank swaps (especially from the Fed), and indeed, not a single country has drawn on the SLL so far. The IMF declined to adopt the pandemic support facility that Fisher and Mazarei (2020) proposed, but such a policy instrument would also strengthen the GFSN during the current pandemic and could be mobilised in future contagious outbreaks that will inevitably occur. Also relevant is the proposed Resilience and Sustainability Trust (RST), which would provide an IMF umbrella for richer countries to lend special drawing rights (SDRs) for investments in climate adaptation, health, and other areas of medium-term vulnerability. SDR loans to others do not come free of charge: they would have a budgetary cost to countries recycling them into an RST, so legislative approvals would be necessary in most cases. However, such approvals might be encouraged by IMF oversight of the resulting loans, and the broader point is that additional concessional lending is welcome to help EMDEs better address vulnerabilities that impinge on the global commons. A further question the G20 should consider is whether less ad hoc criteria for SDR issuances could be formulated. The IMF's upcoming 16th General Review of Quotas will provide another opportunity to strengthen the GFSN through enhanced non-borrowed lending resources.

For EMDEs, improved defensive policies can bolster domestic resilience – and thereby global resilience. Their vulnerability to the global financial cycle makes it understandable why so many less affluent economies, even emerging market economies, have stopped short of full financial opening. In 2012, the IMF officially recognised this reality by developing an 'institutional view' (IV) on capital controls that allows for their use in some circumstances, notably when financial flows threaten economic or financial stability and the capital flow measures (CFMs) do not substitute for necessary adjustments in macro-prudential, monetary, or fiscal policies (IMF, 2012). Nonetheless, research and experience suggested that the 2012 vintage IV was too restrictive, and countries still feared that markets might stigmatise them if they varied CFMs reactively. Thus, the Article IV surveillance process has regularly featured disagreements between IMF staff and country authorities as to whether particular policy measures should be labelled as CFMs or macro-prudential measures, with the authorities often advocating for the latter designation (Everaert and Genberg, 2020).

Recently, the IMF proposed an Integrated Policy Framework (IPF) that conceptualises the use of CFMs, foreign exchange intervention, monetary policy, fiscal policy, and macro-prudential policy as distinct instruments – all of which may be needed to reach multiple policy goals in a small open economy (IMF, 2020). The IMF has re-examined the IV in light of internal review, staff experience, and the IPF (IMF, 2022), concluding that CFMs with a macro-prudential rationale (CFMs/macro-prudential measures) could be justified as *pre-emptive* measures, even before an inflow surge occurs, if they aim to prevent a build-up of financial vulnerabilities, e.g., an overhang of foreign currency debt.<sup>3</sup> This is a step forward, but it does not yet realise the potential of the IPF to place capital control and foreign exchange intervention policies on an equivalent plane with monetary, fiscal, and macro-prudential policies, and thereby remove some of the stigma that currently

---

<sup>3</sup> Recent research from the IMF underscores that 'preemptive' inflow CFMs can reduce EMDEs' exposure to global financial cycle risks (see Das, Gopinath, and Kalemli-Özcan, 2022). The revised IV also allows capital controls to pursue some non-macro-financial goals, such as combating tax avoidance or terrorist financing.

attaches to CFMs. The G20 should therefore welcome the expanded IV but encourage the IMF to take its reconsideration further. This approach would also be in line with the recent recommendations of a group of Association of Southeast Asian Nations (ASEAN) central banks (ASEAN WC-CAL, 2019).

#### 4. A Key Challenge: Dealing with Sovereign Debt Restructuring

If a future sudden stop in capital flows to EMDEs is protracted, and especially if the pandemic lingers on, liquidity support may not be enough to stave off solvency problems. Inflating away domestic currency debt would endanger hard-won gains in inflation credibility, while inflicting economic damage that often falls most heavily on the poor. Another possibility is outright debt restructuring, the only option for foreign currency debt.

Despite some recent improvements, however, the current international architecture for external debt restructuring is inadequate to handle a rash of sovereign defaults, some potentially affecting systemic countries. The G20 should strongly endorse a number of initiatives that could promote more efficient and less disorderly sovereign debt restructuring.

Building on the DSSI initiated in May 2020, the G20 in November 2020 launched the Common Framework for Debt Treatments beyond the DSSI to facilitate debt restructuring by the 73 eligible low-income International Development Association countries in cases of persistent liquidity problems or insolvency.<sup>4</sup> Importantly, the Common Framework included non-Paris Club members such as China (the biggest official creditor to developing countries) together with more traditional financial centre lenders in a framework that effectively extends Paris Club procedures to all official bilateral creditors. While both the DSSI and the Common Framework encompassed official bilateral claims only, they encouraged the involvement of private sector lenders on comparable terms. Private sector participation has been extremely limited so far (to understate the case). The IMF could perhaps strengthen the Common Framework by clarifying that its lending-into-arrears policies (for private and bilateral official arrears) continue to apply when a country seeks to restructure under the Common Framework (Chorzempa and Mazarei, 2021).

Increasingly, EMDE borrowers face diverse sets of lenders, official and private, lending via a range of different instruments with very different contractual terms and restrictions, which in some cases are not publicly disclosed. This landscape raises the challenge of efficient debt restructuring with comparable burden sharing amongst all creditors and with minimal opportunity for holdout creditors to disrupt the process. (There can even be coordination problems amongst a single creditor's diverse official and quasi-official lenders.) The challenges are especially daunting for lower-income borrowers with weaker institutional capacity and resources. By building on the Common Framework, the G20 can help to reduce the immense collective action problems that

---

<sup>4</sup> The DSSI ultimately extended until the end of December 2021, with participation by 48 of the 73 eligible countries (see World Bank, 2022a). Some eligible non-participating countries apparently feared reputational stigma, including potential ratings downgrades, due to entering the DSSI. Another issue was the limited set of official creditors covered.

have only become worse over time, to the benefit of borrowers, lenders, and the global economy at large.

To be most useful, the Common Framework should embrace a larger range of debtor countries than just those that were eligible for the DSSI, including any lower to upper middle-income countries that encounter sustainability problems. G20 members would strengthen the Common Framework further if all G20 members with material foreign sovereign loans joined the Paris Club. More ambitiously, the Common Framework should evolve mechanisms that routinely bring in and coordinate amongst the entire range of private sector creditors early in the restructuring process, to encourage stakeholder participation and widen the base for equitable burden sharing while discouraging free riding. This evolution would be consistent with the stated aims of the Common Framework. At present, the debtor is required to seek comparable treatment of all creditors, not only Common Framework participants. This aim could be incentivised were the G20 to recommend generalised debt service suspension during restructuring negotiations (as recommended by Georgieva and Pazarbasioglu, 2021). As noted, IMF lending policies could support this approach, thereby facilitating productive debtor–creditor engagement in cases of debt distress. The G20 should regularise the formation of creditor committees within a broadened Common Framework, as an efficient mechanism for reducing coordination problems and informational asymmetries (Chorzempa and Mazarej, 2021).<sup>5</sup>

The G20 should encourage other reforms of the sovereign debt landscape. One necessary change is to enhance debt transparency – with respect to creditors, amounts, and terms (including collateral). A first step is to support the Organisation for Economic Co-operation and Development (OECD) initiative to create a digital database based on available sources, but there is also the need to encourage governments and creditors to make much more information available (Sovereign Debt Working Group, 2022). The G20 should ask creditor countries to develop targeted statutory tools that prevent holdout creditors from blocking payments to other creditors, when debtors have made good faith efforts to achieve comparability of treatment across creditor groups. Contract reform is another avenue to support needed debt restructuring. As recommended by the G30 Working Group on Sovereign Debt and COVID-19 (2021: 27), the G20 ‘should disavow the use of contract terms that impair debtors’ or creditors’ participation in international debt negotiations and should commit not to enforce them in their existing bilateral debt contracts, and those of their agencies and state-owned enterprises’. Greater use of state-contingent debt could be encouraged in some settings.

In addition, as recommended by the G30 Working Group on Sovereign Debt and COVID-19 (2021), the preceding enhancements to the Common Framework could be facilitated if the G20 established a ‘standing consultative mechanism’ to coordinate Common Framework exercises, acting as a convener for stakeholders while aggregating information and providing technical

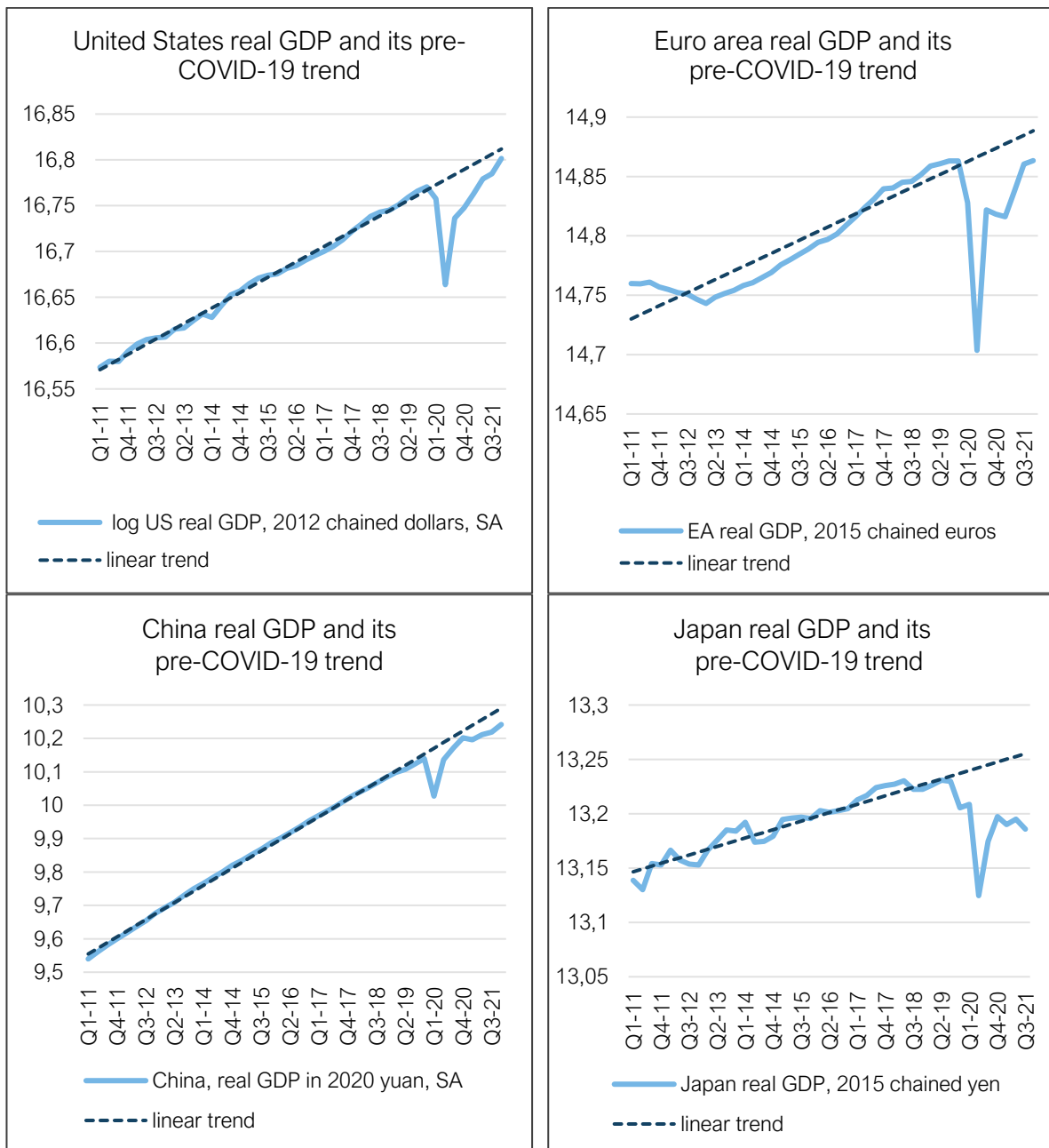
---

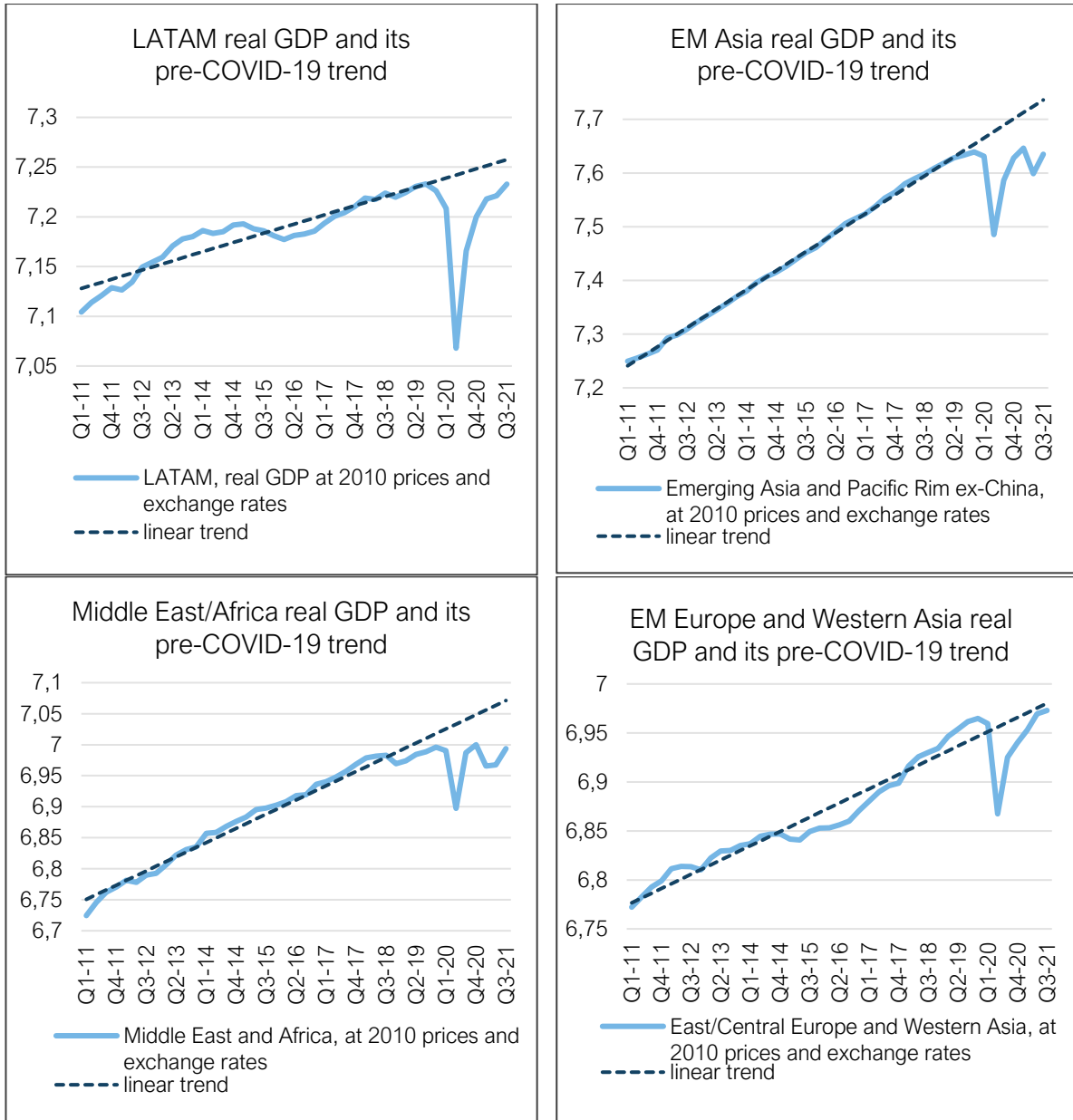
<sup>5</sup> Some contend that creditor committees may be detrimental to debtors in distress because they consolidate creditor bargaining power (e.g., Buchheit et al., 2020). This is far from clear. Even if creditor bargaining power is enhanced ex post, lenders’ ex ante expectation that this will be the case may allow the borrower to borrow on terms that are more favourable to start with, perhaps reducing the likelihood of future debt distress. In addition, the creditor committee framework has the other important advantages noted in the text.



expertise. Gelpern, Hagan, and Mazarei (2020) recommended a G20 ‘central coordination mechanism’ for sovereign debt issues prior to the launch of the DSSI, but the case for such an approach is even stronger considering the Common Framework. It will be stronger still if the Common Framework evolves, as it should, to include broader sets of countries and creditors.

Figure 3.1: Real GDP of Major Countries and Regions Compared with Pre-COVID-19 Trends



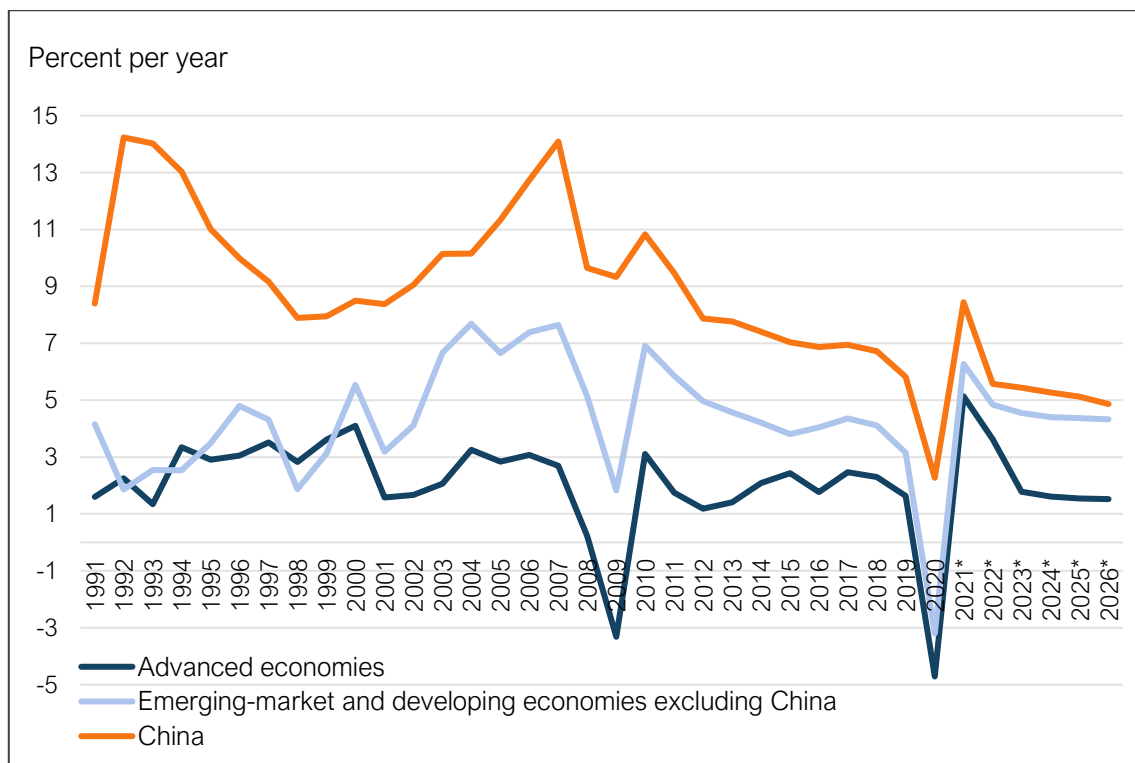


COVID-19 = coronavirus disease, EA = euro area, EM = emerging markets, GDP = gross domestic product, LATAM = Latin America, Q = quarter, SA = seasonally adjusted, US = United States.

Note: Vertical axis units are log points.

Source: Haver Analytics.

Figure 3.2: Downward Trend in Pre-Pandemic EMDE Growth Rates, Even Excluding China

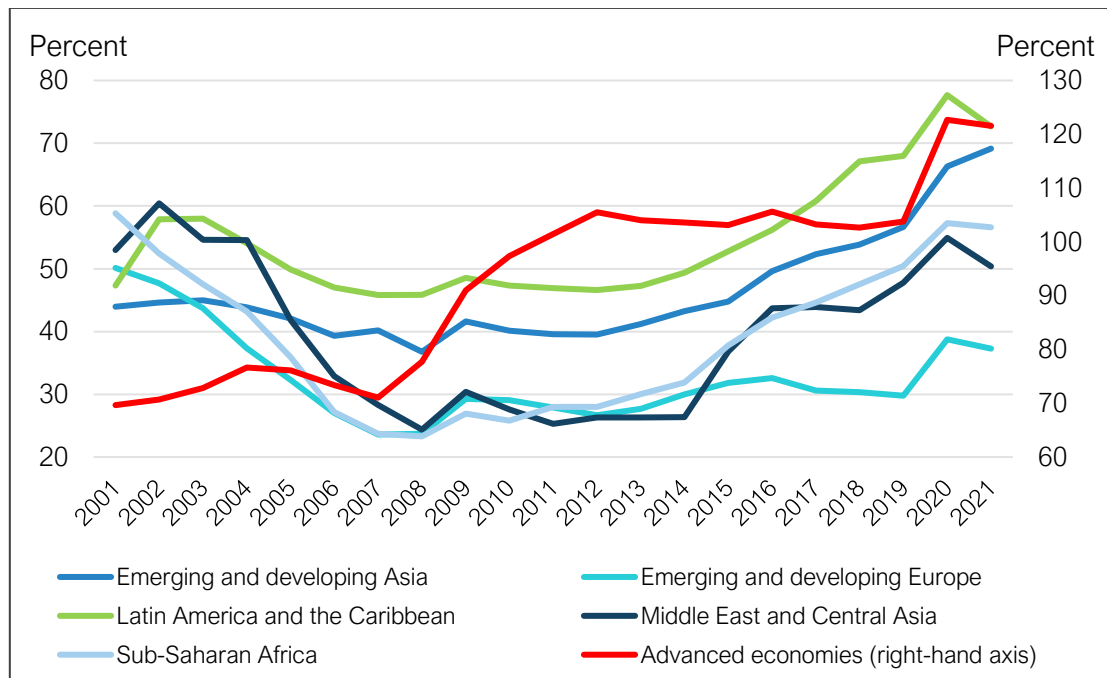


Note: Data projections for years with asterisks.

Source: IMF (2021), World Economic Outlook Database: October 2021.

<https://www.imf.org/en/Publications/WEO/weo-database/2021/October>

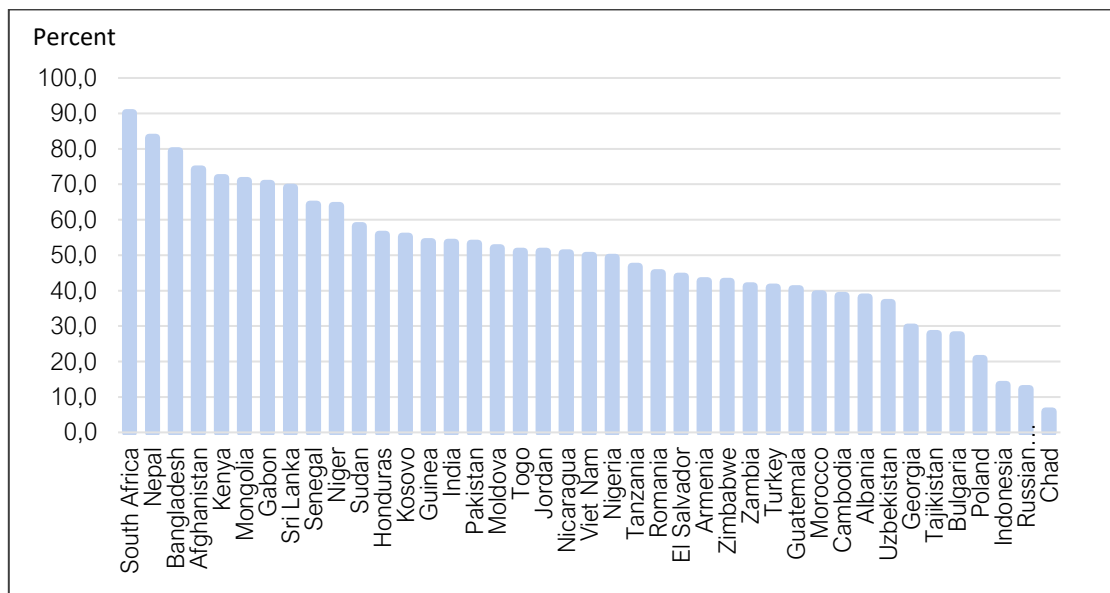
Figure 3.3: Public Debt Ratios to GDP Rose Sharply in 2020



Note: Figures for 2021 are projections. Public debt ratios to GDP rose sharply in 2020, adding to the debt build-up that followed the Global Financial Crisis of 2007–2008.

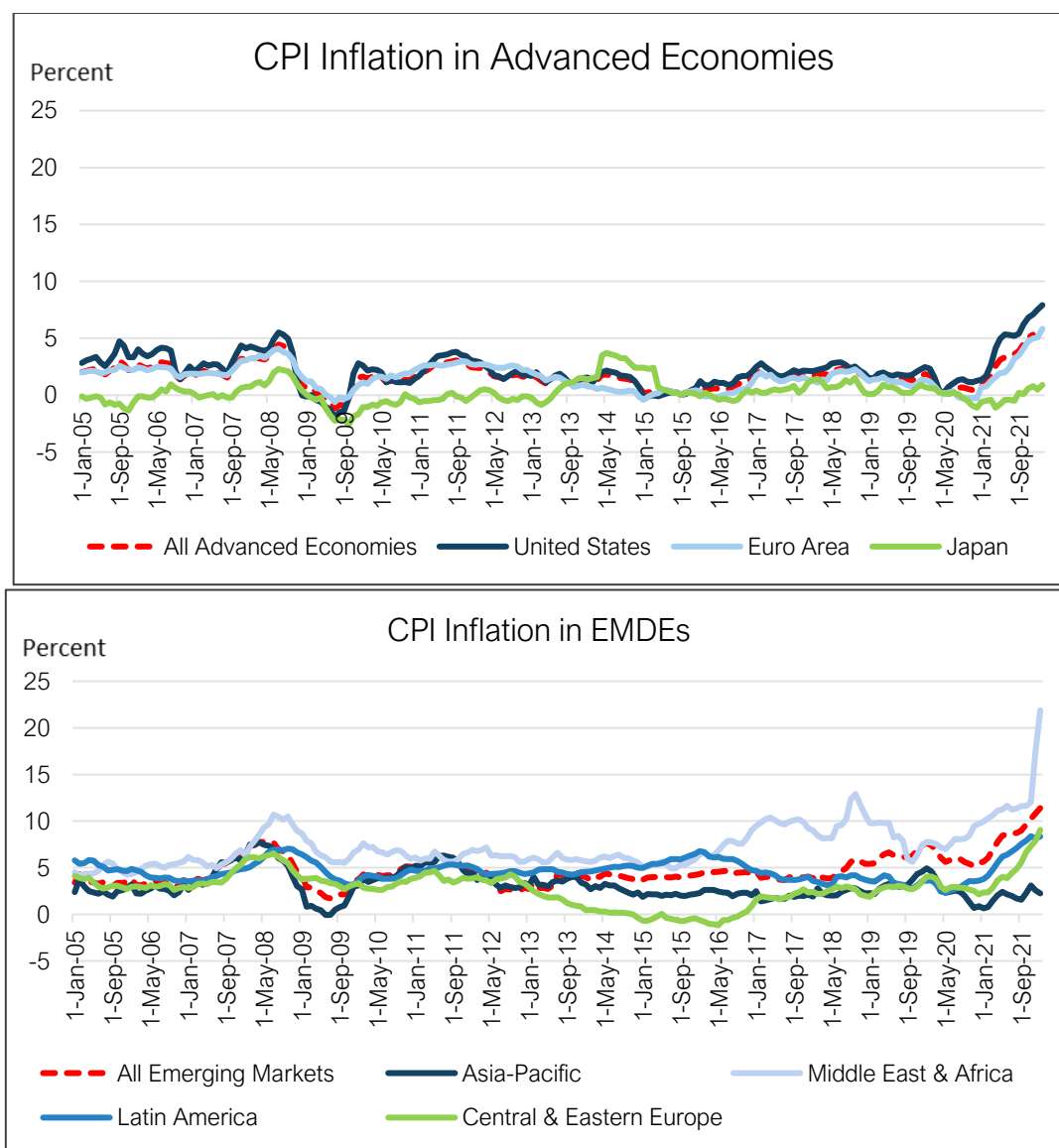
Source: General public debt ratios from IMF, World Economic Outlook Database: October 2021. <https://www.imf.org/en/Publications/WEO/weo-database/2021/October> (accessed 8 February 2022).

Figure 3.4: Share of Business Establishments in Arrears or Anticipating Arrears within 6 Months, May–September 2020



Source: World Bank (2022b).

Figure 3.5: CPI Inflation Levels since 2005



CPI = Consumer Price Index, EMDE = emerging and developing economy.  
 Source: Year-on-year CPI inflation rate through early 2022, monthly, data from Haver Analytics.

## References

- ASEAN WC-CAL (2021), 'Capital Account Safeguard Measures in ASEAN Context', Report, 22 February 2019. ASEAN Working Committee on Capital Account Liberalisation. [https://www.bsp.gov.ph/Media\\_and\\_Research/Primers%20Fags/ASEAN\\_the\\_role\\_of\\_safe\\_guard\\_measures\\_in\\_ASEAN.pdf](https://www.bsp.gov.ph/Media_and_Research/Primers%20Fags/ASEAN_the_role_of_safe_guard_measures_in_ASEAN.pdf) (accessed 7 February 2022).
- Broner, F., T. Didier, S.L. Schmukler, and G. von Peter (2020), 'Bilateral International Investments: The Big Sur?', *Policy Research Working Paper*, No. 9501. Washington, DC: World Bank.
- Buchheit, L., G. Chabert, C. DeLong, and J. Zettelmeyer (2020), 'The Restructuring Process', in S. Ali Abbas, A. Pienkowski, and K. Rogoff (eds.) *Sovereign Debt: A Guide for Economists and Practitioners*. Oxford: Oxford University Press and International Monetary Fund.
- CGFS (2020), 'US Dollar Funding: An International Perspective', *CGFS Papers*, No. 65. Basel: Bank for International Settlements Committee on the Global Financial System.
- CGFS (2021), 'Changing Patterns of Capital Flows', *CGFS Papers*, No. 66. Basel: Bank for International Settlements Committee on the Global Financial System.
- Chorzempa, M. and A. Mazarei (2021), 'Improving China's Participation in Resolving Developing-Country Debt Problems', *Policy Brief*, No. 21-10. Washington, DC: Peterson Institute for International Economics. <https://www.piie.com/publications/policy-briefs/improving-chinas-participation-resolving-developing-country-debt-problems> (accessed 19 March 2022).
- Das, M., G. Gopinath, and Ş. Kalemli-Özcan (2022), 'Preemptive Policies and Risk-Off Shocks in Emerging Markets', *Discussion Paper*, No. 16899. London: Centre for Economic Policy Research.
- Everaert, L. and H. Genberg (2020), 'IMF Advice on Capital Flows to the Republic of Korea and Selected ASEAN Economies', *IEO Background Paper*, No. BP/20-02/07. Washington, DC: Independent Evaluation Office of the International Monetary Fund.
- Fisher, M. and A. Mazarei (2020), 'A Possible IMF Pandemic Support Facility for Emerging-Market Countries', *Policy Brief*, No. 20-11. Washington, DC: Peterson Institute for International Economics. <https://www.piie.com/publications/policy-briefs/possible-imf-pandemic-support-facility-emerging-market-countries> (accessed 2 February 2022).
- FSB (2020), 'Holistic Review of the March Market Turmoil'. Basel: Financial Stability Board.
- G30 Working Group on Sovereign Debt and COVID-19 (2021), *Sovereign Debt and Financing for Recovery After the COVID-19 Shock: Next Steps to Build a Better Architecture*. Washington, DC: Group of Thirty.

- Gelpern, A., S. Hagan, and A. Mazarei (2020), 'Debt Standstills Can Help Vulnerable Governments Manage the COVID-19 Crisis', Realtime Economic Issues Watch, Peterson Institute for International Economics, 7 April. <https://www.piie.com/blogs/realtime-economic-issues-watch/debt-standstills-can-help-vulnerable-governments-manage-covid> (accessed 5 March 2022).
- Georgieva, K. and C. Pazarbasioglu (2021), 'The G20 Common Framework for Debt Treatments Must Be Stepped Up', IMFBlog, 2 December. <https://blogs.imf.org/2021/12/02/the-g20-common-framework-for-debt-treatments-must-be-stepped-up/> (accessed 6 March 2022).
- Hansen, Alvin H. (1939), 'Economic Progress and Declining Population Growth', *The American Economic Review*, 29(1), pp. 1–15.
- Hufbauer, G.C., M. Hogan, and Y. Wang (2022), 'For Inflation Relief, the United States Should Look to Trade Liberalization', *Policy Brief*, No. 22-4. Washington, DC: Peterson Institute for International Economics. <https://www.piie.com/publications/policy-briefs/inflation-relief-united-states-should-look-trade-liberalization> (accessed 31 March 2022).
- IMF (2012), *The Liberalization and Management of Capital Flows: An Institutional View*. Washington, DC: International Monetary Fund.
- IMF (2020), 'Toward an Integrated Policy Framework', *IMF Policy Paper*. Washington, DC: International Monetary Fund.
- IMF (2022), 'Review of the Institutional View on the Liberalization and Management of Capital Flows', *IMF Policy Paper*. Washington, DC: International Monetary Fund.
- Miranda-Agrippino, S. and H. Rey (2020), 'U.S. Monetary Policy and the Global Financial Cycle', *The Review of Economic Studies*, 87(6), pp.2754–76.
- Obstfeld, M. (2021), 'An Uneven Global Rebound Will Challenge Emerging-Market and Developing Economies', *Policy Brief*, No. 21-21. Washington, DC: Peterson Institute for International Economics.
- OECD (2022), *OECD Economic Outlook, Interim Report March 2022: Economic and Social Impacts and Policy Implications of the War in Ukraine*. Paris: Organisation for Economic Co-operation and Development. <https://www.oecd-ilibrary.org/sites/4181d61b-en/index.html?itemId=/content/publication/4181d61b-en> (accessed 10 April 2022).
- Sovereign Debt Working Group (2022), 'Debt Transparency: The Essential Starting Point for Successful Reform'. Washington, DC: The Bretton Woods Committee. <https://www.brettonwoods.org/article/release-event-debt-transparency-the-essential-starting-point-for-successful-reform> (accessed 7 February 2022).

World Bank (2022a), Debt Service Suspension Initiative, Brief, 10 March. <https://www.worldbank.org/en/topic/debt/brief/covid-19-debt-service-suspension-initiative> (accessed 20 March 2022).

World Bank (2022b), *World Development Report 2022: Finance for an Equitable Recovery*. Washington, DC: World Bank.

WHO (2022), ACT-Accelerator 'Fair Share Asks' – by Country. <https://www.who.int/publications/m/item/act-accelerator-fair-share-asks---by-country> (accessed 14 February 2022).



# Chapter 4

## Ensuring Global Financial Stability

José Antonio Ocampo

### 1. Introduction

The current financial stability issues facing the global economy are not only the result of the legacies of the coronavirus disease (COVID-19) crisis, but also of peculiar features of the recovery process under way and the economic effects of the geopolitical risks generated by the Russian invasion of Ukraine. The legacies include the high debt levels facing essentially all economies, and changes in labour markets in some of them (a reduction in labour market participation, in particular). The peculiarities are associated with global inflationary trends – the worst in several decades – which originate not so much in high aggregate demand but in a mix of supply problems that became evident in the last months of 2021 but have worsened with the invasion of Ukraine.

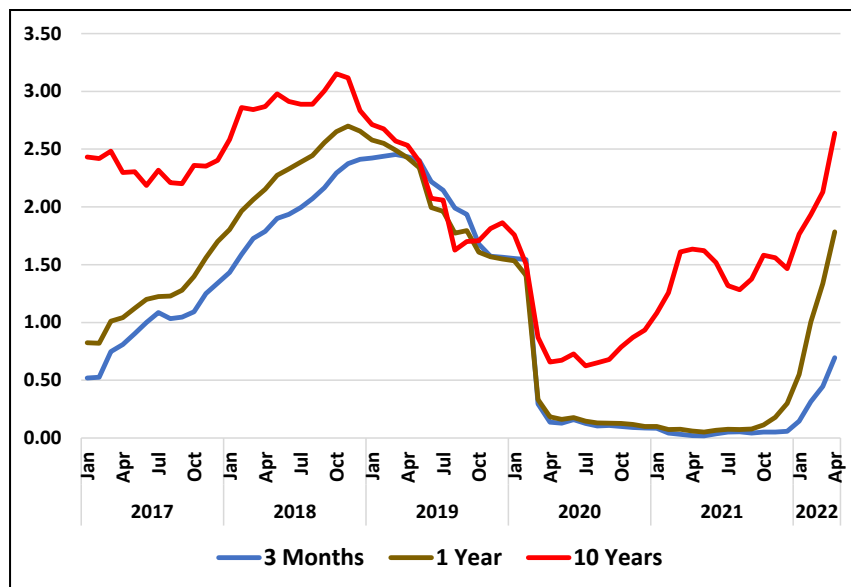
The response of the United States (US) Federal Reserve has been to start to increase interest rates and dismantle quantitative easing. The European Central Bank is also reducing quantitative easing, and long-term euro rates have also started to increase although it has not announced changes in interest rates. The mix of rising interest rates and high debt ratios will not have strong effects in developed countries but is affecting stock markets, which experienced a boom during the crisis thanks to the expansionary monetary policies adopted to manage it. In emerging and developing countries, the problem is more complex since several monetary authorities have increased interest rates on a broader scale, and the mix of high debt ratios and rising international interest rates generates additional risks – particularly of a reduction in private external financing and open debt crises in some countries. This limits their capacity to adopt expansionary macroeconomic policies – a policy space that, in any case, was weaker for most of these countries during the COVID-19 crisis.

This paper examines these issues. The first section covers global conditions. It analyses the trends in interest rates and stock markets, and briefly discusses the challenges associated with the insolvency of some private firms – though with no sign of possible banking crises – as well as the risks generated by crypto assets and the financial effects of climate change. The second section concentrates on the issues affecting emerging and developing countries in relation to debt ratios, and the possible effects of changing global financial conditions on capital flows, both in terms of availability and cost. The last section presents brief conclusions.

## 2. Global Financial Conditions

Global financial conditions changed dramatically during the COVID-19 crisis and the dramatic worldwide recession it generated. To respond to the crisis, all major central banks sharply cut interest rates and adopted aggressive quantitative easing programmes. The expansionary monetary policies were maintained for longer than during the 2007–2009 North Atlantic financial crisis.<sup>1</sup> Figure 4.1 shows that US interest rates were already declining in 2019 due to the economic slowdown but fell sharply in March 2020 – reflecting the strong cut in interest rates by the Federal Reserve. The fall included the 10-year US Treasury bond, which is the reference rate for emerging market bonds. Euro interest rates were already negative in 2019, and thus had less margin to fall in 2020.

Figure 4.1: US Interest Rates (%)

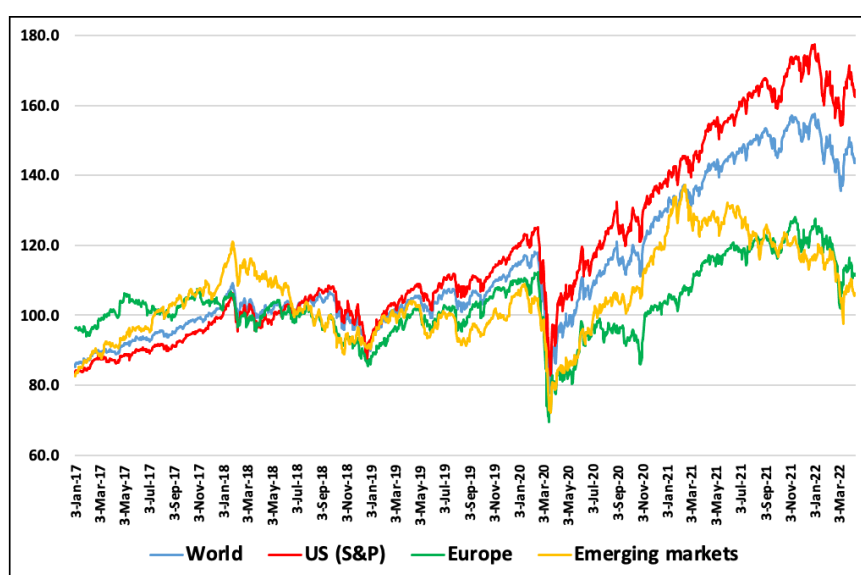


US = United States.  
Source: US Treasury Department.

One of the effects of the aggressive monetary policy was to induce a global stock market recovery from mid-March 2020, followed by a veritable boom throughout that year, particularly in the US (Figure 4.2). Emerging market stock markets also saw a recovery and boom, whereas the recovery in Europe was weaker and only experienced a significant increase in 2021. As we will see in the next section, the expansionary policies also induced a strong recovery in bond financing to emerging economies at low costs. This early stock market recovery, which was also partly associated with quantitative easing, was a very peculiar effect of monetary policies because it took off in the second quarter of 2020 as the world economy was entering a very strong and widespread recession – the most synchronised one in world history (China had been hit earlier, during the first quarter).

<sup>1</sup> 'North Atlantic financial crisis' is used rather than 'global financial crisis' because the crisis was concentrated in the US and Western Europe despite its global effects.

Figure 4.2: Stock Market Prices (average of 2017–2019 = 100)



S&P = Standard & Poor's, US = United States.  
Source: Bloomberg.

US dollar interest rates started to increase in early 2021 as a response to the recovery of the world economy, but the trend was soon partially reversed, and rates remained significantly below pre-crisis levels. The 10-year euro interest rates also increased, but more moderately. The US and European stock markets continued to boom in 2021. Emerging markets experienced a correction, although equity prices remained significantly above pre-crisis levels – particularly in Asia, but not in Latin America (the regional details are not shown in Figure 4.2).

Uncertainties associated with world economic growth, and more so with an increase in interest rates as a response of central banks to rising inflation – a phenomenon that was already taking place in emerging and developing countries – generated the end of the stock market boom in late 2021 and an adverse trend in the first months of 2022. This was compounded by slower growth in earnings as well as the risk of repricing due to over-stretched asset valuations, as the October 2021 *Global Financial Stability Report* of the International Monetary Fund (IMF) had warned (IMF, 2021). The IMF's January *World Economic Outlook Update* projected slower economic growth in 2022 – 4.2% – down from the October 2021 projection of 4.7% at market exchange rates (IMF, 2022a). In turn, world inflation increased to levels not seen during the past four decades, particularly due to rising oil and food prices and global transportation constraints. Rising food prices have severely affected low-income households worldwide, but particularly in developing countries. They have been associated, amongst other phenomena, with climate shocks in several parts of the world, and with rising fertiliser prices and the incentive to produce biofuels generated by high oil and gas prices.

The geopolitical crisis generated by the invasion of Ukraine has also affected global economic trends. It has increased oil, gas, fertiliser, and some food prices (wheat, barley, corn, and sunflower oil, in particular). It has also generated an additional downward hit on global economic growth – to 3.5% according to the April 2022 issue of the IMF's *World Economic Outlook* – due

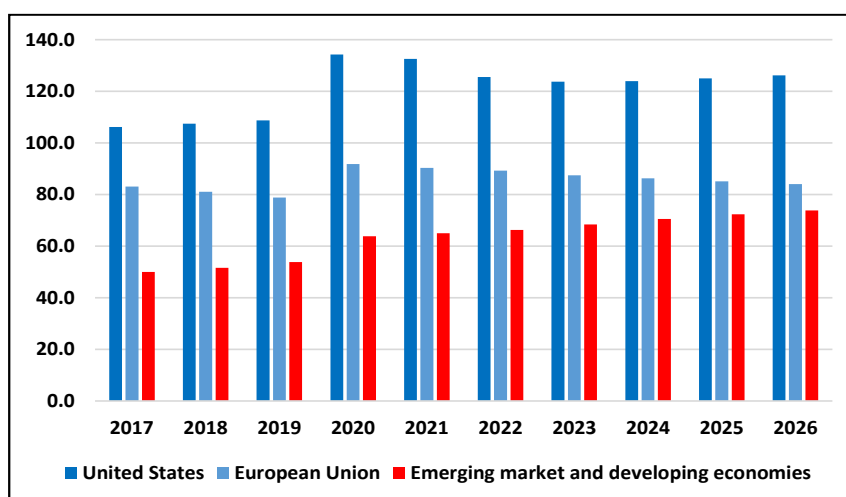
to its strong effects on Western Europe and the collapse of the Russian economy (IMF, 2022b). Lockdowns in China may also affect world economic growth and will particularly hit sectors in which it plays an essential role in global value chains.

The sanctions against Russia have been severe – including the immobilisation of Russian central bank reserves held in Western countries, strict controls on Russian commercial banks' access to the Western financial system, limitations on imports of energy products from Russia, expropriation of assets of the Russian elite, and controls on Western exports of technology products to Russia.

Western firms with investments in or trade with Russia have been affected, but the global financial effects of sanctions have been limited. The initial effect on world stock markets was adverse but short-lived, and even the initial depreciation of the rouble was reversed due to a sharp increase in Russian interest rates, capital controls, and high oil and gas prices that have generated a strong trade surplus in that country. It remains to be seen whether a Russian default will have stronger effects. Standard & Poor's declared Russia in 'selective default' on 4 April 2022 because of the announcement that it would pay its foreign debt in roubles. However, even a final default may have limited effects on global financial markets according to certain analysts (Economic Intelligence Unit, 2022).

Another legacy of COVID-19 is high public sector debt ratios (Figure 4.3). These increased worldwide – particularly strongly in the US and less strongly in the European Union and emerging and developing countries, where they were on an upward trend before the crisis (regional trends amongst these countries will be analysed in the next section). The expectation of the IMF (Figure 4.3) is that public sector debt ratios will fall moderately in advanced countries but will continue to increase in emerging and developing countries. Rising interest rates will have a stronger effect on debt ratios in the last group of nations, but they have continued to be negative in real terms in developed countries.

Figure 4.3: Central Government Gross Debt (% of GDP)



GDP = gross domestic product.

Source: IMF (2022), World Economic Outlook database, April 2022 edition. <https://www.imf.org/en/Publications/WEO/weo-database/2022/April> (accessed 18 April 2022).

The private banking sector is not facing particularly adverse conditions. A remarkable feature of the COVID-19 crisis and current analyses of the world financial situation is that there is no risk of significant banking crises. COVID-19 has had adverse effects on some sectors, and the recovery has been uneven, so some firms may face solvency risks as the World Bank and the IMF Strategy, Policy and Review Department have pointed out (World Bank, 2022; Pazarbasioglu and Weeks-Brown, 2022, based on Araujo et al., 2022). Non-financial firms entered the crisis with elevated debt levels, which had been increasing in emerging market economies, and they rose even further in 2020. One of the most critical cases is that of the Evergrande Group in China, perhaps extensive to housing construction and financing in that country. However, insolvencies declined in 2020 due to significant policy and regulatory support from several governments and central banks, but such support is more limited now. As both Bretton Woods institutions have pointed out in the references, there is therefore a need to improve the insolvency systems of countries where they may not be sufficiently robust. At the same time, commercial banks' defences need to be shored up to absorb the associated losses.

As IMF (2021: 41–57) and many other analysts have pointed out, risks are already significant in the world of crypto assets. These assets sharply increased in value and diversified in 2021. However, the risks are not systemic because of the size of the market.<sup>2</sup> The problems are multiple and include (i) lack of protection for depositors; (ii) very high price volatility; (iii) evidence that some crypto exchanges involve illegal transactions; (iv) weakening of controls over foreign exchange and capital account regulations that many emerging and developing countries continue to experience; and (v) in the case of those countries, the risk of digital dollarisation. There is, therefore, a need to develop global regulatory standards for crypto assets and the agents issuing them, as was the case in the past in other areas of financial regulation that generated major crises. Forthcoming regulations have been announced but have not yet come to fruition. Digital moneys issued by central banks should also assume part of the role those crypto assets play today.

Another essential issue is the financial demands generated by the climate change agenda approved in Paris in 2015 and enhanced at the United Nations Climate Change Conference in Glasgow in 2021 (COP26). This involves increasing financing for climate change mitigation and adaptation, which includes developing new financial institutions and instruments. In terms of risks, the topic of this paper, they involve several issues: (i) the recognition that climate change generates widely known physical risks, particularly disasters associated with hydro-meteorological events that have regional as well as macroeconomic effects, which can severely affect firms and households located in the affected regions; (ii) the adoption of rules for both the financial and non-financial sectors that standardise and make climate-related risk disclosures mandatory, which will also improve the pricing and transparency of these risks; (iii) the adoption of prudential regulation aimed at redressing possible under-pricing of climate risks in financial markets; and (iv) defining an adequate taxonomy of 'green' and sustainable assets that are important for the development of green bonds and markets, and for carbon pricing. These rules will not only help manage climate-related risks at a broad level, but also embed them in firms' risk management and investment decisions. Some advances in this area have been made by the

---

<sup>2</sup> At its peak in April 2021, the crypto market reached US\$2.5 trillion – equivalent to about 12% of US M1.

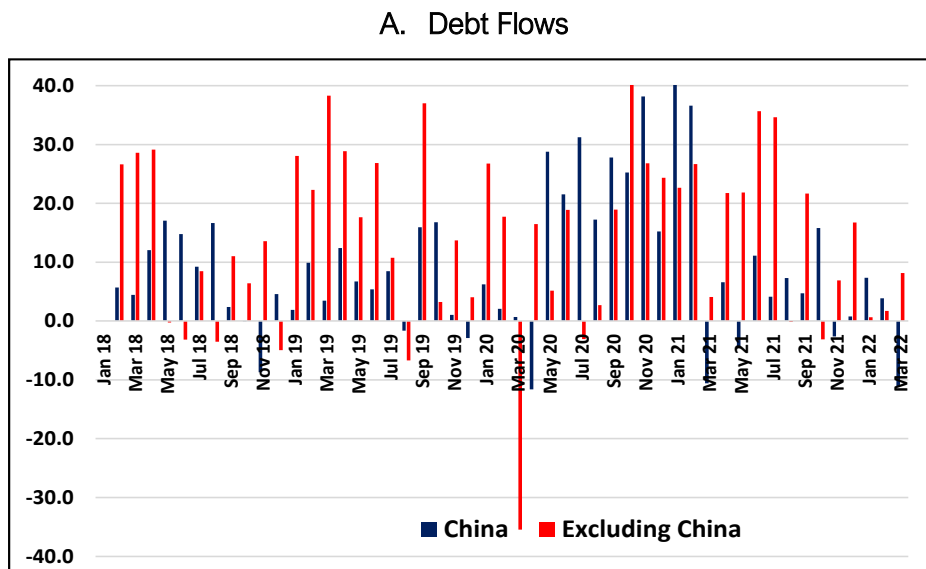
Network of Central Banks and Supervisors for Greening the Financial System, created in 2017 under the leadership of the Banque de France, as well as the Task Force on Climate-related Financial Disclosures created by the Financial Stability Board.<sup>3</sup>

### 3. Financial Conditions in Emerging and Developing Countries

The previous section pointed out certain macroeconomic and financial stability issues that affect emerging and developing countries. To complement this discussion, it is important to underscore the risks associated with a possible tightening of external financing conditions that may generate low capital flows or even reversals, as well as rising costs of private financing in these countries. These risks may generate severe problems in some of these countries due to the high public sector and external debt ratios, as well as the inadequate institutions and mechanisms developed to manage debt renegotiations and eventual defaults.

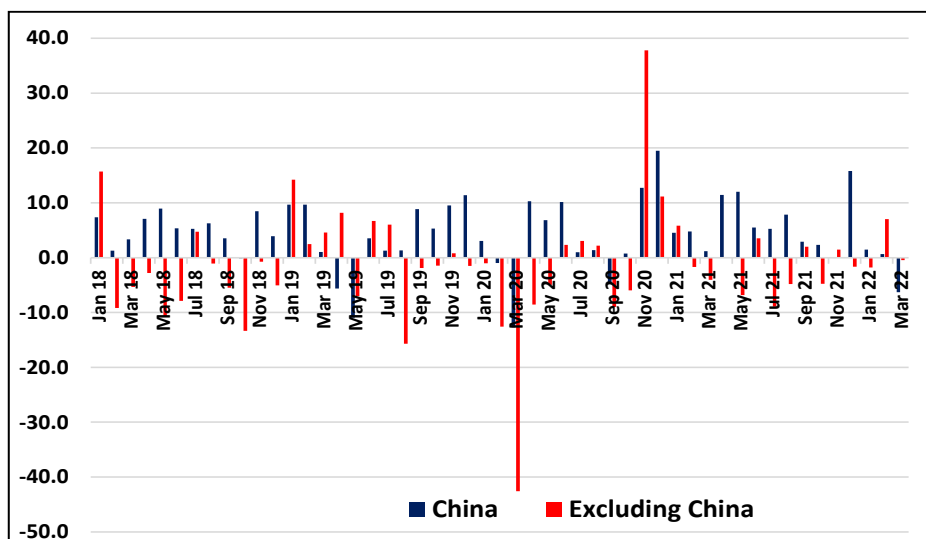
As in previous crises – the crisis that started in East Asia in 1997 and deepened with the Russian default in 1998, and the North Atlantic financial crisis of 2007–2009 – capital flows to emerging economies collapsed at the start of the COVID-19 crisis. This was a ‘sudden stop’ in external financing, as it has been called in the literature, and risk spreads for emerging banking bonds increased the cost of financing. However, the crisis in financing was much shorter and less intense than previous ones.

Figure 4.4: Capital Flows Towards Emerging Economies, 2018–2022 (US\$ billion)



<sup>3</sup> See a broader analysis of these issues in Bernal and Ocampo (2020).

B. Equity Flows

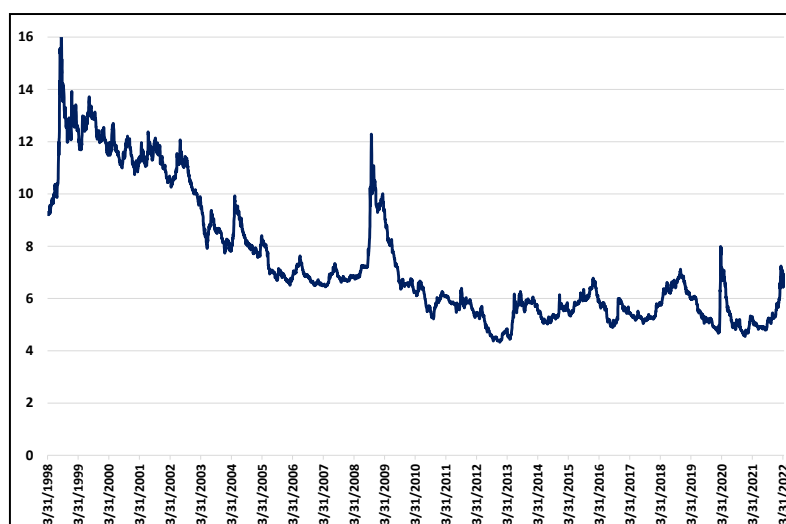


Source: Institute of International Finance.

According to estimates by the Institute of International Finance, as well as other sources,<sup>4</sup> there was a significant outflow of capital from these countries in March 2020, which was characterised at the time as the worst in history. However, thanks to the very expansionary monetary policies of advanced countries, access to hard-currency bond markets returned in mid-April – again, during the global recession – generating a positive net flow in bond financing that month, although it continued to be negative for China (Figure 4.4.A). Therefore, the net interruption of debt financing in this segment of the market only lasted a couple of months, compared with slightly more than a year during the North Atlantic crisis. Equity flows were also strongly negative in March 2020, but also recovered in April, although in this case largely to China – where those flows have largely concentrated since 2018 (Figure 4.4.B).

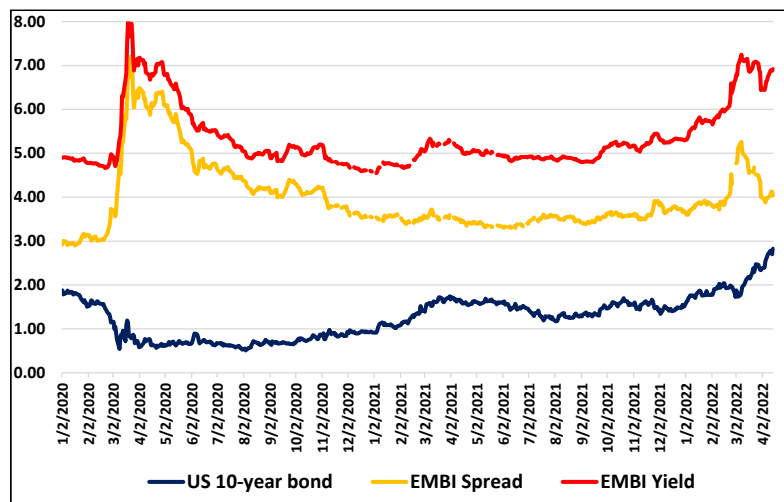
Figure 4.5: Yields of Emerging Banking Bonds (JPMorgan EMBI)

A. Historical Trend, 1998–2021



<sup>4</sup> See the regular issues of JPMorgan’s *EM Flows Weekly*.

## B. Determinants of Yields, 2020–2022



EMBI = Emerging Market Bond Index.

Source: JPMorgan.

In turn, the costs of financing, as reflected in the Emerging Market Bond Index (EMBI) yields for emerging market bonds estimated by JPMorgan, also increased in March 2020. This was despite a reduction in the interest rate of 10-year US Treasury bonds that serves as a reference and was thus determined by a large increase in risk spreads. However, following the historical series since these data have been available, the increase in yields for emerging market bonds was shorter and less intense than during the previous two crises. It returned to pre-crisis levels 5 months after the initial shock, compared with more than a year during the North Atlantic crisis and 5 years after the 1998 Russian default (Figure 4.5.A). The increased risk spreads were not fully reversed, but the mix of their fall since May, together with a reduction in the basic US interest rate, generated a return to pre-crisis yield levels (Figure 4.5.B).

The performance of private bond markets was no doubt a reason for the limited demand for IMF financing in 2020. IMF financing was made available during the peak of the crisis to many countries through emergency facilities, but the amounts were modest. Financial conditions deteriorated moderately in early 2021, pushed by the increase in US interest rates, and in a stronger way since late 2021, pushed by both rising US rates and risk spreads. The upward trend speeded up in March 2022 and was associated with a strong increase in risk spreads, which started before but was enhanced by the invasion of Ukraine. However, risk spreads moderated in April, and although yield levels are now higher than pre-crisis levels (Figure 4.5.B), they continue to be moderate or even low by historical standards (Figure 4.5.A).

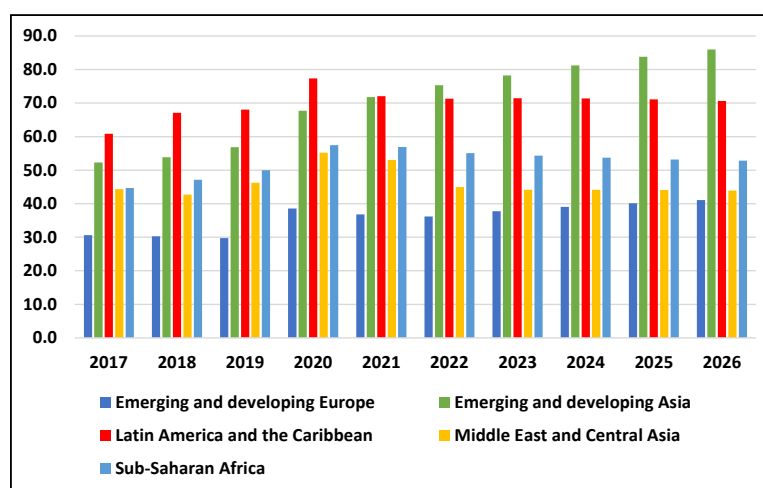
In a modest way, the evolution of both capital flows to emerging and developing countries and the cost of private financing for them may be starting to reflect the attraction of issuing bonds in developed country markets as interest rates increase. This 'flight to quality', as this trend is sometimes called, may become stronger as interest rates continue to rise. Except for a few months, debt flows towards emerging markets have been smaller since August 2021 (Figure 4.4.A). The invasion of Ukraine has also negatively affected flows to China, both of bond and equity financing (Figures 4.4.A and 4.4.B).



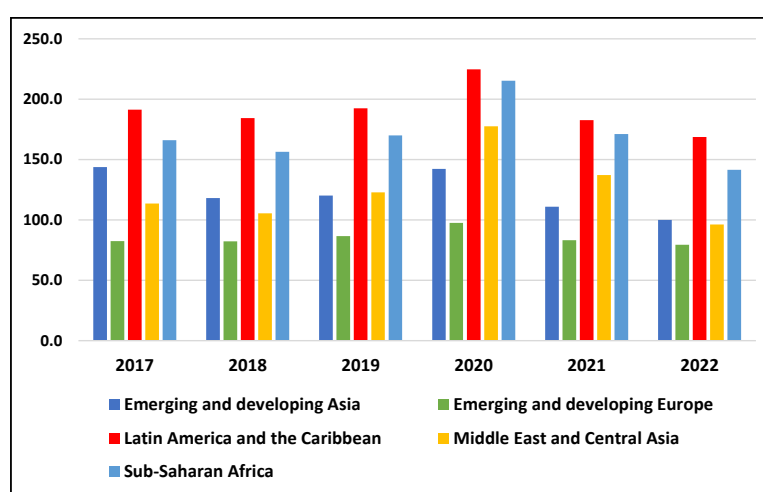
Furthermore, the direct effect of rising US interest rates worsens the conditions faced by countries that have high debt ratios, both because of pre-crisis trends and the effects of COVID-19. Figure 4.6.A illustrates the average public sector debt–gross domestic product (GDP) ratios of different regions in the emerging and developing world, while Figure 4.6.B shows the external debt as a proportion of exports of goods and services.

Figure 4.6: Debt Ratios of Emerging and Developing Countries

A. General Government Debt (% of GDP)



B. External Debt (% of exports of goods and services)



Source: IMF, *World Economic Outlook* database, April 2022 edition. <https://www.imf.org/en/Publications/WEO/weo-database/2022/April> (accessed 18 April 2022).

As these figures show, the problems surrounding debt vary significantly by region – and obviously, by country within regions, a topic that is not addressed in this paper. Regionally, the most significant problems are those faced by Latin American and Caribbean countries for both indicators and by Sub-Saharan Africa for external debt. The price boom that has taken place since 2020 for non-oil commodities and since 2021 for oil will tend to alleviate the conditions of commodity exporters in both regions but can have negative effects in the case of countries that are food and/or oil importers. Developing Asia has the highest public sector debt ratios, which the

IMF expects will increase even further in the next 5 years, but this is not a major risk, since this region has the lowest external debt ratios.

The possible restriction of private external financing calls for stronger efforts to use multilateral development banks (MDBs) as an instrument of financing for emerging and developing countries. The countercyclical response of these institutions to the COVID-19 shock was much weaker than during the North Atlantic crisis – credit commitments from MDBs were 36% higher in 2020 relative to 2017–2019 levels, but they nearly doubled between 2007 and 2010. During both crises, the World Bank was very active, but there were remarkable differences amongst regional MDBs during the COVID-19 crisis – the Asian Development Bank grew faster in 2020 than other regional banks, and the two new institutions headquartered in China (the New Development Bank and the Asian Infrastructure Investment Bank) aggressively expanded their financing; in contrast, regional MDBs serving Africa, Europe, and Latin America and the Caribbean increased their financing very moderately (Ocampo and Ortega, 2022).

In addition, while the Global Plan for Recovery and Reform (adopted by the G20 Leaders in London on 2 April 2009) called for the capitalisation of MDBs, there was no such call during the COVID-19 crisis. This must be, therefore, one of the crucial actions in international cooperation if private external financing to emerging and developing countries is significantly affected. In the case of low-income countries, increased concessional financing through MDBs is also crucial, as well as official development assistance, which has grown very moderately in recent years and remains slightly above 0.3% of GDP in the case of members of the Organisation for Economic Co-operation (OECD) Development Assistance Committee – well below the 0.7% UN target (OECD Development Assistance Committee, 2022).

Another issue is the need for debt relief and better debt workout mechanisms. Actions during the COVID-19 crisis were moderate and limited to low-income countries. The major decision was the launch of the Debt Service Suspension Initiative (DSSI) by the G20 at the onset of the pandemic, which was extended and complemented in November 2020 with a mechanism that allows these countries to renegotiate their debts on a case-by-case basis, which came to be called the ‘Common Framework’. But the use of these initiatives – particularly the Common Framework – has been limited, as well as private sector participation in both. Nothing similar has been offered to middle-income countries, though some (notably Argentina and Ecuador) were able to renegotiate their debts in 2020 based on existing frameworks. The issue of the debt overhangs of a growing group of emerging and developing countries has been high on the agenda of the IMF,<sup>5</sup> the World Bank (World Bank, 2022), and the UN. The UN is particularly concerned and has stated that the world is ‘on the brink of a global debt crisis’ (UN, 2022: 10), but this is not necessarily such a broad-based phenomenon. Solutions for highly indebted countries could include debt-for-nature swaps, large-scale debt relief linked to climate adaptation and mitigation, and more ambitious reforms efforts in sovereign debt relief and management. In this area, several independent proposals are on the table.<sup>6</sup> Therefore, debt relief efforts – including the renewal of initiatives for low-income countries but also programmes for middle-income countries – should be

---

<sup>5</sup> See, amongst others, Georgieva, Pazarbasioglu, and Weeks-Brown (2020).

<sup>6</sup> See, for example, Friedrich-Ebert-Stiftung and Consensus Building Institute (2021).

a central issue in the management of global finance in 2022. Unfortunately, however, decisions in this area have always come with a lag and have been partial in their scope.

It is also useful to think of using a new issue of the IMF's special drawing rights (SDRs), following the successful allocation of US\$650 billion of these reserve assets in August 2021. This would be particularly important for emerging and developing countries facing international liquidity problems – as a group, they would receive close to 40% of these assets. There is also the possibility of the 'recycling' of unused SDRs to low-income countries through the Poverty Reduction and Growth Trust and the recently created Resilience and Sustainability Trust, which would also benefit middle-income countries and the climate change agenda. A structural reform of SDRs would also be an excellent initiative, as this is one of the most underused instruments of international cooperation.<sup>7</sup> One of the recurrent proposals is to increase the share of emerging and developing countries in those allocations, but this would require a change in the IMF Articles of Agreement, which would be a long-term process.

#### 4. Conclusions

The major challenges to global financial stability are associated with the expected increase in interest rates in the face of global inflation and the slowdown in the global economy. Both phenomena started in late 2021 but have been speeded up by the economic effects of the Russian invasion of Ukraine. Rising interest rates are particularly important due to the high public sector debt ratios inherited from the COVID-19 crisis. There are also major risks that emerging and developing countries will have to confront a reduction in international private capital flows and a rise in financing costs. Capitalising and increasing financing from MDBs and official development assistance, as well as a new allocation of SDRs, could mitigate these problems. Debt relief and better debt workout mechanisms would also play a role for emerging and developing countries facing high debt ratios. Stock market corrections in developed countries, associated with rising interest rates and the overvaluation of some assets, may also generate financial stability issues, but are less important than those faced by emerging and developing countries. Action is also needed to manage the risks associated with the growth and high volatility of crypto assets, and the financial risk that climate change is generating. Private creditors face risks in loans to sectors and firms that were strongly affected by the COVID-19 crisis, but there is no evidence of risks of banking crises.

---

<sup>7</sup> See a summary of the reform proposals in Ocampo (2021).

## References

- Araujo, J., J. Garrido, E. Kopp, R. Varghese, and W. Yao (2022), *Policy Options for Supporting and Restructuring Firms Hit by the COVID-19 Crisis*, Departmental Paper, DP/2022/002. Washington, DC: International Monetary Fund Strategy, Policy, and Review Department, and Legal Department.
- Bernal, J. and J.A. Ocampo (2020), 'Climate Change: Policies to Manage Its Macroeconomic and Financial Effects', Background Paper, No. 2-2020, UNDP Human Development Report. New York: United Nations Development Programme.
- Economic Intelligence Unit (2022), 'Russian Default Will Not Cause Global Financial Crisis', 4 April. <http://country.eiu.com/article.aspx?articleid=862006669&Country=Russia&topic=Economy&subtopic=Forecast&subsubtopic=External+debt> (accessed 18 April 2022).
- Friedrich-Ebert-Stiftung and Consensus Building Institute (2021), 'Responding to Risks of Covid Debt Distress', Roundtable Report, July. [https://ny.fes.de/fileadmin/user\\_upload/Roundtable\\_Report\\_Responding\\_to\\_Risks\\_of\\_Covid\\_Debt\\_Distress\\_July2021.pdf](https://ny.fes.de/fileadmin/user_upload/Roundtable_Report_Responding_to_Risks_of_Covid_Debt_Distress_July2021.pdf) (accessed 18 April 2022).
- Georgieva, K., C. Pazarbasioglu, and R. Weeks-Brown (2020), 'Reform of the International Debt Architecture is Urgently Needed', IMF Blog, 1 October. <https://blogs.imf.org/2020/10/01/reform-of-the-international-debt-architecture-is-urgently-needed/> (accessed 18 April 2022).
- IMF (2021), *Global Financial Stability Report – COVID-19, Crypto, and Climate: Navigating Challenging Transitions*. Washington, DC: International Monetary Fund.
- IMF (2022a), *World Economic Outlook Update: Rising Caseloads, a Disrupted Recovery, and Higher Inflation*. Washington, DC: International Monetary Fund.
- IMF (2022b), *World Economic Outlook: War Sets Back the Global Recovery*. Washington, DC: International Monetary Fund.
- Ocampo, J.A. (2021), 'An Excellent but Incomplete IMF Decision', *OECD Development Matters*, Blog, 15 July. <https://oecd-development-matters.org/2021/07/15/an-excellent-but-incomplete-imf-decision/> (accessed 18 April 2022).
- Ocampo, J.A. and V. Ortega (2022), 'The Global Development Banks' Architecture', *Review of Political Economy*, 34(2), pp.224–48.
- OECD Development Assistance Committee (2022), 'ODA Levels in 2021 – Preliminary Data', 12 April. <https://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/ODA-2021-summary.pdf> (accessed 18 April 2022).

Pazarbasioglu, C. and R. Weeks-Brown (2022), 'Governments Must Choose to Support or Restructure Heavily Indebted Firms', IMF Blog, 23 February. <https://blogs.imf.org/2022/02/23/governments-must-choose-to-support-or-restructure-heavily-indebted-firms/#:~:text=Governments%20Must%20Choose%20to%20Support%20or%20Restructure%20Heavily%20Indebted%20Firms,-IMFBlog2022%2D02&text=To%20stave%20off%20risks%20to,or%20liquidate%20those%20that%20cannot> (accessed 18 April 2022).

UN (2022), 'Global Impact of War in Ukraine on Food, Energy and Finance Systems', *Brief*, No. 1, 13 April. <https://news.un.org/pages/wp-content/uploads/2022/04/UN-GCRG-Brief-1.pdf> (accessed 18 April 2022).

World Bank (2022), *World Development Report: Finance for an Equitable Recovery*. Washington, DC: World Bank.

# Chapter 5

## G20's Roles in Improving the Resilience of Supply Chains

Taiji Furusawa and Lili Yan Ing

### 1. Introduction

About half of the total global output of goods and services is sold as intermediate inputs (Baldwin and Lopez-Gonzalez, 2015), and more than two-thirds of all international trade flows involve trade in global value chains (GVCs) (World Bank and WTO, 2019). In the past two decades, the value of intermediate goods traded worldwide has risen threefold to more than \$10 trillion annually (McKinsey Global Institute, 2020).<sup>1</sup> Falling information and communication technology (ICT) costs led to the proliferation of GVCs at diversified production sites. The shares of GVC-related trade in the manufacturing sector relative to total trade rose sharply from 2000 to 2008 in all major regions of the world during the period considered as the golden age of globalisation.

The pandemic lockdowns and limited activities lowered global demand and supply simultaneously, which halted production and trade. The disruption caused shortages of a wide variety of consumer and industrial goods, ranging from health supplies and medical equipment to microchips and semiconductors. About 28% of firms in 62 countries reported at least 20 supply chain disruptions during 2020 compared with 5% in 2019 (BCI, 2022). Furthermore, not only did the coronavirus disease (COVID-19) disrupt firms' direct immediate supplies, but it also affected about 40% of their tier 2 suppliers and beyond. Supply-side shocks were also recorded in sectors with domestic production capacity in which there was little vertical integration and thus high reliance on imported inputs (OECD, 2021a). The disruptions hit not only labour-intensive sectors such as apparel and furniture, but also capital-intensive sectors such as automotives and aerospace (McKinsey Global Institute, 2020).

Section 2 explains how supply shocks affect trade and the economy. Section 3 observes trends in supply chains and challenges. Section 4 concludes and draws policy recommendations for the G20.

---

<sup>1</sup> Based on another measurement using the Organisation for Economic Co-operation and Development (OECD) Trade in Value Added (TiVA) database (OECD, n.d.), total trade in intermediate products globally has also more than tripled – from US\$2 trillion in 2002 to US\$6.7 trillion in 2018.

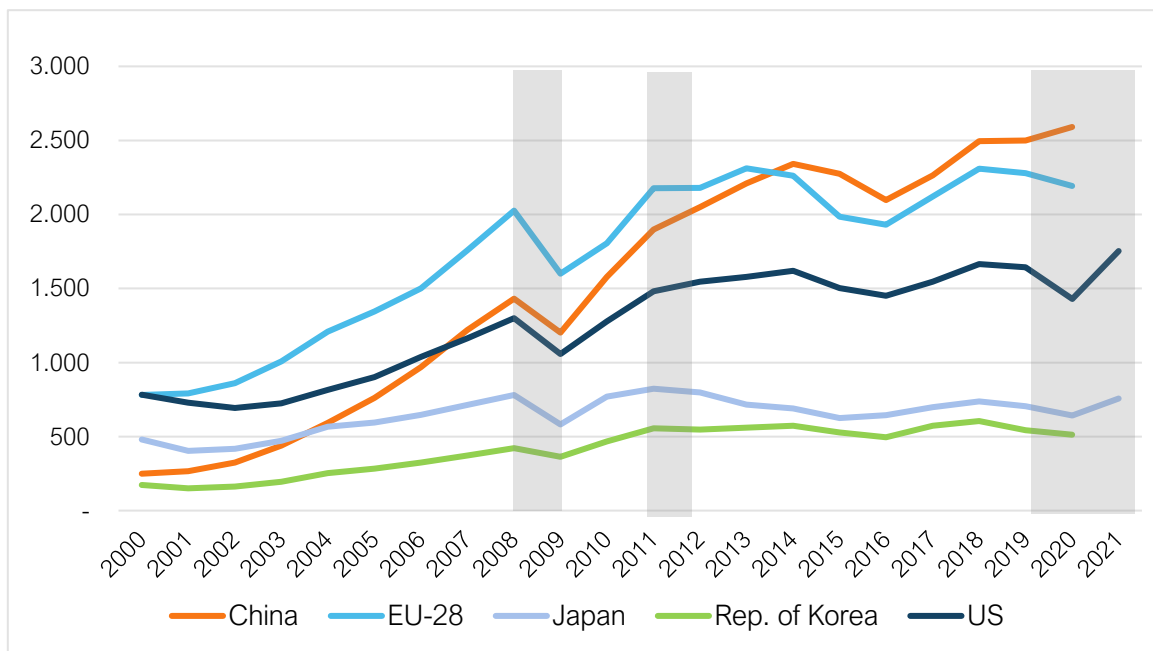
## 2. How Do Supply Shocks Affect Trade and the Economy?

### 2.a. What Do the Data Tell Us?

Since 2000, the world has experienced two massive global shocks – the financial crisis in 2008 and the COVID-19 pandemic starting in 2020. The Great East Japan Earthquake in 2011 disrupted supply chains within Japan and between Japan and its trading partners. Figure 5.1 shows the value of exports from China, the 28 Member States of the European Union (EU), Japan, the Republic of Korea (henceforth, Korea), and the United States (US) from 2000 to 2021. World exports dropped by 16.7% in 2009 due to the financial crisis, although they increased by 21.9% in 2010. Compared with the financial crisis, the impacts of the Great East Japan Earthquake on the world economy were limited. But, not surprisingly, it caused significant and prolonged damage to the Japanese economy. Japan was on the path to recovery from the financial crisis when the earthquake hit. Its exports plunged by 3.0% in 2012 and its gross domestic product (GDP) grew by only 0.02% in 2011 and 1.37% in 2012. Its average annual export growth rate was –2.5%, while that of GDP was as small as 0.4% between 2012 and 2020. Even country-specific shocks, such as the Great East Japan Earthquake, affected production in other countries such as Korea, China, and the US.

Figure 5.2 illustrates that GDP growth rates also dropped significantly in the aftermath of the global financial crisis; the worldwide growth rate dropped to –1.3% in 2009. The damage caused by the financial crisis persisted after 2007/2008, as evidenced through slower trade and GDP growth. The average annual growth rate of world exports fell from 11.4% (2001–2008) to 1.8% (2011–2020), while that of worldwide GDP dropped from 3.4% (2001–2008) to 2.4% (2011–2020).

Figure 5.1: Value of Exports by Major Trading Countries, 2000–2021 (US\$ billion)

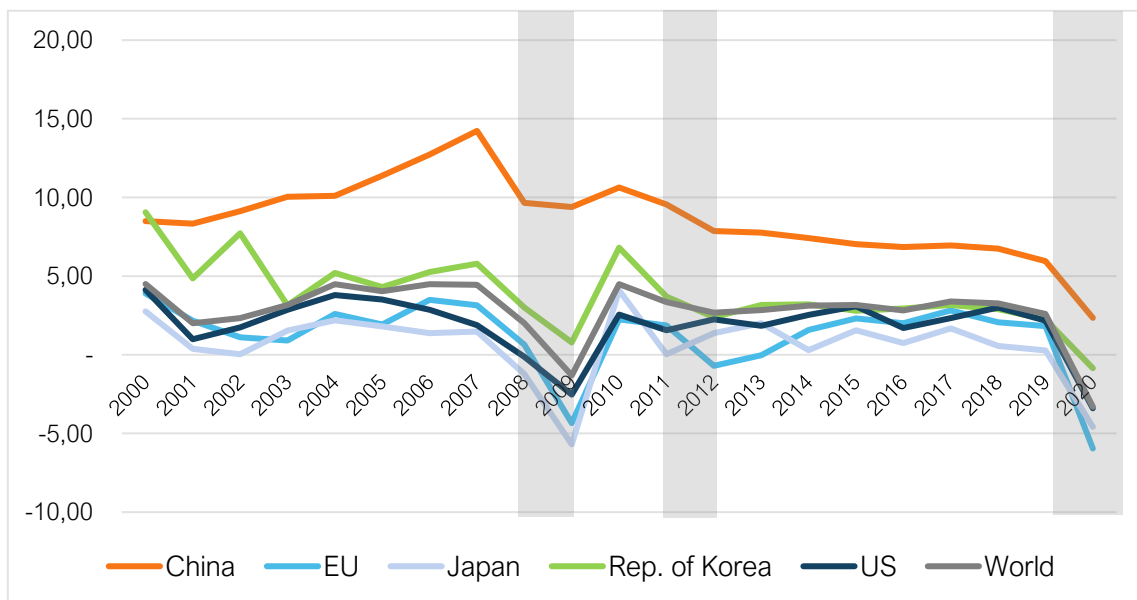


EU-28 refers to the 28 EU member states, US = United States.

Notes: Grey shading indicates the global financial crisis in 2008-2009, the Tohoku Earthquake in Japan in 2011, and the COVID-19 pandemic in 2019-recently.

Source: United Nations (n.d.), UN Comtrade Database. <https://comtrade.un.org/data/> (accessed 14 March 2022).

Figure 5.2: GDP Growth of Five Countries, 2000–2020 (%)



GDP = gross domestic product, EU = European Union, US = United States.

Notes: Grey shading indicates the global financial crisis in 2008-2009, the Tohoku Earthquake in Japan in 2011, and the COVID-19 pandemic in 2019-recently.

Source: World Bank (n.d.), DataBank, GDP Growth (annual %).

<https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG> (accessed 18 March 2022).



## 2.b. Supply Chains and Shocks: A Simple Framework

To examine firms' strategies to cope with supply chain disruptions and government policies to mitigate their economic impacts, we consider a simple economic model with two countries – home and foreign (that can be considered the rest of the world) – which trade goods produced in a representative industry. A large number of firms operate in a monopolistic competition market where firms can sell products and procure inputs without incurring trade costs. A firm can procure customised input from a supplier, domestic or foreign, to produce goods that are differentiated from other firms' products (the framework is in the Appendix).

The competitiveness of the market is a key measure to assess social welfare. It consists of the competitiveness of both the domestic and foreign firms. On the one hand, the domestic firms' aggregate profits increase with the ratio of the competitiveness of the domestic firms to that of the foreign firms. On the other hand, the price index falls as the competitiveness of the market increases. Thus, given the foreign firms' competitiveness, social welfare increases with the domestic firms' competitiveness, both by increasing the domestic firms' aggregate profits and lowering the price index – thereby benefitting consumers.

Since domestic firms choose their sourcing strategies to minimise the total cost of production, such firms' behaviour tends to increase domestic firms' aggregate profits and competitiveness. Consequently, the objective of the government is more or less aligned with the firms' objectives. Nevertheless, the government can give incentives to firms to diversify their input sources or reshore their sourcing to the home country if firms can increase the domestic firms' competitiveness. Such policies also affect the foreign country. An increase in the home firms' competitiveness would decrease the foreign firms' aggregate profits but lower the price index that faces foreign consumers.

Governments seek to maximise their countries' social welfare. This increases with domestic firms' aggregate profits and decreases with the price index, which is an aggregate measure of product prices and decreases with the competitiveness of the market. We examine firms' sourcing strategies and the home government policies under the supply chain-disruptive risks. Five types of shocks will be discussed below. We argue that finding an appropriate policy is difficult when various types of risks coexist, since different policies are optimal against different types of risks. Inducing firms to diversify can be a good policy against idiosyncratic shocks and country-specific shocks, but it is rather harmful against industry-specific shocks and global shocks.

### *i. Idiosyncratic shocks*

Idiosyncratic shocks disrupt firms' supply chains randomly and independently across firms. Firms can partially hedge the risk through diversification. It is important to note that risks disappear in aggregate and the price index will not fluctuate over time due to the law of large numbers. If the fixed sourcing costs are in an intermediate range, firms are indifferent between single sourcing and diversification (i.e. sourcing from two suppliers), so some firms choose single sourcing to save fixed sourcing costs while others choose diversification to reduce the likelihood of being exposed to the supply chain disruption.

The government can increase the number of domestic firms that diversify by providing a subsidy for diversification. Such policies reduce the number of domestic firms whose supply chains are disrupted and hence increase the domestic firms' competitiveness. Therefore, they lower the price index and benefit consumers. However, the subsidy will also lower the domestic firms' aggregate profits (inclusive of aggregate fixed costs) because the domestic firms have chosen their sourcing strategies optimally, so the subsidy can actually harm market-driven competitive (or natural competitive) firms. This creates a dilemma as to whether the government should encourage firms to diversify their input sources by providing such a subsidy or not.

Government subsidies that enhance domestic firms' competitiveness harm foreign countries through profit-shifting from foreign firms to domestic firms but benefit foreign consumers through a decline in the price index. Such policy externalities call for policy coordination between and among countries.

### *ii. Country-specific shocks*

Country-specific shocks hit individual countries independently. An effective way to hedge the risk is diversification of sourcing, as in the case of idiosyncratic shocks. The impact on the economy of a subsidy to induce diversification is similar. It is noteworthy, though, that even if all firms diversify to minimise the risk, aggregate risks will not completely disappear in the case of country-specific shocks.

In this case, governments can enhance domestic firms' competitiveness – hence the overall competitiveness of the market – by inducing them to reshore if and only if the chance of supply chain disruption is greater in the foreign country than in the home country. Such policies benefit consumers but may not increase the aggregate profits of domestic firms since their competitiveness would be lower if a shock hits the home country, which hosts more suppliers for the domestic firms than before. Reshoring is often considered an appropriate policy to reduce exposure to supply chain disruptive shocks. But whether reshoring should be encouraged depends on which countries are more exposed to such negative shocks.

### *iii. Geopolitical shocks*

Geopolitical shocks are caused by geopolitical tensions between or amongst countries. In choosing suppliers, the presence of geopolitical risks is not an issue unless firms' production costs would be lower with foreign inputs rather than domestic ones. An effective way to hedge geopolitical risk is reshoring. Sourcing inputs from a domestic supplier would lower firms' marginal costs in the case of disruption but increase them in normal circumstances. Therefore, reshoring is a good strategy for firms if the likelihood of geopolitical shocks is large and the cost advantage of offshoring in normal circumstances is not large compared with the cost disadvantage in the case of disruption. Government incentives to induce reshoring are also high in such situations. It is noteworthy that geopolitical risks do not automatically make reshoring more appealing than offshoring.

#### *iv. Industry-specific and global shocks*

Industry-specific shocks disrupt the supply chains of a particular industry. Global shocks can be considered massive shocks that disrupt all industries across countries. In our one-industry model, these two shocks are equivalent, therefore we only discuss global shocks here. When a global shock hits the world, all supply chains are disrupted, so diversification or reshoring are of no use. Firms and governments can do nothing to mitigate the effects by restructuring the supply chains. In such cases, diversification is an inferior policy because it only increases the burden of sourcing costs for firms.

### **3. Global Supply Chains: Trends and Challenges**

First, one of the trends in global supply chains (GSCs) is related to the heavy reliance on a very small number of countries as the sole suppliers for a variety of critical inputs and products. Exports are more concentrated in fewer countries than imports, indicating supply-side concentration, with a few countries specialising in producing and selling certain goods abroad (OECD, 2021b).

East Asia has replaced the EU as the largest exporter of intermediate products, primarily driven by China and, to a lesser extent, Japan and Korea. East Asia has also replaced the EU as the largest importer of intermediate products since 2011. By 2018, China already imported almost as many intermediate products as the 27 EU countries combined, cementing its dominant role globally as both exporter and importer of intermediate goods. Some products even have inputs that are made by only one or two suppliers in the world, further limiting the possibility of sourcing diversification. A few countries also play a dominant role in the global production of some critical inputs for modern industries, such as solar panels, rare earth minerals, and lithium-ion batteries (Nakano, 2021).

Second, prior to the pandemic, firms typically used a just-in-time operations strategy, where inventory is sourced and received only when and to the degree it is needed for production in response to orders. The just-in-time strategy is highly efficient in good times, but also prone to even small disruptions affecting the suppliers. Given that the pandemic represents both demand and supply shocks, some firms have started to consider switching their supply chain strategy to the 'just-in-case' model, particularly those that have experienced supply chain issues during the pandemic. The just-in-case supply chain model stocks up some inventory and hence builds up some redundancy ahead of time. In addition, some companies are also considering 'local for local' supply chains to stock up their inventories and switch to a more localised supply chain model (Masters and Edgecliffe-Johnston, 2021). It is argued that shifting to the just-in-case model might help improve firms' supply chain resilience and increase their ability to respond quickly to disruptions. In this model, companies can have sufficient backup inventory (as they pile up the inventories), and the stock will then be used as a buffer to reduce the negative impact of disruptive events (McKinsey Global Institute, 2020).

Third, the pandemic also saw the rising use of export restraints as countries attempted to secure the domestic supply of goods deemed critical. Global Trade Alert showed that governments issued as many as 257 measures of export restrictions in 2020, almost a sevenfold increase from the previous 4-year average (Global Trade Alert, 2020). Furthermore, subtle measures of export restrictions are sometimes hidden behind health-security arguments allowed as an exception to the World Trade Organization (WTO) prohibition on export bans in general. Such actions may not be included in the official statistics of trade-related measures. The proliferation of export restrictions creates uncertainties for producers in other countries relying on inputs from the imposing countries, and thus threatens supply chain stability.

Fourth, significant recent events and developments have amplified the call for the restructuring of GSCs. These include the COVID-19 pandemic; the ongoing trade war and geopolitical tensions, especially between China and the US; the rising number of export restraint measures; and the higher frequency of disruptions expected in the future due to climate change and natural or health disasters, amongst other things. Taken together, such developments increase the demand for supply chain resilience amongst both policymakers and companies.

Fifth, there are typically two broad policy suggestions to reduce the risk from engagement in GSCs: (i) a call for shortening the supply chain by moving production back to the domestic home country (reshoring)/region (nearshoring), or (ii) a call for diversification of suppliers and markets.

#### *Shortening supply chains and reshoring*

The supply chain disruptions caused by trade tensions and the pandemic also magnified the intention of many countries to reduce their dependence on foreign suppliers for critical inputs and raw materials and increase their own domestic production capacity. From the perspective of developed countries, reshoring becomes even more appealing as advances in automation and artificial intelligence make labour cost savings from offshoring production in the context of GVCs less necessary. Reshoring is under way – according to a survey by Kearney (2021) of US manufacturing executives, two out of five respondents indicated that their company has reshored at least a portion of their manufacturing operations to the US in the past 3 years, while another 22% plan to do so in the next 3 years. Another survey in September 2020 suggested that 66% of firms in the world were considering reshoring to some degree (ADB, 2021). It is also estimated that 16%–26% of world exports could be moved either via reshoring, nearshoring, or an additional round of offshoring to new locations (McKinsey Global Institute, 2020).

However, despite the perceived benefit of reshoring amongst companies, some studies find that reshoring could exert negative effects on economic outcomes and supply chain resilience (ADB, 2021; Bonadio et al., 2021; OECD, 2021b). Localisation and reshoring of supply chains through tariffs and production subsidies would not only exert high efficiency costs, but also make them more vulnerable to shocks due to lack of adjustment channels. As a result, localisation of supply chains is unlikely to improve the resilience or stability of supplies. Incentives for reshoring also distort the market, leading to lower welfare and economic activities, as we argue in our simple economic model.

### *Supply chain diversification*

Apart from reshoring or nearshoring, an alternative response from many countries to the rising US–China geopolitical tensions and trade frictions is to reduce their economic dependence on inputs from China and to diversify their sourcing origins. For instance, in 2020, Japan established a fund to subsidise firms that diversify away from China for their inputs (Jiang, Rigobon, and Rigobón, 2021; Bloomberg, 2020). Increasingly, other manufacturing leaders (e.g. Korea, the EU, the US, and India) have been contemplating policies to facilitate a shift away from China.

Another strategy is vertical integration, which is often considered an alternative solution as efforts to mitigate supply volatility and strengthen the market position are intensified during disruptive events such as the pandemic. Through vertical integration, companies can acquire factories or suppliers, allowing them to streamline their operations by obtaining ownership of various production process stages – resulting in more reliable internal chains (Kiers et al., 2022). Some big businesses are pursuing this vertical integration approach. Amazon and Tesla exemplify this trend, as they are actively seeking to expand their range of operations – both forward and backward – in their supply chains (Mihm, 2022). However, we should note that shocks such as natural disasters can disrupt internal supply chains as well as external ones with other firms.

## **4. G20 Roles in Ensuring Supply Chain Resilience without Subtle Protectionism**

The literature on how supply chain resilience (SCR) can be improved at the firm level from the operational or managerial point of view is extensive. However, we focus on government policies and international cooperation to improve SCR.

First, governments need to ensure that the private incentives for resilience and/or diversification are properly aligned with the market and only respond to market failures. If private incentives for SCR fall below the social benefits of SCR, governments may need to deploy policies to incentivise greater investment in resilience through regulatory schemes, diversification subsidies, or other fiscal/tax incentives. In the current absence of a well-functioning multilateral trading system, regionalisation of supply chains via nearshoring might result in better SCR than purely domestic supply chains. Regionalisation of supply chains tends to have security advantages relative to optimised supply chains in distant locations. Therefore, regional trade agreements could and should be extensively used to bolster regional SCR.

Second, strategic stockpiling of some essential goods and critical inputs or raw materials is becoming increasingly necessary to mitigate the effects of shocks and disruptions in the future. An optimal risk management strategy could determine whether stockpiling should involve the final good or its critical inputs. Further work is needed to determine the socially optimal size and allocation of stockpiles to manage. However, what is clear is that there is a need for international cooperation and coordination in this area in case countries revert to hoarding or export restrictions when crisis hits. For this purpose, building greater transparency on availability – particularly of medicines (vaccines), medical supplies, and key inputs – would help in managing global supply chain resilient.

Third, there is a strategic need for investment in digital technologies to improve SCR. Digital transformation can help to boost SCR in several ways. On the one hand, digitalisation of supply chains (e.g. blockchain technology) can improve traceability from beginning to end. It can assist policymakers in identifying where they are vulnerable and perform effective risk assessment in all tiers. Some early warning indicators and information on alternative sourcing origins can be developed. On the other hand, aiding firms' participation in digital supply chains and digital trade, and improving their uptake of digital technologies, are likely to improve SCR.

Fourth, the long-term solution to improve SCR is unlikely to be either renationalisation (reshoring) of supply chains or the previous arrangement of offshoring. Instead, it is more likely to be a mix of domestic, regional, and international production in the context of global cooperation to ensure open trade in times of crisis. In this case, when crisis hits, countries can still rely on trade instead of having to produce domestically in isolation. A policy to promote supply chain diversification (i.e. goods being produced both domestically and abroad) is often more socially optimal than a policy promoting pure reshoring or offshoring. It is worth noting that subsidies are not the only way to incentivise supplier diversification. It is crucial to keep trade and investment regimes open to increase the potential number of countries or suppliers that companies can use as an alternative sourcing origin or production site in times of disruption. To the extent that diversification is possible in a particular value chain, an open trade and investment regime also promotes supply chain diversification and, in turn, resilience.

Last, and the most important one, what governments can and should do is reduce the risks in the first place. They can reduce the likelihood of idiosyncratic shocks by expanding safety nets for suppliers, country-specific shocks by building more resilient infrastructure, geopolitical shocks through peace and conducive discussions between and amongst countries' leaders and providing full support to international organisations that facilitate international cooperation.

## References

- ADB (2021), 'Global Value Chain Reshoring: Overview and Impact on Trade', Presentation, RCI-Policy Open Dialogue Webinar, No. 22, 14 July. [https://aric.adb.org/pdf/rcipod/episode\\_22/GVC%20Reshoring%20Presentation.pdf](https://aric.adb.org/pdf/rcipod/episode_22/GVC%20Reshoring%20Presentation.pdf) (accessed 21 March 2022).
- ADB, UIBE, WTO, IDE-JETRO, and CDRF (2021), *Global Value Chain Development Report 2021: Beyond Production*. Manila: Research Institute for Global Value Chains at the University of International Business and Economics, World Trade Organization, Institute of Developing Economies – Japan External Trade Organization, and China Development Research Foundation.
- Ba, S. and H. Bai (2020), 'Covid-19 Pandemic as an Accelerator of Economic Transition and Financial Innovation in China', *Journal of Chinese Economic and Business Studies*, 18(4), pp.341–48.
- Baldwin, R. and R. Freeman (2021), 'Risks and Global Supply Chains: What We Know and What We Need to Know', *NBER Working Paper Series*, No. 29444. Cambridge, MA: National Bureau of Economic Research.
- Baldwin, R. and J. Lopez-Gonzalez (2015), 'Supply-Chain Trade: A Portrait of Global Patterns and Several Testable Hypotheses', *The World Economy*, 38(11), pp.1682–1721.
- BCI (2021), *Supply Chain Resilience Report 2021*. Caversham, UK: Business Continuity Institute. <https://www.thebci.org/static/e02a3e5f-82e5-4ff1-b8bc61de9657e9c8/BCI-0007h-Supply-Chain-Resilience-ReportLow-Singles.pdf> (accessed 21 March 2022).
- Bloomberg (2020), 'Japan Starts Paying Firms to Cut Reliance on Chinese Factories', 19 July. <https://www.bloomberg.com/news/articles/2020-07-18/japan-to-pay-at-least-536-million-for-companies-to-leave-china> (accessed 21 March 2022).
- Bonadio, B., Z. Huo, A. Levchenko, and N. Pandalai-Nayar (2021), 'Global Supply Chains in the Pandemic', *NBER Working Paper Series*, No. 27224. Cambridge, MA: National Bureau of Economic Research.
- Bown, C. (2022), 'How COVID-19 Medical Supply Shortages Led to Extraordinary Trade and Industrial Policy', *Asian Economic Policy Review*, 17(1), pp.114–35.
- Evenett, S.J. and J. Fritz (2021), *Advancing Sustainable Development with FDI: Why Policy Must Be Reset*. London: CEPR Press.
- García-Herrero, A. (2021), 'What Is Behind China's Dual Circulation Strategy?', *China Leadership Monitor*, Fall 2021(69), pp.1–12.
- Global Trade Alert (2020), Export Restrictions Data. <https://www.globaltradealert.org/> (accessed 2 March 2022).
- Grossman, G., E. Helpman, and H. Lhuillier (2021), 'Supply Chain Resilience: Should Policy Promote Diversification or Reshoring?', *NBER Working Paper Series*, No. 29330. Cambridge, MA: National Bureau of Economic Research.

- Jiang, B., D.E. Rigobon, and R. Rigobón (2021), 'From Just in Time, to Just in Case, to Just in Worst-Case: Simple Models of a Global Supply Chain Under Uncertain Aggregate Shocks', *NBER Working Paper Series*, No. 29345. Cambridge, MA: National Bureau of Economic Research.
- Kearney (2021), Reshoring Index. <https://www.kearney.com/operations-performance-transformation/us-reshoring-index> (accessed 21 March 2022).
- Kiers, J., J. Seinhorst, M. Zwanenburg, and K. Stek (2022), 'Which Strategies and Corresponding Competences Are Needed to Improve Supply Chain Resilience: A COVID-19 Based Review', *Logistics*, 6(12), pp.1–17.
- McKinsey Global Institute (2020), *Risk, Resilience, and Rebalancing in Global Value Chains*. <https://www.mckinsey.com/business-functions/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains>
- Masters, B. and A. Edgecliffe-Johnston (2021), 'Supply Chains: Companies Shift From "Just in Time" To "Just in Case"', *Financial Times*, 19 December.
- Mihm, S. (2022), 'Vertical Integration Is Making a Comeback at U.S. Companies', Bloomberg Quint, 12 January. <https://www.bloombergquint.com/gadfly/supply-chain-woes-are-convincing-ceos-to-bring-back-vertical-integration> (accessed 17 March 2022).
- Nakano, J. (2021), 'The Geopolitics of Critical Minerals Supply Chains'. Washington, DC: Center for Strategic and International Studies.
- OECD (n.d.), Trade in Value Added (TiVA Database). <https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm> (accessed February–April 2022).
- OECD (2021a), *Fostering Economic Resilience in a World of Open and Integrated Markets: Risks, Vulnerabilities and Areas for Policy Action*, Report Prepared for the 2021 UK Presidency of the G7. Paris: Organisation for Economic Co-operation and Development.
- OECD (2021b), 'Global Value Chains: Efficiency and Risks in the Context of COVID-19', OECD Policy Responses to Coronavirus (COVID-19), 11 February. <https://www.oecd.org/coronavirus/policy-responses/global-value-chains-efficiency-and-risks-in-the-context-of-covid-19-67c75fdc/> (accessed 21 March 2022)
- Shih, W. (2020), 'Is it Time to Rethink Globalized Supply Chains?', *MIT Sloan Management Review*, 19 March. <https://sloanreview.mit.edu/article/is-it-time-to-rethink-globalized-supply-chains/> (accessed 21 March 2022).
- World Bank and WTO (2019), *Global Value Chain Development Report 2019: Technological Innovation Supply Chain Trade, and Workers in a Globalized World*. Washington, DC: World Bank.
- Yu, Z., Y. Li, and Z. Ouyang (2021), 'Economic Policy Uncertainty, Hold-up Risk, and Vertical Integration: Evidence from China', *Pacific-Basin Finance Journal*, 68.



## Appendix: A Theoretical Framework of Shocks

Here, we present a simple model to represent firm optimisation in facing and managing shocks. Suppose there are two countries (domestic and foreign) in which a representative industry is a typical monopolistic firm with a constant-elasticity-of-substitution (CES) utility function, with  $\sigma > 1$  being the elasticity of substitution. To produce a product, each firm  $j$  procures a customised input from a supplier to realise the marginal cost of  $c_j = c$ . The marginal cost would be higher at  $c_j = \gamma c$ , where  $\gamma > 1$ , if a firm fails to obtain the customised input due to a supply chain disruption.

Each firm  $j$ 's profits depend on the worldwide market size ( $E$ ); the price of the product ( $p_j$ ); the price index (summary statistics of the prices of all products;  $P$ ); the price elasticity (which takes the same value as the elasticity of substitution;  $\sigma$ ); and the fixed sourcing costs ( $F_j$ ); and can be expressed as

$$\pi_j = \frac{E}{\sigma} \left( \frac{p_j}{P} \right)^{1-\sigma} - F_j.$$

Profits decrease with the firm's own price relative to the price index.

Profit-maximising firms engage in constant markup pricing such that  $p_j = (\sigma/\sigma - 1)c_j$ , while the price index  $P$  is defined as  $P^{1-\sigma} = \sum_j p_j^{1-\sigma}$ , which aggregates the prices for all products sold by home and foreign firms in the home market. Suppose  $n_i$ , where  $i = H, F$ , and  $C_i = \left( \frac{1}{n_i} \sum_{j=1}^{n_i} c_j^{1-\sigma} \right)^{\frac{1}{1-\sigma}}$  denote the number of firms and average marginal costs of firms in country  $i$ , we can express the price index in the home country by

$$P^{1-\sigma} = \left( \frac{\sigma}{\sigma - 1} \right)^{1-\sigma} \Phi,$$

where

$$\Phi = n_H C_H^{1-\sigma} + n_F C_F^{1-\sigma}$$

measures the competitiveness of the market. Each firm  $j$ 's profits can be rewritten as

$$\pi_j = \frac{E}{\sigma} \frac{c_j^{1-\sigma}}{\Phi} - F_j.$$

In the presence of supply chain-disruptive risks, each firm chooses the optimal sourcing strategy: domestic sourcing, foreign sourcing, or diversification (i.e. sourcing from both domestic and foreign suppliers). Firms incur sourcing costs for  $F$  if they choose either domestic or foreign sourcing. They incur  $2F$  if they choose diversification.

The objective of governments is to maximise the expected social welfare. Social welfare can be considered as a function of aggregate profits for domestic firms and an inverse measure of the price index:  $W(\Pi_H, P^{1-\sigma})$ , where

$$\Pi_H = \sum_{j=1}^{n_H} \pi_j = \frac{E}{\sigma} \frac{n_H C_H^{1-\sigma}}{n_H C_H^{1-\sigma} + n_F C_F^{1-\sigma}} - \sum_{j=1}^{n_H} F_j.$$

Social welfare increases with  $\Pi_H$  and  $P^{1-\sigma}$ , both of which in turn increase with the domestic firms' competitiveness, measured by  $\Phi_H = n_H C_H^{1-\sigma}$ .

The reduction in the average marginal costs of domestic firms, denoted by  $C_H$ , enhances social

welfare both by increasing the aggregate profits and by decreasing the price index –thereby increasing the consumer surplus. Indeed, taking  $n_H$  and  $n_F C_F^{1-\sigma}$  as given, the home country benefits from a reduction in  $C_H$  as it increases both  $\Pi_H$  and  $P^{1-\sigma}$ . Since each domestic firm chooses its sourcing strategy to minimise its expected total cost of production, the objectives of the government and the firm are aligned.

Idiosyncratic shocks disrupt firms' supply chains randomly and independently across firms, so  $q$  denotes the probability that each buyer–supplier relationship that is hit by an idiosyncratic shock and  $\theta_H$  denotes a fraction of the domestic firms that diversify. Then the market competitiveness measure can be written as

$$\Phi = n_H[(1 - \theta_H)(1 - q) + \theta_H(1 - q^2)]c^{1-\sigma} + n_H[(1 - \theta_H)q + \theta_H q^2](\gamma c)^{1-\sigma} + n_F C_F^{1-\sigma}.$$

This measure will depend on the realisation of shocks in general. In case of country-specific shocks, with  $q_H$  and  $q_F$  the probabilities of a shock that hits the home and foreign country, respectively, the expected market competitiveness is written as

$$\begin{aligned} E\Phi = & (1 - q_H)(1 - q_F)(n_H c^{1-\sigma} + n_F C_F(0,0)^{1-\sigma}) \\ & + (1 - q_H)q_F[n_H \eta_H c^{1-\sigma} + n_H(1 - \eta_H)(\gamma c)^{1-\sigma} + n_F C_F(0,1)^{1-\sigma}] \\ & + q_H(1 - q_F)[n_H \eta_H (\gamma c)^{1-\sigma} + n_H(1 - \eta_H)c^{1-\sigma} + n_F C_F(1,0)^{1-\sigma}] \\ & + q_H q_F[n_H (\gamma c)^{1-\sigma} + n_F C_F(1,1)^{1-\sigma}], \end{aligned}$$

where  $\eta_H$  denotes the fraction of domestic firms that source from a domestic supplier;  $C_F(s_H, s_F)$  varies with the realisation of shocks, with  $s_i = 1$  if country  $i$  is hit by a shock and  $s_i = 0$  otherwise. In the presence of geopolitical risks that materialise with the probability  $q$ , the expected market competitiveness is written as

$$\begin{aligned} E\Phi = & (1 - q)[n_H \eta_H c^{1-\sigma} + n_H(1 - \eta_H)(\beta c)^{1-\sigma} + n_F C_F(0)^{1-\sigma}] \\ & + q[n_H \eta_H c^{1-\sigma} + n_H(1 - \eta_H)(\gamma c)^{1-\sigma} + n_F C_F(1)^{1-\sigma}], \end{aligned}$$

where  $\beta c$  (where  $\beta < 1$ ) denotes the marginal costs when sourcing from abroad in normal times;  $C_F(0)$  and  $C_F(1)$  denote the foreign firms' average marginal costs when a shock does not and does materialise, respectively.

# Chapter 6

## The G20's Role in Fostering Trade and Investment

Gordon Hanson

There is increasing optimism that the worst of the pandemic may be behind us. Whether the Omicron variants were the last major spikes of the coronavirus disease (COVID-19) or whether there are others still to come, global economic actors are turning away from the immediate demands of the health crisis and towards the challenge of reigniting long-run economic growth. Future growth will, as always, largely depend on expanding the capacity of cities, regions, and nations to sell their goods and services to each other. Yet, global trade faces stiff headwinds. The United States (US)–China trade war has put the world's two largest economies behind obstinate walls of tariffs, rising global geopolitical tensions have complicated efforts to revive multilateral cooperation on trade, and the pandemic has severely disrupted both global supply chains and the movement of people across borders that is essential for international commerce. Members of the G20 must find ways to foster trade and investment in an environment in which the institutions and infrastructure underlying the international trading system are badly strained.

Repairing the global trade engine will require concerted efforts on the part of the G20. Of primary concern, members will need to confront how globalisation has increased economic disparities within their economies. These disparities, which often fall along regional lines, have generated deep pockets of economic hardship, increased resentment towards the institutions of power, and heightened suspicion about the value of open borders. They also represent an intensifying spatial misallocation of resources within countries, which impedes growth. In this chapter, I review the uneven consequences of globalisation for G20 members and discuss approaches that could improve the prospects for trade and investment to deliver greater economic prosperity amongst heretofore excluded and marginalised groups. Having countries focus on fixing domestic distortions is an admittedly unconventional approach to fostering trade and investment. However, the damage done by three decades of globalisation has been intense and mandates commensurately intensive efforts to remediate these harms. Unless those left behind by globalisation – both in advanced and middle-income countries – come to feel that they have more to gain from the global trading system, the politics of openness are likely to remain toxic and an obstacle to cooperation.

There are of course more conventional approaches to fostering trade and investment, which I will mention but not discuss in detail. Top amongst these is restoring the functionality of global trading institutions. As the ability of the World Trade Organization (WTO) to resolve trade disputes has eroded, countries have increasingly turned to bilateral or regional solutions. Admittedly, member

countries, including the US, have frequently acted in bad faith when it comes to supporting the WTO's mission. Be that as it may, in the absence of demonstrable evidence that the WTO works, the organisation may be increasingly sidelined. The G20 could achieve such a demonstration by, amongst other options, supporting WTO efforts to address climate change. Two promising options in this domain are clarifying, first, how border carbon-adjustment taxes could be made compliant with WTO rules, and second, how countries can promote green technology without violating WTO commitments. Unless the WTO is seen as leading on vital issues of the day, it will be seen as an anachronism.

## 1. Globalisation's Uneven Rewards

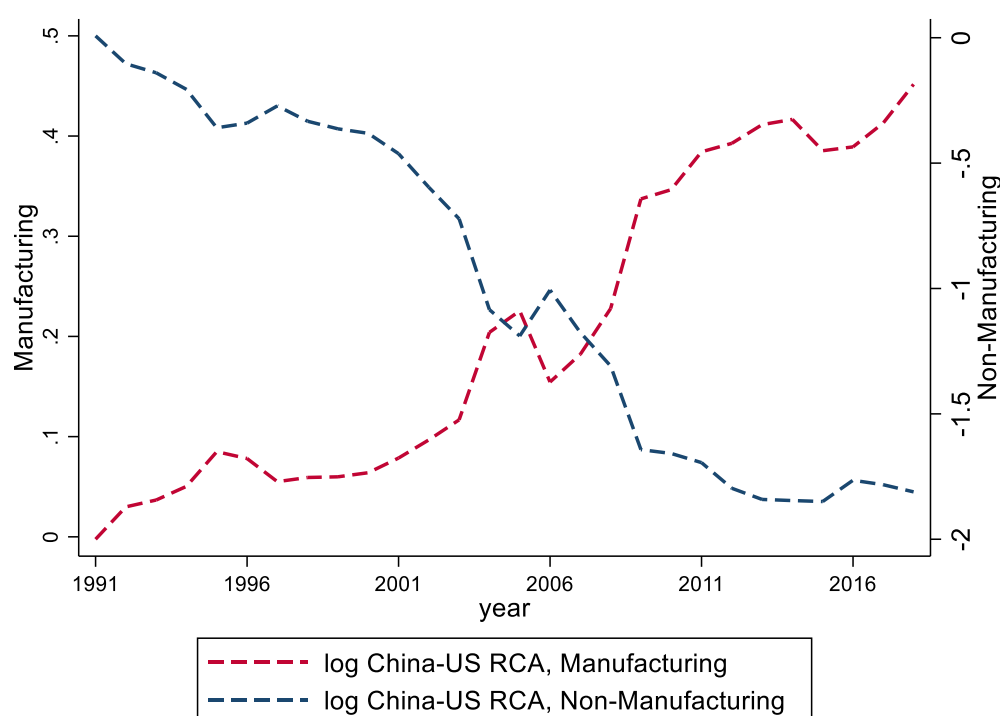
In the heady days of the early 1990s, there was every expectation that expanding global commerce would alleviate global poverty, enhance international security, and lead to convergence in democratic norms. To be sure, the massive increase in international trade and investment fuelled by the fall of communism, trade liberalisation in developing economies, and the formation of the WTO contributed to a substantial improvement in global living standards, especially in China and India. However, in high-income countries, and in many middle-income ones as well, globalisation severely disrupted life in many communities. In rich nations, it was the less educated and those working in traditional manufacturing who were hardest hit; in emerging economies, losers from globalisation included those pushed into working in the informal sector and living in regions poorly connected to global markets.

In retrospect, we now appreciate that by the 1990s high-income countries were comprised of disparate sets of regions that engaged with global markets in fundamentally different ways. Large, dynamic cities attracted the most educated workers, were headquarters to major corporations, and housed clusters of innovative firms in digital technology, finance, the life sciences, and other knowledge-intensive sectors. Expanded global trade meant increased demand for the business services (consummating mergers and acquisitions, consulting on management strategy) and technology services (creating software, licensing patents and other intellectual property) that they produced. Incomes and real estate values soared in London, New York, Shanghai, Silicon Valley, and Seoul, as new talent and capital poured in. Many emerging economies began producing goods that embodied the technology created by global knowledge centres, along rapidly expanding global supply chains. Countries with large commodity sectors – including Argentina, Australia, Brazil, Canada, Indonesia, Russia, and South Africa – saw soaring demand for their exportable goods.

The economic position of many smaller and medium-sized cities and towns in high-income countries was altogether different. In the second half of the 20<sup>th</sup> century, they had become home to large manufacturing factories, fossil fuel-based sectors, and other vestiges of the old industrial economy. Figure 6.1, which describes the evolution of comparative advantage in manufacturing and non-manufacturing for China relative to the US, frames the challenges confronting manufacturing regions in rich countries. As China joined the WTO in 2001 and reformed its economy, its productivity in manufacturing intensified greatly, which caused its comparative advantage in the sector to strengthen correspondingly. For older factory towns in the US Midwest

and Southeast, the United Kingdom's industrial north, and Germany's east, globalisation caused major contractions in the demand for labour via import competition from abroad. Compounding the pain was technological change in the form of automation and the progressive move away from coal and other dirty fuels, both of which dented labour demand for those without a college education. Because traditional industrial regions tended to be highly specialised in their core tradable sectors, the negative shocks that they experienced caused substantial job loss, often within the time span of a decade or less. Factories and mines closed, investment in new businesses largely failed to materialise, and workers, particularly those without a college degree, had difficulty transitioning into new lines of work.

**Figure 6.1: Revealed Comparative Advantage in Manufacturing and Non-Manufacturing, China Relative to the United States**

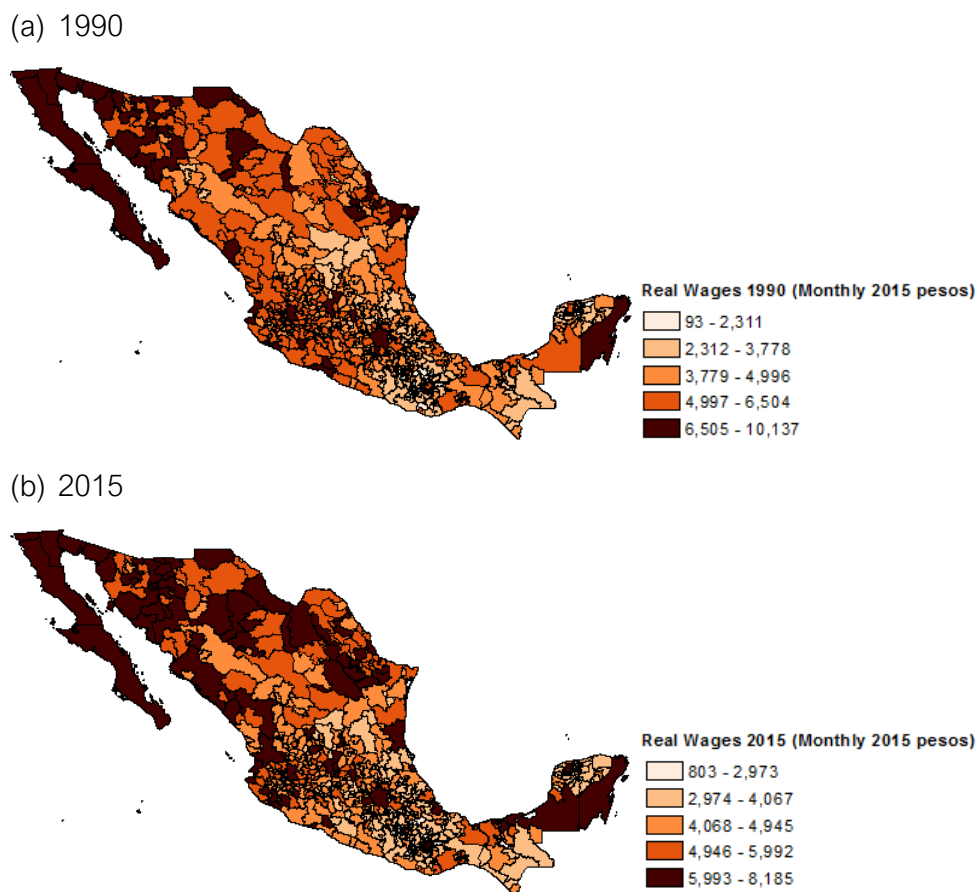


RCA = revealed comparative advantage, US = United States.  
Source: Autor, Dorn, and Hanson (2021).

Perhaps the most surprising feature of how former industrial regions adjusted to changing economic conditions related to the geographic mobility of labour. By and large, local labour markets subject to concentrated job loss did not see much net outmigration of non-college-educated labour. The result was an entrenchment of economic distress. Joblessness of working-age adults remained elevated for decades after the onset of the disruptions, which in some regions contributed to the dissolution of families, drug and alcohol abuse, greater child poverty, and the fraying of the fabric of communities. Although the exact nature of regional decline varied across national contexts, a common feature was diminished economic prospects for non-college-educated workers. Distress ultimately stoked resentment. It is in these left-behind regions that support for nationalist-populist political movements has flourished, as seen in political developments in France, Germany, the United Kingdom, and the US.

In parallel fashion, many emerging economies have developed their own regional economic divides, which likewise have been exacerbated by globalisation and other sources of economic disruption. In Mexico, for instance, the North American Free Trade Agreement (NAFTA) helped industry expand in the country's better-educated and better-connected northern cities, while the country's poorer and more remote south endured decades of stagnation. Figure 6.2 shows real wages by municipality in Mexico in 1990, before NAFTA was enacted, and 2015, once globalisation had reached its apex. Readily apparent is that the regions that enjoyed the greatest wage growth were clustered in the country's north, close to the US border, and in the foreign tourist zones of the country's Baja California and Yucatan peninsulas. In much of southern Mexico, which has weak access to global markets, limited education, and poor infrastructure, real wages declined on average across many municipalities.

Figure 6.2: Real Wages by Municipality in Mexico, 1990 and 2015



Source: Chiquiar and Tobal (2019).

More generally, in much of the emerging world, the absence of economic opportunity tends to manifest not in high rates of joblessness but in high rates of informality, with its attendant adverse consequences for current productivity and future earnings growth. Regionalised patterns of gains and losses from globalisation are also apparent in Brazil, South Africa, and Turkey. Even China has not escaped this predicament. Today, many of its inland regions depend heavily on remittances from workers who have migrated to richer coastal cities, while its heavily industrial

northeast concerningly resembles regions in other countries that later endured protracted decline.

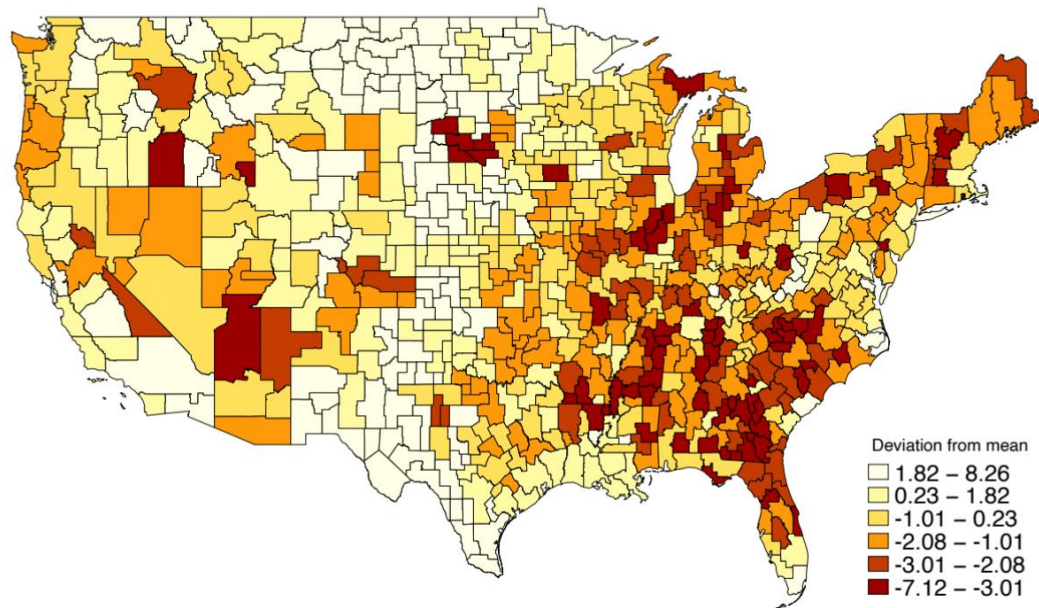
The last 3 decades of globalisation have left many economies riven by regional economic disparities that call attention not just because of the hardship and animosity they engender but because they represent a spatial misallocation of resources. Workers from depressed, low-wage areas are not leaving in sufficient numbers to compress large differences in earnings and living standards across regions within countries. Helping to close regional economic divides would therefore do more than address concerns about equity. It could improve national and global economic efficiency as well.

## 2. Framing the Challenge

The absence of sufficient labour flows within countries from distressed regions with low wages and low employment rates (or high informality) to thriving regions with high-wage jobs and high employment rates (or low informality) is suggestive of market distortions that obstruct the reallocation of resources across sectors and space. Such distortions justify government intervention, depending on their origin and severity. By contributing to a misallocation of resources across regions within countries, these distortions further disrupt the flow of goods, services, capital, and labour amongst G20 members. Removing them could enable countries to improve living standards in distressed regions, while at the same time making trade patterns more strongly grounded in intrinsic regional comparative advantage. An essential task for G20 nations is therefore to assess the health of their internal labour markets in order to identify instances of a misallocation of resources, the causes of these misallocations, and the types of government actions that could help alleviate them.

In Figure 6.3, we see an example of the regional economic challenges confronting high-income nations in the case of the US. The figure maps the change in the employment–population ratio – total employment of individuals 18–64 years of age divided by the population of individuals 18–64 years of age – for US regional economies (defined as commuting zones) between 2000 and 2019. The employment–population ratio summarises the economic health of a local economy. This ratio rises when real wages rise, as more individuals are drawn into paid work, and declines as real wages fall, as more individuals elect to exit the labour force. Concentrated, long-run declines in the employment–population ratio are therefore evidence of the disappearance of attractive opportunities for work. What is striking about Figure 6.3 is that the US is widely considered to have the most flexible labour markets amongst high-income countries. Even in purportedly dynamic market contexts, localised economic stagnation can become entrenched.

Figure 6.3: Change in the US Employment–Population Ratio, 2000–2019



US = United States.

Source: Autor, Dorn, and Hanson (2021).

For emerging economies, there is familiarity to the exercise of how to improve the spatial allocation of resources. As their populations were urbanising in earlier decades, the resource misallocation was obvious: too many people lived in poor rural areas and too few lived in industrialising and service-oriented cities. The solution then was rural–urban migration, which occurred at varying speeds across places. Looking back, it would be a mistake to see market forces as solely responsible for righting that earlier rural–urban disequilibrium. It is true that workers moved to cities largely at their own behest, as new businesses in urban areas set up shop. But governments also played an important role in facilitating resource flows. They built needed infrastructure – such as roads, ports, power plants, water systems, schools, and hospitals – and fortified market structures by deepening capital markets, strengthening legal institutions, and modernising communication systems. These interventions, roundly cheered by market actors at the time, made urbanisation possible.

Today, the challenge is messier. In most G20 countries, with India being an important exception, urbanisation is complete or nearly so. The problem is that too many workers appear stuck in regions or sectors in which productivity is low and opportunities for advancement are meagre. Alleviating these misallocations often entails moving resources between urban areas, which can be costly to engineer. Governments must think inventively about how to help correct existing distortions. A welcome by-product of this effort would be greater trade and investment amongst G20 economies.



### 3. Making Globalisation Work for the Many and Not Just the Few

How can countries expand trade and investment while improving the quality of jobs available to workers, especially those who are not highly educated? To envision how the G20 could achieve progress on this crucial challenge, I discuss evident distortions in housing, labour, and capital markets that appear to impede economies from discovering or fully realising their comparative advantage and imagine how alleviating these distortions could create more widespread prosperity. Because not every distortion is present in every G20 economy, not every intervention would be suited for all national contexts. Yet, there is sufficient commonality in the economic challenges members confront to warrant a collective examination of policy options.

In undertaking this examination, it is worth keeping two regularities in mind. One is that once a country has achieved high levels of urbanisation and settled its sparsely populated regions, it can be difficult to get people to move. Sluggish labour mobility means that any added distortions to mobility can have outsized effects. It also means that it may be harder to bring people to jobs – via people-based policies that ignore geography – than it is to bring jobs to people – via place-based policies that condition on geography. A second regularity is that after periods of economic disruption, uncertainty about comparative advantage may be rife. Just as regions can rapidly industrialise, they can rapidly deindustrialise. Figuring out which tradable activities to pursue next can be daunting. Allowing for experimentation and cultivating economic ecosystems that provide fertile ground for a broad set of activities may therefore have higher social returns than making bets on specific companies or industries.

#### 3.1. Fixing Housing

Perhaps the most common factor that prevents low-wage workers in depressed regions from taking advantage of opportunities in dynamic cities is the lack of affordable housing in these cities. In many countries, housing regulations or other distortions artificially restrict housing supply. In high-income contexts, such restrictions include limits on building height and the number of dwellings that can be constructed on a plot of land (which reduce the density of housing), and onerous processes for obtaining approval to undertake construction (which slows down housing development); in middle-income nations, they include the absence of land titles in many informal settlements (which complicates selling land), burdensome processes for aggregating small land parcels into larger plots (which complicates increasing housing density as cities grow), and rent-seeking by those who oversee the approval of construction projects (which lowers the return on housing investment).

Restrictions on housing supply may mean that when, say, biotech firms in Boston or medical device factories in Tijuana expand their operations and increase employment, the resulting growth in housing demand does more to drive up the price of housing than it does to expand the quantity of housing. Consequently, some individuals, and those with lower incomes in particular, may be pushed out of a city or dissuaded from moving in. Low-wage workers, who could potentially take up jobs in non-traded activities that indirectly support export industries or traded activities that directly support them, may be excluded from opportunities in dynamic cities. The consequence is less economic growth in places like Boston and Tijuana and more inequality in outcomes across regions within countries. Making housing easier to build would let growing regions capitalise on

their comparative advantage and enable low-wage workers to benefit more fully from the resulting expansion.

### **3.2. Building Human Capital**

An important consequence of globalisation is continual turnover in the industries that comprise the export base of a region or country. In a dynamic global economy, the places that excel in specific sectors are constantly changing. As some regions acquire comparative advantage in an industry, other regions may see their comparative advantage in the industry diminish. The resulting turnover in industries that are present in a region requires workers to upgrade their skills, often several times over their careers. Acquiring new skills is likely to be especially important in regions that have suffered a major contraction in their core export industries. Research documents that these events, which typically involve the shutdown of multiple factories and the mass layoff of personnel in a compressed time span, have scarring effects on workers in the form of extended periods of joblessness and lower lifetime earnings.

The scarring effects of job loss run counter to the predictions of standard economic models. According to standard theory, the higher that unemployment is in a region, the lower the wages and the more attractive the region is to firms in tradable industries that wish to expand their operations. Yet, this mechanism tends to be disappointingly absent in regions that have seen their main export industries disappear. Rather than attracting firms to a region, high rates of joblessness (or informality) may deter potential investors, who may have concerns over the degrading of worker skills or be put off by the absence of desired input suppliers in the local economy. For their part, workers may be unsure about which type of training to pursue or in the aftermath of losing a job may lack the financial wherewithal to complete training. The consequence of local inaction by firms and workers is deindustrialisation. Just as positive spillovers between firms can create a virtuous cycle of agglomeration when a region is growing, they can create a destructive cycle of de-agglomeration when a region is contracting.

Promising recent evidence has indicated that active labour market programmes can be successful in improving outcomes for the long-run unemployed, as well as for disadvantaged youth (Katz et al., 2021). Traditional forms of subsidised worker training – in which workers are left to choose programmes on their own, are only offered options selected by government bureaucracies, or are trained for jobs in the public sector – often have poor results (i.e., their costs far exceed any gain in worker earnings). Newer approaches impart skills desired by local employers (where programmes certify participants for occupations that are in demand by sectors expanding nationally) and offer additional employment services (related to finding jobs, retaining jobs, and advancing on the job). Rigorous evaluation of active labour market and sectoral training programmes in the European Union and the US indicate that they substantially increase participants' likelihood of becoming employed and earnings once on the job (relative to no training) and tend to generate sufficient additional earnings to exceed programme costs within 5 years or so. Although there has not been research on the feasibility of conducting sectoral training in distressed regions on a large scale, the success of Denmark's 'flexicurity' framework, which includes an active training component for unemployed workers, is promising evidence in this direction. Governments should be exploring how to deploy new approaches to worker training to help distressed labour markets.

### 3.3. Encouraging Investment

Economies succeed in raising living standards when new businesses or existing firms invest in a manner that raises the productivity of their workers. Encouraging these investments – which expand factories, improve production processes, and introduce new products – is of major interest to policymakers. Because large companies, and multinational enterprises in specific, tend to pay their workers high wages and be successful in breaking into new export markets (relative to other firms), regional and national governments are eager to attract them to their jurisdictions. One consequence of this eagerness is competition amongst jurisdictions in recruiting companies by offering tax breaks, subsidies, and other fiscal inducements. Over the last 3 decades, such tax and subsidy competition has intensified greatly.

A growing body of research indicates that tax competition to recruit individual businesses is often unproductive. The region that ‘wins’ the competition to attract a major company to its locale does tend to see expanded employment in that company’s main industry. However, the winning region generally sees no gain in its aggregate employment, relative to other regions that were under consideration by the targeted firm. Tax competition thus appears to be zero sum – one jurisdiction’s gain is another’s loss – while on net transferring income from taxpayers to business owners. Moreover, the ‘winning’ regions tend to be places that were already primed for success. Governments are thus devoting recruiting resources to luring companies to the most desirable sites for production, at the expense of assisting struggling communities.

Because most of the funds that governments spend on promoting local economic development go to tax breaks and other subsidies, there is potential for public entities to channel resources to distressed regions simply by repurposing these funds, without adding strain to public budgets. Resources currently devoted to tax competition, for instance, may be more productively spent on active labour market programmes in regions with low employment rates or high informality. Other promising uses of these funds include technical assistance (e.g., advice on finding new markets, adopting new technology, or improving logistics or management techniques) to businesses already located in distressed markets and helping these markets repurpose abandoned factories and similar structures for alternative uses.

Today, nearly every regional or national government has an economic development agency whose responsibilities include recruiting new business through subsidies of one kind or another. Governments are deep into an arms race in business recruitment. In an arms race, no individual government has an incentive to disarm. Doing so unilaterally would potentially leave their markets with less investment. The solution is for governments to agree collectively to restrict tax competition. The recent multilateral agreement to establish a minimum corporate tax of 15% is a promising sign that cooperation is possible. The G20 should take the additional step of suppressing the granting of temporary tax breaks in the recruitment of large companies.

## 4. Final Discussion

Policymaking after the pandemic presents G20 members with an opportunity for a reset. A policy reset seems to be very much in demand. In many countries, the public has grown increasingly sceptical about globalisation. With clear justification, the global economy is perceived as being tilted in favour of economic elites. Less educated workers, informal sector businesses, and regions disconnected from the global knowledge economy often receive few tangible benefits from global commerce. If governments blithely propose a return to pre-pandemic approaches to trade and investment, they are likely to invite scorn and strengthen the political standing of those who propose closing borders. To retain credibility and support, policymakers need to articulate a policy framework that shows how globalisation can benefit the many and not just the few.

In contemplating a reset, policymakers should keep three principles in mind. One is that individual job loss is painful and that regionally concentrated job loss can be devastating. Policy should focus on helping displaced workers get back on the job quickly. If policy is tuned only to national business cycles, and not responsive to regional variation in economic conditions, it may allow regional job loss to morph into persistent regional distress, recovery from which is challenging and costly. A second principle is that in a deeply connected world in which industries easily relocate across regional and national markets, policy needs to be attuned to change. Structures need to be in place to help workers move across sectors and firms to learn new ways of business. Because of spillovers in learning, government support for worker training and business development is often justified. However, indiscriminate support for these activities is not. On worker training, evidence shows wide variation in impacts across programmes. Some do little for workers and simply waste public money. Others, especially those that consciously target skills in demand by local business, can be highly effective. There is wide scope for governments to improve the nimbleness of their economies, but only if policy design follows evidence on how to achieve success.

A third principle relates to cooperation amongst governments. The mobility of companies across jurisdictions creates a hard-to-resist urge for politicians to go hunting for trophy firms. Even if countries succeed in establishing a global minimum corporate tax rate, there will still be ample room for governments to induce business to locate in their economies via temporary rewards of one kind or another. Estimates for the US indicate that the scale of funding needed to raise employment rates and improve outcomes in distressed regional economies is considerably less than funds currently spent on subsidies to recruit businesses. Deepening cooperation to avoid tax and subsidy competition offers a triple win: transfers that increase inequality are eliminated, the social return on public spending is increased, and the spatial misallocation of resources is attenuated. In the absence of cooperation, governments are likely to overcommit resources to companies from outside their jurisdictions that set up operations in regions that are already amongst globalisation's winners. That is not a recipe for building popular support for international trade and investment.

Targeting policy to those left behind by globalisation is important also for the challenge of addressing climate change. Transitioning away from fossil fuels will disrupt economic life in communities worldwide. Just as the WTO needs to take a leading role in helping countries use

trade and investment to shift the global economy towards green energy, member countries need to show how this transition can be managed equitably. G20 countries are the logical lead actors to demonstrate how this transition should proceed. If global trading institutions are laggards in helping chart constructive paths for the energy transition, just as they were in addressing the economic and environmental damage caused by globalisation, then we can confidently expect these institutions to drift into irrelevance. The nationalist voices calling for a retreat from globalisation, while also downplaying the urgency of confronting climate change, are legion. It is imperative that G20 members mirror how countries can responsibly participate in global trade investment while both improving livelihoods for those in the bottom half of their earnings distributions and not imperilling the planet.

## References

- Autor, D., D. Dorn, and G.H. Hanson (2021), 'On the Persistence of the China Shock', *NBER Working Paper Series*, No. 29401. Cambridge, MA: National Bureau of Economic Research.
- Chiquiar, D. and M. Tobal (2019), 'Global Value Chains in Mexico: A Historical Perspective', *Banco de México Working Papers*, No. 2019-06. Mexico City: Banco de México.
- Katz, L.F., J. Roth, R. Hendra, and K. Schaberg (2021), 'Why Do Sectoral Employment Programs Work? Lessons from Work Advance', *National Bureau of Economic Research Working Paper Series*, No. 28248. Cambridge, MA: National Bureau of Economic Research.

# Chapter 7

## Digital Transformation: 'Development for All'? \*

Lili Yan Ing, Gene Grossman, and David Christian

### 1. How Digitalisation Has Changed Our Lives

Technological advances over the last two millennia have generated remarkable improvements in the quality of life. But the gains that come with new technologies are rarely shared by all. Notably, we have witnessed in recent years rising income and wealth inequality in most countries, with greater shares accruing to capital owners and highly skilled workers often at the expense of less skilled workers. By 2020, the richest 1% of the world's population owned almost half of global wealth. In the last 2 years alone, the ten highest earners (eight of whom are technological titans) saw their personal incomes more than double, while the poorest 99% of the global population suffered a decline in their collective income during this period (Hardoon, Ayele, and Fuentes-Nieva, 2016; Ahmed et al., 2022). Might there be a connection between technological progress and income and wealth inequality?

Over the past 3 centuries, we have witnessed various technological revolutions that have changed the way we produce goods, organise our business, communicate with one another, and conduct our daily lives. Previous paradigm-changing innovations included the steam engine and the introduction of electric machinery. Now we are in the midst of a digital transformation (DX) that began with the introduction of the digital computer in the early post-war years and extends most recently to the rapid development of industrial robots and artificial intelligence (AI). These advances already have changed the way many goods are produced and many services are delivered. They are undoubtedly responsible for vast increases in income and wealth. Is DX also responsible for the widening gap between rich and poor? Will the recent trends of growing inequality continue? What can the G20 countries do to ensure that most or all citizens benefit from the ongoing technological advances? These are critical questions that confront us today as the digital revolution proceeds apace.

Industrial robots made their first appearance in the 1950s. Since then, deployment has grown exponentially. The rate of new installations worldwide more than doubled from 2012 to 2019, reaching 373,240 per year by the end of that period. The global stock of operational robots increased from 1 million in 2009 to about 2.7 million in 2019.

---

\* The contents are largely based on Chapter 1 Introduction, Robots and AI: A New Economic Era (eds. Lili Yan Ing and Gene M. Grossman, London and New York: Routledge





China, and to a lesser extent Japan, became the fastest new adopters of industrial robots. Together, they contributed almost two-thirds of the global growth in industrial robots from 2012 to 2019 (Stanford University, 2021). The automotive and electronic industries remain the two heaviest users of industrial robots, absorbing between them about 59% of the new sales of industrial robots in 2019 (IFR, 2020).

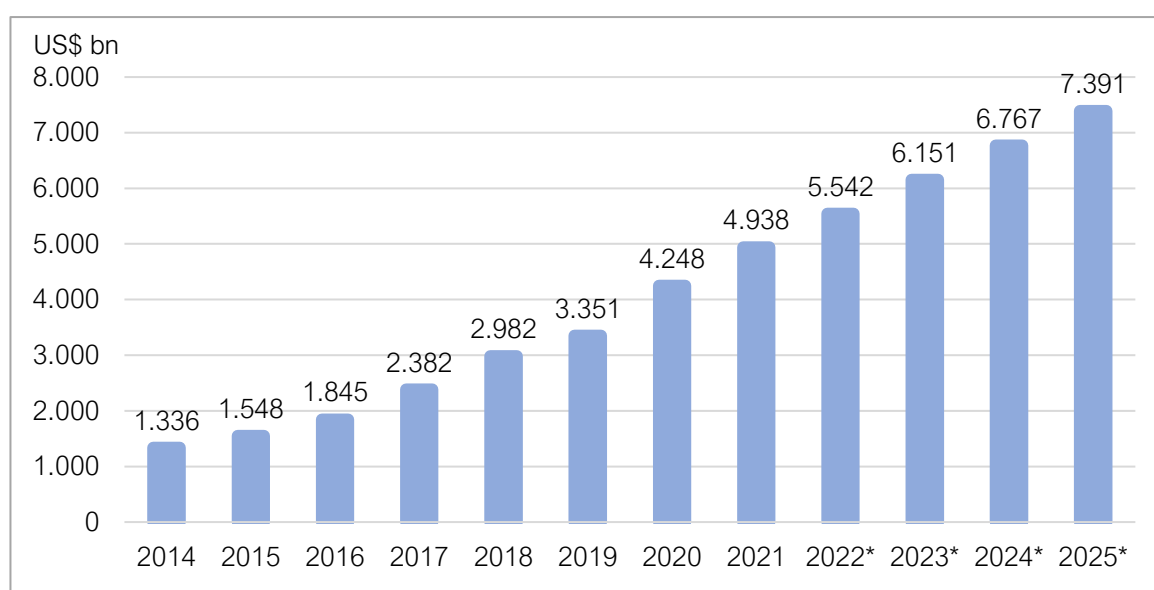
The rapid growth in investment reflects the precipitous decline in prices. The average cost of an industrial robot fell by more than 60% between 2005 and 2017, from US\$68,659 to US\$27,074. Further price declines to under US\$11,000 are expected by 2025 (Ark Invest, 2021). A combination of other factors, such as the increase in robot functionality and flexibility, the improved ease of use and interfaces, and growing awareness of the potential applications of robotic technology are also contributing to the worldwide growth in robot usage (Furman and Seamans, 2019).

Research on AI began in 1956. AI is defined as a non-human system that perceives its environment and takes actions to maximise the probability of achieving its goals. More colloquially, the term AI is used to describe computations that mimic human cognitive functions, such as 'learning' or 'problem solving'. AI has improved massively in the last decade, primarily due to the invention of machine learning techniques that enable computers to have superior predictive power at substantially reduced costs (Agrawal, Gans, and Goldfarb, 2019; Taddy, 2018). Thanks to advances in AI, more responsive and adaptable robots that can better interact with humans, have improved sensory capabilities, and that can better interact with their environment to perform non-routine, uncertain, and more complex tasks, are becoming widely available at ever-lower costs.

Global corporate investment in AI has increased almost sixfold from US\$12.7 billion in 2015 to US\$67.9 billion in 2020. The United States and China dominate AI investment, with a combined contribution of 76% from 2015 to 2020. However, increased demand for AI-related technologies is being observed across the globe: Brazil, India, Canada, Singapore, and South Africa recorded the fastest growth in AI-related hiring from 2016 to 2020 (Stanford University, 2021). This growth is partly in response to the arrival of a wide range of new technologies, such as Software as a Service (SaaS), robotics, the internet of things (IoT), and virtual reality (VR). Spending on DX of business practices, products, and organisations has continued to grow, even amidst the coronavirus (COVID-19) pandemic. It is estimated that global spending on DX technologies and services grew by 10.4% in 2020 to US\$1.3 trillion (IDC, 2022).

DX reduces the cost of sharing information and leads to unprecedented changes, including *what* and *how* we trade (digital trade). The pandemic has accelerated DX, including digital trade. The development of digital trade includes digital payments and digital services delivery. Global retail e-commerce sales in 2020 increased by almost 30% from 2019 levels. In 2020, around 24% of firms received orders online and more than 40% of firms placed orders online (UNCTAD, 2022). Digital trade totalled US\$4.9 trillion in 2021 and is projected to reach US\$5.5 trillion in 2022 and more than US\$10 trillion by 2030 (Statista, 2022).

Figure 7.1: Global Retail E-Commerce Sales, 2014–2025



\* Estimated figures.

Source: Statista (2022).

## 2. DX and Digital Trade: Productivity, Polarisation, and Inequality

### 2.1. Increasing Productivity

Technological advances raise productivity and drive economic growth. Industrial robots, especially those that apply AI, offer perhaps the greatest scope for technological improvement and productivity gain in the modern industrial era. Robots can increase the speed and precision of industrial processes while making them safer and more reliable. They leverage workers' time, while freeing humans to engage in more conceptual and interpersonal tasks. AI can be used to enhance the quality and variety of products available to consumers, provide new forms of entertainment, and offer solutions to pressing medical and environment problems. Clearly, the potential for robots and AI to improve the quality of life is boundless.

The application of industrial robots and AI brings potential gains of two sorts. First, these technologies reduce production and operational costs. Robots can perform many tasks faster and with much greater precision than humans. AI can be employed to predict problems along the production line and to leverage computation as an input to production, resulting in an optimised production process at reduced cost. Second, and perhaps less obvious, industrial robots and AI can help markets to function more efficiently. AI can be used to learn about human preferences and to allocate goods and services from where they are most readily available to where they are most needed, which in turn leads to enhanced efficiency in logistics and delivery.

## 2.2. Labour Market Polarisation

Despite their roles in improving productivity, the adoption of industrial robots, automation, and AI has potential concerning implications for employment and wages, especially for less skilled workers performing routine tasks that can be replaced by machines. Baldwin (2019) estimated that one to six out of every 10 jobs is at risk of being replaced by robots in the coming two decades. The estimates vary across countries, ranging from 36% for Finland (Pajarinen and Rouvinen, 2014), 47% for Germany (Brzeski and Burk, 2015), and 47% for the United States (Frey and Osborne, 2013), to as high as 60% globally (Bughin et al., 2017).

While the digital transformation raises productivity and promotes trade, it could potentially generate labour market polarisation and inequality in both developed and developing countries.

Empirical research suggests that increased diffusion of advanced technologies (particularly computerisation and automation) has led to greater labour market polarisation (i.e., job polarisation) in various countries and contexts (Autor, Levy, and Murnane, 2003; Autor, Katz, and Kearney, 2006; Cavenaile, 2021; Harrigan, Reshef, and Toubal, 2021).<sup>1</sup> Technological diffusion creates labour-displacement effects, whereby capital and technology take over tasks previously performed by human labour. At the same time, rising automation seems to have contributed to the decline in the share of labour in value added (Grossman and Oberfield, 2022). Less skilled workers are most at risk of job displacements by robots and AI. The polarisation of the labour market due to automation is also mirrored to some extent in firm dynamics. Recent firm-level studies show widening gaps in productivity between frontier firms and so-called laggard firms (Calvino and Criscuolo, 2017; OECD, 2015; United Nations, 2017).

In developing countries and least developed countries (LDCs), there is a growing concern that greater adoption of skill-intensive technologies will spell a decline in terms of trade in as much as these countries export labour-intensive goods and services. This could potentially exacerbate a phenomenon of premature deindustrialisation whereby DX accelerates the disappearance of manual and routine jobs. Substantial evidence points to the effects that skill-intensive technologies such as robots and AI have on the comparative advantage of trading nations. Korinek, Schindler, Stiglitz (2021) argue, in this vein, that labour-saving technologies and AI will harm the terms of trade of developing countries and erode their comparative advantage in labour-intensive products, especially if it is based on cheap and unskilled labour.

We know that innovation in advanced countries often responds to factor prices there and may result in technologies that are not appropriate for developing nations, with their ample supplies of less skilled labour. Innovation in advanced countries arises in response to their specific circumstances and challenges, which are starkly different from those of developing countries. For example, innovation in seeds and pesticides in advanced countries with particular geographic features might not be applicable for the problems facing developing countries with their different geographies.

---

<sup>1</sup> However, to date, no robust and direct evidence exists that labour market polarisation *causes* a slowdown in technology diffusion to other firms in the economy.

Given the difference in capital availability between advanced countries and developing countries, productivity-enhancing technologies that rely heavily on capital investments might be of little use and may even be counterproductive in developing countries (Atkinson and Stiglitz, 1969; Basu and Weil, 1998; Stewart, 1987). Acemoglu and Zilibotti (2001) further argue that the technologies used in many LDCs have been designed to make optimal use of the skills available in developed countries. If developing countries lack these skills, there can be a technology-human capital mismatch. Even when there is equal access to the new technologies, the mismatch can lead to a sizeable difference in productivity and output per worker in different parts of the world. While international technological cooperation and diffusion should still generally be encouraged, the research findings serve as a reminder of the need to identify appropriate technologies that can be tailored to the circumstances in developing countries.

### 2.3. Rising Inequality

The adoption of industrial robots, automation, and AI is likely to have heterogeneous effects on the labour market in developed and developing countries. On the one hand, high-skilled workers employed in technology-intensive sectors and workers performing non-routine tasks may benefit as industrial robots leverage their inputs. On the other hand, workers with less education, especially those performing manual tasks on the production line, are most at risk.

Despite mixed evidence about the net effects of greater adoption of industrial robots and AI on certain segments of the labour market, there is no lack of consensus about the distributional implications of these technologies. Automation has undoubtedly contributed to the decline in the labour share of national income. Amongst workers, workers whose skills are complementary to the new technologies experience greater gains than less skilled workers, who stand to be displaced by industrial robots. The new occupations and tasks that AI will create will also likely benefit the more skilled and better educated members of the labour force. These likely effects of new technologies associated with DX come on the heels of more than 2 decades of wage divergence and threaten to increase the social tensions that the greater dispersion has already ignited.

In the absence of appropriate policies, we cannot always count on the private sector to strike the socially desirable balance in its technological choices, as labour-displacing technologies are in many circumstances preferred to labour-augmenting technologies for at least four reasons. First, innovation creates externalities that are unaddressed by markets. Second, businesses and large tech companies tend to focus on automation and eliminating the fallible human element from production processes. Third, the current policy stance on the use of capital relative to labour (i.e., subsidy on capital and tax on labour) generally distorts firms' technological decisions. Fourth, new technologies might require some critical complementary inputs that may not be currently accessible for some firms. Without appropriate policy intervention to deal with these perils, technological innovation and automation might contribute to wider inequality amongst workers and firms.

### 3. Key Challenges in DX and Digital Trade

In addition to concerns about inequality and the possibly adverse effects of new digital technologies on the least skilled, we face several other important challenges from DX and digital trade. One challenge relates to privacy. The fact that private individual information and data are exposed to services providers, including pervasive exchange of data, has fuelled concerns about the possible misuse of personal data.

A second challenge is cybersecurity. The expansion of rapid digitalisation and increased use of data by businesses and consumers for communication, digital trade, and as a source of access to information and innovation, comes with increased threats against data, against systems, and against people.

A third challenge relates to competition. Technological advancement, particularly digital technology, enables firms to produce and operate with massive economies of scale, creating opportunities for 'superstar firms' that are best able to make the investments. The advantage the technologies give to the largest firms potentially contributes to increased market concentration. In turn, higher concentration often reduce competition, raises markups, and can be a barrier to entry for micro, small, and medium-sized enterprises (MSMEs) and start-ups. Safeguarding competition in the digital era is, therefore, more important than ever before.

The fourth challenge concerns digital divide. Digitalised systems and digitally deliverable goods and services still account for lower shares of total trade in low- and middle-income countries than in other parts of the world. For example, only 2% of the population in low-income countries conducted digital trade in 2019 (UNCTAD, 2022). Countries, firms, and individuals vary greatly in their readiness for digital trade depending on their education, skills, and infrastructure. Bridging the digital divide is key to realising DX benefits in an inclusive manner.

### 4. Conclusions and Policy Recommendations

Industrial robots, automation, and AI have increased productivity and lowered production costs for many goods. These technologies offer tremendous potential to help realise the benefits of globalisation for otherwise left-behind groups, particularly MSMEs and geographically difficult-to-reach communities. Although these technologies sometimes substitute for less skilled labour in performing certain tasks, research shows that the induced productivity gains and associated expansion in output of firms that adopt the new technologies may more than offset the direct negative effects on less skilled workers. Furthermore, automation and AI can encourage greater international division of labour in global value chains and promote trade in AI-enabled services. But, as with all new technologies, there will be adjustment costs that policymakers must manage.

Despite the great potential offered by the new technologies, there are currently no comprehensive multilateral frameworks or principles for the conduct of innovations, business operations, and digital trade in goods and services;<sup>2</sup> or for dealing with privacy, cybersecurity, and the digital divide. The G20 provides an effective forum to resolve issues arising from automation and to

---

<sup>2</sup> The digital trade issue has only been discussed in bilateral or plurilateral fora while negotiating recent free trade agreements such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the United States–Mexico–Canada Agreement (USMCA).

ensure the best use of it. Along with the development of robots and AI, it is our responsibility to ensure that these technologies are human-centric and designed to generate shared improvements in human welfare. We can identify four important dimensions of the challenges posed by DX that the G20 might seek to address during Indonesia's presidency of the group.

First, the G20 should implement what it has already committed to in the fields of industrial robots, automation, and AI.<sup>3</sup> Instead of developing new work programmes, the G20 might start by following up on prior commitments and identify specific actions that would make the commitments workable. This includes (i) cooperation and support for digitalisation enablers, comprising the development of digital infrastructure and connectivity; (ii) protection of data privacy and the mitigation of digitalisation risks from a consumer protection standpoint; and (iii) the development of mapping and statistical measurement of the digital economy.

Second, to reduce the adoption cost of industrial robots, automation, and AI for businesses especially in the developing world, and to make these technologies commercially viable there, G20 members should cooperate to promote incentives for technological adoption by developing countries. This year, the G20 should update the Examples of National Policies to Advance the G20 AI Principles developed under Saudi Arabia's presidency. In addition, the G20 should continue to accelerate the implementation of global corporate tax reform. Such reform would end the race-to-the-bottom in corporate taxation and potentially help developing countries to receive more foreign direct investment, which may then contribute to their wider adoption of robots and AI technology. Of course, such incentives should be put under a broader supportive innovation and competition policy environment for thriving AI. This calls for better cooperation amongst G20 countries in providing incentives for the adoption of good technologies for developing countries.

Third, the G20 should improve the quality of key digital enablers for the adoption of industrial robots, automation, and AI. This includes digital infrastructure and the necessary technologies (i.e., electricity, broadband, cloud computing, big data, blockchain, IoT, 3D printing, and virtual interaction or production). Furthermore, the G20 should continue to develop a framework to address security and privacy issues. This is a fundamental and crucial enabler for wider adoption of industrial robots, automation, and AI since the development and deployment of robotic technology and AI feed on a massive amount of data transfer and exchange. From a technological perspective, the G20 should continue to strengthen international cooperation, particularly with respect to regulatory policy, the development of an international standard for responsible and trustworthy industrial robots, automation and AI technologies, research and development, and a framework on how to expand trade rules to accommodate robotics and AI technology standards (Kerry et al., 2021). This requires G20 commitments to ensure digital inclusiveness for all.

---

<sup>3</sup> This includes the G20 Leaders' recognition of the digitalisation wave and adoption of the G20 New Industrial Revolution Action Plan (2016), G20 Roadmap for Digitalisation (2017), G20 Menu of Policy Options for the Future of Work (2018), G20 Repository of Digital Policies (2018), G20 AI Principles (2019), G20 Examples of National Policies to Advance the G20 AI Principles (2020), G20 Roadmap Toward a Common Framework for Measuring the Digital Economy (2020), Policy Options to Support Digitalization of Business Models During COVID-19 (2020), G20 Policy Examples on How to Enhance the Adoption of AI by MSMEs and Start-Ups (2021), and G20 Menu of Policy Options on Digital Transformation and Productivity Recovery (2021).

Finally, we must recognise that the job of implementing and adapting to the massive changes that go along with digital transformation falls on *human capital*. Digital transformation is ultimately a people issue. The G20 should continue to promote efforts to improve preparedness for digital and AI technologies, both amongst the workforce and firms (especially MSMEs, women, and youth) to reduce the digital divide and to promote more inclusive digital participation. We can start by endorsing the implementation of the G20 Policy Examples on How to Enhance the Adoption of AI by MSMEs and Start-ups (G20, 2021). This involves promoting knowledge sharing and mutual learning to accelerate the implementation of industrial robots, automation, and AI for business resiliency. It is crucial for the G20 to further facilitate partnership between the private and public sectors to raise the pool of funds that can be used to reduce digital gaps and improve digital skills worldwide to ensure 'development for all'.

## References

- Acemoglu, D. (2022), 'The New (More) Inappropriate Technology', Presented at International Economic Association Panel 'Should "Appropriate Technology" be Revived?', 2 February. <http://www.iea-world.org/wp-content/uploads/2022/02/Presentation-Daron-Acemoglu.pdf> (accessed 22 March 2022).
- Acemoglu, D. and P. Restrepo (2019a), 'Automation and New Tasks: How Technology Displaces and Reinstates Labor', *Journal of Economic Perspectives*, 33(2), pp.3–30.
- Acemoglu, D. and P. Restrepo (2019b), 'The Wrong Kind of AI? Artificial Intelligence and the Future of Labour Demand', *Cambridge Journal of Regions, Economy, and Society*, 13(1), pp.25–35.
- Acemoglu, D. and F. Zilibotti (2001), 'Productivity Differences', *The Quarterly Journal of Economics*, 116(2), pp.563–606.
- Ackigit, U. and S.T. Ates (2021), 'Ten Facts on Declining Business Dynamism and Lessons from Endogenous Growth Theory', *American Economic Journal: Macroeconomics*, 13(1), pp.257–98.
- Agrawal, A., J.S. Gans, and A. Goldfarb (2019), 'Artificial Intelligence: The Ambiguous Labor Market Impact of Automating Prediction', *Journal of Economic Perspectives*, 33(2), pp.31–50.
- Ahmed, N., A. Marriott, N. Dabi, M. Lowthers, M. Lawson, and L. Mugehera (2022), 'Inequality Kills: The Unparalleled Action Needed to Combat Unprecedented Inequality in the Wake of COVID-19', *OXFAM Briefing Paper*.
- Ahmedov, I. (2020), 'The Impact of Digital Economy on International Trade', *European Journal of Business and Management Research*, 5(4), pp.1–7.
- Andrews, D., C. Criscuolo, and P. Gal (2016), 'The Best Versus the Rest: The Global Productivity Slowdown, Divergence Across Firms and the Role of Public Policy', *OECD Productivity Working Papers*, No. 5. Paris: Organisation for Economic Co-operation and Development.
- Ark Invest (2021), Data on Average Cost of Industrial Robots. Retrieved from Statista. <https://ark-invest.com/articles/analyst-research/industrial-robot-cost-declines/> (accessed 27 September 2021).
- Artuc, E., L. Christiaensen, and H. Winkler (2019), 'Does Automation in Rich Countries Hurt Developing Ones? Evidence from the U.S. and Mexico', *Policy Research Working Paper*, No. 8741. Washington, DC: World Bank.



- Atkinson, A.B. and J.E. Stiglitz (1969), 'A New View of Technological Change', *The Economic Journal*, 79(315), pp.573–78.
- Autor, D.H., L.F. Katz, and M.S. Kearney (2006), 'The Polarization of the U.S. Labor Market', *American Economic Review*, 96(2), pp.189–94.
- Autor, D.H., F. Levy, and R.J. Murnane (2003), 'The Skill Content of Recent Technological Change: An Empirical Exploration', *The Quarterly Journal of Economics*, 118(4), pp.1279–333.
- Baldwin, R. (2019), *The Globotics Upheaval: Globalization, Robotics, and the Future of Work*. Oxford: Oxford University Press.
- Basu, S. and D.N. Weil (1998), 'Appropriate Technology and Growth', *The Quarterly Journal of Economics*, 113(4), pp.1025–54.
- Brzeski, C. and I. Burk (2015), 'The Robots Come: Consequences of Automation for the German Labour Market', *ING DiBa Economic Research*.
- BSR (2017), *Automation: A Framework for a Sustainable Transition*. <https://www.bsr.org/en/our-insights/report-view/automation-sustainable-transition-jobs-workforce>.
- Bughin, J. et al. (2017), 'Jobs Lost, Jobs Gained: What the Future of Work Will Mean for Jobs, Skills, and Wages', *McKinsey Global Institute Report*.
- Calvino, F. and C. Criscuolo (2022), 'Gone Digital: Technology Diffusion in the Digital Era', Brookings Up Front Blog, 20 January.
- Cavenaile, L. (2021). 'Offshoring, Computerization, Labor Market Polarization and Top Income Inequality', *Journal of Macroeconomics Vol. 69*.
- Cockburn, I.M., R. Henderson, and S. Stern (2019), 'The Impact of Artificial Intelligence on Innovation: An Exploratory Analysis', in A.K. Agrawal, J. Gans, and A. Goldfarb (eds.) *The Economics of Artificial Intelligence: An Agenda*. Chicago: Chicago University Press, pp.115–46.
- Frey, C.B. and M.A. Osborne (2013), 'The Future of Employment: How Susceptible Are Jobs to Computerisation?', *Oxford Martin School Working Paper*. Oxford: Oxford Martin Programme on Technology and Employment.
- Furman, J. and R. Seamans (2019), 'AI and the Economy', *Innovation Policy and the Economy*, 19(1), pp.161–91.

- G20 (2021), 'Declaration of G20 Digital Ministers: Leveraging Digitalisation for a Resilient, Strong, Sustainable and Inclusive Recovery', Annex 1: G20 Policy Examples on How to Enhance the Adoption of AI by MSMEs and Start-ups, Trieste, 5 August. <http://www.g20.utoronto.ca/2021/210805-digital.html#annex1> (accessed 21 January 2022).
- Grossman, G.M, and E. Oberfield (2022), 'The Elusive Explanation for the Declining Labor Share', *Annual Review of Economics*, 14, forthcoming.
- Hallward-Driemeier, M. and G. Nayyar (2018), *Trouble in the Making? The Future of Manufacturing-Led Development*. Washington, DC: World Bank.
- Hardoon, D., S. Ayele, and R. Fuentes-Nieva (2016), 'An Economy for the 1%', *OXFAM Briefing Paper*.
- Harrigan, J., A. Reshef, and F. Toubal (2021), 'The March of the Techies: Job Polarization Within and Between Firms', *Research Policy*, 50(7), 104008.
- IDC (2020), 'Worldwide Digital Transformation Spending Guide'. [https://www.idc.com/getdoc.jsp?containerId=IDC\\_P32575](https://www.idc.com/getdoc.jsp?containerId=IDC_P32575).
- IFR (2020), *World Robotics Report 2020*. Frankfurt: International Federation of Robotics.
- IFR (2021), 'Executive Summary: World Robotics 2021 Industrial Robots'. Frankfurt: International Federation of Robotics.
- Ing, L.Y. and G. Grossman, eds. (2022), *Robots and AI: A New Economic Era*. Oxon and New York: Routledge.
- ITU (2017), 'Social and Economic Impact of Digital Transformation on the Economy', *GSR-17 Discussion Paper*. Geneva: International Telecommunication Union.
- Kerry, C.F., J.P. Meltzer, A. Renda, A.C. Engler, and R. Fanni (2021), 'Strengthening International Cooperation on AI: Progress Report'. Washington, DC: Brookings.
- Korinek, A., M. Schindler, and J.E. Stiglitz (2021), 'Technological Progress, Artificial Intelligence, and Inclusive Growth', *IMF Working Paper*, No. 2021/166. Washington, DC: International Monetary Fund.
- Micco, A. (2019), 'Automation, Labor Markets, and Trade', *University of Chile Department of Economics Working Paper Series*, No. 486. Santiago de Chile: University of Chile.
- Myovella, G., M. Karacuka, and J. Haucap (2019), 'Digitalization and Economic Growth: A Comparative Analysis of Sub-Saharan Africa and OECD Economies', *Telecommunications Policy*, 44(2), 101856.

- OECD (2015), *The Future of Productivity*. Paris: Organisation for Economic Co-operation and Development.
- OECD (2016), 'Automation and Independent Work in a Digital Economy', *Policy Brief on The Future of Work*. Paris: Organisation for Economic Co-operation and Development.
- OECD (2021a), *Bridging Digital Divides in G20 Countries*. Paris: Organisation for Economic Co-operation and Development.
- OECD (2021b), *Development Co-operation Report 2021: Shaping a Just Digital Transformation*. Paris: Organisation for Economic Co-operation and Development.
- OECD (2021c), *OECD Business and Finance Outlook 2021: AI in Business and Finance*. Paris: Organisation for Economic Co-operation and Development.
- OECD (2021d), 'What Happened to Jobs at High Risk of Automation?', *Policy Brief on The Future of Work*. Paris: Organisation for Economic Co-operation and Development.
- Pajarinen, M. and P. Rouvinen (2014), 'Computerization Threatens One Third of Finnish Employment', *ETLA Brief*, No. 22. Helsinki: ETLA Economic Research.
- Stanford University (2021), 'The Economy', in *Artificial Intelligence Index Report 2021*. Stanford: Stanford University, pp.80–106.
- Statista (2022), Retail E-Commerce Sales Worldwide from 2014 to 2025. <https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/> (accessed 24 March 2022).
- Stewart, F. (1987), 'The Case for Appropriate Technology: A Reply to R.S. Eckaus', *Issues in Science and Technology*, 3(4), pp.101–09.
- Taddy, M. (2018), 'The Technological Elements of Artificial Intelligence', *NBER Working Paper Series*, No. 24301. Cambridge, MA: National Bureau of Economic Research.
- UNCTAD (2022), 'Digital Trade: Opportunities and Actions for Developing Countries', *UNCTAD Policy Brief*, No. 92. Geneva: United Nations Conference on Trade and Development.
- United Nations (2017), 'Frontier Issues: The Impact of the Technological Revolution on Labour Markets and Income Distribution'. New York: United Nations Department of Economic and Social Affairs.
- World Economic Forum (2018), 'Digital Transformation Initiative: Maximizing the Return on Digital Investments'. Geneva: World Economic Forum.

World Economic Forum (2020), *The Future of Jobs Report 2020*. Geneva: World Economic Forum.

# Chapter 8

## The Technology Gap in the Developing World and the G20: An Empirical Profile

Haroon Borat, Caitlin Allen Whitehead, and David de Villiers

### 1. Introduction

The Fourth Industrial Revolution refers to the rapid technological advancement launched, in many ways, by the microelectronics revolution and the information and communication technology (ICT) advances that ensued in the 1970s (Baldwin, 2019). These new technologies have significantly impacted on the sectors and workplaces of domestic economies around the world. The pace of change is likely to accelerate with the introduction of frontier technologies such as artificial intelligence (AI), the internet of things (IoT), big data, blockchain, 5G, 3D printing, robotics, drones, gene editing, nanotechnology, and solar photovoltaic. These 11 technologies alone are estimated to represent a US\$350 billion market which could grow to US\$3.2 trillion by 2025 (UNCTAD, 2021).

We introduce the notion of a ‘technology gap’ at the country and regional level and measure its evolution since 2000, with a distinct focus on the features of both technology adoption and technology production – which may be differentially driving overall country and regional trends in this gap. Additionally, we measure the accumulation of tertiary education focused on STEM subjects – and how this shapes the technology gap in the developing world.

Our model assumes that the technology gap is a function of country and region-level endowments (and changes in these endowments) in the adoption of technology, production of technology, and human capital accumulation. Simply:

$$TG_i = f(TA_i, TP_i, HK_i) \quad (1)$$

$TG_i$  represents the technology gap at the country or regional level  $i$ ; and  $TA_i$ ,  $TP_i$ , and  $HK_i$  are technology adoption, production, and human capital at country or region  $i$  – all of which empirically coalesce into a measure of  $TG_i$ . The composite measure of the technology gap is presented through the application of the Alkire-Foster Multi-Dimensional Poverty Index widely used in poverty studies (Alkire and Foster, 2011). Hence, our proposed  $TG$  measure involves deriving a threshold ‘technology poverty line’ – which we set as the mean for each indicator – and then estimating the mean normalised gap for each subgroup’s deviation from this technology line. The

two key measures for our technology gap index are denoted as  $TG_0$  and  $TG_1$ .  $TG_0$  measures the proportion of countries that can be denoted as below the global mean for the given measure of technology.  $TG_0$  is analogous to the headcount index in household poverty estimates.  $TG_1$  measures the average distance below the technology gap line. The summary measures – our Alkire-Foster technology gap index – thus allow for an assessment of the changing nature of technology vulnerability in the developing world and the G20 over time.

## 2. Technology Adoption and Production: Stylised Facts

Table 8.1 shows that on average, internet usage has rapidly expanded from 2000 to 2020. Hence, the number of internet users per 100 individuals in the world has increased fivefold from an average of 11 internet users per 100 over 2000–2003 to 55 users per 100 in 2016–2020 – an average annual growth (AAG) rate of 10% per year consistently for two decades in the world economy. Particularly noteworthy is how low-income countries exhibited the highest growth rates – at about 30% per annum – in internet usage rates. Yet, disparities remained large in 2020: whilst internet usage rates exceed 80% for high-income economies and are close to this rate for the G20 – they remain below 15% for low-income countries and less than 35% for lower middle-income countries. If we accept that the countries require internet capabilities to engage with frontier technologies, we conclude that inequitable internet usage could hinder technology adoption and have a spillover effect on an economy’s ability to produce new technologies, thereby creating a technology gap on both fronts.

**Table 8.1: Average Technology Adoption Rates by Country Income Classification and in the G20, 2000–2020**

Country group	Average no. of internet users (per 100 people)			Average ICT goods imports (% of total goods imports)		
	Year	2000– 2003	2016– 2020	% change p.a.	2000– 2003	2016– 2020
High income	31.59	84.28	6.13	11.14	9.35	–1.06
Upper middle income	5.54	58.61	15.37	8.57	6.95	–1.26
Upper middle income (excl. China)	5.57	59.96	15.49	8.22	6.63	–1.29
Lower middle income	1.30	34.84	22.05	5.19	4.95	–0.29
Low income	0.19	12.41	28.83	3.77	3.13	–1.12
G20	23.42	76.72	7.46	11.81	8.61	–1.90
World	10.99	54.86	10.23	7.98	6.87	–0.90

ICT = information and communication technology, p.a. = per annum.

Source: Authors’ calculations based on World Bank (various years), World Development Indicators. <https://databank.worldbank.org/source/world-development-indicators> (10 December 2021).

Table 8.1 also contains data for our second indicator of technology adoption: ICT goods imports as a percentage of total goods imports. Whilst there are income level differences in ICT import shares, these are not as stark as internet usage rates. Additionally, ICT import shares did not change substantially over the 20-year period. Interestingly, all regions of the world reveal a slight contraction in the share of ICT imports in total goods imports. For high-income countries, the

average share of ICT imports was 11% over 2000–2003 – less than 3 percentage points higher than for upper middle-income countries. This difference had not changed substantially two decades later.

In terms of our second measure of the technology gap – technology production – Table 8.2 estimates the number of patent applications by residents since 2000. Global average data show that the total number of patent applications increased from about 820,000 in 2000 to more than 2.1 million by 2019 (World Bank, various years), representing a 2.5-fold increase in patent application activity in the world economy. These data show a clear and stark divide between higher- and lower-income countries’ tepid patent application performance relative to China’s massive increase over the same period. Table 8.2 thus shows that in the early period, the average number of patent applications by residents in high-income countries was about 20,000, dropping to about 500 for lower middle-income countries – and ultimately falling to a paltry 41 patents on average for low-income countries. Patent applications in China during 2000–2003 totalled about 25,000, increasing by 23% per year to reach 1.2 million by 2019 (World Bank, 2000-2003). Put differently, China’s patent applications as a share of the global total increased from 3% in 2000 to 58% in 2019. It is notable that the upper middle-income sample including China records a patent application annual growth rate of 17% compared with a marginal decline in high-income countries and a growth rate of 1% in the G20. This measure of technology production reveals a clear widening of digital inequality, as low-income and indeed middle-income country (excluding China) patent numbers have not only grown slowly but on average are at levels ranging from 13 to 320 times less than the number of patent applications in high-income economies.

**Table 8.2: Average Technology Production Rates by Country Income Classification and in the G20, 2000–2020**

Country group	Average number of patent applications, by residents ('000)			Average high-tech exports (% of manufactured exports)		
	2000–2003	2016–2020	% change p.a.	2004–2007	2016–2020	% change p.a.
High income	19,861.13	18,895.69	–0.30	15.22	15.04	–0.10
Upper middle income	2,679.25	38,480.31	17.53	8.77	9.56	0.69
Upper middle income (excl. China)	1,359.23	1,381.43	0.10	7.76	9.00	1.19
Lower middle income	521.33	1491.17	6.58	3.00	7.34	7.42
Low income	41.68	68.54	1.70	0.50	5.20	20.60
G20	43,468.64	112,104.70	5.91	15.06	15.30	0.13
World	9,269.35	19,888.24	4.74	11.42	10.20	–0.90

p.a. = per annum.

Source: Authors’ calculations based on World Bank (various years), World Development Indicators. <https://databank.worldbank.org/source/world-development-indicators> (10 December 2021).

As with patent applications, there is strong variation in the average share of high-tech exports by income group, with the share increasing by country group income level. There are some positive

trends, though, as the lower middle-income and low-income country growth rates in high-tech exports were the highest in the world economy over the period.

Table 8.3 provides estimates of the global Gini coefficient for our two measures: technology adoption and technology production. We see that in 2000, the measure of global inequality of internet usage was very high – with a Gini of 0.63. However, this Gini of internet usage declined steadily to its current value of 0.32 in 2016–2020. The extent of the decline in internet usage inequality is more pronounced when limiting the sample to G20 countries, with the Gini index shrinking by 5.7% p.a. from 0.48 to 0.15 over the period. Inequality in ICT goods imports notably is about half of that for internet usage at the start of the period, at 0.39. It also declines over the period, albeit at a rate of only 0.5% p.a., to reach a Gini of 0.35.

**Table 8.3: Gini Coefficient of Technology Adoption and Production Rates, World and G20**

TG measure	Technology adoption		Technology production	
Period	Internet users (per 100 people)	ICT goods imports (% of total goods imports)	Patent applications, by residents	High-tech exports (% of manufactured exports)
Full sample				
2000–2003	0.63	0.39	0.93	-
2004–2007	0.58	0.36	0.93	-
2008–2011	0.49	0.34	0.92	0.47
2012–2015	0.39	0.35	0.94	0.46
2016–2020	0.32	0.35	0.95	0.45
<i>% change p.a.</i>	<i>-3.33</i>	<i>-0.54</i>	<i>0.11</i>	<i>-0.36</i>
G20 countries				
2000–2003	0.48	0.25	0.79	-
2004–2007	0.39	0.22	0.77	0.36
2008–2011	0.28	0.20	0.75	0.33
2012–2015	0.19	0.21	0.80	0.32
2016–2020	0.15	0.21	0.83	0.33
<i>% change p.a.</i>	<i>-5.65</i>	<i>-0.87</i>	<i>0.25</i>	<i>-0.54</i>

ICT = information and communication technology, p.a. = per annum, TG = technology gap.

Source: Authors' calculations based on World Bank (various years), World Development Indicators. <https://databank.worldbank.org/source/world-development-indicators>.

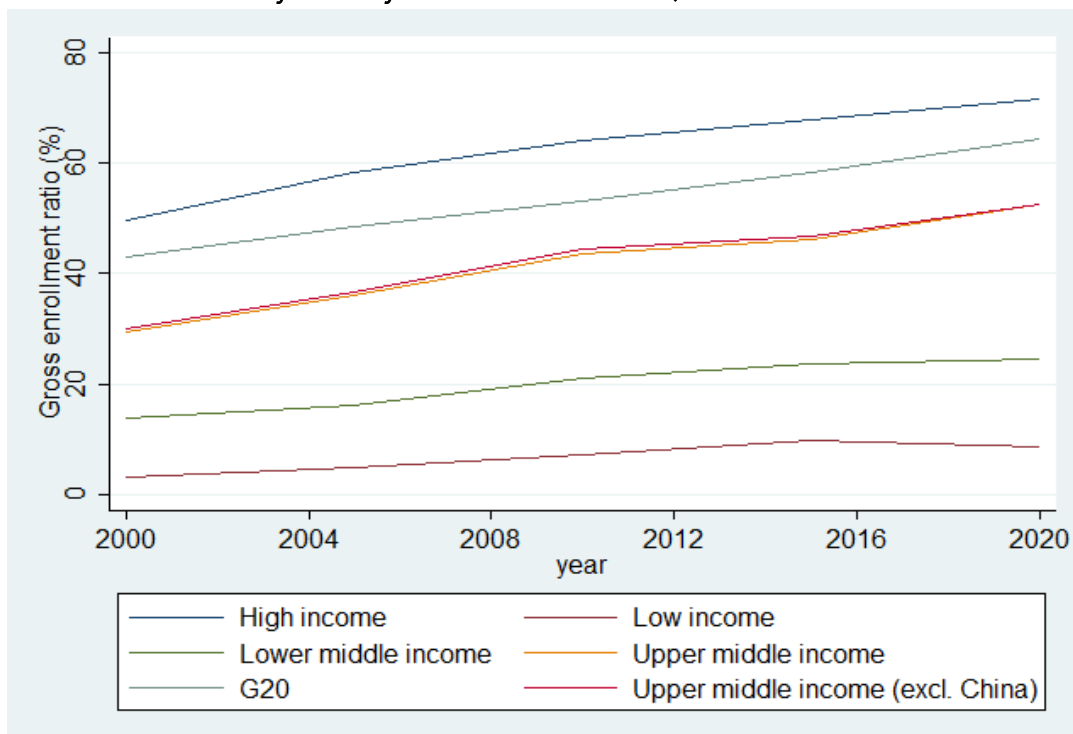
In terms of technology production, inequality of patent applications yields an extraordinary Gini of 0.93 in 2000, which increases over the period to reach 0.95 by 2020. The results for the G20 are no different as the Gini rises from 0.79 to 0.83 over the period. Inequality in technology production, as measured by high-tech exports as a share of manufactured exports, is represented by a Gini index 0.47 in the 2008–2011 period and shows a marginal decrease over the period. The G20 Gini index for high-tech exports is about 0.36 in 2004–2007, decreasing to 0.33 over the period. Whilst these data suggest that there have been marginal gains in reducing technology production inequality, this has been overwhelmed by the very high and sticky Gini for patent applications.



### 3. Human Capital Accumulation for Technology Production

Figure 8.1 shows average tertiary education gross enrolment ratios (GERs) for countries by income level over 2000–2020. We observe distinctly lower levels of tertiary GERs for lower middle-income and low-income countries – less than 25% for both groups – a trend that does not change significantly over the reporting period. In contrast, the tertiary GER for the upper middle-income countries ranges from 30% to 50%, while high-income countries have a tertiary GER of about 10 times that of low-income countries. Limiting the sample to G20 countries, the tertiary GER is between 40% and 65%.

Figure 8.1: Average Tertiary Education Gross Enrolment Ratios by Country Income Classification, 2000–2020



Source: Authors' calculations based on World Bank (2000–2021), World Development Indicators. <https://databank.worldbank.org/source/world-development-indicators>

Whilst a steady increase in tertiary GER is observed for all income groups – even lower middle-income and low-income countries – this did not result in a narrowing of the GER gaps by country income level.

Using the QS World University Rankings database (QS, various years), Table 8.4 provides data on the top 500 higher educational institutions by subject and income level. The data illustrate a significant maldistribution in the quality of higher education institutions in STEM fields in the world economy: more than 80% of the top 500 ranked universities in STEM fields in the world are in high-income countries, with an additional 16% located in upper middle-income countries.

**Table 8.4: Top 500 Educational Institutions by Subject and Country Income Classification, 2021**

Country group	Eng. & tech. (no.)	Share (%)	Natural sciences (no.)	Share (%)	Life sciences and medicine (no.)	Share (%)	Total STEM (no.)	Share (%)
High income	393	75.58	400	79.84	426	84.86	1,219	80.04
Upper middle income	96	18.46	81	16.17	64	12.75	241	15.82
Upper middle income (excl. China)	58	11.15	46	9.18	37	7.37	141	9.26
Lower middle income	31	5.96	20	3.99	11	2.19	62	4.07
Low income	0	0.00	0	0.00	1	0.20	1	0.07
G20	362	69.62	368	73.45	365	72.71	1,095	71.90
Total*	520	100.00	501	100.00	502	100.00	1,523	100.00

Notes: \* Counting G20 countries once only.

Source: Authors' calculations based on QS World University Rankings by Subject, Institution, and Country (QS, 2022).

Put differently, 1,219 of the 1,523 best STEM universities in the world are in high-income countries; only one is in a low-income country and only 62 are in lower middle-income countries. There are about 8.6 times more top 500 STEM-field universities in high-income countries relative to upper middle-income economies outside of China. It is noteworthy that these shares do not change when examining subfields within STEM categories of data.

In trying to measure the extent of inequality in human capital accumulation, we present the Gini coefficient for tertiary GERs and QS STEM field rankings in Table 8.5. Whilst inequality in GERs for tertiary education has declined, inequality in quality differentials for the global sample has actually increased.

**Table 8.5: Gini Coefficient of Human Capital Accumulation, Tertiary GERs, and STEM Field Rankings: The World and the G20**

TG measure	Human capital accumulation	
	Tertiary GER	QS-ranked STEM fields
	Full sample	
2000–2003	0.45	-
2004–2007	0.44	0.60
2008–2011	0.42	0.63
2012–2015	0.37	0.61
2016–2020	0.34	0.61
<i>% change p.a.</i>	<i>-1.60</i>	<i>0.17</i>
	G20 countries	
2000–2003	0.32	-
2004–2007	0.31	0.58
2008–2011	0.28	0.61
2012–2015	0.23	0.54
2016–2020	0.22	0.53
<i>% change p.a.</i>	<i>-2.17</i>	<i>-0.79</i>

GER = gross enrolment ratio, p.a. = per annum, TG = technology gap.

Source: Authors' calculations based on QS World University Rankings by Subject, Institution, and Country (QS, 2022).

Whilst there has been a narrowing in inequality in both human capital measures in the G20, the reduction has been much slower in terms of the QS rankings (quality differences) than that of tertiary GER (quantity differences).

#### 4. An Integrated Global Technology Gap Index

Following the procedure to estimate the technology gap index described above, the headline result from Table 8.6 is that, for 2016–2020, 61% of countries in the global sample are classified as having a 'technology gap'. This estimate of the global technology gap declined from 72% in 2000 to 61% in 2020. The smallest gap is found in technology adoption, with 54% of global economies yielding a technology gap. Close to 70% of the global sample report a technology production gap. This persistence is driven by the significant country-level maldistribution in patent applications.

Table 8.6. An Alkire-Foster Global Technology Gap Index, 2000–2020

Period	Adoption	Production	Education	Total
Headcount index ( $TG_0$ )				
2000–2003	0.70	0.90*	0.55**	0.72
2004–2007	0.68	0.75	0.72	0.72
2008–2011	0.62	0.75	0.68	0.68
2012–2015	0.57	0.75	0.54	0.62
2016–2020	0.54	0.68	0.61	0.61
<i>% change p.a. 2004–2007 to 2016–2020</i>	<i>-1.84</i>	<i>-0.81</i>	<i>-1.27</i>	<i>-1.28</i>
Technology gap ( $TG_1$ )				
2000–2003	0.44	0.83*	0.34**	0.48
2004–2007	0.38	0.61	0.62	0.52
2008–2011	0.32	0.56	0.57	0.48
2012–2015	0.28	0.58	0.40	0.41
2016–2020	0.26	0.60	0.53	0.46
<i>% change p.a. 2004–2007 to 2016–2020</i>	<i>-3.06</i>	<i>-0.12</i>	<i>-1.23</i>	<i>-1.11</i>

p.a. = per annum.

Notes:

\* Excludes high-tech exports.

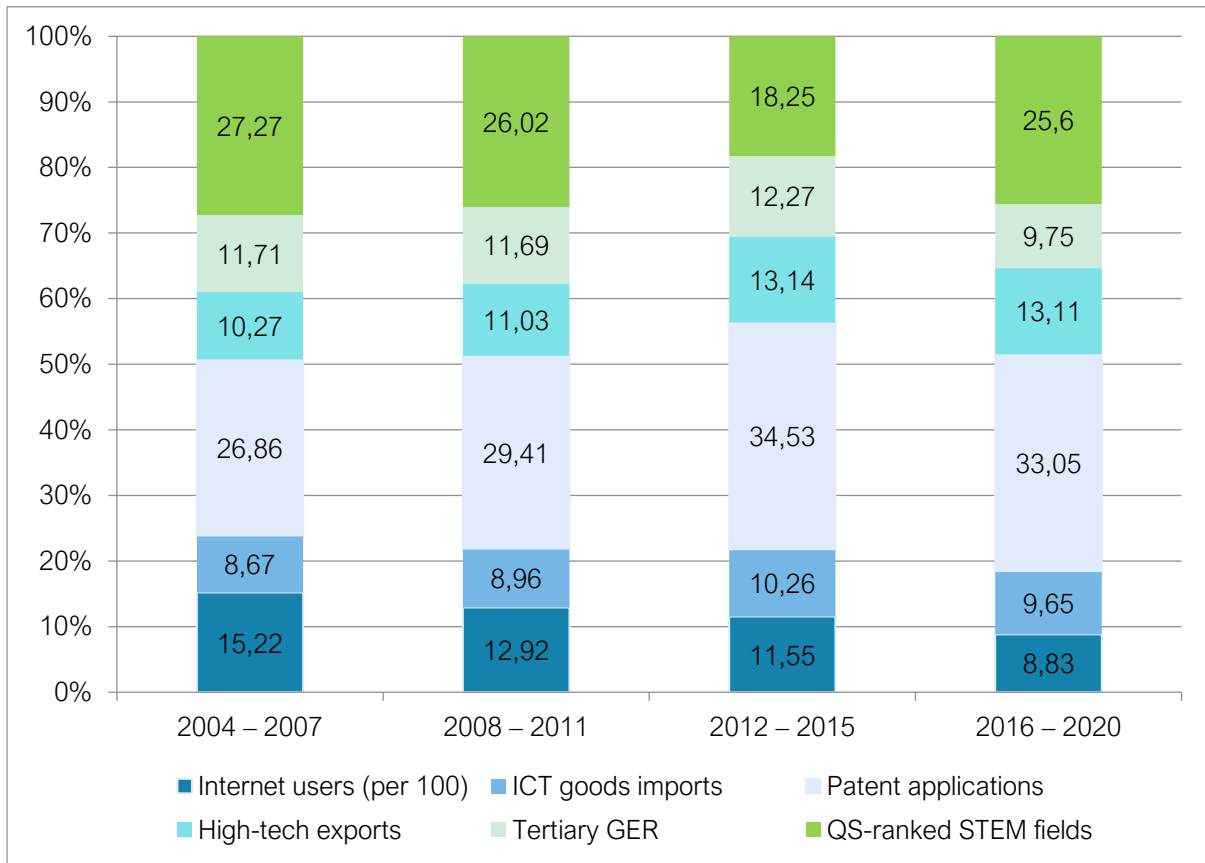
\*\* Excludes the number of top 500 QS ranked universities.

Sources: Authors' calculations based on World Bank (various years), World Development Indicators. <https://databank.worldbank.org/source/world-development-indicators>; and World Bank (various years), Education Statistics (EdStats). <https://datatopics.worldbank.org/education/>

The average technology gap or  $TG_1$  results are instructive. On average, the data show that the global average technology gap has declined from 0.52 to 0.46. This means that even though countries have remained 'poor' in the technology dimension, their position relative to the technology gap line has improved or narrowed. The largest reduction in this relative gap remains in the area of technology adoption, followed by human capital improvements. There has been no change in the relative technology production gap.

Figure 8.2 estimates the percentage contribution made by each of the individual six indicators to the overall Alkire-Foster technology gap index. The highest contributor to the index in the initial period is the QS ranking of STEM fields. During 2004–2007, about 27% of global technology vulnerability was due to disparities in the quality of STEM-offering higher education institutions across the world. Nevertheless, the QS share declined over time. For the full period under review, patent applications constitute the largest share of the overall technology gap in the world economy – ranging from 27% to 35% for the two decades since 2000. Ultimately, differences in STEM field rankings and patent applications together have consistently accounted for more than half of the overall technology gap.

Figure 8.2: Average Contribution by Indicator to the Technology Gap Index, 2000–2020



GER = gross enrolment rate, ICT = information and communication technology.

Source: Authors' calculations based on World Bank (various years), World Development Indicators. <https://databank.worldbank.org/source/world-development-indicators>; and World Bank (various years), Education Statistics (EdStats). <https://datatopics.worldbank.org/education/>.

In terms of technology adoption – through internet usage and ICT imports – these variables declined in importance over the period, suggesting again that technology adoption rates have served to reduce the overall technology gap in the developing world. Whilst GER enrolment rates have declined as a contributor to the technology gap, these are overshadowed by the inertial trends in STEM rankings. Finally, as an element of technology production, exports of high-tech goods – although less important for fuelling the gap – edged up to account for 13% of the global technology gap.

## 5. Policy Recommendations

We concentrate here on the policy proposals emanating from the core focus of this chapter: (i) improvements to internet usage at the firm and household level; (ii) technology policy solutions designed to ultimately increase patent applications; and (iii) a higher education strategy that is biased towards STEM-aligned graduates.

First, on improvements to internet usage in low-income and lower middle-income countries, work by Brookings and *Our World in Data* indicate that an individual who cannot afford a basic package of connectivity – which their empirical estimates set at 1.5 gigabytes (GB) per month, at a minimum download speed of 3 megabits per second (Mbps) – should be defined as internet poor (Cuaresma et al., 2021). The analysis suggests that pricing rather than provision of infrastructure lies at the heart of improving and increasing internet usage rates in low-income countries. The policy prescription is clear: low- and middle-income countries should prioritise pricing by encouraging enhanced competitiveness amongst large telecommunications and data providers as well as regulation, to encourage and facilitate the provision of cheaper data packages for poor households either at the individual or firm level.

In terms of the patent gap, increased patent registrations require the introduction of an innovation policy package that ranges from higher education institutions and linked research divisions to small and medium-sized enterprises (SMEs) and finally large dominant firms. If one thinks of this as a discrete technology policy approach, domestic policy design could focus segmentally on higher education institutions; microenterprises; SMEs; and larger, more dominant, high-productivity export-oriented firms. In each segment, arguably a different mix of policy options would be required.

In the case of higher education institutions, the clear metric here is the national government expenditure on research and development (R&D). Tertiary institutions lie at the heart of early innovation and new technologies, which can ultimately drive key technology breakthroughs. Most developing economies spend insufficiently on R&D, particularly in the STEM fields. Such R&D support should be extended to include support and guidance to universities on management and internalising of the potential gains from research and innovative ideas in the STEM fields.

Linked to this is the need for governments to have a well-funded technology and innovation centre, which is focused on isolating ideas that the market may not initially value or where venture capital funds can partner with such a government-run innovation centre. Such public-private partnerships could bring universities, governments, and the private sector into a growth-enhancing partnership. Technology and innovation centres that are funded and run by the government are often an after-thought or do not exist in many developing countries.

In the case of firm-based support, microenterprises – particularly low-productivity firms in many developing countries – would require support designed to reduce the cost of technology adoption. This support could involve subsidised internet costs, together with active government support for the delivery of frugal innovation solutions to firms operating in poorer communities.

For higher-productivity, formal SMEs, governments should also consider subsidising the cost of technology, perhaps in a slightly more targeted form. Many of these SMEs lie at the heart of generating frugal innovative solutions and adaptive technologies in developing country settings. The government's role here would be to support initiatives through supply-side incentives designed to encourage new local technological innovation to solve issues that foreign technology firms do not address.

Finally, large, often export-oriented, firms require a more nuanced support package from governments. These could range from healthy tax breaks to venture capital funds focused on new and adaptive technology solutions as well as explicitly encouraging firms to internalise the gains from knowledge spillovers and transfers from foreign direct investment.

In the area of higher education, two clear interventions should anchor government support: first, a focus on increasing the number of STEM field offerings in university programmes. Tuition costs, in terms of government subsidies for STEM courses, should strongly reflect these preferences; and second, it is also critical that such a special focus on the quantity of STEM graduates be combined with an attempt at increasing the quality of these programmes. Quick wins may be possible here. For example, a strategy followed by a number of East Asian economies is to enter into arrangements with the top 500 STEM universities in developed economies, wherein students from developing economies take advantage of exchange and/or knowledge transfer opportunities at top STEM institutions. Government bursary programmes could facilitate such students' access to these programmes.

## 6. Conclusion

First, internet usage has risen dramatically, yet the headcount and the relative gap measures of internet usage are still very high in poorer countries. Second, patent applications yield inordinately high levels of inequality – reflected in the dominance of China and high-income countries. Patent registrations as one of proxies of technological gap recorded significant divide across countries. Third, whilst there are income gaps in tertiary education enrolment rates, the data show that inequality in the QS rankings of STEM fields looms large as a key driver of the technology gap. The contribution of this variable to the overall global technology gap is 26%, with this measure's headcount index high for most categories of economies in the global sample. Taken together, the global and regional level analysis of the technology gap confirms that patent applications and STEM rankings jointly shape and drive the technology gap in the world economy.

## References

- Alkire, S. and J. Foster (2011), 'Counting and Multidimensional Poverty Measurement', *Journal of Public Economics*, 95(7–8), pp.476–87.
- Baldwin, R. (2019), *The Globotics Upheaval: Globalization, Robotics, and the Future of Work*. New York: Oxford University Press.
- Bhorat, H, R. Kanbur, B. Stanwix, and A. Thornton (2021), 'Measuring Multi-Dimensional Labour Law Violation with an Application to South Africa', *British Journal of Industrial Relations*, 59(3), pp.928–61.
- Cuaresma, J.C., M. Fengler, K. Fenz, H. Kharas, and L. Saenger (2021), 'Measuring Internet Poverty', Brookings, 26 July. <https://www.brookings.edu/blog/future-development/2021/07/26/measuring-internet-poverty/> (accessed 15 March 2022).
- QS (various years), QS World University Rankings. <https://www.topuniversities.com/university-rankings/world-university-rankings/2022> (accessed 1 March 2022).
- UNCTAD (2021), *Technology and Innovation Report 2021: Catching Technological Waves – Innovation with Equity*. Geneva: United Nations Conference on Trade and Development.
- UNIDO (2019), *Industrial Development Report 2020: Industrializing in the Digital Age*. Vienna: United Nations Industrial Development Organization.
- World Bank (various years), *World Development Indicators*. <https://databank.worldbank.org/source/world-development-indicators>



# Chapter 9

## Inclusive Growth:

### What Key Specific Actions that are Feasible for the G20 Acting in Concert would Help the Poorest Countries Escape from Mass Poverty?

Paul Collier

*What Key Specific Actions that are Feasible for the G20 Acting in Concert would Help the Poorest Countries Escape from Mass Poverty?*

#### 1. Why is this question of overriding importance?

##### *Making sense of the recent evidence*

Every country has some unique characteristics, and to adapt Tolstoy's famous phrase, while affluent countries are all similar, those poor countries diverging from the rest of humanity are each 'unhappy' in their own way. However, to avoid drowning in detail, I am going to compress both countries and time into three groups.

The bottom billion are a group of around 60 poor countries which have been diverging from the rest of humanity. I will argue that they have been trapped more fundamentally: they face economic, political, and social hurdles, one or more of which they have been unable to overcome. In consequence, that are not even able to ignite a transition: the journey out of mass poverty.

The original analysis was done in *The Bottom Billion* (Collier, 2007). The countries faced the common symptom of poverty and divergence but were found in each continent, albeit with particular concentrations in Africa and Central Asia. The data for that book ended in 2003, and in my current work I have been able to update it. I can now show that the countries of the bottom billion have continued to diverge.

The country groups will be (i) the bottom billion, as used in my original book; (ii) the advanced countries – the affluent billion – as defined by membership of the Organisation for Economic Co-operation and Development (OECD); and (iii) the emerging market economies, which cover around 5 billion people from a vast range of countries such as Brazil, China, India, Indonesia, Turkey, and Viet Nam. This picks up a core argument of the book that the concept of 'developing country' was no longer fit for purpose: we needed to focus on the minority of countries, with about a billion people, where the biggest obstacles were to be found. This enables us to see whether the big story since 2003 has been divergence or convergence.

Similarly, I simply divide the time periods into four phases, designed to fit the distinctive episodes important for the bottom billion. They are the pre-2003 period on which the book was based, 2003–2014, 2014–2019, and 2019 onwards. The pre-2003 phase simply confirms that at the time of writing, the 60 countries of the bottom billion had indeed been falling behind. The 2003–2014 phase is distinguished because for the poorest countries it was a Golden Decade during which several favourable but unsustainable changes fortuitously coincided. The 2014–2019 period was a return to normality and so particularly important as an indication of underlying trends: it is a reasonable counterfactual for the future once the massive coronavirus disease (COVID-19) disruption has played out. Finally, 2020–2021 is the beginning of that massively disruptive COVID-19 shock, the impact of which has been highly distinctive for the poorest countries. Rather than use the limited growth data, I discuss the likely disruptive period separately.

Table 9.1 shows the growth rates of gross domestic product (GDP) per capita for the three groups of countries. The first column takes the period up to 2003, the data used in *The Bottom Billion*. As described there, the bottom billion were diverging from the rest of humanity, growing less rapidly than the emerging market countries and not even making progress in catching up with the vastly more affluent societies.

The middle column shows that, even during the Golden Decade, the bottom billion continued to diverge from rest of humanity. The rate of divergence with the emerging market countries actually accelerated. The crash in the growth of the affluent countries enabled convergence between the OECD and the bottom billion, but this was not sufficient to offset the accelerated divergence from the far larger group of emerging market countries.

The third column takes the story to December 2019, just prior to COVID-19. This column – the reversion to normality – is the most disturbing. The pace of growth in the bottom billion collapsed to far below even the pre-2003 period. Divergence with the emerging market countries further accelerated to a massive 2.7% a year, but now the bottom billion were diverging even further from the affluent societies of the OECD.

**Table 9.1: Average GDP per Capita Annual Growth, by Group and Period (%)**

Group	Pre-Golden Decade	Golden Decade	Post-Golden Decade
BB	2.4	4.0	1.0
EM	3.1	4.9	3.7
OECD	2.4	0.9	1.5

BB = bottom billion, EM = emerging markets, GDP = gross domestic product, OECD = Organisation for Economic Co-operation and Development.

Notes: Constant prices; purchasing power parity exchange rates.

Source: Collier, P. (forthcoming), *Horizons and Heroes*. London: Allen Lane.

So much for the crudest data – per capita GDP growth. A better guide to the long-term prospects for living standards is the growth of wealth per capita. New data from *The Changing Wealth of Nations* (World Bank, 2021) for the first time enable us to match this in virtually the same country groups and time periods. The post-Golden Decade period loses only 2019, covering 2014–2018.

These results are set out in Table 9.2. They tell an alarming story which has not previously been noticed.

Both before and after that exceptional Golden Decade, wealth per capita in the bottom billion was in absolute decline. In both other groups, in all three time periods it was growing. The bottom billion were not only diverging relative to the rest of the world but heading in the opposite direction. Even during the Golden Decade, it continued to diverge rapidly from other developing countries.

**Table 9.2: Average Annual Growth in Total Wealth per Capita, by Group and Period (%)**

Group	Pre-Golden Decade	Golden Decade	Post-Golden Decade
BB	-0.5	3.1	-1.0
EM	2.9	5.5	3.0
OECD	1.5	0.7	1.1

BB = bottom billion, EM = emerging markets, OECD = Organisation for Economic Co-operation and Development.

Notes: Constant prices; market exchange rates.

Source: Collier, P. (forthcoming), *Horizons and Heroes*. London: Allen Lane.

The full enormity of these figures becomes apparent when we look at absolute levels of wealth per capita. Over the entire three periods, it rose in the bottom billion by just US\$5,000 in all forms. In the affluent societies, despite the spectacular crises, it increased by US\$76,000 and in the emerging market countries by US\$46,000. This is an alarming divergence. The emerging market economies are catching up so rapidly with the already affluent that they are indeed likely in the next few decades to merge into the OECD. But on these data, there is scant basis for belief in the convergence of the bottom billion with the rest of humanity over any meaningful time frame. More likely, by 2050, a vastly expanded and remarkably wealthy OECD will confront another group of countries in which mass poverty is deeply entrenched.

Finally, I draw attention to another astonishing result that should be of immediate concern to the Indonesian G20 in view of its understandable focus on planetary sustainability. Once again, I use *The Changing Wealth of Nations* data, now focusing on renewable natural capital such as timber and fish. There are really severe problems with the measurement of this concept, so a qualification is called for: the topic will need a sustained global research effort. But for the moment, what we have is shown in Table 9.3.

**Table 9.3: Annual Percentage Change in Renewable Natural Capital per Capita During Each Period**

Group	Pre-Golden Decade	Golden Decade	Post-Golden Decade
BB	-3.5	-1.3	-2.8
EM	-0.5	1.7	0.5
OECD	0.2	0.9	0.5

BB = bottom billion, EM = emerging markets, OECD = Organisation for Economic Co-operation and Development.

Source: Collier, P. (forthcoming), *Horizons and Heroes*. London: Allen Lane.

On these data, not only is the planet's renewable natural capital declining, but this is entirely concentrated in the bottom billion, where it has been happening rapidly in all three periods. This is partly due to the behaviour of international companies in them, and partly because societies were spending their renewable natural capital out of desperation, faced with the crisis of diverging wealth and income revealed in the two previous tables.

If these data are broadly substantiated, which we are unlikely to know for many years, they suggest that the challenge of a sustainable planet is fundamentally subsumed in the larger challenge of reversing the divergence of the poorest and most fragile countries.

## 2. What can be done to reverse the divergence of the poorest countries from the rest of humanity?

### *The economic complexity of transition in the poorest societies*

The escape from mass poverty depends upon the generation of productive jobs. Such jobs both directly raise the incomes of their workers and indirectly stabilise the society by bringing hopeful prospects to young people. But they depend upon harnessing the opportunities of scale and specialisation. No society has ever succeeded in generating them without relying largely upon legally recognised business organisations employing anything from 20 workers to many thousands of them. The notion that the escape from mass poverty can be driven predominantly by small farmers and microenterprises is a romantic chimera.

The poorest countries are desperately short of formal firms because they do not provide a good habitat for business. There are various reasons for this, some of which are due to domestic economic policies. The international economic agencies have long made a fuss about poor domestic policies, but in doing so they miss the most fundamental one, which is indeed the one in which they could make their most important contribution. It is that the standard market forces that propel growth in the emerging market and advanced economies themselves frustrate both the entry of established foreign firms and the formation of new domestic firms in countries that are small and poor. The key economic theory of why this is the case is the *pioneering problem* facing investors in highly uncertain markets (Bhidé, forthcoming).

A firm pioneering local production for an unserved market in a small, poor country faces major hurdles. Radical uncertainty contributes a double whammy. The market for the product or service is uncertain. If the product is being imported, will consumers only buy one that is locally made if it is cheaper, or will they be willing to pay a premium? This is *market uncertainty*.

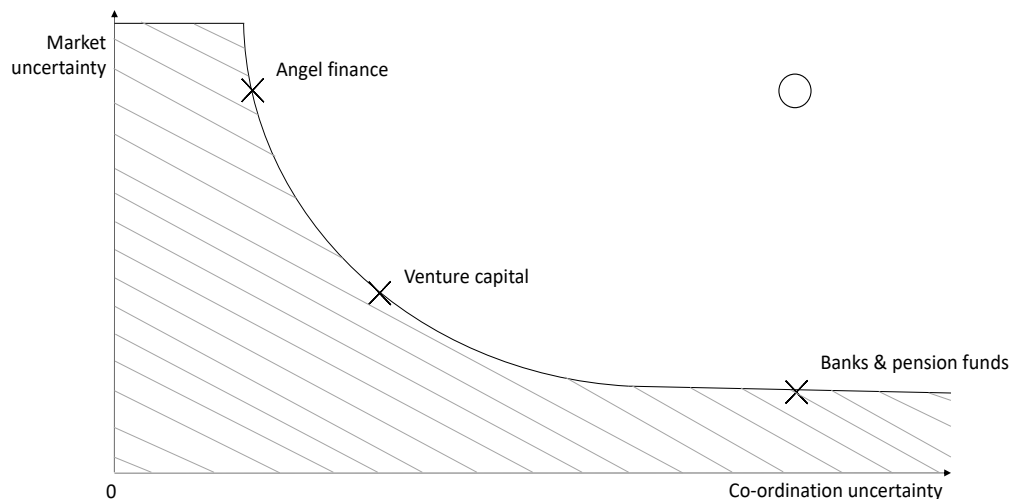
But the investment also faces *coordination uncertainty*, the main source of which is the future behaviour of other firms. Modern production of goods and services harnesses scale and specialisation not just at the level of the firm, but at the larger levels of clusters and value chains. No firm wishes to be the pioneer firm in a cluster because the cluster may not form. If it needs five firms before a cluster is viable, each firm will rationally wait until it is the fifth and so the cluster never forms. The only way to overcome this is for the pioneer investment to go in big – a large

firm enters, dragging its suppliers and some of its customers with it. This was feasible in China because once the economy began to grow, it was evident that all major firms could not stand aside and miss such a vast future market. There is no equivalent compelling reason for a major international firm to go in big into Mali, Haiti, or Afghanistan.

The global financial sector, even at its most sophisticated, cannot finance this double whammy of uncertainty. It has designed mechanisms to overcome either form of uncertainty in isolation, but not in combination.

I summarise this in Figure 9.1. The three crosses represent the three different types of finance, and the curve which joins them constitutes the frontier of feasible combinations of investment risk that can be financed. The money that can get an idea launched: founders-cum-angels. The money that can take it to a viable scale: venture capital. And the money that can take it all the way to big: banks-cum-pension funds.

Figure 9.1: Finance and Uncertainty



Source: Author.

An affluent economy has all of them, while the countries of the bottom billion have none of them: but why not? The circle denotes the absence of finance – even in affluent economies – for the double whammy: a totally new product that needs big finance for scale. That is the problem facing practically all new investment except natural resources extraction. That is why there are none of the other three forms of finance in the countries of the bottom billion: none of these forms of finance would find enough businesses to finance because the opportunities to break into a modern economy require a form of finance that does not exist anywhere.

The rare Silicon Valley exceptions prove the rule: Steve Jobs with the iPhone; Elon Musk with the Tesla. But how did they do it? They were both visionary charismatic showmen who sold a glamorous narrative to a fan club of early buyers. They also relied on modularity in their businesses: each established units which could run profitably even if the vast, high-glamour bets failed. Yet, in both cases, it was a precarious high-wire act: the circus floor is strewn with the

corpses of wanabees. A more realistic way to crack the problem in the bottom billion is a change in public policy.

As if uncertainty were not enough of an obstacle, there are others. A pioneer will need to bring skilled foreign workers in to train the workforce. If it is successful, other firms will enter and get their skilled labour much more cheaply by poaching the ready-trained workers from the pioneer: it pays to be the second entrant. If the finance is to come domestically, it will require deferring consumption, which is inherently always hard in a poor society. Another obstacle is the putty-clay nature of investment: just as an omelette cannot be turned back into eggs, so a concrete building cannot be turned back into the time and material inputs needed to finance it. A building remains that particular building, in that particular place, for decades. It only enables future consumption to be higher if it enhances future production, and that depends upon what the future has in store. Building an office block in Bujumbura is only useful if businesses will want to put a workforce there.

In advanced market economies, making such investments has become less scary: although the building cannot be reverse-engineered, it can be sold. Depending on the price others are willing to pay for it, the initial investor may be able to restore the option of using equivalent resources for something else. But in small, poor societies, there is only a limited market for the asset. If a block of apartments turns out to have nobody wanting to live in it, then the initial investor will be unable to find any buyer who would not face the same problem: the investment would be a write-off. So, commitment to an irreversible specific-purpose investment is scary because the future is inherently and radically uncertain.

### *The crucial implication for all international collective action*

If this is the typical context, all international action needs to recognise that it can have a valuable niche role, but only if it also recognises its limitations. The agency for action must be vested in domestic leadership. Only they have the deep contextual knowledge that is essential to understand what is feasible; and only they can build the trust of a sufficient number of citizens, which is essential for their willing compliance in achieving national goals. International actors need the modesty to recognise that they cannot possibly 'know best' what to do in such complex situations, nor do they have the moral legitimacy to impose conditions on what domestic leaders should do.

Unfortunately, in some of the bottom billion, the interests of those who rule the state and control its coercive power are fundamentally misaligned with the well-being of their citizens. Where this is the case, or where there is no consensus amongst a substantial majority of international actors as to whether it is, there is no basis for collective international action. In these situations, the most realistic international approach is to wait until there is a domestic realignment of the interests which control the state. Such realignments do happen: often, through a new alliance between some of the ruling factions which control coercive power and some of the factions of those citizens who have been excluded from power. Once this happens, the international community is plunged into uncertainty: none of its members can be sure of what to do.

---

*The new opportunity for substantial international consensus on swift provisional action*

What new leaders decide to do may be determined by what they see as feasible. *A new international policy of swift and supportive unconditional international help for a widely agreed initial period would make embarking on transformation less daunting.*

I suggest that there is a common interest amongst a substantial majority of G20 governments which arises in the following situation. It starts from a country that is very poor, but whose domestic leadership has manifestly frustrated economic growth. Perhaps unexpectedly, the country's leadership changes. In such situations, the pertinent G20 governments should swiftly and unconditionally grant a 10-year moratorium on all debt service and repayments. The rationale is fourfold. Firstly, it gives the new leadership a period during which it controls some freed-up discretionary resources. During the decade, they can learn by trial and error, and from mentoring by successful recent transitions in countries that were similar. Secondly, by providing new leaders with the freedom to forge their own path, it provides impartial outside observers an opportunity to better assess the characteristics of that leadership. Thirdly, it is almost costless to creditor G20 governments. Typically, the government benefiting from the moratorium lacks the revenue to make many of the payments to creditors. A swift decade-long moratorium would be a sensible compromise between the current minimalist G20 collective creditor response to the COVID-19 crisis, and the infeasibly generous approach of automatic swift debt cancellation. G20 creditor governments would simply be facing reality.

Finally, instead of agonising as to whether to provide support in a situation of fundamental ignorance, it enables the pertinent international community to postpone its decision on its revealed choice of strategy, free of pressures and after a period during which the leadership has had time to learn. At that point, there is inescapably a judgement call, most plausibly taken by the International Monetary Fund (IMF), as the *de facto* coordinator for much international action.

Making a judgement is what IMF staff are paid to do. But the key criterion should no longer be acceptance of a negotiated IMF programme. It would become whether the new leader has revealed in their own freely chosen actions during that period of uncertainty, sufficient willingness and aptitude to sacrifice their own personal interests for the common good. Are they reconciling the short-term interests of their supporters with the longer-term needs of the economy? In reaching this assessment, new leaders should not be expected to be 'saints' or geniuses. The judgement would be about whether the leadership has been taking steps consistent with gradually persuading ordinary citizens to prioritise contributing to a better future for the nation's children, alongside their own individual interests. More succinctly, are they building some 'willing compliance' of citizens to contribute to the public interest? These are subtle matters not reducible to mechanistic 'tick-box' rules, but an impartial observer can, over time, form a defensible assessment. In some situations, a judgement may be possible within months; in others, it may take some years: there can be no time-based rule.

In reaching that assessment, three massive temptations must be resisted. One is the universalist strategy that has been common in the international agencies, of assuming that there is equally useful work to be done in all contexts at all times. This is wishful thinking: some countries spend

long periods during which the ruling domestic power is fundamentally hostile to any reasonable interpretation of transition, and efforts which refuse to face this reality dissipate scarce international resources and contaminate otherwise favourable expectations about the genuine opportunities for transition.

The next temptation is the presumption that because new leaders are only ‘amateur’ economists, professional international agencies ‘know best’ what to do. The agencies *cannot* know enough because they lack the deep knowledge of what is feasible in a highly distinctive local context. If the agencies proffer advice, especially if backed by explicit or implicit conditionality, *they become too powerful to be resisted, while being too distrusted to be accepted*. This results in the devastatingly damaging and familiar game in which leaders sign documents that commit them to actions in which they do not believe, and so undermine by offsetting countermeasures. In such situations, IMF staff typically claim credit for a few short-term reforms, but this is at the enormous cost of destroying the vital process by which a government learns from its freely chosen policy experiments.

The final temptation is for senior political appointees, both in the agencies and in international meetings, to assume that they have the moral authority to insist on the priorities that leaders of poor countries should adopt. Other than in rare extreme situations, this is widely perceived within poor countries as a form of moral imperialism. However popular it might be with the voters to whom internationally powerful politicians are answerable, it is usually highly counterproductive within the countries subject to it.

### 3. What can the G20 do now?

The G20, run by finance ministries, is a recent and promising mechanism for international cooperation. Given current tensions, it is sensible to form large majorities of pertinent G20 governments, which can collectively take leadership in tackling the challenge of reversing the economic divergence of the poorest countries from the rest of humanity.

I will focus on five practical new mechanisms. The first, and overarching one, is a new public acknowledgement of divergence as a major problem, matched by a commitment to endeavour to reverse it. The second is the debt moratorium proposed above. The third, which follows from the second, is to harness the scope for *voluntary compacts* between the governments of small, poor countries wishing to make their habitat for business more attractive in a fiscally sustainable way, and the G20 governments willing to use their development finance institutions (DFIs) and their aid agencies which own their DFIs, to encourage their firms to make pioneering investments. The fourth is an essential ethical intervention to rectify the very limited support that the poorest countries have had in coping with both the economic and medical consequences of the COVID-19 crisis. The fifth, the counterpart of the fourth, is to commit to taking effective action to close the safe havens for corrupt fortunes made at the expense of the poorest countries.



---

### *A public commitment by the G20 to reversing the divergence of the poorest countries from the rest of humanity*

The evidence on the persistent divergence of the poorest societies from the rest of humanity is now unambiguous. Reversing this needs to be publicly acknowledged by the G20 as a globally important priority in its own right. By acknowledging it, G20 governments would implicitly or explicitly signal that ‘business as usual’ could not continue. This would licence a much-needed learning phase of ‘whatever it takes’: innovations by public agencies and major corporations. Fortunately, there is considerable scope for being much more effective. Reversing divergence is entirely feasible, though not merely by scaling up previous approaches.

#### *G20 finance in the infrastructure of connectivity*

No country has ever escaped mass poverty while being self-sufficient, yet many of the poorest countries are currently isolated due to their inadequate infrastructure for physical and digital connectivity. Building this infrastructure is a major investment which is best financed by aid. The switch of aid programmes from this to a more emotive social agenda has been damaging. The notion that, in tiny economies, such infrastructure could be financed by global capital markets has proved a fantasy: investors demand prohibitively high rates of return. Financing the vital infrastructure of connectivity could be reconciled with the political need for glamour and speed by a G20 commitment to enhanced digital connectivity.

#### *G20 finance for viable businesses*

As to opportunities for viable businesses, the specific opportunities are best chosen not by international agencies but by local leaders, bringing in such expertise as they choose – completely delinked from agency conditionalities. For example, the Government of Rwanda devised an ingenious integrated strategy for developing tourism, piggybacked on attendance at conferences. By the onset of COVID-19, it had become the second most visited country in Africa. No international agency would have thought of such a strategy or had the capacity to stick with it for a decade. Ethiopia has rapidly developed a light manufacturing export sector, which has been successful despite persistent criticism by the IMF. It is also now exporting climate-friendly hydroelectricity within its subregion. Some countries in both Africa and Central Asia have opportunities for regional export clusters and value chains within their regions. These are best discovered through decentralised innovation rather than devised in international agencies.

#### *The decade-long moratorium on debt service and repayments amongst G20 creditors*

The rationale and mechanics of this approach are set out above in the final part of section 2. They are a realistic and inexpensive compromise between tokenism and a premature new round of debt forgiveness. The World Bank, IMF, and bilateral agencies are not wrong to point to deficiencies in the contribution of host governments to an adverse business climate, although they do overemphasise it. But once new leaders are free to set their own priorities, some will want to partner with pertinent subgroups of the G20 in forging voluntary partnerships. This feeds into the next proposal.

*The opportunity for a voluntary partnership compact to assist economic transitions*

I have helped to develop the idea of compacts in two phases. The first was through my work in Jordan with Alex Betts, the Director of the University of Oxford's Refugee Studies Centre, during Jordan's refugee crisis of 2015. The outcome of that work was the *Jordan Compact*, discussed in our book, *Refuge* (Betts and Collier, 2017). The model has now been widely adopted with other countries, which provide the main global havens for refugees.

In 2016, I was asked by the German Ministry of Finance to assist with the Africa component of its G20 Presidency in 2017. This introduced the *Compact with Africa*, at which around 200 German firms were introduced to seven African governments with a view to finding mutually beneficial investment opportunities, joined by some other G20 governments. But the key weakness of the Compact with Africa was that the DFIs of the G20 countries were not yet in a position to play a sufficiently active role and were not yet aware of the full extent of the pioneering problem.

There are around 40 DFIs around the world. Until recently, they have largely regarded each other as competitors: there is no association or forum at which they all meet. Since 2018, in partnership with the International Finance Corporation of the World Bank and the British International Investment of the Government of the United Kingdom, I have hosted an annual meeting at Oxford at which the largest 30 DFIs meet to discuss how they could work together towards a common agenda of being more effective in the poorest countries. There has now been sufficient progress to link this to a G20 initiative with the same objective, should the Government of Indonesia wish to make this a priority.

*The specific asks of G20 governments in respect of their DFIs*

G20 governments with DFIs face a choice concerning the instructions they give to their aid agencies, which are usually the direct public owners of their DFIs.

Currently, most aid agencies impose well-intentioned regulations, such as avoiding reputational risk, requiring a commercial rate of return on investment, and insisting that all investments lead to verifiable reductions in carbon emissions. *These conditions have the unintended but inevitable practical effect of leading their DFIs to minimise investment in fragile countries.* Further, since there is only a tiny pool of projects that meet all these requirements, DFIs compete against each other to get them: this destroys the collaboration which is necessary for achieving the overall objective of using DFIs to overcome the pioneering problem. Quite clearly, facing the immanent task of helping the economy of Ukraine to recover, DFIs will play a vital role. Any overly restrictive conditions that their aid ministries have previously imposed on them which impede effective assistance to Ukraine will be set aside. No G20 government can afford to be seen to adopt one approach to Ukraine, while maintaining tougher rules for the assistance of Yemen (where, at the time of writing, new leadership looks to have created an opening).

Generalising from this, what aid agencies need to be doing is to insist that their DFIs rapidly and substantially increase the number of jobs that they create in countries that are very poor and fragile, and that *this is their overriding priority.* This will open a practical conversation with their

DFIs. Most likely, as with the Private Sector Window of the International Finance Corporation, it will result in some aid money being used to meet the initial costs of pioneering. It will almost certainly involve the overhead operating costs of the DFIs in societies that are poor and fragile from being covered by aid budgets. Each of these countries has a distinct and complex local context. It is necessary to understand this context in order to find good opportunities on which sensible investment decisions can be based, but for that it is necessary to have a team resident on the ground. Even with a resident team in place, the deal size will usually be small, and the deal flow will be limited and intensive in terms of staff time. If these overhead costs are loaded onto the projects, very few DFI investments will be commercially viable. The pertinent criterion for G20 public interest is not whether these DFI investments are commercially viable, but *whether the businesses which are catalysed due to them usually become commercially viable and thereby generate sustainable jobs*. Once this becomes the criterion, DFIs have an incentive to collaborate because by pooling their operations in these countries they can reduce their individual overheads and widen the pool of foreign firms that can be attracted.

### *The G20 Response to the African COVID-19 Crisis*

#### *The vaccine response*

It now looks likely that the world will only be reasonably safe from the emergence and spread of new variants once the poorest countries have high vaccination rates.

Excellent recent work by Agarwal and Gopinath (2021) at the IMF has established that the cost of paying for this – through a massive increase in the supply of vaccines and the enhanced support for health systems that would enable vaccines to be distributed – would be trivial in comparison to the economic benefits to the global economy.

At a time of global political gridlock, the G20 would get some much-needed kudos were Indonesia to corral other members to fund this undertaking. To date, pledges have been trivial relative to costs. By gathering the 20 heads of government together for a rare in-person meeting, they might reach a collective agreement first to fund that cost by mutual commitments to contribute, and then to find a simple formula for dividing it up between them, based on just two criteria: the size of the economy and per capita income.

#### *The macroeconomic response*

COVID-19 and its disruptions have been a huge economic blow to the business sector around the *world*. OECD governments have responded by protecting their firms through incurring large fiscal deficits. This is sensible, not least to protect the vast organisational capital that the business sector has accumulated, and which would take many years to re-establish were it destroyed. The business sector in the poorest countries is smaller, but for that very reason it is more vital to protect the little organisational capital that it has. Excellent new analysis from the latest *World Development Report* of the World Bank shows the acute dilemma facing the poorest countries (World Bank, 2022). Their business sectors are facing severe debt distress, accentuated by the

constraints on their governments, which have faced debt distress and so are unable to increase their own indebtedness by anything like as much as the OECD economies.

This double-distress threatens to turn the COVID-19 disruption in the poorest countries into a prolonged crisis of debt restructuring. The average time taken in the past for global coordination to restructure debts has been 8 years, and due to the current more complex structure of claims, and geopolitical tensions, it could take even longer – precipitating disorderly defaults with unknowable but potentially catastrophic consequences.

The G20, and in particular the brief meeting of heads of government, is by far the most credible moment to reach rapid agreement on this existentially important matter.

A relatively straightforward way of remedying this situation is to link it to the recent issue of special drawing rights (SDRs). Since the quotas of countries that are small and poor are tiny, this has done little to increase their spending power directly. But were the G20 countries mutually to pledge whatever modest proportion of their own increase in SDRs they can reach general agreement on, to help the very poorest countries, it might provide more substantial resources. I suggest that they could be reallocated to the poorest countries unconditionally, based on two very simple and uncontentious criteria: very low per capita income of recipient countries, as measured by per capita GDP in 2020, and an equal per capita allocation between recipient countries. This would avoid the delay, disagreements, and loss of agency in any attempts to make eligibility depend upon either how the money was used or which countries should be favoured. I would avoid using the official ‘low-income countries’ categorisation since it has long become detached from the realities of current global poverty.

### *Closing the safe havens for money stolen from poor countries*

As a result of the crackdown on the assets of Russian oligarchs, quite astounding amounts of money and luxury assets have already come to light. This demonstrates that when a broad consensus of the international community takes grand corruption seriously, it is entirely feasible to address it effectively and rapidly. Having demonstrated that it can be done, unless the G20 now commits to adopting the same approach to clamp down on the vast wealth looted from poor countries, it will lose its legitimacy as a key global actor. On such a matter, there can be no double standards.

## References

- Agarwal, R. and G. Gopinath (2021), 'A Proposal to End the COVID-19 Pandemic', *IMF Staff Discussion Note*, No. SDN/2021/004. Washington, DC: International Monetary Fund.
- Betts, A. and P. Collier (2017), *Refuge: Rethinking Refugee Policy in a Changing World*. Oxford: Oxford University Press.
- Bhidé, A. (forthcoming), *Uncertainty, Judgment and Enterprise: Reclaiming and Extending Frank Knight's Abandoned Idea*. Oxford: Oxford University Press.
- Collier, P. (2007), *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done About It*. Oxford: Oxford University Press.
- World Bank (2021), *The Changing Wealth of Nations 2021: Managing Assets for the Future*. Washington, DC: World Bank.
- World Bank (2022), *World Development Report 2022: Finance for an Equitable Recovery*. Washington, DC: World Bank.

# Chapter 10

## Financing Infrastructure

Justin Yifu Lin and Yan Wang

The world is committed to achieving the 17 Sustainable Development Goals (SDGs) by 2030. Nearly 3 years since the onset of the coronavirus disease (COVID-19) pandemic and amid the ongoing war in Ukraine, the repercussions of both crises – disruptions to supply chains and regrouping of countries – are in evidence around the world. The fallout is exacerbating a large divergence in development due to the uneven recovery from the health crisis, looming stagflation, and the global climate crisis. In the longer term, the outlook for emerging market and developing countries (EMDCs) remains dampened by the lasting legacies of the pandemic – the erosion of skills from lost work and schooling, a sharp drop in investment, higher debt burdens, and greater financial vulnerability. Progress in achieving the SDGs has been derailed in many countries.

Economic development is a process of structural transformation, and infrastructure is essential for facilitating this transformation. This paper attempts to address the issues of how to overcome inadequate financing for infrastructure and what resources and institutions should be relied on in the post-pandemic era. Section 1, drawing on the conceptual framework of new structural economics, highlights the importance of development starting at home, i.e., based on a country's endowments and comparative advantages. Section 2 discusses the critical role of infrastructure for development. Section 3 addresses the challenges of building new and green infrastructure, new sources for infrastructure financing, multilateralism and coordination, the role of patient capital (or ultra-long-term capital), new national and development banks and funds, and new instruments such as real estate investment trusts (REITs). Section 4 concludes with proposals.

### 1. Infrastructure and Structural Transformation

Modern economic development, featuring a constant increase in productivity and per capita income, is a process of continuous structural transformation, including the upgrade of industries from traditional agriculture to manufacturing and further to services (Kuznets, 1966). In the process, both infrastructure and institutions require improvements in line with the needs of industry to make the application of specific technology feasible and to reduce the transaction costs of organising the production and market exchange (Lin, 2011). Developing countries have the potential to grow faster than developed countries due to the advantages of backwardness (Gerschenkron, 1962).

Irrespective of the development stage, each country has comparative advantages in certain sectors. The failure of development in a country is most likely caused by bottlenecks in soft and hard infrastructure, whereby a country's comparative advantages remain in a latent state and its enterprises fail to be competitive in the domestic and international markets due to high transaction costs. If development assistance is used to help remove the infrastructure bottlenecks of structural transformation in developing countries, the recipient countries should be able to tap into the potential of advantages of backwardness, grow faster than developed countries, and provide the material conditions to achieve many of the SDGs. Otherwise, the assistance will not be effective despite the best intentions of the partner country or institutions. Most development assistance to developing countries from multilateral and bilateral development institutions is used for humanitarian purposes (e.g., health and education) and improvements in governance (e.g., transparency, law, democracy, and the business environment). Such projects fall largely into the category of improving soft infrastructure. The hard infrastructure bottleneck remains the major obstacle to development in developing countries.

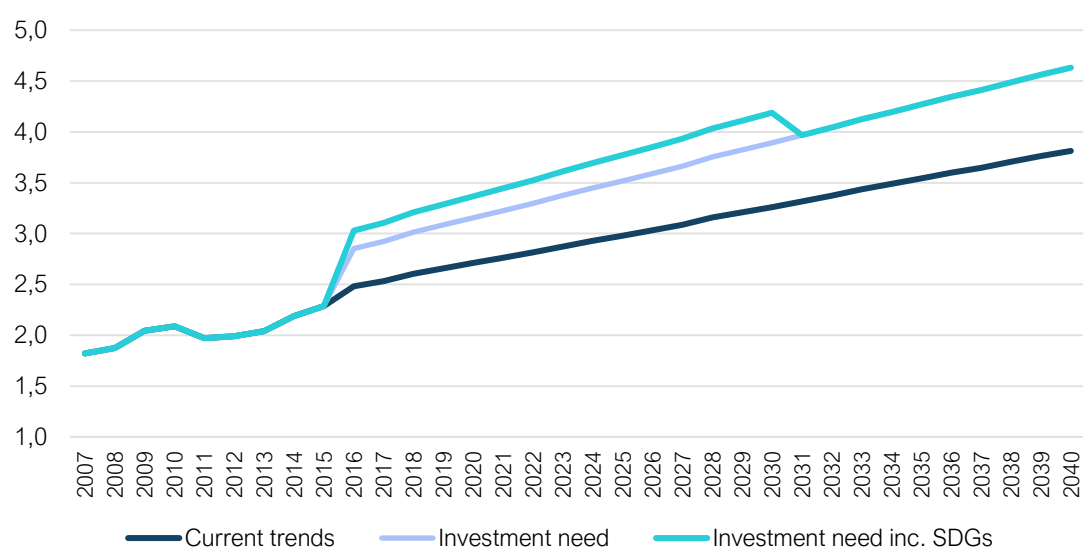
Infrastructure investment is necessary for a country to diversify and upgrade its industries. Empirical studies have shown that there is a great need for infrastructure investment, and that public investment multipliers in low initial public capital countries are significantly higher than in high initial public capital countries (ADB, 2017; Fay et al., 2019; Izquierdo et al., 2019).

Figure 10.1 shows a projection that global infrastructure investment needs will reach US\$94 trillion by 2040 to keep pace with profound economic and demographic changes and to close infrastructure gaps. It also forecasts a global infrastructure investment gap of about US\$15 trillion, which is equal to a 16% infrastructure investment deficit. In addition, to achieve universal household access to drinking water and electricity in line with the SDGs, a further US\$3.5 trillion is needed, widening the gap to about US\$18 trillion. Closing the global investment gap will require annual infrastructure investment to increase from the current level of 3.0% of global GDP to 3.5%. Meeting the SDGs will require this to increase further to 3.7% by 2030.<sup>1</sup>

---

<sup>1</sup> Previous studies by other sources show similar magnitudes to the Global Infrastructure Hub estimates. For example, the Asian Development Bank estimates infrastructure investment needs during 2016–2030 to total US\$26 trillion (in 2015 prices) or US\$1.7 trillion per year in 25 selected economies and subregions of Asia (ADB, 2017). The African Development Bank estimates the continent's infrastructure needs to total US\$130 billion–US\$170 billion per year, with a financing gap of US\$68 billion–US\$108 billion (AfDB, 2018). The Inter-American Development Bank calculates an infrastructure financing gap of US\$150 billion per year in Latin America and the Caribbean.

Figure 10.1: Global Infrastructure Needs, 2007–2040



SDG = Sustainable Development Goal.  
Source: Global Infrastructure Hub, 2018.

Table 10.1: Infrastructure Investment Gap, 2016–2040 (US\$ trillion)

Scenario	Asia	Europe	Americas	Africa	Oceania
Gap without meeting the SDGs	4.6	2.0	6.5	1.7	0.2
Additional investments needed to meet the SDGs	1.6	<0.1	0.3	1.6	<0.1
Gap including meeting the SDGs	6.1	2.0	6.8	3.3	0.2
% change in gap	34%	1%	5%	97%	6%

SDG = Sustainable Development Goal.  
Source: Global Infrastructure Hub (2018).

The financing gap may have been widened further due to below-average growth stemming from three crises of the Financial Crisis in 1997–1988, the Global Financial Crisis (GFC) in 2008–2009, and the current economic crisis in 2019–2021 due to COVID-19, and the predominance of short-term thinking from creditors' points of view (Table 10.1).

## 2. Infrastructure: Core Capital for Facilitating Development

Infrastructure is essential for people's lives operation of the economy, and facilitation of structural transformation. In addition, critical public assets have intrinsic value to country or sovereign stakeholders. Mazzucato (2018) argues that value is "in the eye of the beholder", and stakeholder values are often higher than or deviate from the shareholder value". Infrastructure in operation not only generates cash flow and jobs but should also be able to leverage public and private



investment, just like the equity capital of a firm in an initial public offering. ‘Capital begets more capital’ has been supported by previous studies.<sup>2</sup>

The role of government in creating value by building infrastructure has often been neglected. For instance, as voices from the Global South have increasingly lamented, evaluations of debt sustainability – such as the International Monetary Fund–World Bank Debt Sustainability Framework for Low-Income Countries (IMF, n.d.) – have tended to focus narrowly on liabilities, without taking adequate account of the asset side of the public sector balance sheet. They have given too much weight to foreign exchange reserves and other liquid cash flows, from the angle of creditors seeking repayment, but not much weight to fixed public assets as indispensable assets for people’s livelihoods and development.

Blanchard (2022:8) argues that, theoretically, “Debt becomes unsafe when there is a non-negligible risk that, under existing and likely future policies, the ratio of debt to GDP will steadily increase, leading to default at some point”. And there is no magic number or one-size-fits-all threshold. The time has come to reform the Debt Sustainability Framework to distinguish between debt due to effective (not wasteful) infrastructure investment and debt due to financing government consumption and pensions. It is time to incorporate considerations for public assets and liabilities, using public sector net worth as a comprehensive measure for debt sustainability.

Further, the rate of economic growth depends on whether the infrastructure bottleneck for industrial upgrading and technological innovation is eliminated (Annex). While GDP indicates how much monetary income or output a country produces in a year, wealth also covers the value of the underlying national assets, including the natural endowments, produced capital, and infrastructure that form or unleash a country’s comparative advantages. As such, asset mapping and wealth accounting provide essential insights into a country’s prospects for maintaining and increasing its income over the long term.

### 3. Infrastructure Financing and the New Instruments

Infrastructure projects are usually lumpy, risky, and long-term; and require a large amount of financing. They have a huge environmental impact, and take a long time, sometimes several decades, to see returns. We support all the calls for international coordination for building more and better infrastructure, especially those in the past 2 years. In addition, we would like to make these recommendations.

#### 3.1 Building digital and low-carbon infrastructure for resilience and sustainability

In light of the heightened risks of climate change and extreme weather in the post-pandemic era, when the development priority shifts from the containment of COVID-19 to sustainable development, the nature of infrastructure itself must be transformed to focus more on low-carbon and green infrastructure. This infrastructure must be consistent with the Paris Agreement and

---

<sup>2</sup> For instance, Thomas Piketty’s *Capital in the 21<sup>st</sup> Century* cogently illustrates this point using massive tax return-based data sets (Piketty, 2014).

nationally determined contributions (NDCs). It should focus on agriculture, rural development, regional connectivity, and risk mitigation for climate change. Policymakers should rethink their plans for infrastructure, prioritising resilience, and risk mitigation.

In addition, the G20 should call for building high-quality ‘smart, digital, and innovative’ infrastructure, and age-ready cities (Das et al., 2022). The new infrastructure should not only meet basic needs, but also serve as the digital basis for technology advancement in industry, as well as the needs of a rapidly ageing population. Building new infrastructure has recently become a top development priority for all countries – industrialised as well as EMDCs.

### 3.2 Financing challenges and new sources of finance

Building new and green infrastructure will be expensive and require a large amount of financing. But some of the new and low-carbon infrastructures can be profitable and can be financed by green finance funds, sovereign wealth funds (SWFs), and the private sector via public–private partnerships (PPPs). It is critical to engage more actors, including the private sector, bilateral development agencies, and multilateral development banks (MDBs), with a view to blended financing. Given the long-term nature of the investments needed, all participants need to embrace the concept of patient capital (Lin and Wang, 2017b; Kaplan, 2021). Real patient capital is hard to come by: the limited amount comes from MDBs, regional and national development banks, SWFs, public wealth funds (PWFs), and state-sponsored green investment funds.

Too little attention has been paid to public assets financed and constructed by other countries’ infrastructure investments jointly with host countries. Infrastructure projects completed under bilateral and South–South cooperation form part of the host countries’ public assets and generate huge externalities that benefit all other sectors and investors (Wang and Xu, 2022). Connectivity has been created across the region and between the region and the rest of the world. In the meantime, these infrastructure investments have increased local employment and reduced illegal immigration to developed countries.

Given the high debt levels, many governments have to make more out of less and use more PPPs and equity investments. They should focus on *bottleneck-releasing infrastructure investments* that maximise economic returns and generate user fees. If debt-financed infrastructure investments are solely repaid through additional tax revenues generated by these investments, amortisation of the investments is likely to be prolonged, even if the growth impact is high. Therefore, governments should seek to implement innovative financing mechanisms using public sector resources to leverage long-term private sector financing.

### 3.3 ‘Going beyond aid’ and moving from debt to equity

In *Going Beyond Aid* (Lin and Wang, 2017a), we proposed broadening the definitions of development finance (DF). The Organisation for Economic Co-operation and Development–Development Assistance Committee (OECD–DAC) definitions of official development assistance (ODA) and other official flows (OOFs) are a good starting point, but they need to be reformed to clarify and take into account all forms of finance aimed at supporting development. For monetary policy instruments, there are M0, M1, M2, and M3. In development finance, we can define DF1, DF2, DF3, and DF4 similarly (see below), according to the extent of ‘concessionality’ with a

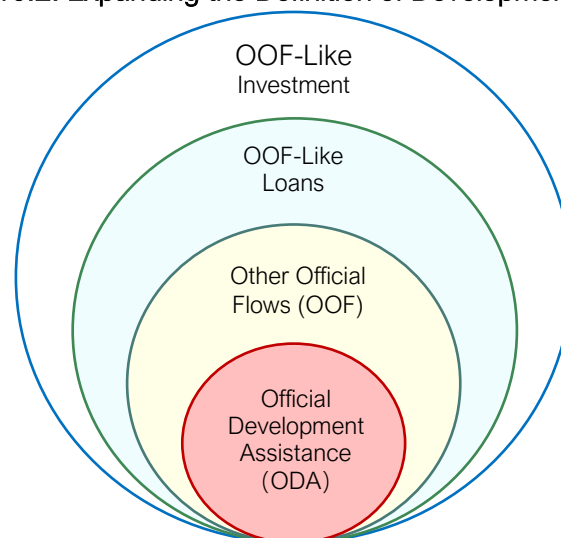
consistent benchmark market interest rate; the source (the extent of 'official' or state involvement); the destination countries (low- or middle-income developing countries); and the objectives of the financing (for economic development and welfare).

A new set of clearer definitions would facilitate transparency, accountability, and selectivity by development partners; encourage SWFs to invest in developing countries; and facilitate PPPs in developing country infrastructure.

We propose redefining development finance in the following ways (Figure 10.2):

- DF1 = ODA (as defined by the OECD–DAC, with reforms dated in 2014 and implemented in 2018).<sup>3</sup>
- DF2 = DF1+OOF, including preferential export credit.
- DF3 = DF2+OOF-like loans (non-concessional loans from state entities for development but at market interest rates).
- DF4 = DF3+OOF-like investment (equity investments by SWFs, PWFs, or development projects supported by state guarantees, or PPP projects for public infrastructure, which provide global public goods for sustainable development). The latter concept would be consistent with but different from and broader than the Total Official Support for Sustainable Development proposed by the OECD–DAC (OECD, n.d.-b).

**Figure 10.2: Expanding the Definition of Development Finance**



Note: The circles correspond to DF1 = ODA; DF2 = ODA+OOF; DF3 = DF2+OOF-like loans; and DF4 = DF3+OOF-like investment.

Source: Authors.

Most infrastructure finance is from the tax revenue of each EMDC, as shown by Fay et al. (2019). The amount of net ODA (or DF1 in Figure 10.2) is quite small (around US\$160 billion (OECD, n.d.-a) annually in recent years) – mainly used in humanitarian aid and not large enough for

<sup>3</sup> For the OECD–DAC definition of ODA, see OECD (n.d.-b).

infrastructure projects. The OOFs (DF2) only included preferential export credits, usually for equipment and machinery imports. International infrastructure finance mainly relies on OOF-like loans (DF3) from MDBs and national development banks (NDBs) that can issue large and long-term loans, which are less concessional, often at market interest rates; and OOF-like investment (DF4), including equity capital for the early stages of infrastructure projects, to leverage private funds in PPP projects.

Previous studies have provided various estimates of G20 financing flows for sustainable infrastructure that approximate DF3 and DF4. For example, a study led by the Brookings Institution and Boston University Global Development Policy Center (Bhattacharya et al., 2019) estimated that G20 foreign direct investment flows and development finance institution flows from MDBs and NDBs to EMDCs from 2011 to 2017 for sustainable infrastructure were just over US\$1 trillion – or US\$154.8 billion per year (Table 10.2). The World Bank estimated that EMDCs need to invest (or receive investments) of roughly US\$15 trillion–US\$27 trillion per year for infrastructure from 2015 to 2030 to achieve the SDGs and meet the 2°C climate change target (Rozenberg and Fay, 2019). As a share of that estimate, the annual amount of US\$154.8 billion is just 7.4% of the midpoint of those World Bank range estimates, and just 2% of the total need estimated by the OECD and New Climate Economy (Bhattacharya et al., 2019).

**Table 10.2: G20 Outflows to EMDC for Sustainable Infrastructure, 2011–2017 (US\$ billion)**

Item	Total (US\$ billion)	Annual (US\$ billion)	Share of EMDC need	Share of global need
MDBs (part of DF1 & 3)	180	25.7	1.2%	0.3%
NDBs (part of DF2 & 3)	621	88.8	4.2%	1.2%
FDI (part of DF4)	282	40.3	1.9%	0.5%
Total	1,083	154.8	7.4%	2.0%

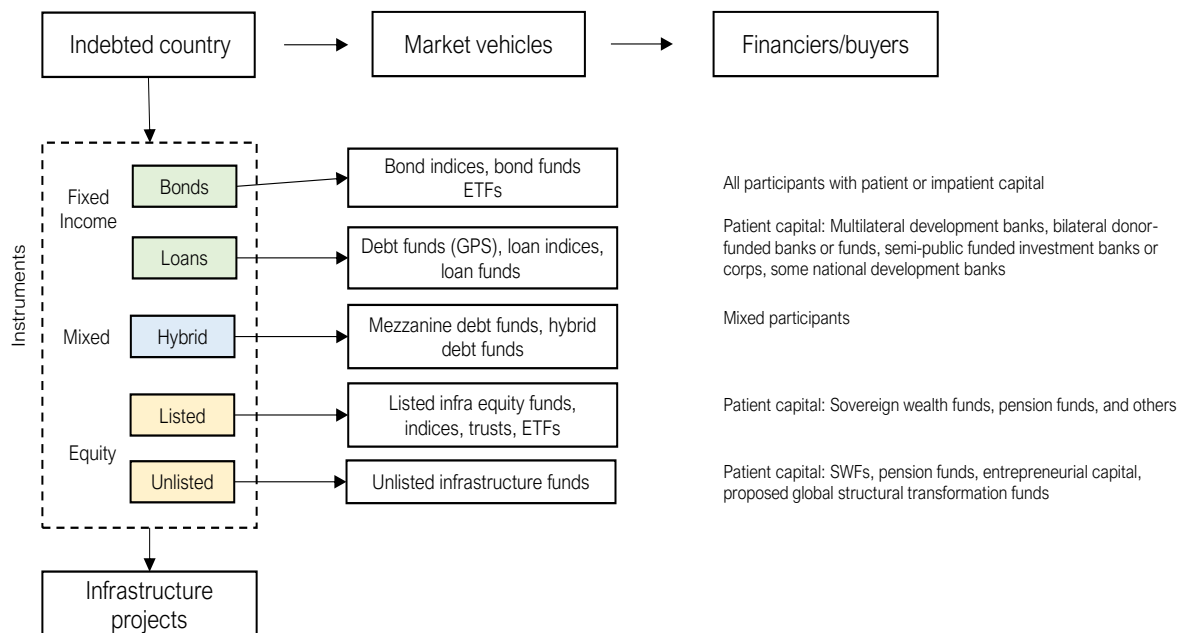
EMDC = emerging market and developing country, FDI = foreign direct investment, MDB = multilateral development bank, NDB = national development bank.

Source: Bhattacharya et al. (2019).

### 3.4 New financial instruments

We propose a taxonomy of innovative infrastructure financing instruments, drawing on the OECD Institutional Investors and Long-term Investment Project. The coverage of instruments is comprehensive, spanning all forms of debt and equity and risk mitigation tools deployed by governments and economic agents. Under this framework, patient capital serves as the financier of infrastructure financing instruments with a long-term horizon. Furthermore, unlisted equity-like instruments or unlisted infrastructure funds are also better suited for patient capital than short-term debt instruments for impatient capital (such as hedge funds) that can be traded frequently (OECD, 2015; Lin and Wang, 2017b).

**Figure 10.3: Taxonomy of the Financial Instruments Required for Infrastructure Finance and Patient Capital**



ETF = exchange traded fund, GP = general partner, SWF = sovereign wealth fund.

Source: Based on Lin and Wang (2017b) on patient capital and OECD (2015).

A global trend of moving to green financing and equity financing is emerging. One option is to set up public REITs. Such REITs provide an investment opportunity for ordinary investors to benefit from valuable real estate, access dividend-based income and total returns, and help infrastructure development. Asset owners can monetise their qualified assets by selling and listing them through REITs and reinvesting the proceeds in new projects. The spinoff (new projects) will help originators to deleverage by recouping investments and deconsolidating liabilities. Meanwhile, improved balance sheets enhance their financing capacities for new investments. This process also revitalises existing assets by unlocking their value and turning illiquid infrastructure assets into liquid REITs that can be publicly traded.

#### 4. Proposal for International Cooperation in a Post-COVID-19 World

In view of the huge infrastructure financing gap, the post-pandemic agenda is clear: countries must build on their endowments and tackle infrastructure bottlenecks to unleash their potential for sustainable development. With an appropriate approach to policy and financing, countries can mobilise the required resources to accelerate their growth towards sustainable, resilient, and inclusive development. This section provides proposals for international cooperation in a post-COVID-19 world to move to green financing, patient capital, and equity financing.

We support previous G20 commitments on infrastructure, especially the G20 Principles for Quality Infrastructure Investment and G20 Guidelines on Quality Infrastructure for Regional Connectivity. The upcoming G20 Summit in Indonesia should make the following proposals related to infrastructure financing:

- Prioritise infrastructure that addresses country-specific bottlenecks to structural transformation and job creation, and that is consistent with a country's NDCs and plans to achieve the SDGs, with a focus on agriculture, rural development, regional connectivity, resilience, and risk mitigation for climate change. The G20 Summit should call on all partners, including the private sector, not to finance new coal-fired power plants in any part of the world.
- The infrastructure financing gap is huge, exemplified by the Global Infrastructure Hub's estimate of the US\$18 trillion gap from now to 2040. The G20 should play a leadership role in proposing new initiatives and coordinating global efforts. One possibility is to use part of the US\$650 billion special drawing rights (SDRs) to establish a global green finance fund for green infrastructure. The newly formed Resilience and Sustainability Trust at the IMF is a good step in the right direction, albeit the size is far from adequate. In our view, the SDRs are not efficiently allocated for development.
- Strengthen G20 support for multilateralism – including the existing MDBs and funds, but also newly established MDBs, i.e., the Asian Infrastructure Investment Bank and the New Development Bank. Hundreds of new development finance institutions have been established in recent years. More new development institutions, such as Green Funds and PWFs, should be encouraged and financed.
- It is high time for the G20 leaders, the IMF, MDBs, rating agencies, and development practitioners to consider that a country's key infrastructure – such as water, electricity, transportation hubs, and telecom centres – are a country's core capital, like the tier I capital in the Basel Agreement. They should be valued favourably to support the country's viability and sustainability in the longer term, as compared to countries without these key infrastructures.
- Innovation is needed for both debt relief and green transformation. To create such a virtuous cycle, creditor countries should use tailored solutions in debt-distressed countries. These could include debt-to-bond swaps and debt-to-nature swaps, as well as asset+ based refinancing (Xu et al., 2021; Gallagher and Wang, 2020; Wang and Xu, 2022). Some of these proposals involve using SDRs for debt-to-bond swaps (Xu et al., 2021). We call on international financial institutions to take more responsibility in supporting (rather than rejecting) these innovative approaches from the Global South.

To achieve the SDGs in the post-pandemic era, all countries need to know what the government owns (asset) and owes (liability), to distinguish patient capital from footloose investors, and to separate long-term (structural) and short-term (liquidity) issues. Therefore, a public asset mapping exercise could be experimented with in countries, using public sector net worth as a comprehensive measure for debt sustainability. To address the long-term structural issues,

policymakers everywhere need to work with patient capital holders such as MDBs, regional and national development banks, SWFs, PWFs, and green funds by experimenting with innovative asset+ based refinancing, REITs, and other approaches suggested above. It is essential to make a concerted effort to reinvigorate investment in both hard and soft infrastructure, expand access to vaccinations, improve digital connectivity, and invest in green infrastructure to bolster growth along a sustainable, resilient, and inclusive path for achieving the SDGs by 2030 and beyond.

## Annex: How to Identify Bottlenecks<sup>4</sup>

To use the scarce financial resources effectively, it is essential to identify a country's infrastructure bottlenecks before the actual investment. For this purpose, we propose a method and use it to examine a panel data set of five broad indicators of infrastructure needs across all G20 and Asian developing countries from 2000 to 2017, using data sources from the World Development Indicators World Bank and GlobalEconomy.com. Our data set includes 39 countries – 16 upper middle-income countries, 19 lower middle-income countries, and 4 low-income countries. Table 10.A1 lists the countries in our data set. The following indicators are used to identify bottlenecks in infrastructure sectors: water, energy, road/rail/port transportation, telecommunications, and internet access.

**Table 10.A1: Sectors and Indicators for Bottleneck Identification**

Category	Indicator and Unit
<b>Infrastructure</b>	<b>Infrastructure</b>
1. Water	1. People using at least basic drinking water services (% of population), 2000–2017 (Source: World Bank World Development Indicators (WDI)).
2. Energy	2. Access to electricity (% of population), 2000–2017 (Source: WDI).
3. Road/Rail/Port/Air transportation	3. Road quality, 2006–2017; railroad infrastructure quality, 2009–2017; port infrastructure quality, 2006–2017; air transport infrastructure quality, 2006–2017, using the Borda method (Source: The Global Economy).
4. Telecommunications	4. Mobile cellular subscriptions (per 100 people), 2000–2017 (Source: WDI).
5. Internet access	5. Individuals using the internet (% of population), 2000–2017 (Source: WDI).

Source: Authors, based on the above-mentioned databases.

For each indicator and country, we first take the average value over 2000–2017 and then divide the countries into three income groups: low-income, lower middle-income, and upper middle-income. Second, for each country, we take the ranking order (percentile) of each indicator within their income group. For most of the above indicators, a higher-ranking order (percentile) indicates better access within the income group and hence a lower urgency for investment, except for the environment where a higher-ranking order (percentile) indicates worse emissions or deforestation within the income group and hence more urgency for investment.

For each country, we identify four out of five infrastructure indicators as bottlenecks. We order these bottlenecks by the level of urgency from 1 to 4. For each country, the lowest ranking

<sup>4</sup> For methodology, see Lin and Wang (2017a: 124–29).





Table 10.A2: G20 and Asian Developing Countries, By Income Group

Low-income countries	Lower middle-income countries	Upper middle-income countries
Afghanistan, North Korea, Syria, Yemen	Bangladesh, Bhutan, Cambodia, India, Indonesia, Iran, Kyrgyzstan, Lao PDR, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Palestine, Tajikistan, Timor-Leste, Uzbekistan, Viet Nam	Argentina, Armenia, Azerbaijan, Brazil, China,* Georgia, Iraq, Jordan, Kazakhstan, Lebanon, Malaysia, Maldives, Mexico, South Africa, Thailand, Turkey, Turkmenistan

\* China is not included in the bottleneck analysis.

Source: Authors.

## Acknowledgement

The authors are grateful to Kevin Gallagher, Ying Qian, and two anonymous reviewers for comments and to Yinyin Xu for excellent research assistance.

## References

- ADB (2017). *Meeting Asia's Infrastructure Needs*. Manila: Asian Development Bank.
- AfDB (2018). *African Economic Outlook 2018*. Abidjan: African Development Bank.
- Bhattacharya, A., K.P. Gallagher, M. Muñoz Cabré, M. Jeong, and X. Ma (2019), *Aligning G20 Infrastructure Investment with Climate Goals and the 2030 Agenda*, Foundations 20 Platform, A Report to the G20.
- Blanchard, O. (2022), 'Deciding When Debt Becomes Unsafe', *Finance & Development* (IMF), 59(1), pp.8–9.
- Das, M.B., A. Yuko, T.B. Chapman, and V. Jain (2022), *Silver Hues: Building Age-Ready Cities*. Washington DC: World Bank.
- Fay, M., H.I. Lee, M. Mastruzzi, S. Han, and M. Cho (2019), 'Hitting the Trillion Mark: A Look at How Much Countries Are Spending on Infrastructure', *Policy Research Working Paper*, No. 8730. Washington, DC: World Bank.
- Gallagher, K. and Y. Wang (2020), 'Sovereign Debt Through the Lens of Asset Management: Implications for SADC Countries', *GEGI Working Paper*, No. 042. Boston, MA: Boston University Global Development Policy Center.
- Gerschenkron, A. (1962), 'On the Concept of Continuity in History', *Proceedings of the American Philosophical Society*, 106(3), pp.195–209.
- Global Infrastructure Hub (2018), *Global Infrastructure Outlook: Infrastructure Investment Needs – 50 Countries, 7 Sectors to 2040*. Oxford: Oxford Economics.
- IMF (n.d.), Debt Sustainability Analysis: Low-Income Countries. <https://www.imf.org/en/publications/dsa> (02 December 2021).
- Izquierdo, A., R. Lama, J.P. Medina, J. Puig, D. Riera-Crichton, C. Vegh, and G. Vuletin (2019), 'Is the Public Investment Multiplier Higher in Developing Countries? An Empirical Exploration', *IMF Working Paper*, No. 19/289. Washington DC: International Monetary Fund.
- Kaplan, S.B. (2021), *Globalizing Patient Capital: The Political Economy of Chinese Finance in the Americas*. Cambridge: Cambridge University Press.
- Kuznets, S. (1966), *Modern Economic Growth: Rate, Structure, and Spread*. New Haven, CT and London: Yale University Press.

- Lin, J.Y. (2011), 'New Structural Economics: A Framework for Rethinking Development', *World Bank Research Observer*, 26(2), pp.193–221.
- Lin, J.Y. and Y. Wang (2017a), *Going Beyond Aid: Development Cooperation for Structural Transformation*. Cambridge: Cambridge University Press.
- Lin, J.Y. and Y. Wang (2017b), 'The New Structural Economics: Patient Capital as a Comparative Advantage', *Journal of Infrastructure, Policy and Development*, 1(1), pp.4–23.
- Mazzucato, M. (2018), *The Value of Everything: Making and Taking in the Global Economy*. London: Allen Lane.
- OECD (n.d.-a), Official Development Assistance. <https://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/official-development-assistance.htm> (accessed 12 April 2022).
- OECD (n.d.-b), Official Development Assistance – Definition and Coverage. <https://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/officialdevelopmentassistancedefinitionandcoverage.htm> (accessed 20 April 2022).
- OECD (2015), *Infrastructure Financing Instruments and Incentives*. Paris: Organisation for Economic Co-operation and Development.
- Piketty, T. (2014), *Capital in the 21st Century*. Cambridge, MA: Harvard University Press.
- Rozenberg, J. and M. Fay (2019), *Beyond the Gap: How Countries Can Afford the Infrastructure They Need while Protecting the Planet*. Washington, DC: World Bank.
- The Global Economy (various years), <https://www.theglobaleconomy.com/>
- Wang, Y. and Y. Xu (2022), 'Debt Restructuring in Africa: Building Public Assets and Addressing Bottlenecks for Low-Carbon Economic Transformation', *GGI Working Paper*, No. 020. Boston, MA: Boston University Global Development Policy Center.
- World Bank (various years), *World Development Indicators*, <https://databank.worldbank.org/source/world-development-indicators>
- Xu, J., R. Marodon, and X. Ru (2020), 'Identifying and Classifying Public Development Banks and Development Finance Institutions', International Research Initiative on Public Development Banks and Development Financing Institutions, *AFI Working Paper*, No. 192/*NSE Development Financing Research Report*, No. 2. Beijing: Peking University Institute of New Structural Economics.

Xu, Q. et al. (2021), 'Policy Measures to Deal with Debt Crisis in Developing Countries' (in Chinese), Proposal Presented in September 2021, *Cai-Jing*.

# Chapter 11

## Green Finance

### –The Road from Billions to Trillions

Ishac Diwan and Homi Kharas

#### 1. Introduction

Green financing can be considered as a structured financial activity that contributes to better environmental outcomes. As a general proposition, these activities can be disaggregated into three main areas: (i) sustainable infrastructure, notably the transition of energy systems to reduce the use of fossil fuels; (ii) adaptation and resilience, including the use of nature-based solutions; and (iii) agriculture and the transformation of land use, including the need for biodiversity conservation. In this paper, we refer to these as green activities – the investments, policies, and institutional changes needed to implement ambitions for a green and just transition of the global economy.

The main constituent elements of green activities have been clearly articulated by recent reports (e.g., IMF, 2021; World Bank, 2020; and United Nations Inter-agency Task Force on Financing for Development, 2021). For developing countries, in particular, they include a major role for public sector activities that allows countries to fulfil their nationally determined contributions (NDCs) under the Paris Agreement (UNFCCC, 2015). Green finance, as used here, is any finance that supports these activities. It therefore extends beyond climate finance, although the greenhouse gas emissions reductions involved in energy, transport, and land use transitions represent a large part of the financing needs.

The G20, as the main steering group for the global economy, is best positioned to advocate for changes that would support the development of green finance. It has already established the G20 Sustainable Finance Working Group (SFWG), under the Italian Presidency in 2021, which has laid out priority areas in a roadmap (G20 SFWG, 2021). This is a good step forward. The classic gains from collective action apply to green finance: larger investment multipliers when many countries act together; opportunities for learning-by-doing across different places, contexts, and issues; and larger markets that can spur technological innovation.

What is needed is a reform of the international financial architecture that can deliver green financing to developing countries at scale and with urgency and purpose. The most recent Intergovernmental Panel on Climate Change report (IPCC, 2022) suggested that developing countries would need to increase their climate financing by a multiple of 4x to 8x over 2019 levels, or by US\$1.8 trillion–US\$3.4 trillion per year.

In this paper, we go beyond existing proposals on how to support green finance by focusing on the reforms in public institutions needed to support developing countries to reach the climate goals of the Paris Agreement (Bhattacharya and Stern, 2021). In particular, we make recommendations on how the G20 SFWG can advance two of its work streams:

- Enhancing the role of international financial institutions (IFIs) in supporting the goals of the Paris Agreement and the 2030 Agenda, by changing:
  - the size and allocation rules for official development assistance (ODA);
  - the size and orientation of non-concessional official finance, including the role of IFIs in mobilising and catalysing private finance; and
  - debt resolution.
- Improving the comparability and interoperability of approaches to align investments to sustainability goals, specifically by:
  - the development of carbon markets and offsets in which all developing countries can participate.

## 2. Scale and Urgency of the Challenge

The numbers associated with green finance are often strikingly large, but the incremental costs, net of associated co-benefits, are far smaller and could even be negative. Green finance is not costly, in the traditional sense, but shifts costs from the future to the present. Precise figures would need detailed country NDCs and the related investment plans. The experience with the South Africa Just Energy Transition proposal, presented at the 26th United Nations Climate Change Conference (COP26) in Glasgow in 2021, suggests that investment and financing needs are likely to exceed the initial estimates made at COP15 in Copenhagen in 2009 when the US\$100 billion pledge was made, once all the transition costs are taken into consideration – including, for example, those related to compensation for workers affected by the closure of carbon-intensive activities.

The large size of the estimated financing needs suggests three important implications. First, given that the Sustainable Development Goals (SDGs) are already grossly underfinanced, making progress on the climate goals will require that green financing be both *additional* to what currently flows to finance the SDGs and *conditional* on the green activities being implemented.

Second, more grants should be provided to developing countries, in relation to their level of poverty and underdevelopment – the concessionality of climate finance matters as well as its volume in recognition of:

- equity for countries that have not contributed to carbon emissions, but that are now hurt by them;
- valuation differences on the benefits of a green transition for advanced economies and developing countries, given the higher discount factor in developing countries;
- adoption differences for green technologies, given the high interest rates developing countries face; and
- international assistance to compensate those adversely affected by a green transition.

The current situation has large gaps between lofty global goals, scarce public funds, and private capital unwilling to take on the risks of long-term investment in infrastructure and other green activities in developing countries. This suggests that a two-track approach is required. Because green finance requires scaled-up financing over decades, starting now, there is a set of issues to be tackled in the short run and, in parallel, a need for system reforms of the international financial architecture that will have an impact in the medium and long run.

### 3. A Path Forward – Consolidate the Base First

At COP15 in 2009, developed countries pledged to provide US\$100 billion annually in climate finance by 2020. This pledge has been extended through 2025, but the most recent figures (2019 estimate of US\$79.6 billion) suggest that the target for 2020 will not be met (OECD, 2019).

The experience of climate finance to date has highlighted several issues:

- The aggregate mobilised volume, despite being intended as a floor, is inadequate.
- Without a methodology for establishing additionality, there is a risk that climate finance will crowd out other development finance.
- Too little financing is being allocated to adaptation.
- Some vulnerable country groups, notably small island developing states, have had difficulty in accessing funds.

Given the reduced trust, legitimacy, and credibility that failure to fulfil the climate pledge has brought about, the G20 could usefully commit to the green pledge of its advanced economy members in its leaders' communiqué as well as articulate the increased ambitions of other G20 members in the run-up to COP27. Making the pledge more granular, in terms of specific pledges of official concessional and non-concessional finance and private capital to be mobilised by specific agencies, would introduce greater accountability into the pledge. Without such a scorecard, there is a risk that the US\$100 billion pledge will become akin to the 0.7% ODA target – aspirational but with little real commitment from many major donors.

Consolidating and delivering on the US\$100 billion pledge, and addressing the issues of allocation identified above, is an early priority for the G20. However, this is not enough. A clear signal that this is only the first step in a more ambitious programme of stepping up green finance would help to build credibility and commitment amongst developing countries that their voices are being heard.

We recommend that the G20 SFWG include in its annual report a stocktaking of progress towards the US\$100 billion climate pledge, both in terms of the aggregate amount and in terms of important disaggregation by geography and sector. The report could include issues for leaders to discuss.

We further recommend that a digital database of all cross-border activities supported by G20 members be established to improve transparency on what is being done by the G20 on green finance, in line with the Government of Indonesia's priority to track G20 commitments using digital



technologies. For example, several countries, including about half of the G20 members, already participate in the International Aid Transparency Initiative. An equivalent effort, but with participation from all G20 countries, narrowly focused on green finance, would generate up-to-date data in a standardised form. It would need to be extended to cover aid, non-concessional G20 bilateral flows, and mobilised private capital.

Such a database would build a stronger knowledge base on the scope and amounts of green finance that would shorten the current 2-year lag in reporting on official green finance to 1 year.<sup>1</sup> It would also provide opportunities to document the impact of the funds released under the US\$100 billion climate finance pledge and drive a learning agenda for donors and recipients alike.

Establishing a common knowledge platform, open to all, is critical for the G20 to scale up green finance. There are many ways to scale up, but three common features are focused attention, strategic planning and management, and resource allocation. The proposed knowledge platform would support each of these.

#### 4. Increasing and Reallocating Climate-Related ODA

Although the G20 is not a forum for discussing ODA pledges, it could usefully underline the sense of its members that additional ODA remains central to the global green transition. Green bilateral public finance for climate change totalled US\$30 billion per year in 2018 and 2019. This would have to increase by at least 50% by 2025 as part of a package to finance green transitions on the scale required (Kharas and Dooley, 2021). Some countries, including the United Kingdom and the United States, have already agreed to double their bilateral commitments by around 2025, but more progress is needed.

ODA is a particularly valuable component of climate finance due to its concessional terms. At present, grants only constitute US\$16.7 billion, or slightly more than 20% of total climate finance. But the large gaps in climate finance are in precisely those areas where concessional assistance is needed most:

- for adaptation and resilience
- for land use system changes
- for vulnerable and low-income countries

ODA has one additional role. It can be a system multiplier. Green activities need to be coordinated and planned, and domestic institutions and policies strengthened, to ensure country ownership of the activities, including through technical assistance. Concessional finance is best suited for these purposes.

There are two implications of this assessment for the G20 to consider. First, because of its special nature, there should be a sub-target within the US\$100 billion climate finance pledge for

---

<sup>1</sup> The lag in ODA reporting on green finance is 2 years and on other aspects of green finance it is even longer and more ad hoc.

concessional finance. The G20, which has not traditionally been a forum for aid pledges, could nevertheless encourage other forums to negotiate and set such a sub-target.

The second implication is to discuss the way in which concessional climate-related finance, most of which emanates from G20 members, is allocated. Middle-income countries that are willing to move on ambitious green transition plans cannot access ODA for the institutional and technical support they need to move from political commitment to action.

Importantly, as already noted, climate-related ODA allocation discussions must be held in conjunction with discussions on boosting the volume of aid to remove any inference that funds are being taken away from low-income countries to support this new global agenda.

## 5. Enhancing the Role of IFIs

Multilateral development banks (MDBs) currently finance about US\$38 billion in climate finance to developing countries, of which about 40% is for adaptation and the rest is for mitigation projects (African Development Bank et al., 2021). MDBs have announced their intention to ramp this up to US\$50 billion per year by 2025, divided equally between adaptation and mitigation (OECD, 2021). In doing so, they can count on the specialised Climate Investment Funds they have developed. The MDBs face a number of headwinds, however.

Several MDBs are now starting to reduce the level of their overall lending, as a natural counterpart of the countercyclical expansion of their COVID-19 response. The International Bank for Reconstruction and Development (IBRD), for example, has a board-approved sustainable lending level of US\$25 billion per year through 2025, considerably less than the US\$35 billion it committed in 2021. Regional banks are also constrained, although to different degrees. Amongst the major MDBs, only the European Investment Bank, the Asian Infrastructure Investment Bank, and the New Development Bank appear to have sufficient capital headroom to scale up climate commitments to a significant degree.

In the medium term, recognising that climate finance requires investments over a period of decades, or more, all the MDBs will face capital constraints if they are to play a material role. There are opportunities to use capital more effectively, for example by asset sales, to retain profits as equity and reserves, and to refine capital adequacy frameworks. Some innovations, such as the credit line issued to the European Investment Bank by the European Central Bank, could be explored for other MDBs to free up capital – potentially, advanced economies could provide a liquidity backstop to IBRD using their surplus special drawing rights (SDRs) – and these innovations are worth additional study.

But such fine-tuning will not be sufficient to underpin the 3X expansion in MDB lending for green finance that is required. It must be accompanied by shareholder commitment to capital increases. The process through which new capital is raised for MDBs has been long, complicated, and undertaken institution by institution. Ensuring an appropriate contribution to climate finance will

require a more strategic process where the contours and ambitions for the system are outlined. Because of the time lags involved, it would be best to start this process as soon as possible.

Despite considerable efforts, MDBs have not been able to leverage their lending multiple times with mobilised private capital. In the forward-looking Climate Finance Delivery Plan, only US\$0.80 of private money is expected to accompany each US\$1.00 of MDB lending (OECD, 2017). Raising the mobilisation rates of MDB finance is a pressing concern. Blended finance has started to grow, reaching about US\$40 billion–US\$50 billion in recent years, and a larger pipeline of projects by the International Finance Corporation in particular is promising for further future growth, but efforts on this front must be accelerated.

## 6. Reallocating More SDRs to Accelerate Green Transitions

The US\$650 billion SDR allocation agreed in August 2021 created hopes that new resources could flow to developing countries. While SDRs were allocated in line with long-outdated quotas, rich countries have started rechannelling part of their allocation.

At this point, pledges remain timid and are only directed at International Monetary Fund (IMF) facilities. The Poverty Reduction and Growth Trust, which supports the delivery of the SDGs, is being enlarged by about US\$20 billion. In support of the green agenda, a new Resilience and Sustainability Trust (RST) is being established at the IMF, and the challenge is now to get it up and running with funding of about US\$50 billion. While other facilities at the IMF can be used to respond rapidly to climate disaster, the main goal of the RST should be to signal those fiscal mechanisms are in place to back NDCs, to encourage co-financing by MDBs and bilateral financing institutions.

To generate demand for RST funding, it will be important for access to be aligned with NDC needs, and for the new instrument to have minimal conditionality. In the current discussions, the question of conditionality looms large. But when NDCs are credible and legitimate, they should allow for some shifting of conditionality from Bretton Woods macro conditions to national parliaments, based on negotiations on how to build resilience conducted between national governments and the communities affected.

In the long run, a specialised institution, such as a Global Green Bank, may have to be created to generate the leverage that the RST cannot provide. The option of SDR reallocation to finance World Bank and regional development bank programmes should be developed.

A large SDR allocation to MDBs to finance the green agenda would allow green finance to move towards wholesaling. To date, climate finance has been allocated to specific projects. Project interventions will remain important – particularly in specialised domains that are best served by vertical funds, such as those related to biodiversity, capacity and institution building, or monitoring and evaluation. But as financial flows going to the green agenda become larger, increased reliance on wholesaling through country systems becomes necessary. Country platforms that focus on broad sector plans (transport, energy, construction, and land management), and that are financed in more wholesale ways, should become more prevalent. This would also dynamise

the process of setting up NDCs and improving them over time – which requires devising policy reforms and initiatives, building the needed institutions, constructing a pipeline of projects, and developing mutual accountability mechanisms between national stakeholders and the international community.

## 7. Expanding and Integrating Carbon Markets

New carbon sequestration reduces the effort needed to reach net zero. It can come from three sources: reforestation and avoided deforestation; avoidance or reduction of emissions such as methane from landfills; and technology-based removal of carbon from the atmosphere. The first forest-related source can be produced at much lower costs in some poor countries, and it could radically change the climate narrative – from viewing poor countries as victims (and focused solely on adaptation needs) to important actors in saving the planet (by actively sequestering carbon).

Projections by Climate Action show that Africa has enormous untapped potential in reforestation: if it could sell carbon removal at US\$50/ton, up to US\$15 billion of annual revenue could be generated on the continent, creating 35 million–86 million jobs, and enormous livelihood improvement in the process (Climate Action Platform Africa, n.d.). McKinsey suggests that at this price, annual global demand for carbon credits could reach 1.5–2.0 billion tons by 2030, and up to 7–13 billion tons by 2050 – i.e., about 10%–20% of the required reductions by 2050 (Blaufelder et al., 2021).

The market for offsets, however, is currently restricted to a shallow ‘voluntary market’, where buyers are firms that voluntarily offset their own emissions for corporate social responsibility reasons. Transactions tend to be over the counter at low and dispersed prices of US\$2–US\$10 per ton. The size of these operations was estimated at around 160 million tons in 2020 (at about US\$1 billion), but it is growing fast (by 70% in 2021) (UNFCCC REDD+, n.d.-a). Demand has been beefed up by global sector agreements, such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

The inclusion of offsets in national markets would greatly expand demand. There have been two main constraints to this: first, policymakers need to be sure that these offsets have high enough quality (and are thus real). Second, they need an internationally recognised mechanism to count these as part of their own NDCs. There is now progress on both fronts, and room to consolidate and magnify the potential gains for developing countries to become large producers of carbon offsets.

On the first quality front, the worry relates to negative earlier experiences (especially under the Kyoto Clean Development Mechanism), which had pushed the European Union to outlaw forestry credits in its cap-and-trade programme due to concerns about their environmental integrity (Song and Moura, 2019). Since then, the growth of organised exchanges for voluntary offsets has pushed for the development of more disciplined standards based on four principles: additionality, permanence, verification, and measurability. These could extend to subnational exchanges – California has already proposed standards for forest offsets that it could accept in its ‘cap and

trade' carbon market (EDF, n.d.). Several standards certification agencies have emerged, such as REDD+, which certifies emissions reductions related to forestry (UNFCCC REDD+, n.d.-b).

Much progress has also been achieved on the second criterion of how to measure and attribute ownership to offsets that are traded. With the recent amendment of Article 6 of the Paris Agreement, it is now possible to account globally for carbon offsets (UNFCCC, 2015). The amendment has established a legally recognised way of crediting carbon credits to be used by the 193 parties to the Paris Agreement in determining their NDCs. This involves the upkeep of a global registry where countries' NDCs are kept, together with regular measurements of their actual emissions, with carbon trade netted out (UNFCCC, n.d.).

## 8. Dealing with Sovereign Debt

Green finance cannot evolve without confidence that countries will be able to maintain access to external credit, public and private. But currently, the need for green finance vastly surpasses the limits imposed by the creditworthiness of sovereign governments. Worse, the global urge to expand green finance is taking place at a time of mounting debt-servicing difficulties, which will be exacerbated by the expected tightening of monetary policy in the United States and the European Union. From a policy perspective, this makes it important to rapidly resolve the current debt overhang in ways that do not deter private flows in the future, and over time, to strengthen the financial architecture in ways that allow for closer global integration of capital markets. The Common Framework for debt treatment beyond the debt service suspension initiative needs to be refreshed in a way that encourages speedier debt resolution while dealing with more cases.

An expansive programme of green transformation will inevitably result in debt obligations that exceed the current thresholds used in debt sustainability analyses by credit rating agencies, the IMF, and the World Bank. This is because the thresholds place a premium on the analysis of liquidity rather than solvency. Where public investments in green transformation are high, there is a rise in public assets associated with the rise in public liabilities, and solvency may even be improved if projects are well executed. Many countries have successfully set up and used public wealth funds to finance infrastructure assets in particular. But doing this well requires an accounting approach that properly uses the International Financial Reporting Standards, rather than book value, as well as a management approach that prioritises a return on public assets (Detter and Fölster, 2018). A successful green transformation has the potential to substantially raise the value of local government land holdings.

The debt overhang is raising particular tensions amongst low- and middle-income countries, which, having struggled to cultivate capital market access (to offset their loss of access to ODA), resist being asked to restructure their private debts and jeopardise this access. Helping low- and middle-income countries to maintain market access should therefore be a priority. There are many technical options: swapping sovereign debt into long-term concessional green debt; the provision of partial risk guarantees by MDBs for new green debt, after restructuring; and debt claims that are more flexibly indexed to risk (such as state-contingent bonds). The G20 could develop a menu of those it is willing to support.

## References

- African Development Bank et al. (2021), *2020 Joint Report on Multilateral Development Banks' Climate Finance*.  
<https://thedocs.worldbank.org/en/doc/9234bfc633439d0172f6a6eb8df1b881-0020012021/original/2020-Joint-MDB-report-on-climate-finance-Report-final-web.pdf>  
(accessed 20 April 2022).
- Bhattacharya, A. and N. Stern (2021), 'Beyond the \$100 Billion: Financing a Sustainable and Resilient Future', *Policy Note*. London: London School of Economics and Political Science Grantham Research Institute on Climate Change and the Environment.  
<https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2021/11/Beyond-the-100-billion.pdf> (accessed 20 April 2022).
- Blaufelder, C., C. Levy, P. Mannion, and D. Pinner (2021), 'A Blueprint for Scaling Voluntary Carbon Markets to Meet the Climate Challenge', McKinsey, 29 January.  
<https://www.mckinsey.com/business-functions/sustainability/our-insights/a-blueprint-for-scaling-voluntary-carbon-markets-to-meet-the-climate-challenge> (accessed 20 April 2022).
- Climate Action Platform Africa (n.d.), <https://capa.earthrise.media/> (accessed 20 April 2022).
- Detter, D. and S. Fölster (2018), 'Unlocking Public Wealth: Governments Could Do a Better Job Managing Their Assets', *Finance and Development*, 55(1), pp.44–47.  
<https://www.imf.org/external/pubs/ft/fandd/2018/03/pdf/detter.pdf> (accessed 20 April 2022).
- EDF (n.d.), 'A California Standard to Help Save Tropical Forests', Environmental Defense Fund.  
<https://www.edf.org/climate/california-standard-help-save-tropical-forests> (accessed 20 April 2022).
- G20 SFWG (2021), *2021 Synthesis Report*. [https://g20sfgw.org/wp-content/uploads/2021/11/Synth\\_G20\\_Final.pdf](https://g20sfgw.org/wp-content/uploads/2021/11/Synth_G20_Final.pdf) (accessed 20 April 2022).
- IMF (2021), *Group of Twenty: Reaching Net Zero Emissions*. Washington, DC: International Monetary Fund. <https://www.imf.org/external/np/g20/pdf/2021/062221.pdf> (accessed 20 April 2022).
- IPCC (2022), *Climate Change 2022: Impacts, Adaptation and Vulnerability. Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge and New York: Cambridge University Press (in press).  
<https://www.ipcc.ch/report/ar6/wg2/> (accessed 20 April 2022).

- Kharas, H. and M. Dooley (2021), 'Status Check: Managing Debt Sustainability and Development Priorities Through a "Big Push"', *Brookings Global Working Paper*, No. 162. Washington, DC: Center for Sustainable Development at Brookings. <https://www.brookings.edu/wp-content/uploads/2021/10/Status-Check.pdf> (accessed 20 April 2022).
- OECD (2017), 'Blended Finance: Mobilising Resources for Sustainable Development and Climate Action in Developing Countries', *Policy Perspectives*. Paris: Organisation for Economic Co-operation and Development. <https://www.oecd.org/cgfi/forum/Blended-finance-Policy-Perspectives.pdf> (accessed 20 April 2022).
- OECD (2019), 'Statement from OECD Secretary-General Mathias Cormann on Climate Finance in 2019'. <https://www.oecd.org/newsroom/statement-from-oecd-secretary-general-mathias-cormann-on-climate-finance-in-2019.htm> (accessed 20 April 2022).
- OECD (2021), 'Forward-Looking Scenarios of Climate Finance Provided and Mobilised by Developed Countries in 2021–2025', *Technical Note*, Climate Finance and the USD 100 Billion Goal. Paris: Organisation for Economic Co-operation and Development. [https://www.oecd-ilibrary.org/finance-and-investment/forward-looking-scenarios-of-climate-finance-provided-and-mobilised-by-developed-countries-in-2021-2025\\_a53aac3b-en](https://www.oecd-ilibrary.org/finance-and-investment/forward-looking-scenarios-of-climate-finance-provided-and-mobilised-by-developed-countries-in-2021-2025_a53aac3b-en) (accessed 20 April 2022).
- Song, S. and P. Moura (2019), 'An Even More Inconvenient Truth: Why Carbon Credits for Preservation May Be Worse Than Nothing', *ProPublica*, 22 May. <https://features.propublica.org/brazil-carbon-offsets/inconvenient-truth-carbon-credits-dont-work-deforestation-redd-acre-cambodia/> (accessed 20 April 2022).
- UNFCCC (n.d.), Nationally Determined Contributions (NDCs). <https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/nationally-determined-contributions-ndcs#eq-2> (accessed 20 April 2022).
- UNFCCC (2015), *Paris Agreement*. Bonn: United Nations Framework Convention on Climate Change Secretariat. [https://unfccc.int/files/meetings/paris\\_nov\\_2015/application/pdf/paris\\_agreement\\_english.pdf](https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english.pdf) (accessed 20 April 2022).
- UNFCCC REDD+ (n.d.-a), United Nations Framework Convention on Climate Change Reducing Emissions from Deforestation and Forest Degradation in Developing Countries. <https://redd.unfccc.int/> (accessed 20 April 2022).
- UNFCCC REDD+ (n.d.-b), United Nations Framework Convention on Climate Change Reducing Emissions from Deforestation and Forest Degradation in Developing Countries Lima REDD+ Information Hub. <https://redd.unfccc.int/info-hub.html> (accessed 20 April 2022).

United Nations Inter-agency Task Force on Financing for Development (2021), *Financing for Sustainable Development Report 2021*. New York: United Nations. <https://developmentfinance.un.org/fsdr2021> (accessed 20 April 2022).

World Bank (2020), *Transformative Climate Finance: A New Approach for Climate Finance to Achieve Low-Carbon Resilient Development in Developing Countries*. <https://openknowledge.worldbank.org/bitstream/handle/10986/33917/149752.pdf> (accessed 20 April 2022).



# Chapter 12

## Strengthening the Multilateral Trading System: the ‘WTO Rising’ Imperative

Richard Baldwin and Dmitry Grozoubski<sup>1</sup>

### 1. Introduction

The World Trade Organization (WTO) – which was built around yesterday’s consensus to tackle yesterday’s challenges – is being pushed to breaking point by the entrenched disagreements of today. It will need reimagining if it is to rise to the 21st century challenges confronting humanity. And rise it must.

The great trials confronting humanity imperil lives, not just livelihoods. Climate change, the pandemic, and persistent economic inequalities threaten to tear communities apart, spark social upheavals, and foster extremist politics within nations. Between nations, the same factors create strife that may lead to a fractured global economy, to commercial wars, or even real ones.

What does trade and the WTO have to do with this?

Trade is not the only thing we need to tackle these problems, but there will be no solutions without trade. We cannot fight climate change, repair the economic and health damage caused by the coronavirus disease (COVID-19), or redress economic inequality unless goods, technology, data, expertise, services, and capital move from nations where they are abundant to nations where they are scarce.

This is exactly what trade does. International commerce is driven by arbitrage that moves things from where they are abundant, and thus relatively cheap, to where they are scarce, and thus relatively dear. Much more international commerce will be needed to solve the existential problems. However, the required trade growth will not happen without a high-performing multilateral trade system to provide certainty and to smooth inevitable frictions. This, in turn, requires a WTO that has the status, the clout, and the resources it needs. Call it the ‘WTO rising’ imperative.

---

<sup>1</sup> This paper was prepared to assist and support the Government of Indonesia in its G20 presidency as part of a project (Indonesia’s G20: Recover Together, Grow Stronger) led by the Jakarta-based think tank, the Economic Research Institute for ASEAN and East Asia (ERIA).

This short paper focuses on how the WTO can help with two of the challenges: climate change, and economic recovery from the pandemic. This is not to deny that there is ample room for improvement in other areas of the WTO's portfolio (see Wolff, forthcoming 2022, and others).<sup>2</sup> Before turning to concrete recommendations, we lay out the case that the WTO is simultaneously indispensable and inadequately equipped to handle the scale of difficulties thrown up by climate change and recovery from the pandemic.

## 2. Buttressing the Climate Rescue's Trade Pillar

Hundreds of millions of people are at risk from climate change, and the disruption, poverty, hunger, disease, and economic and social inequalities it threatens to unleash and exacerbate (IPCC, 2021). And the matter is pressing. The most recent IPCC report (IPCC, 2021) and the United Nations Environment Programme's *Adaptation Gap Report 2021* (UNEP, 2021) tell us that humanity has only a few decades to rescue itself from the climate change it is causing. The alternative to this climate rescue is human misery on a vast scale.

### 2.1. Trade is part of the problem but there is also no solution without trade

Solving the problems of too much heat, too little fresh water, and too much seawater (rising seas) all involve know-how moving from nations that have it to nations that do not. Much of this know-how is moving across borders embedded in goods, services, investments, or intellectual property. This is why any solution that mitigates global emissions without trapping billions in perpetual poverty will require much more trade. As WTO Director-General Ngozi Okonjo-Iweala put it in a recent speech, 'There is no going green, without going global'.<sup>3</sup>

Taking food, for example, a 2018 FAO report points out that food will be much harder to grow in parts of the world where there are many people and easier to grow in places where there are few people (FAO, 2018). If the billions that are alive today and those to be born by 2050 are to be fed, trade in food must surge, and along with it the movement of agrochemicals, fertilisers, and heat- and drought-resistant variants. Again, that requires more trade.

How, though, will economies pay for the escalation of climate change mitigation efforts and adaptations? Equally critically, how will economies (especially developing and least developed economies) manage the trade-offs between faster and greener growth? Aid, solidarity, and corporate social responsibility programmes can be expected to play their part but are unlikely to be enough. The power of the market must be harnessed. Countries importing know-how must generate their own counterflows of goods and services. This will require economies, most notably advanced economies, to remain open.

None of this is to deny that trade is part of the climate problem. International trade is, after all, woven into the fabric of almost every economic activity on the planet – and most of these activities

---

<sup>2</sup> A preview of Wolff (forthcoming) is available in Wolff (2022). Also see Srinivasan (2020), Gao (2021), and Hopewell (2021), *inter alia*.

<sup>3</sup> Delivered virtually at the National Bureau of Economic Research (NBER) Trade and Trade Policy in the 21st Century Conference, 8 April 2022.

emit greenhouse gases. Trade is thus inseparable from the climate emergency. However, would curtailing trade make things better or worse?

An analogy might help. Agriculture is responsible for about a fifth of greenhouse gas emissions, but no one argues that we should solve the climate crisis by eliminating agriculture. Starving humanity will not save humanity. The answer with food production – as it is with trade – is to acknowledge that food and trade are simultaneously parts of the problem and integral elements of the solution. They are essential pillars of economic activity that both support human life and drive climate change.

## **2.2. Frictions are coming – and the system must step up to manage them**

Government interventions encouraging more sustainable production, consumption, and growth are positive and desirable, but they will produce trade frictions. Foreign subsidies, for instance, risk causing a domestic backlash if constituencies feel they are being forced to sacrifice disproportionately or are being cheated in the competition for the jobs of the future. Such level-the-playing-field thinking underpins the European Union’s proposed Carbon Border Adjustment Mechanism (CBAM), and it has already caused frictions. A Japanese government spokesperson at the June 2021 G7 meeting, for instance, said the CBAM sparked ‘one of the quite controversial, heated discussions among the concerned parties’ (Mathiesen, Vela, and Webber, 2021).

Without the WTO as a space to share and discuss policies and their resultant frictions, there is a real risk of nations squabbling while Rome burns. Starkly put, there will be no climate rescue without trade, and managing trade’s role and the inevitable frictions that will arise. There is no getting around this. The touchstone thesis of the rules-based trade system is that governments set some basic rules of the game, and businesses decide what to make and how based on market signals. Climate mitigation and adaptation, however, require governments to alter or override market signals in ways that re-enforce the fight against climate change.

Put differently, the tools that governments use today to fight climate change, and will increasingly use tomorrow, will unavoidably alter markets in ways that will upset trade partners. As policies such as procurement preferences, production, research, and development (R&D), and consumption subsidies and taxes increasingly incorporate climate considerations, they will inevitably create winners and losers. The losers will object. Even if used exclusively in good faith, and innocent of all protectionist intent, policies like border tax adjustments aimed at reducing carbon leakage and/or reducing competitiveness losses, or supply-side subsidies designed to encourage domestic production and export of green goods, will still predictably create reactions by trade partners that could easily degenerate into retaliatory cycles. International competition for so-called ‘green jobs’, while positive, is a likely source of such disputes.

One clear example is that the rush into green industries and the creation of green jobs may create situations akin to what we see in steel. There is every risk of governments subsidising and protecting the same politically attractive green industries while neglecting others; and utilising protectionist measures which limit import competition, harm innovation, and curtail the dissemination of new technologies.

While binding rules to prevent the frictions above would be desirable, and we envisage and commend the work of negotiators trying to arrive at a consensus towards them, we must be realistic. The odds of the WTO agreeing on such rules are incredibly low, and climate governance is such a new field that any rule-making today could risk imperilling the policy innovations of tomorrow. Rather, as discussed below, we need mechanisms, procedures, and forums to facilitate transparency and discussion around the policies governments are contemplating and implementing.

Without such a space, there is every risk that governments, operating on imperfect information about the policies of their neighbours and facing political pressure at home, will react in ways that hinder the climate rescue.

### 3. Reducing Poverty and Hastening the Economic Recovery with ‘Telemigration’

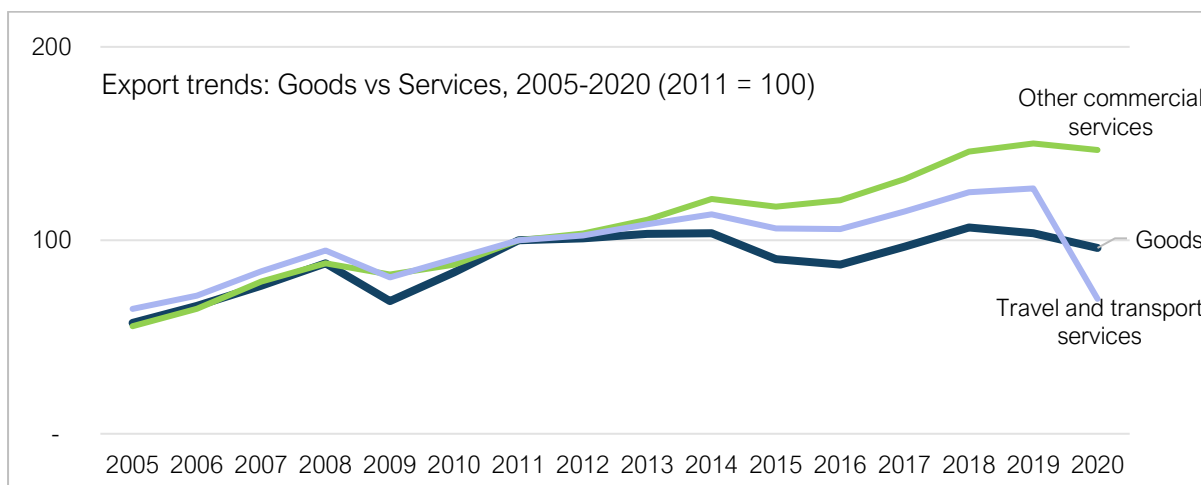
COVID-19 is devastating livelihoods as well as lives. It threw almost 100 million into extreme poverty in 2020 (Gerszon Mahler et al., 2021). A recovery is under way, but moving slowly and unevenly, and is now imperilled by economic shocks arising from a polarising conflict in Europe. The multilateral trade system can help reverse the damage by fostering job creation. As International Labour Organization (ILO) Director-General Guy Ryder phrased it, ‘Without a deliberate effort to accelerate the creation of decent jobs ... the lingering effects of the pandemic could be with us for years in the form of lost human and economic potential, and higher poverty and inequality’ (ILO, 2021a).

Creating export jobs is hard, but recent developments in international commerce offer hope that the multilateral trade system can boost job creation rapidly. The hope lies in services trade, especially ‘telemigration’, which means international telework (Baldwin, 2019). These opportunities are widely underappreciated despite several recent high-profile reports stressing the role of services trade in development (WTO, 2019; Nayyar, Hallward-Driemeier, and Davies, 2021; ILO, 2021b; ADB, 2022). Online work also has implications for women’s opportunities since, as ILO (2021b: 22) noted, ‘The preference or need to work from home or for job flexibility is particularly important for women in developing and developed countries alike’.

#### 3.1. Exports of ‘intermediate services’ are booming

Trade in goods has stagnated for a decade, but trade in services has not (Figure 12.1). World goods trade grew 4% from 2011 to 2019, but Other Commercial Services (OCS), which basically means office work, rose by 50%, with the growth of travel and transport service exports lying in between. COVID-19 decimated travel and transport, but OCS held up. Goods trade is still the largest component (76%), but services now account for almost a quarter of export earnings globally. As the figures show, two of the three regions hardest hit by the pandemic (Africa, and Latin America and the Caribbean) saw goods exports fall during 2011–2019 but saw service exports boom. Least developed countries’ exports experienced slow growth that contrasts sharply with a boom in services (from a small base).

Figure 12.1: Export Growth in Goods and Services Trade, 2011–2019, and 2019 Export Shares



8-year export growth: Goods versus Services

	Goods	Other Commercial services	Travel & Transport services
World	4%	50%	27%
Share of region's total exports in 2019	76%	14%	10%
Africa	-22%	46%	24%
Share of region's total exports in 2019	81%	5%	14%
Least-developed countries	5%	19%	80%
Share of region's total exports in 2019	83%	5%	13%
South and Central America and the Caribbean	-22%	19%	26%
Share of region's total exports in 2019	79%	8%	13%

Notes: Pandemic disruptions caused travel and transport services to collapse in 2019 and 2020. In 2020, world goods trade and services trade amounted to US\$17.6 trillion and US\$4.9 trillion, respectively.

Source: WTO Trade in Commercial Services (WTO Stats), <https://stats.wto.org/> (accessed 10 March 2022).

What sort of services are being exported from, say, Africa? Data from the WTO show that Africa is experiencing rapid export growth in service sectors that some may not associate with African competitiveness. For instance, between 2011 and 2019, R&D services exports rose by 448% (from a small base), professional and management consulting services by 192%, and financial services by 56%. For complete details, see WTO (2019).

This happened because digital technology opened the door to trade in ‘intermediate services’. The notion of intermediates is familiar when it comes to goods – intermediates are to produce things while final goods are consumed. Likewise, intermediate services are services that go into the production of things, but which do not get delivered directly to the clients. For example, legal research behind a court filing is an intermediate service, while the court filing is the final service.

Before the information and communication technology (ICT) revolution made it easy to coordinate complex processes over long distances, most intermediate services were undertaken by the company producing the final service. Now, however, many intermediate services are provided by contract suppliers. The contractors are often domestic, but increasingly they are sitting abroad given the vast wage difference between advanced and emerging markets. This is creating export-linked jobs for bookkeepers, forensic accountants, CV screeners, administrative assistants, online client help staff, graphic designers, copy editors, personal assistants, travel agents, software engineers, and the like. Calculations using the Organisation for Economic Co-operation and Development (OECD) Inter-Country Input-Output (ICIO) matrix show that more than half of all existing service-sector exports are intermediate services rather than final services (authors' calculations).

An important point is that intermediate services face few barriers because existing service-sector regulations overwhelmingly target final services only (OECD, 2022).

### 3.2. Service-export-linked jobs are booming

Service exports tend to be 'job-rich' since services tend to be labour intensive. This point can be seen in OECD data that use ICIO analysis to calculate the number of jobs associated with trade in all sectors, including service sectors. The data only cover OECD members and a few large non-members, but they are revealing.

**Table 12.1: Importance of Business Service Exports in Overall Job Creation  
2011–2018 (in thousand)**

Country	Total jobs created (net)	Export-linked jobs created	
		Economy wide (net)	Business service sectors (net)
Brazil	4,780	3,853	1,620
Mexico	3,859	2,819	1,276
Turkey	5,116	1,679	783
South Africa	2,414	372	334
Indonesia	14,974	885	1,357

Source: OECD (2021), Trade in Employment (TiM) data set, 2021 edition.

[https://stats.oecd.org/Index.aspx?DataSetCode=TIM\\_2021](https://stats.oecd.org/Index.aspx?DataSetCode=TIM_2021) (accessed 2 March 2022).

For a selection of nations, Table 12.1 shows the number of jobs created in the country overall (first column), and those related to exports in the second and third columns. In Mexico and Brazil, business service jobs linked to exports were a big slice of the total, economy-wide job creation. In Turkey, the figure (about 15%) was smaller, but new Turkish jobs that were linked to business services were a third of all new export-linked jobs. In South Africa, service exports accounted for a high share of all export-linked job creation (about 90%). For Indonesia, export-linked business-service job creation was a much smaller component of total job creation, but since non-service export jobs actually fell in the country, the service-export-linked job creation (equal to 1.357 million) was more than 100% of export-job creation in all sectors.

The point is that services exports are already an important source of export jobs. The expansion is widespread and includes least developed nations which were hit so hard by COVID-19. This is why we believe that supporting intermediate services exports is one vital way for G20 leaders to foster economic recovery from the pandemic and reverse the rise in poverty.

Critically, from a poverty reduction point of view, the jobs in services export sectors are providing opportunities to segments of the population that do not historically benefit as strongly from manufacturing-led growth, as well as to small and medium-sized enterprises which might otherwise struggle to harness the capital, global reach, or economies of scale to compete internationally in goods. There is an inclusivity dividend to be collected if governments work hard enough.

#### **4. Specific policy recommendations**

Ensuring that trade helps rather than hinders the climate rescue and helps speed up the recovery with service-export-linked jobs are two very concrete challenges that G20 leaders can address in 2022. We start with trade's contribution to the climate rescue.

##### **4.1. Building the trade pillar of the climate rescue**

The first specific recommendation on climate is premised on three realities: (i) there will be no climate rescue without a well-functioning world trade system; (ii) the trade system will come under enormous stress since national climate plans involve policies – like subsidies, border taxes, and preferential government procurement – that will inevitably create trade clashes; and (iii) to keep the climate rescue on track, G20 leaders must prevent the conflicts from derailing adoption of national climate policies.

Recommendation No. 1: There is nothing new about the disputes that will arise, but disputes over policies motivated by concern for humanity's future should be treated differently from ordinary commercial disputes. G20 leaders should create a process, together with the WTO leadership, that prepares the ground for climate-related disputes, and ultimately leads to a new infrastructure for handling climate-related disputes via mediation, negotiation, discussion, and adjudication (a restored or reimagined binding dispute settlement mechanism would be an optimal outcome even if it is unlikely in the short term).

The new process should start with scientific, economic, legal, and political fact-finding and analysis. The process should be open, transparent, and inclusive. We stress that it must include scientific expertise since the efficacy of climate policies will surely matter in the disputes, and rapid technological advances are continually changing the meaning of 'least trade-distorting' policies. Given its existing expertise and near-universal membership, the WTO should be provided with the necessary resources and mandate to evolve and take on this new role.

This new system need not be a revolution. The WTO of today has mechanisms for addressing these frictions but they are limited, siloed, and do not systematically recognise the climate imperative. We propose the establishment of holistic and sustainability-centric procedures and

guidelines. The new infrastructure should enable the WTO and its strengthened and empowered the Secretariat to rise as a facilitator and illuminator of these climate-related disagreements, and an honest broker providing good offices where day-to-day tensions can be aired, discussed, moderated, and resolved.

As part of this, G20 leaders should stress the usefulness of the Trade and Environmental Sustainability Structured Discussions (TESSD) that are already ongoing at the WTO. These discussions, which are typical of the new WTO approach that allows like-minded members to cooperate under the WTO umbrella, are not a replacement for the mandated Committee on Trade and Environment; they are a supplement. The key point is that like-minded nations will cooperate somewhere. It might as well be in the WTO since it has a long tradition of openness and inclusion. There is no 'Security Council' or 'Executive Board' in the WTO.

TESSD meetings, open to any WTO member whether they are a signatory or not, represent the most established and active venue to host discussions between all WTO members about the types of policies they are contemplating, how these will impact other members, and how emerging frictions can be managed. Importantly and unusually, TESSD is also open to stakeholders other than governments, lending its deliberations an inclusivity vital to maintaining public support and ensuring maximal, broad input.

G20 policymakers have an opportunity to demonstrate leadership around this initiative by agreeing to participate actively in TESSD meetings and supporting the WTO Secretariat in fully resourcing and supporting them. Critically, participation in the TESSD and its deliberations need not entail a commitment to participate in any evolution of the TESSD towards plurilateral rule-making, which some G20 Members consider inappropriate.

More broadly, G20 policymakers should recommit their officials and ministries to fully embracing the monitoring, deliberation, and transparency pillars of the WTO, especially on climate-related issues. Though not as headline-grabbing as negotiations or disputes, the WTO's role in shining a light on policies and allowing their implications to be discussed may prove even more critical to preventing the climate rescue descending into green trade wars.

### *Link the trade and climate communities*

The climate and trade communities are siloed and separated. This cannot continue. The WTO should be explicitly included in efforts to advance, amplify, and coordinate the climate rescue. Thus:

Recommendation No. 2: G20 leaders should call for the creation of a meeting co-chaired by the WTO Director-General and the United Nations Framework Convention on Climate Change (UNFCCC) Executive Secretary or UNFCCC Conference of the Parties (COP) presidency on the programme of each COP meeting. The meeting would have as its goal the coordination of international efforts on trade and climate. A signal, from the very top, that trade policy is an ally of the climate fight, and that climate is an indispensable consideration for trade policy, is imperative. The G20, and then the WTO and COP in partnership, can provide that signal.



#### 4.2. Facilitating the economic recovery with service export jobs

Emerging and developing country service exports have boomed with little or no international cooperation. India's services export miracle, for instance, was accomplished without a single trade agreement being signed. We believe service exports, and the creation of associated jobs, will continue to thrive given the lack of formal barriers to trade in intermediate services and the explosive pace at which digital technology is making remote workers seem less remote. There are, nevertheless, some steps that G20 leaders should take to prevent new roadblocks being placed on this new pathway to prosperity.

In the medium run, the rapid growth of telemigration will change the lives of office workers and professionals and create upheaval in advanced economies just as the rapid rise of manufactured exports did during the last decades (Baldwin, 2019). The upheaval is then very likely to produce new forms of protection to limit telemigration that will look quite different to protection in goods sectors. It is not feasible to put Trump tariffs on, say, companies in the United States having telemigrants check receipts against expense claims. One possible backlash may be to use privacy and national security regulations to hinder the necessary cross-border information flows.

Recommendation No. 3: To manage a future backlash, G20 leaders should establish an eminent persons' group to think ahead about how the WTO can anticipate and monitor the backlash, suggest updates to the rules-based multilateral trading system necessary to accommodate the rapid rise of services trade, and rethink the trade–development nexus and the WTO's role.

As with the 1958 Haberler Report, the committee should prognosticate how the world trade system can address these barriers in a fair, transparent, and inclusive fashion.<sup>4</sup> Part of the mandate should be to develop significantly improved ways of measuring services trade, and of identifying barriers to trade in intermediate services. Today, the measurement of telemigration is abysmal since statistics on trade in services have not received the attention and resources that they deserve in the 21<sup>st</sup> century. The WTO should be given the resources to investigate ways of setting up development-friendly statistics gathering, potentially through new or expanded partnerships with others like the International Monetary Fund (IMF).

### 5. Concluding remarks: The 'WTO rising' imperative

The measures we call for in this paper are not dramatic. We do not suggest that G20 leaders call for a grand new update to the WTO rules; a treaty-based, unified global carbon price; or a restoration of the WTO Appellate Body. While laudable goals, the likelihood of securing a consensus on these changes in the time we have is low. However, there are still practical steps to be taken.

---

<sup>4</sup> A report by a panel of four eminent experts commissioned to forecast trade trends and provide suggestions for the General Agreement on Tariffs and Trade (GATT) contracting parties before the 13th Session in Geneva on 16 October 1958 (GATT, 1958).

G20 leaders can provide the WTO with an infusion of the political capital and focus that it needs to rise and evolve to meet the challenges of the 21<sup>st</sup> century. Perhaps even more critically, by focusing on the monitoring pillar and enhancing the WTO's function as a transparency and discussion forum, G20 leaders can give the organisation new life without first solving long-standing areas of contention.

More broadly, to ensure that international commerce plays its role in tackling humanity's existential challenges, the status and clout of the WTO must rise. International commerce will be one of the economic mainstays in the fight against climate change and extreme poverty, and the global effort to reduce inequality via the creation of export-linked jobs in developing and emerging economies. The WTO rising imperative is about increasing the likelihood that international commerce remains as rules based as possible while supporting sustainable, inclusive, and equitable growth.

Above all, a mindset change is needed. Leaders must recognise that the WTO is not just about commercial calculations best left to diplomats and trade ministers. It is about coming together to find ways of countering the challenges that endanger humanity. It is about saving millions of lives. It is about countering developments that threaten to lock billions into perpetual poverty. It is a place that requires head-of-state attention and the status to match. We are arguing that G20 leaders need to perceive trade as part of the solution to humanity's existential challenges, and 'WTO rising' as an imperative.

## Acknowledgement

We thank Shuhui Xiang, Rebecca Freeman, and Angelo Theodorakopoulos for assistance with the data and calculations.

## References

- ADB (2022), *Asian Economic Integration Report 2022: Advancing Digital Services Trade in Asia and the Pacific*. Manila: Asian Development Bank.
- Baldwin, R. (2019), *The Globotics Upheaval: Globalization, Robotics, and the Future of Work*. New York: Oxford University Press.
- Baldwin, R. and R. Forslid (2020), 'Globotics and Development: When Manufacturing Is Jobless and Services Are Tradable', *NBER Working Paper Series*, No. 26731. Cambridge, MA: National Bureau of Economic Research.  
[https://www.nber.org/system/files/working\\_papers/w26731/w26731.pdf](https://www.nber.org/system/files/working_papers/w26731/w26731.pdf) (accessed 28 March 2022).
- Benz, S. (2017), 'Services Trade Costs: Tariff Equivalents of Services Trade Restrictions Using Gravity Estimation', *OECD Trade Policy Papers*, No. 200. Paris: Organisation for Economic Co-operation and Development. <https://doi.org/10.1787/dc607ce6-en> (accessed 30 March 2022).
- FAO (2018), *The Future of Food and Agriculture: Alternative Pathways to 2050*. Rome: Food and Agriculture Organization of the United Nations.
- Gao, H. (2021), 'WTO Reform and China: Defining or Defiling the Multilateral Trading System?', *Harvard International Law Journal*, 62, pp.1–38.
- GATT (1958), 'Trends in International Trade', A Report by a Panel of Experts. Geneva: Contracting Parties to the General Agreement on Tariffs and Trade.
- Gerszon Mahler, D., N. Yonzan, C. Lakner, R.A. Castañeda Aguilar, and H. Wu (2021), 'Updated Estimates of the Impact of COVID-19 on Global Poverty: Turning the Corner on the Pandemic in 2021?', World Bank Blogs, 24 June.
- Hopewell, K. (2021), 'Trump & Trade: The Crisis in the Multilateral Trading System', *New Political Economy*, 26(2), pp.271–82.
- ILO (2021a), 'Slow Jobs Recovery and Increased Inequality Risk Long-Term COVID-19 Scarring', WESO Trends 2021, 2 June.
- ILO (2021b), *World Employment and Social Outlook 2021: The Role of Digital Labour Platforms in Transforming the World of Work*. Geneva: International Labour Organization.
- ILO (2021c), *World Employment and Social Outlook: Trends 2021*. Geneva: International Labour Organization.

IPCC (2021), *Climate Change 2021: The Physical Science Basis, Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press (In Press).

Mathiesen, K., J.H. Vela, and E. Webber (2021), 'The EU's Carbon Club of One: Brussels Seeks G7 Support as It Pushes Ahead with A Border Tax for Carbon, but the US and Japan Are Concerned', *Politico*, 12 June. <https://www.politico.eu/article/eu-carbon-border-tax-support-g7-us-japan/> (accessed 30 March 2022).

Nayyar, G., M. Hallward-Driemeier, E. Davies (2021), *At Your Service? The Promise of Services-Led Development*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/35599> (accessed 30 March 2022).

OECD (2020), *OECD Services Trade Restrictiveness Index: Policy Trends up to 2020*. Paris: Organisation for Economic Co-operation and Development.

OECD (2022), *OECD Services Trade Restrictiveness Index: Policy Trends up to 2022*. Paris: Organisation for Economic Co-operation and Development.

Srinivasan, T.N. (2020), *Developing Countries and the Multilateral Trading System: From GATT to the Uruguay Round and the Future*. New York: Routledge.

UNEP (2021), *Adaptation Gap Report 2021: The Gathering Storm – Adapting to Climate Change in a Post-Pandemic World*. Nairobi: United Nations Environment Programme.

Wolff, A. (forthcoming), *World Trade Governance: The Future of the Multilateral Trading System*. Cambridge: Cambridge University Press.

Wolff, A.W. (2022), 'WTO 2025: Restoring Binding Dispute Settlement', *PIIE Working Paper*, No. 22-5. Washington, DC: Peterson Institute for International Economics. <https://www.piie.com/publications/working-papers/wto-2025-restoring-binding-dispute-settlement> (accessed 17 April 2022).

WTO (2019), *World Trade Report 2019: The Future of Services Trade*. Geneva: World Trade Organization.