RESILIENCE AND ECONOMIC GROWTH IN TIMES OF HIGH UNCERTAINTY

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TOWARDS E-COMMERCE DEVELOPMENT IN THE CAREC REGION

Ghulam Samad and Soo Hyun Kim

ABBREVIATIONS

ADB	Asian Development Bank
ADBI	Asian Development Bank Institute
AIDS	Acquired Immune Deficiency Syndrome
AMC-DBM	Asset Management Company of Development Bank of Mongolia
ASEAN	Association of Southeast Asian Nations
B2C	Business-to-Consumer
CA	Central Asia
CAC	Codex Alimentarius Commission
CACILM	Central Asia Countries Initiative for Land Management
CAHDR	Central Asia Human Development Report
CAREC	Central Asia Regional Economic Cooperation
CATI	Computer-Assisted Telephone Interview
CG	Corporate Governance
CGDC	Corporate Governance Development Center
CIS	Commonwealths of Independent States
CLM	Committee on Land Resources Management of the Ministry of Agriculture of the Republic of Kazakhstan
CO2	Carbon Dioxide
COVID-19	Coronavirus Disease 2019
CRS	Constant Returns to Scale
CSA	Climate-Smart Agriculture

CSO	Civil Society Organization
CSR	Corporate Social Responsibility
DEA	Data Envelopment Analysis
DRM	Disaster Risk Management
EBRD	European Bank for Reconstruction and Development
EC	Efficiency Change
EFCA	Eurasia Foundation of Central Asia
EIA	Environmental Impact Assessment
EITI	Extractive Industries Transparency Initiative
ESG	Environmental, Social, and Governance
ESIA	Environmental and Social Impact Assessment
ETT	Erdenes-Tavantolgoi
EU	European Union
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investments
FE	Fixed Effect
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GFC	Global Financial Crisis

ABBREVIATIONS

GGEI	Global Green Economy Index
GHG	Greenhouse Gas
ha	Hectares
HIV	Human Immunodeficiency Virus
ICT	Information and Communication Technology
IEA	Impact Evaluation Analysis
IFRC	International Federation of Red Cross and Red Crescent Societies
ILO	International Labor Organization
IMF	International Monetary Fund
INRM	Integrated Natural Resources Management
IPPC	International Plant Protection Convention
ISO	International Organization for Standardization
IWRM	Integrated Water Resources Management
IXP	Internet Exchange Point
JSC	Joint Stock Company
KGS	Kyrgyzstani Som
Kt	Kiloton
KZT	Kazakhstani Tenge
LDN	Land Degradation Neutrality

LDN TSP	Land Degradation Neutrality Target Setting Program
LEM	Long-Run Economic Multiplier
LLC	Limited Liability Company
LP	Linear Programming
mCDI	Modified Combined Deficit Index
MEGNR	Ministry of Ecology, Geology, and Natural Resources
MI	Malmquest Index
MICS Plus	Multiple Indicator Cluster Survey Plus Survey
MoA	Ministry of Agriculture of the Republic of Kazakhstan
MPI	Malmquest Productivity Index
MSME	Micro, Small and Medium Enterprise
MUB	Municipality of Ulaanbaatar
NDA	National Development Agency
NGO	Non-Governmental Organization
OECD	Organization for Economic Cooperation and Development
OIE	World Organization for Animal Health
OLS	Ordinary Least Squares
OWID	Our World in Data
OxCGRT	Oxford COVID-19 Government Response Tracker

ABBREVIATIONS

PRC	People's Republic of China
R&D	Research and Development
SARS	Severe Acute Respiratory Syndrome
SDG	Sustainable Development Goal
SDSN	Sustainable Development Solutions Network
SLM	Sustainable Land Management
SME	Small and Medium-Sized Enterprise
SPI	Speed of Policy Implementation
SPS	Sanitary and Phytosanitary
SSU	Subsoil and Subsoil Use
TC	Technological Change
TCO	TengizChevronOil
TFA	Trade Facilitation Agreement
TFP	Total Factor Productivity
TFPCH	Total Factor Productivity Change
TT JSC	Tavantolgoi Joint Stock Company
TTF	Trade and Transport Facilitation
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNCITRAL	United Nations Commission on International Trade Law

UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children's Emergency Fund
US	United States
USD	United States Dollar
VRS	Variable Returns to Scale
WB	World Bank
WDI	World Development Indicator
WHO	World Health Organization
WIUT	Westminster International University in Tashkent
WTO	World Trade Organization

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FOREWORD

Welcome to the second volume of the CAREC Institute annual book, focused on challenges and opportunities for economic growth in the CAREC region in the post-COVID-19 world. Resilience and Economic Growth in Times of High Uncertainty explores insights of existing major challenges facing SMEs and households, new prerequisite resilient trends for economic growth, climate change risks for food security, and potential opportunities for enhanced commercial connectivity to boost economic activity in the CAREC region.

Looking back at the years of the pandemic, one can see a challenging period for all the world economies. Unlocking productivity factors, specialization, scale, and developing markets of global reach — the main drivers of globalization and economic growth over the past three decades — are all heavily challenged. Initially a health crisis, the global pandemic triggered unprecedented economic and social disruption, with substantial ramifications for many domains of the economy. Some service sectors that were strongly impacted by the pandemic are still suffering setbacks. Small and micro businesses suffered especially strongly. These generate a substantial share of GDP and income in the CAREC region and account for an even larger share of employment; they still might need specific support to fully recover.

Even though GDP growth reaccelerated in 2021 to reach 2019 levels in almost all CAREC economies, 2022 brought serious new challenges. New virus variants evolved, geopolitical tensions evoked the risk of fragmenting the global geo-economic order causing setbacks for international trade. Surging energy and food prices are further augmenting global poverty and global 'stagflation.' CAREC economies are not immune to these developments. Both their exports and their imports are affected, and price increases negatively impact the real incomes and livelihoods of the populations in the CAREC economies.

Navigating the uncertainty brought on by the COVID-19 crisis and amplified by new emerging threats, the CAREC economies are currently in the midst of a fundamental transition to a path full of challenges that require concerted, resilient, and inclusive actions from governments. A confluence of health crisis and ongoing geopolitical disruptions are making this transition a hard one. However, having a better understanding of and therefore addressing the deep connections between diverse sectors of the economy is key to maintaining and improving current and future economic growth.

To improve the chances of navigating safely through this period and making a strong and resilient recovery, the availability of evidence-based response measures is critical. While the world gradually feels its way towards a changing normal, rethinking and reckoning some policy options and business practices can be pivotal against the backdrop of all ongoing and augmenting economic, social, environmental, and political challenges. Research findings compiled in this volume of the CAREC Institute annual book reveal some underpinnings of how resilient crisis measures might appear across different sectors of the CAREC economies and what potential growth options can be helpful along the road.

Editors

The editorial team would like to thank a number of people and teams who have been involved in the development of this second volume of the CAREC Institute annual book. Our foremost thanks go to Syed Shakeel Shah, former Director of the CAREC Institute, and Iskandar Abdullaev, Deputy Director of the CAREC Institute, who have contributed to shaping this volume as reviewers and editors, and led us through this journey. Equally important to note are the efforts made by CAREC Institute research team led by Qaisar Abbas and knowledge management team led by Xin Lei. We also thank Johannes Linn, Non-Resident Senior Fellow at the Brookings Institution, who continuously contributes to the CAREC Institute's knowledge generation activities.

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INTRODUCTION

Johannes F Linn / The Brookings Institution

The CAREC region — encompassing Afghanistan, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Mongolia, Pakistan, Turkmenistan, Uzbekistan and two provinces of the People's Republic of China (PRC) (Inner Mongolia and Xinjiang Uygur Autonomous Region) — represents a critical land bridge on the Euro-Asian supercontinent, connecting Asia with Europe as well as North Asia with South Asia. It provides important overland transport corridors that facilitate trade across the entire Euro-Asian continental space. Improved connectivity across the region is also critical for the integration of the CAREC regional markets and for linking the land-locked member countries to global markets.

The Central Asia Regional Economic Cooperation (CAREC) Program was created in 2000 by six countries (Azerbaijan, Kazakhstan, Kyrgyz Republic, PRC, Tajikistan, and Uzbekistan) with the support of six international institutions (ADB, EBRD, IMF, Islamic Development Bank, UNDP, and the World Bank) to encourage regional cooperation among the member countries, especially in the areas of transport and transport facilitation, trade and trade facilitation, and energy. Since then CAREC has expanded its membership to 11 members and broadened its mandate to cover a wide range of substantive topics, including not only its traditional focus areas, but also agriculture, education, health, water, tourism, gender, and ICT/digital. Under the CAREC umbrella, as of December 2021, member governments and development partners have invested USD41 billion in improved infrastructure, capacity building, and policy reform.

The CAREC Institute was established by the CAREC member countries in 2009 as an international organization, initially operating virtually, but since 2015 functioning as a physical entity with its headquarters in Urumqi, Xinjiang Uygur Autonomous Region (PRC). The goal of the institute is to assist CAREC and its member countries with research, knowledge sharing, and capacity building to support economic cooperation and integration among CAREC countries. One of the key events organized by the CAREC Institute is its Annual

Research Conference, with the second CAREC Institute Research Conference having taken place on 11-12 April 2022 on the theme 'Resilience and Economic Growth in Times of High Uncertainty in the CAREC Region.' This volume compiles selected research papers presented at the second research conference.

This introduction briefly traces the history of research on regional cooperation and integration in Central Asia, by revisiting a milestone report prepared by UNDP in 2005 in partnership with ADB and the World Bank, the '2005 Central Asia Human Development Report: Bringing down barriers: Regional cooperation for human development and human security' (CAHDR). By highlighting the main findings and messages of the CAHDR, by assessing which of them remain relevant for the CAREC region today, and by identifying gaps in the analysis of the report, the stage is set for an overview of the papers in this volume and their contribution to further advance the understanding of regional cooperation opportunities and challenges in the CAREC region.

THE 2005 CENTRAL ASIA HUMAN DEVELOPMENT REPORT: FINDINGS AND LESSONS FROM PAST RESEARCH

The CAHDR was the first report of its kind for Central Asia. It covered the five former Soviet Republics of Central Asia and was prepared by an interdisciplinary team of international experts for the United Nations Development Program (UNDP), with strong participation of Central Asia experts and national advisory groups for each country. The focus of the report was on regional cooperation for human development and security. The coverage of issues was broad, including: (i) history and human development trends; (ii) trade and investment; (iii) natural resources: water, energy, and the environment; (iv) regional threats: natural disasters, drugs, crime, and terrorism; (v) the social development challenge:

migration, health, education, and gender; (vi) political and institutional constraints and opportunities; and (vii) cooperation with neighbors and international partners.

Overarching messages

The report's overarching messages include the following:

- Central Asia is a pivotal region and land bridge at the heart of Euro-Asia, surrounded by some of the world's largest and most dynamic economies;
- Increased regional cooperation and economic integration will produce big gains with a regional economy potentially twice as large as in 2015 relative to 2005; costs of non-cooperation are high (lost economic opportunity, disease, natural disasters, environmental destruction, conflict, and insecurity);
- The most important areas for cooperation are trade and transit, water, energy, disaster preparedness;
- Border barriers need to be drastically lowered — CA needs borders with a 'human face';
- Domestic policy reforms (including social policy) and good governance need to complement regional cooperation; and
- The UN Secretary General should appoint a special envoy and representative to follow up on the recommendations in this report.

These overarching messages were buttressed by a set of sector and theme-specific messages.

Trade and investment

Central Asia's economies were found to suffer from severe formal and informal border barriers, with the report providing estimates of the time and cost implications. These barriers were reinforced by complex and opaque trade policies, by poor and poorly maintained transport infrastructure (road, rail, air), by wasteful investments to avoid border crossings, and unsupportive 'behind the border' business and transit conditions. The report included the following recommendations:

- WTO accession and possibly a Central Asia common market as a long-term goal;
- Trade and transport facilitation (TTF) policies;
- Improved infrastructure nationally and regionally;
- Reform of behind border business conditions;
- Creation of an effective regional organization; and
- International support for regional cooperation.

In the years following the report's publication, CAREC picked up on this agenda with the development of the CAREC corridors, transport investments, and some progress on the TTF agenda. The UNDP followed up with more analytical work on Central Asian regional trade, migration, and remittances (UNDP 2015). Investments under the PRC's Belt and Road Initiative also supported infrastructure development; however, significant barriers remain at the borders, reinforced during the COVID-19 pandemic.

Water, energy, environment

The report showed dramatic inefficiencies in the domestic management of water and energy that needed to be rectified. It further noted that regional cooperation was essential to optimize the development, sharing, and export of water and energy. It also highlighted a large number of water and environmental hotspots, including the Aral Sea disaster, dam safety, water-related cross-border community conflicts, radioactive tailings, and water and air pollution. The report quantified the potential losses from the mismanagement of the region's natural resources as well as the benefits from remedial action. It recommended the following steps:

- Improvement in national water, energy, and environmental management;

• Regional cooperation on cross-border water, energy, and environmental issues;
• Engagement with civil society in addressing these issues and cross-border community cooperation;
• Regional and international organizations to focus on these issues (including support for the adoption of global conventions).

Progress made on these issues has been limited. CAREC has focused on support for recreating the regional electricity grid and its effective management and recently prepared an energy strategy (CAREC 2010). The World Bank and other international funders supported the development of a major electricity transmission line from Kyrgyzstan and Tajikistan to Afghanistan and Pakistan (CASA1000). CAREC did not deal with water issues until recently but is now focused squarely on this issue with its 'Water Pillar'; many fundamental challenges remain in managing national and regional water resources and environmental threats.

Natural disasters, drugs, crime, and terrorism

The CAHDR identified significant regional threats from major natural disaster risks (especially earthquakes), from cross-border drug trade and drug-related crime, terrorism threats emanating especially from Afghanistan, limited national and regional risk preparedness and response capacity and a narrow focus on security solutions, rather than on risk preparedness and on underlying societal drivers of these regional threats. The report made the following recommendations:
• Development of comprehensive national risk response and reduction strategies, balancing security and social aspects;
• Building capacity for national disaster preparedness and response;
• Cooperation with neighboring countries and preparation of regional disaster responses;
• A response from regional and international organizations focusing on these risks.

The UNDP engaged in a follow-up program of work on disaster risk that culminated in the publication of a synthesis report in 2013 (Thurman 2013). However, many of the risks identified in the CAHDR remain today and will need continued attention on a national and regional basis.

Migration, health, education, gender

The CAHDR report highlighted that Central Asia faces common challenges in managing migration, restoring quality health services and responding to epidemic threats, improving education and advanced skills acquisition, and stemming the erosion of women's rights. The region's migration and health threats have important regional dimensions, while education and gender issues are predominantly national in nature. The report recommended regional action in a number of areas, including:

• Exchange of experience on best practice, establishment of common standards and norms, and support for information and knowledge exchange;

• Allowing cross-border access to education and health services for border communities; and

• Regional and international organizations to support regionwide initiatives to improve social conditions, including migration and gender related.

As noted earlier, UNDP (2015) focused on migration and remittances in Central Asia, building on the analysis of CAHDR. CAREC prepared a health strategy (CAREC 2021) and a gender strategy (CAREC 2022). However, the social issues identified in CAHDR remain important today, reinforced by the COVID-19 pandemic, continuing challenges in education and health systems, and continued migration pressures and gender equality issues.

Political and institutional constraints

The CAHDR noted a number of political and institutional constraints to regional cooperation. National authorities were more concerned with protecting than with sharing national sovereignty in the early years after independence. Legitimate cross-border activities were often stifled (especially for small businesses and traders), while illegal ones (smuggling, drug trade, and so on) were overlooked by the authorities. Corruption was pervasive. This could lead to a potential vicious cycle, as poor governance leads to rising popular resentment and opposition is in turn crushed by increasing government control. These factors were seen to limit regional cooperation. The report recommended the following actions:

- Liberalization of economic and political systems with greater transparency and accountability;
- Pursuit of regional cooperation as part of a beneficial cycle, with economic and social gains underpinning reforms;
- Regional organizations to organize peer reviews of reforms, conflict resolution, and support for CSOs; and
- International organizations to support governance and institutional reforms.

Many of these problems persist today and still interfere with effective regional cooperation.

Cooperation with neighbors and international partners

The report noted that Russia and (increasingly) China are the principal neighbors for Central Asia with many political and economic ties, but also that Afghanistan and Iran are important neighbors. The International Monetary Fund, multilateral development banks (MDBs), and UN agencies are the principal international partners, and their support for CAREC is a significant opportunity. All neighbors and partners are fundamentally interested in a stable, prosperous, transit-friendly CA region, but have a limited focus on supporting regional economic integration and cooperation and are constrained in addressing key governance obstacles. The report made the following recommendations:

• An expanded scale of engagement, especially by the international development partners;
• A focus by partners not only on national economic and social development, but also on regional economic cooperation;
• Support governance reforms;
• More coordination across partners;
• Help for building strong regional organizations (including CAREC);
• Appointment of a UN special envoy to encourage and support the authorities in increasing their regional cooperation.

In fact, no UN special envoy was appointed and no regional organization with an exclusive focus on the five Central Asia republics was established, while CAREC expanded its membership as noted earlier. Selective regional initiatives for Central Asia have been developed by multilateral and bilateral development partners, focused on specific areas of cooperation (such as, in the area of disaster prevention and early warning). ADB focused much of its attention and resources on supporting CAREC and the CAREC Institute.

Scenarios

The CAHDR developed five scenarios of possible cooperation, ranging from a most pessimistic one with largely closed borders, very weak regional institutions, and very narrow and superficial cooperation to the most optimistic one, leading to deep integration, with open borders, strong formal regional organizations, and broad and deep cooperation. Both extreme scenarios — the most pessimistic and the most ambitious (deep integration) — were regarded as unlikely. The most likely scenario was seen to be an intermediate one (cluster integration) with a subset of countries in the region cooperating more closely than others. A more optimistic was also considered, involving more universal cooperation among the countries, with relatively open borders, strengthened regional institutions, and a wider range of areas with relatively intensive cooperation. The actual outcome over the last 15 years falls in the middle range of the scenarios. Since Uzbekistan opened up its economy and developed a more cooperative approach after a change in government in 2016, the prospects for improved cooperation have brightened considerably, but many challenges remain.

Lessons for research on Central Asian regional cooperation

In retrospect, the CAHDR had some strengths worth remembering for research on Central Asia. It had a clear focus on regional cooperation at a time when nation-building was still the principal focus for national authorities. It had a comprehensive coverage and interdisciplinary approach and team, and an explicit focus on social and governance aspects. It took an 'inside-out' perspective by relying extensively on experts from Central Asia, and it drew on an opinion survey to bring in the views of the wider population on the issues. In terms of an 'outside-in' perspective, the report relied on cooperation between UNDP, ADB, and the World Bank. The CAHDR argued not only in qualitative terms, but also tried to quantify the benefits of cooperation and of costs/losses of non-cooperation/inaction. It explored alternative cooperation scenarios and their implications and tailored its recommendations to national governments, regional organizations, and the international community. As a result of these strengths, the report represents a useful 'baseline' for researchers who are today working on regional cooperation and economic integration in Central Asia.

However, with the benefit of hindsight, the report revealed some important blind spots, or areas that could and perhaps should have been explored in greater depth:

• Sectoral and functional perspectives — agriculture, industry, services, labor and financial markets, urban-rural dimensions and tourism were not addressed;

• Climate change — the adaptation challenge was mentioned only in passing, not as a focus of serious exploration, and there was no mention of climate change mitigation,

limiting the carbon footprint, pursuit of renewable energy, and so on;
• Internet connectivity — this, too, was mentioned in passing, but not as a significant force of connectivity, of change, and with associated risks;
• Pandemic threats — epidemic threats were mentioned (SARS, avian flu, HIV/AIDS), but pandemic threats for COVID-19 were not envisaged;
• Threats to sovereignty — the influence of neighbors was largely presented as beneficial; potential risks to the sovereignty of the Central Asian republics from its large neighbors were not considered;
• Concepts and terminology — the report, understandably, did not incorporate much of today's terminology, including green economy, economic corridors, land-linked (instead of land-locked), (climate) smart cities, digital transformation, e-commerce, and so on.

Revisiting a comprehensive report that was prepared almost 20 years ago provides an opportunity to consider how the perspective of analysis, research, and policy shifts with time and the limits on the ability of researchers to identify the key issues on the horizon that will have to be addressed by future generations. Looking back today, an honest assessment would admit that the challenges of climate change, pandemic threats, and internet connectivity were on the horizon, and should have been identified more clearly, at least as part of a horizon scanning exercise. Subsequent reports on Central Asia, involving some of the same authors as the CAHDR, did address many of the issues that the CAHDR missed, while also building on some of the strengths of the CAHDR. These include the following: 'Kazakhstan 2050: Toward a Modern Society for All' (Aitzhanova et al. 2014), 'Central Asia 2050: Unleashing the Region's Potential' (Nag et al. 2016), and 'The Central Asian Economies in the Twenty-First Century: Paving a New Silk Road' (Pomfret 2019). What is more, CAREC and the CAREC Institute have worked intensively on many important regional issues requiring cooperation, including in energy, water, agriculture, climate, health, gender, and e-commerce.

Despite its limitations, the CAHDR correctly identified the cooperation agenda at the time as a critical opportunity which, if acted on consistently by the authorities, could have substantially improved the economic and social trajectory of the region. But, again seen with the benefit of hindsight, an honest assessment would conclude that the report had only limited impact. Why? One reason was its limited dissemination and that a core recommendation — the appointment of a UNDP special envoy — was not implemented. There was follow-up with CAREC as the report's findings were presented to the CAREC Senior Officials Meeting and the CAREC Ministerial Conference in 2005 and the CAHDR project leader and principal author served as special adviser to CAREC during 2005 to 2010. This meant that some of the messages of the report were included in the work of CAREC during these years. But beyond this there was little follow-up; in particular, other development partners, aside from the ADB, did not systematically focus on regional cooperation as a priority of their engagement with Central Asian countries. Moreover, the regional water agenda was too controversial at the time (especially for Uzbekistan), the social agenda not inherently 'regional,' and the governance agenda politically sensitive. Moreover, proposals for strengthening regional organizations were too optimistic, and the widening of the membership of CAREC beyond its Central Asia core probably weakened the interest of the Central Asian member countries in CAREC as an instrument for their cooperative endeavors. Finally, one must recognize that the economic argument and quantification of benefits and costs carried little weight when faced by political reality, where regional cooperation and the policy changes it might require are often not seen as serving the interests of important national stakeholders.

What, then, are the lessons for current and future research on regional cooperation in Central Asia? Most importantly, economists must not be discouraged by the apparently overwhelming power of politics; they need to hammer away at the message that economic benefits and losses are real, computable, and make a difference in people's lives. CAREC and the CAREC Institute are excellent platforms for this. At the same time, economists have to pay more attention to politics, have to understand who are winners and losers, and have to find ways to compensate deserving losers. They must realize the need for constituency and coalition building, must reach and convince leaders, and must be patient and build on opportunities for action when these arise. In their research, economists must not forget the 'old' issues over the 'new' — trade and infrastructure investment remain critical; water and energy resources need better management; the operation and maintenance of infrastructure assets remain a major challenge; seismic risks remain high; and longstanding environmental challenges are still important. At the same time, the 'new' issues — such as, climate change, pandemic threats, and the impact of the digital revolution — need to be addressed. Moreover, researchers have an obligation to scan the horizon for important new issues or for new aspects of current or 'old' issues, explore them, and bring them to the attention of policy makers in real time. Finally, the publication of academic papers, books, and reports is only the beginning of the process of achieving results; if researchers want their ideas to have an impact, they — and their organizations — need to find ways to influence public opinion, policy, and programs that are being designed and implemented by national authorities, by private business, by civil society, and by international development partners.

The research papers in this volume help fill important gaps in knowledge

The research papers presented at the Second Annual Research Conference of the CAREC Institute and collected in this volume provide a valuable compilation of research results, mostly by experts from the CAREC region. They offer a fitting response to the 'blind spots' of the CAHDR identified earlier, by addressing the impact of the COVID-19 pandemic, looking at key aspects of climate change and green economy, exploring important policy issues relevant to agriculture and food security, and looking at regional connectivity from the perspective of e-commerce development.

Understanding current uncertainties about businesses and households

The first three papers in this part focus on the impact of the COVID-19 pandemic. The first chapter, by Brendan Duprey and Aizhan Salimzhanova, analyzes the impact of the COVID-19 pandemic on small and medium size enterprises (SMEs) in the five Central Asian republics. It finds that the impact has been severe, especially for SMEs in the tourism, hospitality, services, transport, construction, and manufacturing sectors. Lockdowns, supply-chain disruptions, border closures and so on resulted in reduced SME activity and employment loss. The authors note that governments responded with various policy packages designed to support SMEs, including finance, grants, and relief from taxes and utility charges. However, this provided only a partial cushion and continued support (such as tax deferrals and financial assistance) will be needed.

The next chapter, by Dina Azhgaliyeva, Ranjeeta Mishra, Trinh Long, Peter Morgan, and Wataru Kodama, estimates the impacts of COVID-19 on household businesses, employment, and education in ten CAREC countries (minus the PRC) drawing on household interviews (1,000 interviews per country). The paper confirms the negative impact on SMEs and employment noted by Duprey and Salimzhanova. It also notes that there were significant losses in education owing to school closures, with increased dropout rates and rising educational gaps. However, the analysis shows that the impact differed significantly across countries and households. For example, households with higher education, older household heads, and paid employment experienced less joblessness; household businesses with access to digital communication, which were able to adjust in response to the drop in demand, were less severely affected; and older children as well as children from educated households were more likely to attend virtual classes.

A third chapter by Kamalbek Karymshakov, Dastan Aseinov, and Burulcha Sulaimanova focuses specifically on the impact of COVID-19 on household income in Georgia and

Mongolia, based on in-depth household interviews. The authors found that households with younger and male heads as well as households with lower assets, greater job losses, and less access to the internet tended to experience greater household income losses. They also noted that households receiving government support experienced smaller losses than those without access to such support. The authors recommend close monitoring of the household-level impact of pandemics and government responses that are targeted to the specific needs of households — especially those with fewer assets. Improved digital connectivity will also help contain the negative impact on income from the pandemic.

New imperatives for green economic growth

This part of the book includes two papers addressing the issues relevant for incorporating social and environmental issues into company business decisions, the green development, and climate change challenges in the CAREC countries. Chapter four, developed by Aigerim Tleukhanova, Yelif Ulagpan, Ablay Dosmaganbetov, Anastassiya Vorobyeva, Akbota Batyrkhan, and Stefanos Xenarios, focuses on the role of corporate social responsibility (CSR) in Kazakhstan and the implications for Mongolia. It focuses especially on the mining industry and the application of CSR principles by selected firms. It concludes that CSR is relatively well known and understood as a concept in larger mining firms, but there is limited information on its actual implementation. In Kazakhstan, state agencies support CSR standards in principle, but there is no regular monitoring and regulatory standards remain unclear. In Mongolia, there is no CSR legal framework (although Mongolia belongs to the Extractive Industries Transparency Initiative [EITI]), limited reporting, and hence little information on CSR practices. In conclusion, the authors note that CSR should play an important role in both countries, and that firms do accept CSR as a regulatory standard where required. They recommend that incentives (including tax incentives) be deployed for wider acceptance and compliance with CSR standards.

In chapter five, Bakhrom Mirkasimov, Etenesh Asfaw, Zohid Askarov, and Azizakhon Mukhammedova consider the determinants of carbon emission and the potential economic impact of 'green' economy strategies in Central Asia by focusing on Kazakhstan and Uzbekistan. Their analysis confirms that increased reliance on renewable energy lowers carbon emission, as does higher forestry cover. Higher population growth, urbanization, net exports, and primary energy use raise emissions. Interestingly, higher economic growth is associated with an inverted U curve for emissions, with higher growth initially raising emissions, but after a threshold value leading to lower emissions, in part because higher economic growth rates make it easier to manage the energy transition. The authors note that while, in the long term, decarbonization can also result in higher growth rates, in the short term it presents the authorities with difficult choices because of the potential negative social impact of higher energy prices. In conclusion, they stress the importance of green cities, forestry, and increased energy efficiency.

Climate change risks for agriculture and food security

Climate change inevitably weakens agricultural resilience in the CAREC region unless active countersteps are taken. This issue has taken on increased urgency as a result of the current food security crisis in the world, which also has the CAREC region in its grip. In chapter six Iroda Amirova and Etenesh B Asfaw present the results of an empirical study of agricultural productivity and resilience to external shocks in selected CAREC countries by considering the impacts of the 2008 and 2020 economic crises on agricultural productivity. They analyze that changes in total factor productivity are owing to technological change and changes in efficiency. They define resilience in terms of whether agricultural productivity is robust and adaptable in response to crises. They noted that resilience to external shocks varied across countries, with Azerbaijan and Mongolia being the least resilient. They conclude that maintenance of agricultural productivity is important during crises, that measures to improve technological change and efficiency are critical for enhancing resilience, and that it is important that governments support agriculture in times of crisis, rather than ignoring it.

The chapter by Zhanel Sembayeva, Lilia Mussina, Madina Kazbek, Ablay Dosmaganbetov, and Stefanos Xenarios focuses on sustainable land-use resources in drought-prone regions of Kazakhstan and the implications in the wider Central Asia region. The authors note that climate change is reinforcing land degradation owing to rising aridity, salinization, and more intensive droughts. This reduces agricultural yields, leads to food insecurity, and constrains the achievement of key Sustainable Development Goals (SDGs). Inadequate sustainable land and water resource management systems and insufficient attention to land use laws and regulation compound the climate threats. Increased attention to these challenges by national governments and international development partners is therefore a high priority.

E-commerce development in CAREC

Increasing connectivity through regional cooperation remains at the core of the mandate of CAREC and the CAREC institute. The final chapter in this volume takes up the digital connectivity challenge in the CAREC region. Written by Ghulam Samad and Soo Hyun Kim, the chapter looks at the development potential of e-commerce in the CAREC region by considering the e-commerce infrastructure and regulations, by exploring the role of financial technology (fintech) and by highlighting the need for e-certification for sanitary and phytosanitary clearance of goods that cross borders in the region. The main conclusion of the paper is that e-commerce, fintech, and e-certification could play a major role in supporting increased commercial connectivity for the region by significantly lowering transaction costs and access to trade and finance, but much remains to be done to strengthen the infrastructure and regulatory practices in all three areas.

THE WAY FORWARD

There has undoubtedly been progress in improving regional connectivity in the CAREC region and in developing the knowledge base through research and analysis of many policy areas highlighted in the Central Asia Human Development Report, as well as in important areas that the report did not address, including the response to pandemics and climate change, agriculture and food security, and digital connectivity. This volume exemplifies the deepening of research capacity and activity in core areas of development for the CAREC region. The role of the CAREC Institute in serving as a knowledge and networking platform and in strengthening the capacity for research and policy analysis in the CAREC region is of growing importance and visibility. It is critical that all the Institute's stakeholders — its member countries, its partner think tanks and research centers in the CAREC countries, and its international development partners — work closely with the management of the CAREC Institute to ensure that it has the capacity, resources, and support to deliver on its promise as a central knowledge hub for regional economic cooperation and integration in the CAREC region.

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PART I

UNDERSTANDING CURRENT UNCERTAINTIES ABOUT BUSINESSES AND HOUSEHOLDS

Chapter 1

CROSS-COUNTRY POLICY COMPARISON OF SUPPORTING SMES DURING THE COVID-19 PANDEMIC

Recovery strategies for SMEs in the economies of Central Asia

Brendan Duprey and Aizhan Salimzhanova

1.1 INTRODUCTION

Pictures from: https://rabbit.bigbigwork.com/home

Small and medium-size enterprises (SMEs) dominate Central Asian economies, representing more than 90 percent of total business and providing employment to thousands of people. Like other SMEs around the world, Central Asian businesses were impacted by the COVID-19 pandemic. A common public policy response to the pandemic has been to enforce the temporary closure of certain business activities. Quarantine and the disruption of inessential activities, as a measure to control the spread of the pandemic, has negatively affected national economies around the world. Government support of businesses varied in different countries and regions. Each country had different policies during the pandemic to give financial support to enterprises and their workers. For example, some governments provided assistance by supporting workers who had been laid off. Some supported small business owners by paying a proportion of their wage income. Other countries had measures in place to provide tax relief for SMEs during the pandemic. Analyzing different country policies is useful, as it helps governments understand and therefore adopt the best practices to help the SME sector and progress towards economic recovery.

This chapter study makes a cross-country analysis to assess the effectiveness of current governmental policies to support enterprises in Central Asian countries in the context of the spread of the pandemic. The authors evaluate the support received by various SMEs during COVID-19, which provides additional insight into the problems experienced by SMEs and how they are dealing with the crisis. Moreover, this chapter includes analysis of current government relief programs in the Central Asian region. The authors carry out a cross-country policy analysis using qualitative research design methods. The content analysis method is used to analyze both primary and secondary source data from international organizations and local governments in Central Asia.

The results of this chapter support the development of strategic decisions that focus on SME recovery and sustainable growth during and after the pandemic. Research results illustrate which strategies are best for SMEs in relation to their economic survival at the time of the pandemic and adapt to the quickly changing environmental circumstances. Overall, this chapter aims to develop an enhanced understanding on how governments can support SMEs, to develop sustainability strategies to not only survive but to thrive once the pandemic passes.

The ongoing economic uncertainty owing to the pandemic has affected all countries of the world without exception, including the countries of Central Asia. The main challenges are a decrease in revenue, the risk of personnel infection, interruptions in supply chains, a lack of anti-crisis management, and uncertainty in the future. According to the UN data, about 90 percent of all enterprises in the world belong to the category of micro, small, and medium-size enterprises. They employ approximately 70 percent of the working population and account for 50 percent of global GDP (United Nations 2021). Large businesses, using their accumulated capital and assets, could adapt to new conditions during the coronavirus pandemic; whereas SMEs, owing to their small and medium size, were most at risk of bankruptcy. In this regard, the governments of almost all countries, including the Central Asian countries, urgently developed and implemented various measures to support SMEs.

Policy measures taken in connection with COVID-19 in various countries differ markedly from each other and largely reflect both the assessment of the situation by the government and its financial capabilities. Kazakhstan and Uzbekistan immediately responded to the crisis by imposing strict quarantine measures, closing borders, and preparing extensive anti-crisis packages (Flanders Investment & Trade 2022, UNESCAP 2022, Kurolova et al. 2021, ILO 2020a). As the crisis deepened, they took additional sanitary and fiscal measures. The Kyrgyz authorities also recognized the danger of the situation and reacted immediately (Dzushupov 2021); however, the scale of the response was limited by the capacity of the state budget, which is rapidly depleting, as well as a growing need for international emergency financial support. Tajikistan and Turkmenistan reported no or almost no cases of the disease and initially planned only a few measures such as limiting entry to the country, closing borders, and forcibly quarantining people arriving from abroad, which they then gradually refined (Pirogov 2020). According to official state statistics and WHO, no cases of COVID-19 have so far been registered in Turkmenistan (WHO 2022).

Given the critical part SMEs play in the economic wellbeing of the countries, it is essential to analyze how the crisis has affected SME performance in the region. The authors therefore carried out this analysis of the impact of COVID-19 on SMEs in Central Asia. Having a lack of relevant studies for this region, this analysis of the performance of SMEs in Central Asia with the occurrence of the pandemic, makes this study a valuable contribution to the existing research.

1.2 METHODOLOGY

The authors used the comparative case study method. The case considered for our research is the recovery strategies for SMEs in the economies of Central Asia, chosen because the region's economic and social characteristics are specific to Central Asia. According to George and Bennett, a case can be defined as a 'class of events,' such as a particular kind of economic system that the researcher decides to study in order to further the development of knowledge regarding the causes of likeness or difference within a particular class of events (George & Bennett 2005).

The comparative component of our case study was to compare strategies to support the ability of SMEs to cope with the economic impacts of COVID-19 within Central Asia. According to George and Bennett, a comparative method involves a non-statistical comparative analysis of a selected number of examples. Within the comparative case study field, we chose to use a controlled comparison whereby we specifically targeted COVID-19 recovery strategies in Central Asia between 2019 and 2022. This method is equivalent to an experiment and allowed us to draw causal inferences from the data.

1.2.1 Sampling methods

Review of primary and secondary source material:
In order to obtain validity for the proposition, we used data triangulation to increase the overall quality of the research (Yin 1994). This was done through the gathering of theoretical literature, archival records, and formal documentation. In addition to increasing the validity of the research, triangulation provided explanatory richness to the analysis (Yin 1994). The primary source material obtained comprised government reports and official correspondence with representatives from governmental institutions tasked with collecting data. Moreover, secondary source information was collected from academic articles, textbooks, reviews of legislation, and so on.

Rapid sampling technique:
Owing to the time urgency related to the formulation and development of effective strategies to combat the impacts of COVID-19 on SMEs in Central Asia, the authors used the rapid review technique. This was conducted so that the research results could be applied in a timely fashion. The authors used rapid review that evaluates what is already known about a policy and practice issue by applying systematic review methods. The search strategy was flexible, unbiased, and comprehensive. Recommendations for future practice and research were included. Since the topic of the paper is relatively new and emerging, and there is a lack of survey sources as well as a short timeframe for research, the rapid review method was conducted.

In the review process, the authors of this paper used a systematic review recommended by Jesson (Jesson et al. 2011), which included:
- Mapping the field through a scoping review;
- Comprehensive search;
- Write up.

At the beginning, the authors made a research plan with questions and keywords. The aim of the chapter was to make the cross-country policy comparison of supporting SMEs during the COVID-19 pandemic. The research questions formulated were as follows:

- What are the recovery strategies for SMEs in the economies of Central Asia?
- What are the main findings of the existing studies?

The following keywords were used: SMEs in Central Asia, COVID-19, SMEs during the COVID-19 pandemic, and SME support measures in Central Asian countries. The authors used inclusion and exclusion criteria. The inclusion criteria were: publications in the period 2020-2022, publications (research papers and articles from official sources) in English and Russian languages, focus on SMEs during the COVID-19 pandemic, and focus on the recovery strategies for SMEs in Central Asia.

To ensure that the review included papers from relevant journals, the authors included the following in the literature review: International Small Business Journal, International Journal of Disaster Risk Reduction, Malaysian Journal of Society and Space, Emerging Markets Finance and Trade, Journal of Business Venturing Insights, Journal of Business Research, Research in International Business and Finance, Small Business Economics Journal, National Tax Journal, Journal of Industrial and Business Economics, Central Asia Regional Economic Cooperation (CAREC) Institute official resources, Asian Development Bank official resources, PWC and KPMG resources, OECD data, National Statistics Agency of the Republic of Kazakhstan data, and other official information resources.

The authors went through the abstracts and sections of the articles to cover the scope of this study. This procedure uncovered about 40 articles and publications that contained the criteria set of the analysis. These papers were divided between the two authors, so that each author read about 20 papers and publications. The authors went through each piece of data and information entry together and discussed the content.

This joint discussion allowed the authors to make a cross-country policy comparison of supporting SMEs during the COVID-19 pandemic in Central Asian countries. It helped to clarify what is known about recovery strategies for SMEs in the economies of Central Asia.

In the final stage of the review process, the authors wrote up their findings and provided policy recommendations for the governments.

1.3 REVIEW OF LITERATURE

The outbreak of COVID-19 caused an economic crisis and affected businesses and industries all over the world. According to author Lu, China was the first country that felt the effects of the coronavirus; it overcame the effects and continued economic production (Lu et al. 2021). Research conducted by Lu L on the impact of the pandemic on SMEs in China, suggests public policies to help mitigate its negative effects. In February 2020, the authors examined the impact on 3,194 SMEs (out of 6,034) working in primary, manufacturing, wholesale and retail trade, hospitality, and new economy industries in Sichuan, China (Lu et al. 2021). The authors used online survey and follow-up interviews. Research results illustrated that the impact was different on various industry sectors: 'the primary industry sector was affected by poor logistics; the manufacturing industry sector had supply chain management problems; the wholesale and retail trade industry sector by the need to accelerate their online services; the hospitality industry sector (the most severely affected sector) by cashflow pressure; and the new economy industry sector by short-term pressures. Short-term revenue decline and an inability to resume work and production were common problems faced by all surveyed SMEs' (Lu et al. 2021). The main reasons SMEs were unable to reactivate work were: a lack of employees who were confined by government regulations, a reduction in market demand, and a lack of preventative products. These findings from Sichuan (China) provide valuable references for global industry recovery.

Studies on the impact of the pandemic on SMEs in Malaysia also show that problems related to finance issues — such as, cashflow, access to stimulus packages, and risk of bankruptcy — were business challenges as well (Ratnasingam et al. 2020, Omar et al. 2020). However, besides these common problems, the pandemic influenced various sectors in different ways. Author Gu in their study of Jiangsu Province (China) showed that the hospitality industry, with accommodation and catering services, was seriously affected by the pandemic, and had crucial cashflow pressure (Gu et al. 2020). But supply chain management and product delivery were not notably influenced. However, the manufacturing industries had problems with the supply chain rather than financial challenges (Gu et al. 2020).

A study from Sweden included data collected from 456 SMEs in the Norrbotten region in March 2020, at the peak of the COVID-19 crisis (Thorgrena & Williams 2020). In March 2020, the chamber of commerce in Norrbotten gathered thorough data on the SMEs to understand how to help exposed SMEs, and provide accurate recommendations for the Swedish Minister for Trade (Thorgrena & Williams 2020). According to the study, the surveyed firms were from five industries: service companies (26.8 percent); tourism/cafés/restaurants (19.5 percent); manufacturing (12.7 percent); retail (12.9 percent); logistics and transportation (6.6 percent); and other (contractors and construction companies) (21.5 percent). Authors Thorgrena and Williams show that 'the long-term impact that firms thought the pandemic would have on their business were as follows: minimal = 4 percent; little = 26 percent; great = 47.8 percent; critical = 22.2 percent.' The authors were asking why 30 percent of companies supposed the pandemic would have minimal or little long-term effect on their business. Thorgrena and Williams emphasize that the data was collected just after the first COVID-19 cases occurred in Sweden, and public discussion was then sharpened on how the crisis was influencing the hospitality, retail, and service industries. Research shows that, in general, despite the challenging times, SMEs were quite optimistic. This study also states that, within the time the pandemic occurred and beyond the data collection period, it was clear that many other industries would also be affected by the crisis, whether positively or negatively (Thorgrena & Williams 2020).

Author Fabian Eggers, in his analysis of small businesses in different countries worldwide, describes SMEs with low or unstable cashflow as notably vulnerable during crises, because they are struggling to retain their profitability during these hard times. Research reveals there is an interrelation between finance and strategy, especially entrepreneurial and market orientation in strategies (Eggers 2020). The study shows that entrepreneurial and market orientation together lead to flexible marketing efforts and are therefore crucial during the crisis. Furthermore, 'entrepreneurial orientation and market orientation can be grouped into an entrepreneurial marketing post-disaster business recovery framework, which underscores that seeking opportunities, organizing resources, creating customer value, and accepting risk are apparently different in a post-disaster context' (Eggers 2020).

In March 2020, governments worldwide started to take action to protect public health in the face of the global COVID-19 pandemic. These measures still exist and include social isolation, closure of public places, cancellation of events with more than ten people, and cessation of non-essential activities (Nicola et al. 2020, Saez et al. 2020). Other recommendations made by authorities include avoiding public transport and maintaining social distancing (Ali & Alharbi 2020). As a result, these limitations have reduced the economic activity of all kinds of enterprise. Countries with a strong economy are also significantly impacted. The quarantine caused a decrease in GDP of the United Kingdom by 3 percent (Nicola et al. 2020). It also increased the unemployment rate, forced businesses to cease trading, and caused more social inequality (Nicola et al. 2020, Blustein et al. 2020, O'Connor et al. 2020). Studies show that strict containment measures had a serious effect on China's economy. Data from the National Bureau of Statistics on 17 April 2020 shows that China's first quarter GDP decreased by 6.8 percent — the first reduction in China's economy since 1992. In spite of the high rate of reopening of business and government activity to help SMEs to recover, the effects of the pandemic have not been terminated, as it is not yet fully under control in the world (Normile 2020).

Bartik et al., in their survey of more than 5,800 small businesses in the United States, discovered that 43 percent of small companies were temporarily closed by December 2020 (Bartik et al. 2020). Mass layoffs and closures have occurred, and businesses have reduced their employee counts by 40 percent (Bartik et al. 2020). The study also shows survival rate differences across industries. In-person industries — for instance, personal services or retail — showed lower prospects of overcoming the pandemic than professional services or other sectors that require minimal in-person contact (Bartik et al. 2020). Bartik also shows that one fifth of America's small business workers specialize in retail trade, leisure, and hospitality sectors, which are especially at risk during the pandemic. Predictably, the probability that firms will reopen after the crisis decreases as the crisis lasts longer (Bartik et al. 2020).

'In Latin America and other emerging economies, the negative influence of the pandemic is likely to be more serious because of additional issues like poor healthcare systems, misinformation about COVID-19, limited access to clean water and sanitation services, poverty and vulnerable ethnic groups, precarious job security, and so on.' (Burki 2020). Particularly, SMEs in developing countries are family-owned in most cases, and have the difficulty of economic burdens and uncertainty (Caballero-Morales 2021). Although government loan schemes have been developed to assist companies to get through the pandemic, these are not efficient as they require constant cashflow to keep workers, pay rent, and invest in their infrastructure (Caballero-Morales 2021).

In the CAREC Institute study on the impact of COVID-19 on SMEs in Pakistan, Uzbekistan, Kazakhstan, and Georgia, the authors surveyed SMEs (including micro businesses) within the period from December 2020 to January 2021; this generated data on company assessment of the economic impact of the pandemic, and the mechanisms developed to cope with difficulties. Companies compared their work at the end of 2020 with the situation before the pandemic, which helped to amass empirical data on the impact of COVID-19 (Weafer et al. 2021). This data provided information to governments about successful policy interventions. In particular, the research examined the impact of the COVID-19 pandemic on SMEs, which included data on sales (as well as online sales), employment, wages, cashflows, access to finance, support that SMEs received, and government support programs (Weafer et al. 2021). By using the technique developed by the United Nations Development Program (UNDP), survey results were accumulated in one overall score, which showed how companies in four countries dealt with the impact of the pandemic, and the Resilience Index was developed (Weafer et al. 2021), enabling cross-country comparison. From 64 percent to 89 percent of SMEs showed no, or poor, resilience to the effects of the COVID-19 pandemic (Weafer et al. 2021). Very few firms displayed strong resilience. In Uzbekistan and Kazakhstan, in particular, most SMEs indicated no, or poor, resilience: 64 percent and 77 percent respectively.

In general, the study shows that most SMEs in Pakistan, Uzbekistan, Kazakhstan, and Georgia were negatively affected by the pandemic. The primary effect was a significant decrease in demand owing to lockdown, workers not being able to go to their workplaces, and negative impacts on supply chains (Weafer et al. 2021). So, according to authors, it is not surprising that many companies experienced negative effects, and nine in ten investigated companies reported that their businesses were negatively affected, with the temporary closure of 60 percent of SMEs in Georgia, almost half of Pakistani and Kazakh SMEs, and a third of Uzbek companies (Weafer et al. 2021). The authors also concluded that, the smaller the firms, the more significantly they were affected.

Another study conducted by ADBI experts used data from four CAREC member countries: Azerbaijan, Georgia, Kazakhstan, and Mongolia (ADB Institute 2022). This research investigated factors that impacted the capability of companies to adjust production during the COVID-19 outbreak. The authors used the data gathered by the World Bank Group, which highlighted issues on COVID-19 and company behavior during the pandemic. A probit model was used to study how a variety of factors — such as company characteristics and government policy — influenced the possibility that a company will adjust its activities to the new conditions. The results indicated that those firms that successfully adapted to the pandemic crisis were young companies, foreign firms that were recently innovative, having female managers, a formal firm strategy, and their own website (ADB Institute 2022). Overall, the research findings indicate that firms are adapting to the new circumstances.

Overall, the research results of the previous studies show that most SMEs were severely affected by the crisis, and have faced issues such as supply chain disruption, decrease in demand, reduction in sales and profit, and so on. Central Asian enterprises are no exception and were hit hard by the pandemic. Despite high rates of economic growth in recent years, the level of GDP per capita and other indicators in the majority of Central Asian countries is at the average for developing countries (Mukhitdinova 2015).

Governments worldwide provided support programs as the economy shut down in order to slow the spread of the coronavirus (Bhutta et al. 2020). In the United States, the Paycheck Protection Program (PPP), which provides funds to small businesses, spent US$650 billion at the beginning of the pandemic (Bhutta et al. 2020). The program administered by the Small Business Administration (SBA) issued loans to SMEs to help small businesses retain their employees (Fairlie & Fossen 2021). Overall, small businesses were provided with a total of 15 million loans or advances (Fairlie & Fossen 2021).

The German government's measures to protect businesses affected by the COVID-19 crisis comprised taxation support, state-supported work compensation for a short-term period, and loans provided by Kreditanstalt für Wiederaufbau (KfW) (PWC 2020). The UK government implemented the Coronavirus Job Retention Scheme (CJRS) to support company workers; this program covered 80 percent of employee salaries up to a £2,500 per month (Belitski et al. 2021). About 8.7 million employees took some time off at an estimated total cost of around £60 billion (Yue & Cowling 2021). In China, the government started supporting SMEs in February 2020 (Belitski et al. 2021). A package was presented by the government to support the digitalization of SMEs during the crisis (Belitski et al. 2021). Comprehensive policy measures were announced for SMEs in China. These included 'deferred tax payments for SMEs, reducing rent costs, waiving administrative fees, subsidizing R&D costs for SMEs, social insurance subsidies, subsidies for training and purchasing teleworking services, and additional funding to support SME loans' (KPMG 2020a).

Author Fabian Eggers denotes that many SMEs were not doing well in the short term because of existing issues such as 'little or no investment in improvements and knowledge of the market, lack of formal planning and demand forecasting, lack of managerial and technical skills, and limited economic resources' (Eggers 2020). These all make SMEs increasingly insecure when employees are quitting their jobs and there is a reduction in demand because competitors are entering the market (Eggers 2020). Other authors outline that in the context of the crisis, innovation helped to increase the organizational resilience of businesses and economic development in sectors like manufacturing and service (Forsman 2011, Ucaktürk et al. 2011, Nah & Siau 2020). And according to Eggers, the development of a methodology for improving SME performance can help enterprises to have increased flexibility and better relationships between their decision makers and their customers (Eggers 2020). Therefore, author Santiago-Omar Caballero-Morales proposes a methodology based on the following two aspects:

- 'Optimization: to improve the processes of SMEs and reduce waste and costs, as cost optimization is important for business survival and continuity;
- Innovation: for the development of new products that meet new market needs. The achievement of innovation cannot be affected without prior optimization of the processes' (Caballero-Morales 2021).

Juergensen outlines that SMEs can benefit from schemes of innovation support (Juergensen et al. 2020). Product and marketing innovations, in particular, are more advantageous for standalone SMEs. Marketing innovations might be useful to retain existing customers and attract new ones (Juergensen et al. 2020). Juergensen claims that 'for specialized suppliers, the main focus will need to be on process and organizational innovations, enabling them to compete on price and quality' (Juergensen et al. 2020). At the same time, 'more investments in entrepreneurship and startup support will turn critical to promote knowledge-based SMEs' (Juergensen et al. 2020).

Le et al. (2020), based on the research of Thanh Hoa province, in their study provide the model of policy-related factors from government action (at all levels) affecting the survival and development of SMEs (Le et al. 2020). The authors outline that, starting from December 2019 to the present day, the world is affected by the COVID-19 pandemic. The pandemic negatively influenced world and Vietnamese socioeconomic activities, including most industries and economic sectors (Le et al. 2020). The authors investigate the construction of a model focusing on: '(i) tax support policies; (ii) preferential bank policies, such as reducing interest rates and extending repayment periods; (iii) government capital support packages; (iv) insurance policies; (v) the actions of public administration; and (vi) the role of professional associations' (Le et al. 2020). Based on the research, author Le provides the following recommendations (Le et al. 2020):

- 'Issue policies to reduce bank interest rates and extend the repayment period for businesses: this is one of the important solutions to help businesses overcome the pandemic, especially for SMEs with small scales, limited capital, and limited market share';

- 'Promptly deploy support packages to stabilize and recover production: timely support packages will create favorable conditions for enterprises to maintain production and business activities in the context of the market being seized owing to disruption in production chains';

- 'Proposal for tax exemption; the reduction of taxes, fees, and charges for businesses: the reduction of tax collection, or some fees and charges will contribute to reducing business costs';

- 'Suspend the payment of retirement and death insurance fund: in the immediate future, the policy should focus on two specific groups: (1) employees who have stopped work or quit their jobs owing to the COVID-19 pandemic: (2) enterprises affected by COVID-19 with more than 50 percent of employees having to be laid off or take time off, or over 50 percent of the total value being damaged owing to the COVID-19 pandemic';

- 'Strengthen supply and demand linkage, promote trade, and promote cooperation among enterprises through the role of professional associations: in the difficult period of the impact of the COVID-19 epidemic, cooperation among enterprises in the same industries or in production chains can be an important way to help businesses overcome the epidemic';

- 'Improve the proficiency of staff in the state administrative system: the research results show that the operational efficiency of the state administrative system plays an important role in supporting businesses to overcome the COVID-19 pandemic. Simplifying procedures also helps business to facilitate their operations' (Le et al. 2020).

1.4 MAIN INDICATORS OF SMES AND SUPPORT MEASURES IN CENTRAL ASIAN COUNTRIES

The economies of CA are defined as the five former Soviet republics of CA: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. After gaining independence in 1991, the countries of CA went through the transition to market economies and experienced substantial economic decline. SMEs contribute almost 90 percent of all businesses in Central Asia (OECD 2018). But SME contribution to GDP varies from 25 percent to 41 percent (OECD 2018). This figure is different in Uzbekistan, where it is closer to the OECD average of 55 percent (OECD 2018). SMEs employ 78 percent of the workforce in Uzbekistan and only 38 percent in Kazakhstan (OECD 2018). Generally, low-value added sectors, particularly agriculture and trade, are small businesses. There are a variety of obstacles to SME growth and development in the region; these are related to limited resources (financing) for SMEs and weak regulatory frameworks. But some governments in CA — for instance, in Kazakhstan — support SME access to finance through measures such as subsidized rate of interest, direct loans, and tax exemptions (OECD 2018).

According to ADB data, the economies of the CA countries most influenced by the COVID-19 pandemic are Kazakhstan and Kyrgyzstan. As depicted in Table 1.1, these countries had a negative GDP growth in 2020: (-2.5) for Kazakhstan and (-8.4) for Kyrgyzstan. Other CA countries also had a decline in GDP growth, although the indicators are not negative.

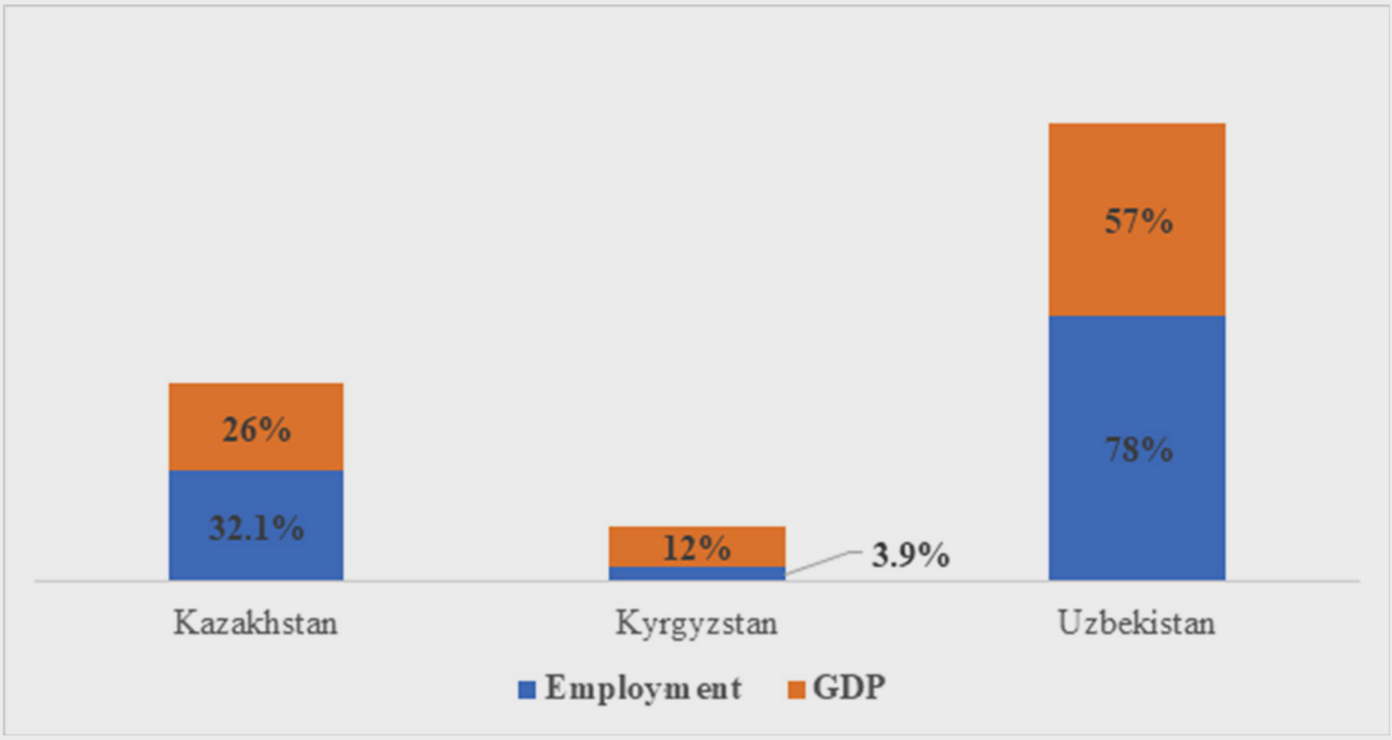
Table 1.1. GDP growth, Central Asian countries (annual percentage)

	2019	2020	2021	2022	2023
Caucasus and Central Asia	4.7	-2.0	5.6	3.6	4.0
Kazakhstan	4.5	-2.5	4.0	3.2	3.9
Kyrgyzstan	4.6	-8.4	3.6	2.0	2.5
Tajikistan	7.5	4.5	9.2	2.0	3.0
Turkmenistan	...	...	5.0	6.0	5.8
Uzbekistan	5.7	1.9	7.4	4.0	4.5

Source: ADB 2022

Figure 1.1 shows that SMEs play a substantial role in the CA economy, as they constitute an essential part of a country's GDP and provide employment for the population. The further development of small businesses in manufacturing, trade, and service sectors can assist economies to shift from natural resource sectors where large companies are mainly overrepresented in the Central Asian region (OECD 2018). Most SME producers and firms in the region supply only domestic markets, which means there is much scope to increase trade.

Figure 1.1. SME percentage share of GDP and employment



Source: ADB 2018

1.4.1 Kazakhstan

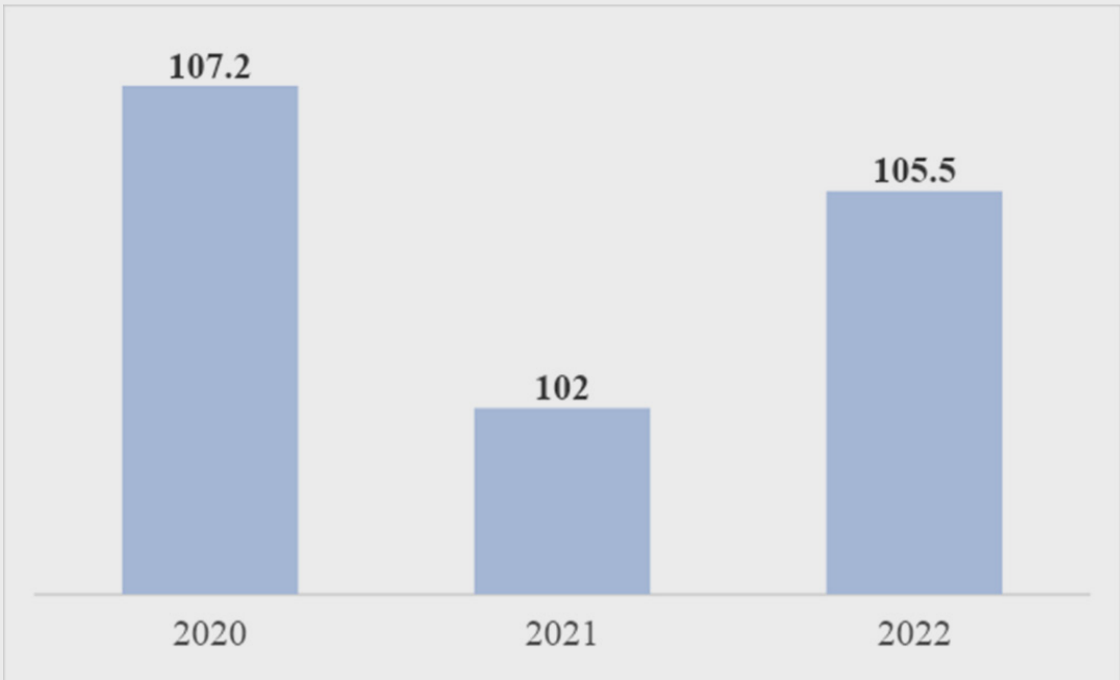
The role of SMEs in Kazakhstan's economy has become increasingly important in recent years. The number of SMEs increased twofold from 2005 to 1 357 311 in 2020 (National Statistics Agency of the Republic of Kazakhstan). In 2005, small businesses made up 11 percent of Kazakhstan's GDP and in 2019 this figure increased to 31.7 percent. Employee numbers also increased in this period: in 2005, there were 1 875 526 SME employees, whereas at the end of 2020 this figure grew to 3 369 915 (National Statistics Agency of the Republic of Kazakhstan). Kazakhstan's government assists SME growth with special programs. There are support infrastructures like business incubators, technoparks, consulting and training centers, and financial support through loans and grants.

The state of emergency and the quarantine had a negative impact on business in Kazakhstan (KPMG 2020b):
- About 300,000 enterprises suspended activity;
- More than 1.6 million people took unpaid leave;
- 1 million enterprises were directly affected by the pandemic, mainly in the sphere of services and trade;
- About 14,000 to 15,000 enterprises with bank loans applied to reschedule the debt;
- 4.5 million people received social payment from the state.

According to the CAREC Institute study, COVID-19 negatively affected almost nine in ten SMEs (including micro firms) in Kazakhstan. 86 percent of investigated SMEs had significant problems with business operations: 70 percent of manufacturing firms to 94 percent of service firms (Weafer et al. 2021). The medium-size firm sector experienced the worst situation, with 96 percent of firms reporting a negative impact. The most significant effect of the crisis associated with the pandemic is that 49 percent of SMEs had to temporarily stop trading. Service and trade sectors were affected the most: 53 percent and 52 percent respectively experienced temporary closure (Weafer et al. 2021). 68 percent of all SMEs had a decline in sales in November 2020 compared with February of the same year. 34 percent of those firms reported a decline of more than 50 percent. The services sector suffered the most: 72 percent of companies in this sector reported an overall sales decline. In terms of firm employment level, 35 percent of all SMEs (including micro firms) needed to reduce the number of their permanent employees. The sole trader segment was least impacted: two thirds of surveyed firms indicated that they did not need to change the level of staff at all. Thirty nine percent of companies had to reduce employee working hours (Weafer et al. 2021). Three quarters of SMEs suffered a decrease in cashflow. Agricultural firms particularly suffered, with 91 percent reporting cashflow problems. 54 percent of all SMEs had external support. Mostly, companies denoted support from friends and families (22 percent of companies). 17 percent of SMEs stated that they received support from the national government. Only 31 percent of SMEs received government support during the COVID-19 pandemic. However, 60 percent of medium-size firms, along with manufacturing firms (48 percent) were positive about government support during the pandemic. Overall, SMEs would rather get financial support: over half of all MSMEs preferred zero interest loans (54 percent) and tax relief (53 percent) (Weafer et al. 2021).

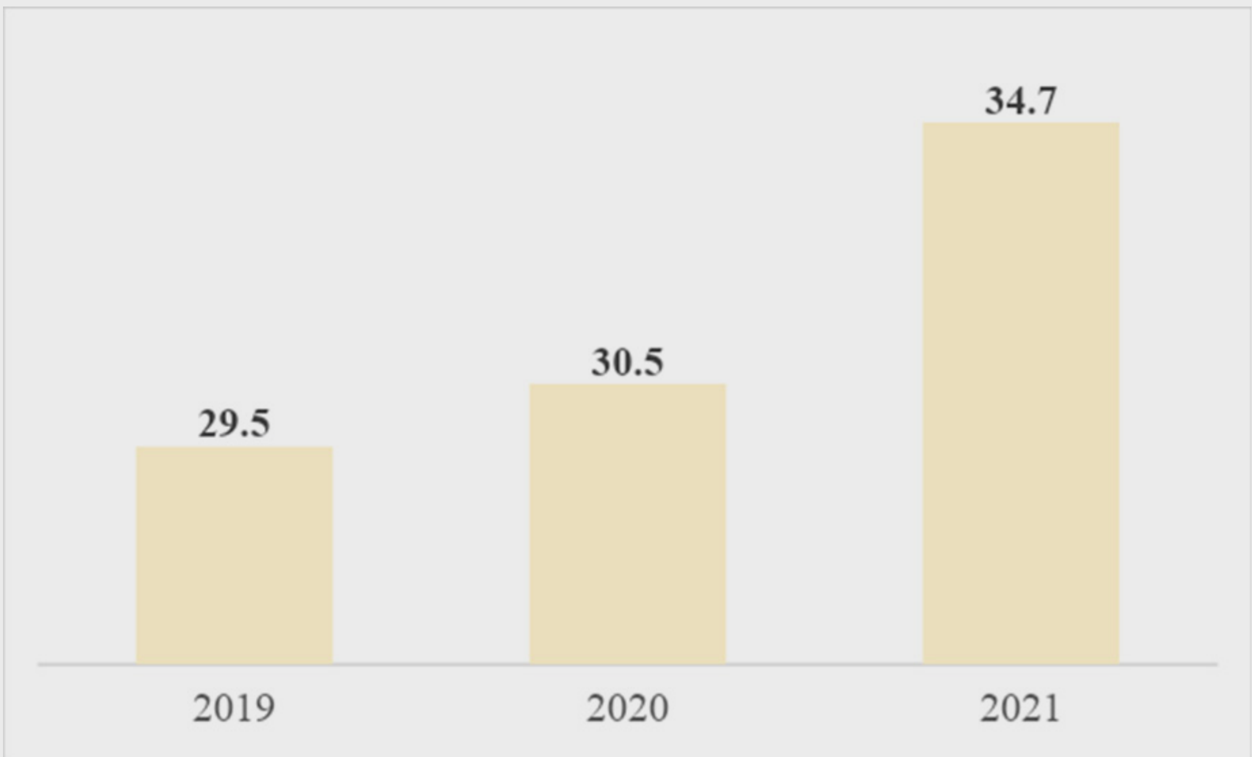
Data from the National Statistics Agency shows that the number of operating SMEs in Kazakhstan declined during 2020 to 2022 (Figure 1.2). However, the share of SMEs in GDP and the number of people employed in small and medium-size businesses in Kazakhstan has slightly increased in the last three years. We can assume that during the pandemic the number of SMEs increased—for instance, companies providing healthcare, pharmaceutical, and delivery services. But, in general, growth has decreased compared with 2019.

Figure 1.2. Number of operating SMEs in Kazakhstan, as a percentage of the corresponding period of the previous year (data for 1 January)



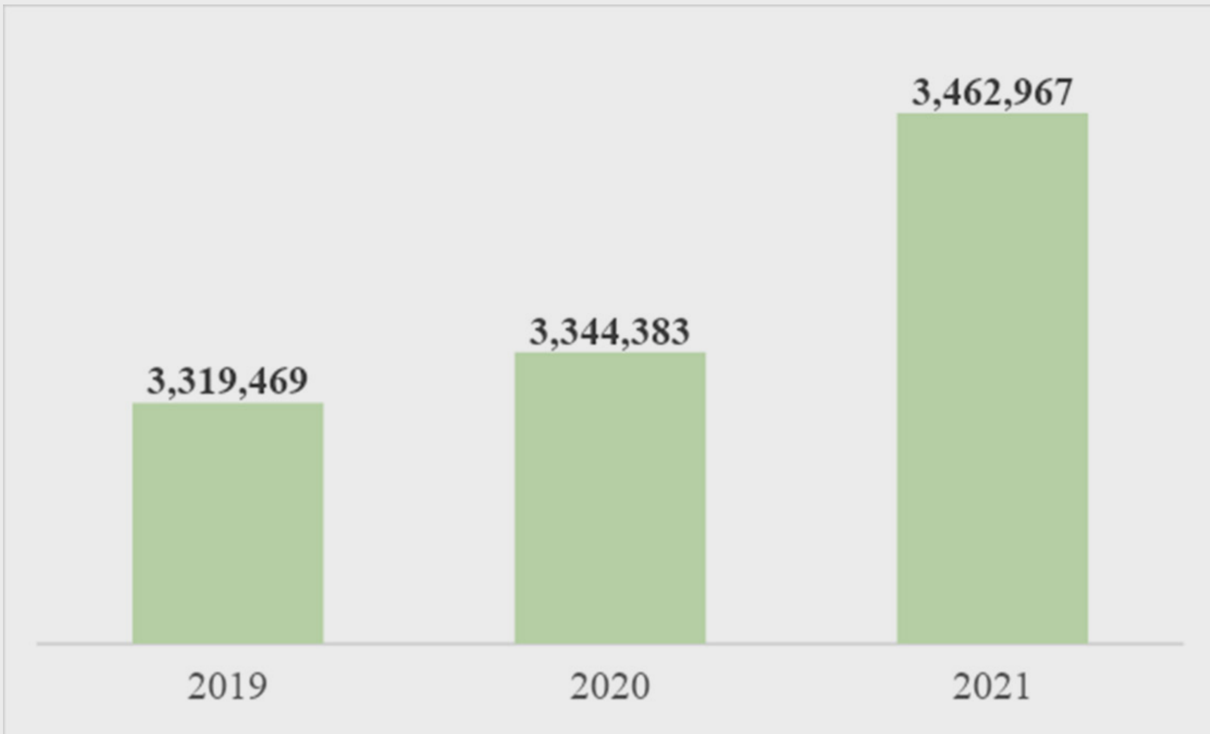
Source: National Statistics Agency of the Republic of Kazakhstan

Figure 1.3. Percent share of SMEs in GDP in Kazakhstan, data for three quarters of the corresponding year (January to September)



Source: National Statistics Agency of the Republic of Kazakhstan

Figure 1.4. Number of employees in SMEs in Kazakhstan, data for three quarters of the corresponding year (January to September)



Source: National Statistics Agency of the Republic of Kazakhstan

Support for SMEs in Kazakhstan was announced immediately after the introduction of a state of emergency. The decision was made to provide 600 billion KZT (about US$1.4 billion) to SMEs as working capital at a favorable interest rate for a period of one year. At the end of 2020, an additional 170 billion KZT (about US$400 million) was funded (Lyapunov 2021). In addition, 84.5 billion KZT (about US$200 million) was allocated for the implementation of the 'Business Roadmap' (Official information resource of the Prime Minister of the Republic of Kazakhstan 2020). The Business Roadmap 2025 program has been successfully implemented since 2010 and, along with existing state support programs for small and medium-size businesses, it is one of the most popular in Kazakhstan. Business Roadmap 2025 includes a new direction: microcrediting for micro and small businesses. Preferential lending under the Business Roadmap 2025 program is provided at a rate of 6 percent per annum for a period of five years; the loan amount is up to 7 billion KZT (about US$16 million) without industry restrictions (Official information resource of the Prime Minister of the Republic of Kazakhstan 2021). The amount of credit support per entrepreneur has been increased to 7 billion KZT (US$16 million); earlier it was 2.5 billion KZT (about US$5.8 million). The loan amount for the replenishment of working capital has been increased from 60 million KZT (US$140 thousand) to 500 million KZT (about US$1.2 million) and is provided as a revolving loan fund. Enterprises engaged in the trade sector are entitled to receive state support loans of 100 million KZT (Ministry of National Economy of the Republic of Kazakhstan). According to data from JSC 'DAMU' Entrepreneurship Development Fund, in December 2020 applications of 4,180 small and medium-size businesses in the negatively affected sectors of the economy were approved for subsidizing interest rates up to 6 percent on loans totaling 754 billion KZT (about US$1.7 billion) (Agency of the Republic of Kazakhstan for regulation and development of the financial market 2020).

Starting 1 January 2020, the income of small and micro businesses that use special tax regimes was exempt from income tax. This measure covers about 1.2 million micro and small businesses for a total amount of 382 billion KZT (official information resource of the Prime Minister of the Republic of Kazakhstan 2021). Moreover, until 1 October 2020, Kazakhstan SMEs were exempt from contributions for compulsory social health insurance (online edition Zakon.kz). A list of entities that will use the 'zero' rate for taxes and social payments has been approved; these are companies working in trade, transport and maintenance, education, medicine, tourism, the restaurant and hotel business, entertainment, software engineering, and fitness (Kapital.kz 2020). In addition, SMEs in Kazakhstan received exemption from renting state property until 1 July 2021 (official information resource of the Prime Minister of the Republic of Kazakhstan 2021).

1.4.2 Kyrgyzstan

According to official data of the National Statistical Committee of the Kyrgyz Republic, in 2020 SMEs in Kyrgyzstan received 135.3 billion Kyrgyzstan Soms (KGS) of revenue (gross income) from the sale of products (goods and services). Their share in the revenue of enterprises in the real sector of the economy was 27.4 percent (National Statistical Committee of the Kyrgyz Republic 2021).

Compared to 2019, the revenue level of SMEs decreased by 12.6 billion KGS—8.5 percent; however, compared to 2016, it increased by 36.3 billion KGS (1.4 times). The largest volume of proceeds was received by industrial enterprises (38.2 percent of the total volume of SMEs), construction (21.0 percent), as well as wholesale and retail trade, and repair of cars and motorcycles (17.0 percent). Of the total revenue, 65.7 percent was provided by SMEs in Bishkek (National Statistical Committee of the Kyrgyz Republic 2021).

In 2020, SME activity showed a positive balanced financial result: 2.5 billion KGS, the lowest result over the past five years. In 2020, firms in the following sectors became unprofitable: industrial enterprises (3.37 billion KGS); professional, scientific, and technical activities (1.69 billion KGS); organizations in the real estate business (494.7 million KGS); cargo transportation and storage (36.1 million KGS) (National Statistical Committee of the Kyrgyz Republic 2021). In addition, in 2020, firms in the following sectors became less productive: construction, hotels and restaurants, information and communications, financial intermediation and insurance, administration and support, education, and health and social services. According to the National Statistical Committee of the Kyrgyz Republic, there was a revenue increase in agriculture, forestry, and fishing by 1.7 times; in other service activities by 1.5 times; and in wholesale and retail trade, as well as car and motorcycle repair services, revenue increased by 2 percent (National Statistical Committee of the Kyrgyz Republic 2021).

The ADB allocated US$50 million to Kyrgyzstan to combat the consequences of the coronavirus. The bank approved a US$50 million loan and grant to help the Kyrgyzstan government mitigate the serious negative health, social, and economic impacts of the coronavirus (Borisenko 2020). ADB's financial support will help with the government's urgent priorities, give social protection to the vulnerable parts of society, and provide fiscal stimulus to the poor to support SMEs and the manufacturing industries of the economy (Borisenko 2020).

In turn, the government of Kyrgyzstan gave SMEs various types of deferral for taxes and other expenses. From April to October 2020, taxpayers had the right to apply for a deferral/installment plan of tax debts resulting from force majeure circumstances for up to a year (Lazaryan 2020). The deadline for submitting reports was extended to 1 July 2020 and any sanctions within that timeframe were cancelled. Additionally, the deferral of rental payments and payments on budgeting loans was introduced in Kyrgyzstan. These measures affect borrowers who were forced to suspend activities because of the introduction of an emergency (Lazaryan 2020).

1.4.3 Tajikistan

According to the World Bank's 'Doing Business 2020' report, Tajikistan's business environment has been improving; it rose from 126th place in 2019 to 106th in 2020 (EBRD in Tajikistan 2020). However, the country still has issues with access to foreign currency liquidity and SMEs have difficulty finding skilled personnel. SMEs play an important role in the economy of a country; however, business owners have problems because of the pressure of state regulatory policy, which can lead to the transition of businesses to the informal sector (EBRD in Tajikistan 2020).

SMEs (including micro level firms) in Tajikistan suffered as a result of the pandemic crisis. They experienced a lack of financial resources, which led to delays in the supply of raw materials (disruption in supply chains). According to UNECE data, 63.1 percent of SMEs suffered mainly because of the closure of international borders and local markets during the pandemic (Bakhtdavlatov 2021). SMEs in the tourism and hospitality sectors suffered the most from COVID-19; and agricultural enterprises suffered the least. Only a small amount of SMEs (5.8 percent) experienced an increase in sales and turnover. The most common negative impacts on SMEs in Tajikistan included firms' inability to pay off loans, pay taxes, produce goods or services at pre-COVID-19 levels, and pay salaries (Bakhtdavlatov 2021). More than 25 percent of SMEs in Tajikistan stated that they had difficulties repaying loans, and 22.6 percent of SMEs had problems with paying taxes regularly. 81.6 percent of SMEs in the country were concerned about the impact of COVID-19 on their business. A very small number of surveyed SMEs in Tajikistan (6.3

percent) were neither influenced by nor worried about the outbreak of the pandemic and its potential effect on their activities; however, this applied mainly to companies that are least dependent on regional supply chains (Bakhtdavlatov 2021).

Very few SMEs in Tajikistan adopted innovative adaptation strategies (28 percent of affected businesses) to cope with the coronavirus outbreak, including the following (Bakhtdavlatov 2021):

- Reduction in the production of goods and services (40.3 percent)
- Introduction of new goods or services (27.1 percent)
- Transition to online marketing and/or sales (24.3 percent)
- Conclusion of contracts with new sellers or suppliers (17.4 percent)

Overall, UNECE experts show that the economy of Tajikistan was already unstable because of economic shocks over the last ten years and the pandemic made the situation even worse (Bakhtdavlatov 2021).

In summary, the Tajikistan government implemented its action plan to reduce the impact of external risks on the economy because of the pandemic crisis (Information and Analytical Department of the CIS Executive Committee 2020). The plan included the provision of tax incentives and tax holidays for vulnerable SMEs, the postponement of non-tax audits, and the attraction of financial assistance from international financial institutions (Information and Analytical Department of the CIS Executive Committee 2020).

1.4.4 Uzbekistan

The CAREC Institute survey shows that 86 percent of all SMEs (including micro level firms) in Uzbekistan claimed that the COVID-19 crisis had a negative effect on their operations (Weafer et al. 2021). The companies that operate in the service sector were most negatively influenced; 94 percent of SMEs in the service sector showed that they were negatively impacted by the pandemic (Weafer et al. 2021). One quarter of firms in the agricultural sector showed that the crisis had a positive impact on them (Weafer et al. 2021). Overall, only a third of all SMEs (including micro level firms) in Uzbekistan experienced a temporary closure of their business; a fifth of these were manufacturing firms. About half of respondents (49 percent) had a monthly revenue decrease in November 2020 compared with February 2020 (just before COVID started). A quarter of all respondents (firms) saw no revenue change. Only 15 percent of SMEs in Uzbekistan reported a decrease in the number of their permanent employees and 73 percent showed no change in employee numbers (Weafer et al. 2021).

SMEs in the agricultural sector had to downsize 32 percent of staff. 70 percent of SMEs reported having cashflow problems (Weafer et al. 2021). And two thirds of Uzbek SMEs (including micro level organizations) did not receive any external support during the pandemic crisis. Firms that received aid stated that it was national government support; only 11 percent of companies used it. However, up to 65 percent of SMEs reported that the government provided enough support during the pandemic, with 75 percent of agricultural firms making this statement. Overall, SME owners in Uzbekistan would like to receive the following government support in the future: 77 percent want the government to provide loan guarantees, 60 percent want a loan repayment moratorium, and 57 percent would like to have simplified loan procedures and zero interest loans (Weafer et al. 2021).

Statistics Committee of Uzbekistan data shows that there was an increase in the production level of SMEs in the following sectors: industrial enterprises, construction, export and import, trade, agriculture, and services between 2017 and 2021 (Table 1.2). This increase was most pronounced from 2019 to 2020 and in 2021 with the start of the pandemic.

This data indicates that the pandemic did not have a significant negative effect on SMEs operating in those sectors in Uzbekistan (State Statistics Committee of the Republic of Uzbekistan). On the other hand, the employment level of Uzbek SMEs decreased from 10,318,900 to 9,865,700 from 2019 to 2020 (the year when COVID-19 started) (State Statistics Committee of the Republic of Uzbekistan). Also, the passenger transportation level and overall passenger turnover in Uzbekistan's SMEs decreased in the last three years with the start of the pandemic. Table 1.3 shows the sector share of SMEs in Uzbekistan; it is noteworthy that the share of SMEs in the country's GDP, export and import, employment, and construction sectors decreased from 2019 to 2021.

Table 1.2. The volume of key indicators of SMEs and private entrepreneurship in sectors of the economy of Uzbekistan, 2017-2021

Indicators	2017	2018	2019	2020	2021
Industry (billion soums)	61,367.8	87,962.0	83,344.2	103,020.8	121,719.2
Construction (billion Uzbek soums)	22,469.4	37,451.7	53,960.9	63,866.6	77,762.0
Employment (million people)	10.5	10.1	10.3	9.9	-
Export (billion US dollars)	2.9	3.8	4.7	3.1	3,711
Import (billion US dollars)	7.5	10.9	15.0	10.9	12,389.0
Trade (billion Uzbek soums)	92,973.0	114,896.4	138,920.7	164,106.1	249,493.3
Agriculture, forestry, and fisheries (billion Uzbek soums)	152,010.5	191,759.2	219,466.9	253,238.2	307,280.2
Services (billion Uzbek soums)	69,212.7	84,433.4	103,106.6	114,052.7	144,812.7
Freight transportation (million tonns)	548.8	611.7	641.0	638.9	678.9
Freight turnover (billion ton-km)	10.4	11.7	12.2	12.3	13.1
Passenger transportation (billion people)	5.0	5.2	5.3	4.9	5.2
Passenger turnover (billion people km)	111.4	115.3	117.4	107.8	114.7

Source: State Statistics Committee of the Republic of Uzbekistan

Table 1.3. Percent share of small business and private entrepreneurship in Uzbekistan, 2017-2021

Indicators	2017	2018	2019	2020	2021
GDP	65.3	62.4	56.0	55.7	54.9
Industry	41.2	37.4	25.8	27.9	27.0
Construction	64.8	73.2	75.8	72.5	72.4
Employment	78.0	76.3	76.2	74.5	-
Export	22.0	27.2	27.0	20.5	22.3
Import	53.6	56.2	61.6	51.7	48.7

Source: State Statistics Committee of the Republic of Uzbekistan

The EBRD allocated US$220 million to finance small businesses in Uzbekistan. Four Uzbek commercial banks were provided with credit lines to finance SME projects and a line of trade finance for a total of US$220 million (Amuyeva & Başay 2020). The Uzbek government developed measures to support entrepreneurs whereby personal income tax and social tax were suspended. Uzbekistan also temporarily abolished taxes on land and property to support businesses. The President of Uzbekistan, Shavkat Mirziyoyev, signed a decree on further measures to support the population and business entities during the coronavirus pandemic; this was aimed solely at private enterprises with no state share in the authorized capital. The tax breaks increased the survival chances of the Uzbek SMEs during hard times (Stashkina 2022). For two months (from 1 May to 1 July 2020), the social tax rate for small enterprises and micro firms was reduced by 11 percentage points (from 12 percent to 1 percent). From 1 June to 1 September 2020, all small businesses, markets and shopping malls, cinemas, catering enterprises, and public transport enterprises in Uzbekistan were exempt from paying property tax and land tax. Property and land taxes due from small businesses and micro firms for April and May 2020 were also written off (Stashkina 2022). In addition, the State Fund for Entrepreneurship Support partially compensated for covering interest expenses on loans.

1.5 CONCLUSION AND POLICY RECOMMENDATIONS

Analysis shows that the COVID-19 pandemic had an effect on the performance of SMEs in all Central Asian countries; the growth level changed and slowed as the pandemic occurred. Government and lockdown policies influenced the operation of SMEs in Central Asia. Some sectors in particular were impacted, including the tourism, hospitality, services, construction, and manufacturing industries. Without doubt, all CA countries were seriously influenced by COVID-19, but there were some differences in the regulatory interventions, financial capacities, economic development, and so on. With reference to these differences, this study gives some insight for further research in this topic.

In early 2020, economic growth in the region suddenly stopped as a result of the pandemic. In 2022, some SMEs are still not back to their pre-crisis sales levels. Some restrictions have still not been lifted, including social distancing requirements, restrictions on hours of operation and customer numbers, and the mandatory use of sanitary equipment. However, with support from local governments and international organizations, the economies of the Central Asian countries are gradually recovering. The crisis had a more detrimental effect on the economies of the region rather than on the health of the population; the levels of morbidity and mortality in Central Asia are lower than in some countries that border the region. The economic growth of some countries in the region depends heavily on migrant remittances and the exports of extractive industries. Thus, the closure of borders and the fall in demand for raw materials have seriously affected growth prospects.

The impact of the crisis on the private sector, and especially on SMEs, which have fewer reserves, required government support to cushion the blow. During the period of the most stringent quarantine measures, governments introduced measures to support SMEs and entrepreneurs. These measures included tax and financial measures, the simplification of administrative procedures and requirements, and the suspension of inspections and audits. Emergency support programs — such as target loan portfolios, loan guarantees, and funds to support SMEs — the scope and scale of which were determined by the state budget, became the central element of the anti-crisis packages. Exemption from taxes and social contributions was introduced and, in some cases, a deferral of payment for utilities and rent.

Based on the findings of this study and the review of literature, the authors suggest some policy measures to help SMEs to deal with the consequences of pandemic. Their analysis of government fiscal measures and monetary policies aimed at preventing the negative effects of COVID-19 gives valuable insight into the performance of SMEs after the pandemic. It also leads to a broader country/regional context analysis to enable them to come up with specific policies, strategies, and programs.

The analysis shows that the COVID-19 pandemic continues to impact the economies of CA countries, specifically SME performance. SME growth halted in 2020. Regulatory measures such as lockdowns and border closure have significantly affected trade and consumption in Central Asia — especially because the countries in the region are highly dependent on the export of raw materials, primary commodities, and agricultural products. The lockdown and movement control strategies advised in dealing with COVID-19 were executed through social distancing, self-isolation, and travel restrictions, all of which forced SMEs to be temporarily closed down. The impacts from those regulations are likely to lead to job losses and to the disruption of the economic ecosystem, leading to financial difficulties and even bankruptcies. There is also a risk of increased inequality (for women, migrants, informal workers, and the rural population). The governments of CA countries should further diversify their economies if they want to decrease their vulnerability to economic shocks and increase their support of SMEs — specifically, providing access to finance and development support and export promotion. Foreign trade could be helpful for SMEs in terms of providing more resilience for companies (compensating for falls in domestic demand) and to enhance innovation and diversify supply chains.

Furthermore, our study reveals that, because of the COVID-19 pandemic, there was a decline in the growth of SMEs and their employee numbers (in some sectors) in 2020 to 2021 compared to 2019. Therefore, employee protection and accuracy of information play an important role in sustainable production, business operation, and updating stakeholders about the situation. The governments of CA countries should provide the development and promotion of entrepreneurial training programs through training centers. These programs should include searching for investors and mentors, knowledge sharing, and networking to invest in the human capital skills and attitudes needed to meet the challenges and demands of the contemporary labor market and economic system after the pandemic.

Governments should analyze the restructuring of strategies to reduce the economic burden. Increasing resilience capability and positive social relations are effective strategies for businesses during the crisis. Similarly, the International Labour Organization proposed that the policy actions should include the health and safety of workers, economic stimulation, and income and employment support (ILO 2020b). The exemption of SMEs from paying personal income tax and social benefits (social taxes and insurance) for the pandemic period would also be a substantial support for businesses.

Governments should ensure minimization of the supply-chain malfunction for SMEs to enable entrepreneurs to keep their businesses going during this difficult period. Governments might also facilitate SME applications for government support and not overload SMEs with regulatory and legislative requirements in these hard times. Moreover, it would be reasonable to encourage SMEs through the provision of subsidies and grants to ensure their resilience and sustainability, as they were negatively affected by the crisis.

Governments need to further develop their government support programs and assess the needs of firms, particularly the needs of various sectors. In addition to tax relief, SMEs might also need more financial assistance such as interest-free or low-interest loans, loan forbearance, and tax reductions. More focus can be concentrated on collecting timely data on SMEs in the CA region. Regular quick surveys can be used to assess the issues faced by firms and to provide timely feedback to governments as well as cross-country comparisons.

CA governments should also consider the informal sector; working only with formal businesses might neglect an important part of the economy — the informal sector, which is a source of a large number of workplaces. Informal businesses, similar to SMEs, typically face great obstacles to accessing finance. In addition to more targeted assistance, policymakers might increase the ability of banks and financial organizations to lend to SMEs by easing collateral, giving partial credit guarantees, and providing a standard loan application process.

Considering that this topic is a relatively new area of research with not much published scholarly material, we propose a deeper analysis on the effects of the regulatory government interventions on SME performance and on society in general. This would enable a better understanding of the effects of those regulations and an appreciative comprehension of future economic development and growth. Other measures for optimizing the work of SMEs (based on Kuckertz et al. 2020) could be: flexible worker rotation and payment options; temporarily reduce some activities; analyze new opportunities that have resulted from the crisis, such as growth of online sales opportunities; and provide protection for the enterprise's assets (people, processes, profits, partnerships) (Kuckertz et al. 2020). The state and business need to have a common platform for a constructive and transparent dialog. We believe that only open discussions with experts and sufficient timely support of business will help the country to overcome the crisis and ensure long-term sustainable growth.

This study has a few limitations. Firstly, it is not an empirical analysis, but more a qualitative research with secondary data analysis. While this is limiting to some degree, research has found that quantitative analysis may provide generalizability (breadth) but does not provide depth in terms of understanding the complexity of particular cases. Case study research is a multi-perspective means of analyzing cases in depth (Feagin, Orum, & Sjoberg 1991). Secondly, this research does not focus on the impact of COVID-19 on SMEs from an industry perspective, as was done in the similar studies in China and other countries. Owing to constraints of time and budget, and a lack of data, authors have examined only the impact of pandemic on SMEs in Central Asia, without looking at specific industries. These constraints prevented the research team from digging deeper into the data. While limiting, such generalized research provides the researchers with the ability to isolate the phenomenon (COVID-19 interventions on SMEs in Central Asia) and its impacts on the sector. This approach provides a form of inductive reasoning that can strengthen the generalizability of the researchers' conclusions. A survey containing a complete classification of industries in Kazakhstan and the CA countries would, therefore, be recommended to examine the COVID-19 impact differences on SMEs in various industry sectors. More research is required to develop policy recommendations for the government authorities responsible for maintaining SME resilience.

Considering that both the danger and the impact of COVID-19 in the CA countries will persist for some time, the governments of these countries should continue to implement business support programs and make the necessary adjustments to them. The following sectors suffered most: transport, catering, hospitality, and tourism. These sectors need to receive further support, such as tax deferrals and financial assistance programs. The countries of Central Asia need to apply long-term structural economic reforms if they want to improve the business environment and move towards a more private sector-led growth model.

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BACK

IMPACT OF COVID-19 ON HOUSEHOLD BUSINESS, EMPLOYMENT AND SCHOOL EDUCATION

Evidence from household survey in the CAREC countries

Chapter 2

Dina Azhgaliyeva, Ranjeeta Mishra, Trinh Long, Peter Morgan, and Wataru Kodama.

2.1 INTRODUCTION

Pictures from: https://rabbit.bigbigwork.com/home

The COVID-19 outbreak triggered one of the worst employment crises worldwide since the great depression[1]. Policy interventions such as lockdowns, 'social distancing,' travel restrictionss, and school closures and uncertainties in future economic outcomes have affected labor demand and supply. These negative effects manifested through several channels, including unemployment or reduction in working hours, decline in sales and income of household businesses, restricttion on commuting, need to stay at home to look after sick household members or children, higher commodity prices, and limited

1 The earlier version of this paper was posted as ADBI Working Paper (Azhgaliyeva et al. 2022a).

availability of staple items (Morgan and Trinh 2021). The shocks are expected to increase poverty and widen inequality, especially in developing countries; the Central Asia Regional Economic Cooperation (CAREC) member countries — Afghanistan, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, the People's Republic of China (PRC), Tajikistan, Turkmenistan, and Uzbekistan — are no exceptions. Azhgaliyeva et al. (2022b) found that the pandemic brought a decline in household income as well as financial difficulties to households in these countries. In order to develop appropriate policy responses to the employment crises and other related challenges, it is necessary to understand the current employment and labor market situation from the viewpoint of a typical household. The Asian Development Bank Institute (ADBI) has been conducting household surveys in CAREC countries to better understand the impacts on vulnerable households as part of the Asian Development Bank's overall strategy to deal with the current crisis. Assessing the magnitude of these challenges and identifying the most vulnerable households are critical to deploying effective policy responses for the region's efficient recovery, economic development, and regional integration, in line with the CAREC Strategy 2030.

The contribution of this chapter is to provide empirical evidence on the impact of the COVID-19 crisis on employment, household business, and child education, which are not studied in Azhgaliyeva et al. (2022b), in the CAREC region. We use household data from computer-assisted telephone interviews (CATIs) carried out in ten CAREC countries: Afghanistan, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan. The surveys were conducted from mid May through to the end of August 2021. Representative samples of 1,000 households in each country were surveyed and asked about their socioeconomic conditions from June to December 2020. We compare employment and household business conditions as well as education in school in June 2020 and in December 2020 to see how households were affected by and able to cope with the COVID-19 pandemic.

2.2 LITERATURE REVIEW

2.2.1 Effects of the COVID-19 Pandemic on Household Business

A large body of studies also examined the effects of COVID-19 on firm activities (Adian et al. 2020; Apedo-Amah et al. 2020; Inoue and Todo 2020; Dai et al. 2021; Sonobe et al. 2021; Sun, Bao, and Lu 2021). There are several channels through which the pandemic affected firms; these include supply shocks, demand shocks, uncertainty, and credit crunch (Adian et al. 2020 and Apedo-Amah et al. 2020). Depending on the nature of the crises, the transmission may differ. For example, during the global financial crises, the main channel was access to finance; however, in contrast to previous crises, the most prominent feature of the COVID-19 pandemic is that firms were hit in all channels (Adian et al. 2020). Nonpharmaceutical measures such as stay-at-home orders or lockdown policies reduced the labor supply, since workers were forced to stay at home, and therefore supply chains were disrupted. Using structural econometric methods, Brinca, Duarte, and Castro (2020) decomposed changes in working hours into supply and demand shock contributions and found that the supply shock contributed more than the demand shock. Candia, Coibion, and Gorodnichenko (2020) suggest that some firms (and most households) formed aggregate inflation expectations during the pandemic, seeing it as a supply shock.

At the same time, firms were affected by the decline in demand, which comes from several sources: decline in income; increases in precautionary savings; and increases in unplanned expenditure. Morgan, Trinh, and Kim (2022) showed that in seven Association of Southeast Asian Nations (ASEAN) countries, more than 70 percent of households experienced a decline in income in the early phase of the pandemic and 45 percent of households experienced a decline in income in the second half of 2020 in comparison to the first half of the year. Meanwhile, 32 percent of households in the ASEAN countries reported a decline in expenditure and a change in expenditure pattern, with a higher share of expenditure going on hygiene and healthcare products (Morgan, Trinh, and Kim 2022). From a firm's perspective, many business owners and managers of both public and small firms reported that the negative demand shock was their most pressing concern in the early phase of the pandemic (Bartik et al. 2020 and Hassan et al. 2020). Meyer, Prescott, and Sheng (2022) further find that firms are overwhelmingly worried about the decline in demand and sale revenues. In a survey of small US firms, Bartik et al. (2020) reports that, among small US firms, the reasons behind the temporary closure of firms are mainly demand shocks rather than supply shocks.

With regards to the COVID-19 pandemic, previous studies find that household businesses, which are mostly small, are more affected than larger firms. As Meyer, Prescott, and Sheng (2022) argued, in the early phase of the pandemic, demand shock, rather than supply shock, is the major channel through which the pandemic affects the operation of a firm, and demand shock is mostly attributed to nonpharmaceutical measures imposed by governments around the world. However, in contrast with the larger firms, many informal firms (and small and medium-size enterprises) are operating in sectors that are more prone to be affected by nonpharmaceutical measures, such as retail or transportation (Fairlie and Fossen 2022). Empirical evidence also shows that small firms tend to experience worse performance than that of larger firms. Using a dataset of 13 countries, Adian et al. (2020) show that small firms are 9 percent more likely to experience a fall in sales, while the figure for larger firms is only 8 percent. They are also less likely than larger firms to report increased sales. Sun et al. (2021) show that in the PRC small firms are also more likely to face weak market demand than larger firms. However, it should also be noted that, except for firms operating in industries that are experiencing a growth in demand — such as healthcare or home office equipment and digital firms — larger, more formal firms may also face the same problem since, in addition to a decline in domestic demand, these firms may be affected by a decline in foreign demand (Adian et al. 2020).

2.2.2 Effects of the COVID-19 Pandemic on Children's Education

The COVID-19 pandemic is profoundly transforming society, and such transformation often exacerbates social and economic inequalities in its wake (Engzella, Frey, and Verhagena 2021). To slow down and curb the spread of the virus, governments around the world have imposed a range of measures, including suspending in-person learning at schools. At the early stage of the pandemic, school closure was implemented in 188 countries, affecting some 95 percent of the world's student population (UNICEF 2020). In response, schools have moved to online learning.

School closures have devastating effects on education in many aspects. For the children, going to school is the best way to learn new skills and their ability (Burgess and Sievertsen 2020). Carlsson et al. (2015) show that students significantly raise their test scores by 1 percent of a standard deviation with just ten days of extra schooling. Similarly, Lavy (2015) reports that total weekly hours of instruction in language, mathematics, and science matter for improving test scores among children in advanced economies. In the context of the pandemic, Burgess and Sievertsen (2020) estimate that if a child experiences 12 weeks (60 school days) less schooling, this implies a loss of 6 percent of a standard deviation in the test score.

Not only is there a decrease in accumulating knowledge, but also the likelihood of school dropouts increases. Hallgarten (2020), based on an analysis of the educational impact of the Ebola outbreaks, shows that, during the COVID-19 pandemic, several factors would hinder children from continuing their education. These factors included (1) lack of quality education, (2) reduction in the availability of education services, (3) reduced access to education services, and (4) the lower utilization of schools (Hallgarten 2020). UNESCO (2020) estimates that 24 million children are at risk of not returning to school, resulting in the same level of out-of-school children as in 2000, despite two decades of progress in educational access.

To sustain education, schools around the world started to offer classes using alternative means, such as online classes or classes through the television system. However, online classes or the distance learning approach have many disadvantages. Reimers (2022) argues that these alternative learning approaches only partially restore the opportunity to learn and the quality of instruction. This is partly because more than half of Mexican students find such learning activities (online classes or classes through the TV or radio programs) boring (Mejoredu 2020 as cited in Reimers 2022). Furthermore, many students find online classes challenging, since they do not receive adequate support and explanation from their teachers and feel confusion about the activities they are supposed to carry out (Reimers 2022).

The COVID-19 pandemic also further widened the educational gap across genders and groups of students for several reasons. First, many children do not have internet access, personal computers, TVs, or even a radio at home. For example, 43.6 percent of Mexican households did not have internet access during the pandemic (Reimers 2022). In sub-Saharan Africa, a full 80 percent of children lacked internet access at home. This figure was 49 percent in Asia and the Pacific, 39 percent in Latin America, and 34 percent in the Arab States, while it was only 14 percent in Western Europe and North America, and 20 percent in Eastern Europe and Central Asia (Giannini 2020). In ASEAN countries, Morgan and Trinh (2021) show that about 8 percent did not attend any online classes, 19 percent attended only a few, and 16 percent attended some but not all. Most children who do not have internet access are from poorer households (Morgan and Trinh 2021). Second, the pandemic caused household economic situations to worsen, especially among poorer households. Consequently, many children — especially girls and children from low-income households and children with disabilities — have further engaged in at-home work to support their parents (Azevedo et al. 2022; Morgan, Trinh, and Kim 2022; Reimers 2022). This ultimately amplifies the effects of learning inequalities, which are rather high (UNESCO 2020).

This research is inspired by and closely related to studies by Azhgaliyeva et al. (2022b) and Morgan and Trinh (2021). This chapter uses the same household survey from ten CAREC member countries (excluding the PRC) as Azhgaliyeva et al. (2022b). While Azhgaliyeva et al. (2022b) assessed the impact on household income, expenditure, and financial difficulties, this chapter assesses the impact on households, employment and children's school education. The main contribution of this chapter is that it studies education and employment in the CAREC member countries (excluding PRC) during the COVID-19 pandemic.

Morgan and Trinh (2021) carried out CATIs on households in eight Southeast Asian countries, which include: Cambodia, the Lao People's Democratic Republic, Indonesia, Malaysia, Myanmar, the Philippines, Thailand, and Vietnam in 2020. A nearly identical survey questionnaire (with some modifications to facilitate understanding for households in the CAREC countries) was used for this study.

Morgan and Trinh (2021) examined the impacts of COVID-19 on employment in seven ASEAN countries. They found that 44.4 percent of employees lost their jobs (either temporarily and permanently) or experienced a workload cut. Notably, 73.5 percent of Filipino employees in their samples either lost their job or had to reduce their working hours. In Vietnam, Thailand, Myanmar, and Malaysia, the figures are high — from 45 percent to 50 percent. Interestingly, the proportion of employees in Indonesia who lost their job and/or had their working time reduced is rather low, especially compared with the Philippines.

Morgan and Trinh (2021) examined the impacts of COVID-19 on children's education. They found that about 27 percent of children who stopped schooling could not fully participate in online learning programs because of weak/insufficient internet connections and/or a lack of digital devices. Two factors related to COVID-19 had a significant and negative impact on the intensity of online classes taken by children in an average household: (1) having at least one person who lost their job or had working hours reduced and (2) experiencing financial difficulties.

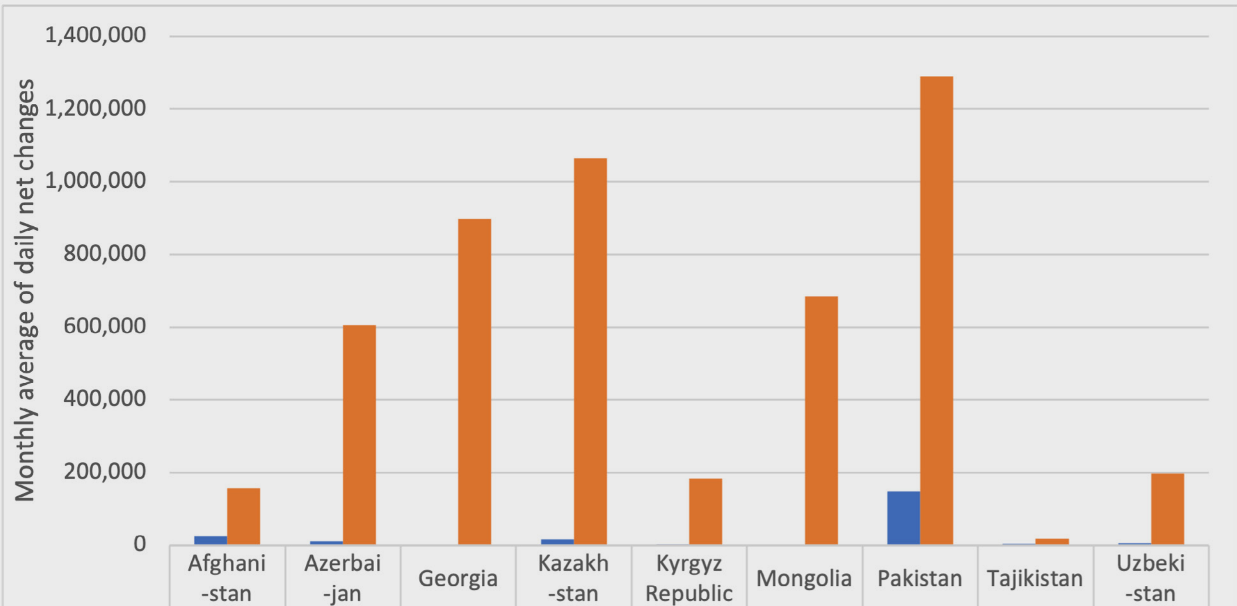
The recent book, COVID-19 Impacts and Policy Options: An Asian Perspective (Beirne, Morgan, and Sonobe 2021), provides important insights into the economic effects of the COVID-19 pandemic in Asian countries and some policy implications for supporting vulnerable households. However, evidence of the pandemic's impact in the CAREC region is scarce, making it difficult to draw up policy recommendations.

2.3 SPREAD OF COVID-19 AND GOVERNMENT RESPONSES

2.3.1 COVID-19 in CAREC

Figures 2.1-2.3 present the changes in the phase of the COVID-19 pandemic in nine CAREC countries (excluding the PRC and Turkmenistan). Each figure shows the monthly average of daily net changes in confirmed cases of COVID-19 and deaths, respectively. However, data on COVID-19 cases and deaths is not available for Turkmenistan (Figure 2.2). Figures 2.1-2.2 demonstrate a large increase in COVID-19 confirmed cases and deaths from June 2020 to December 2020 in nine CAREC countries.

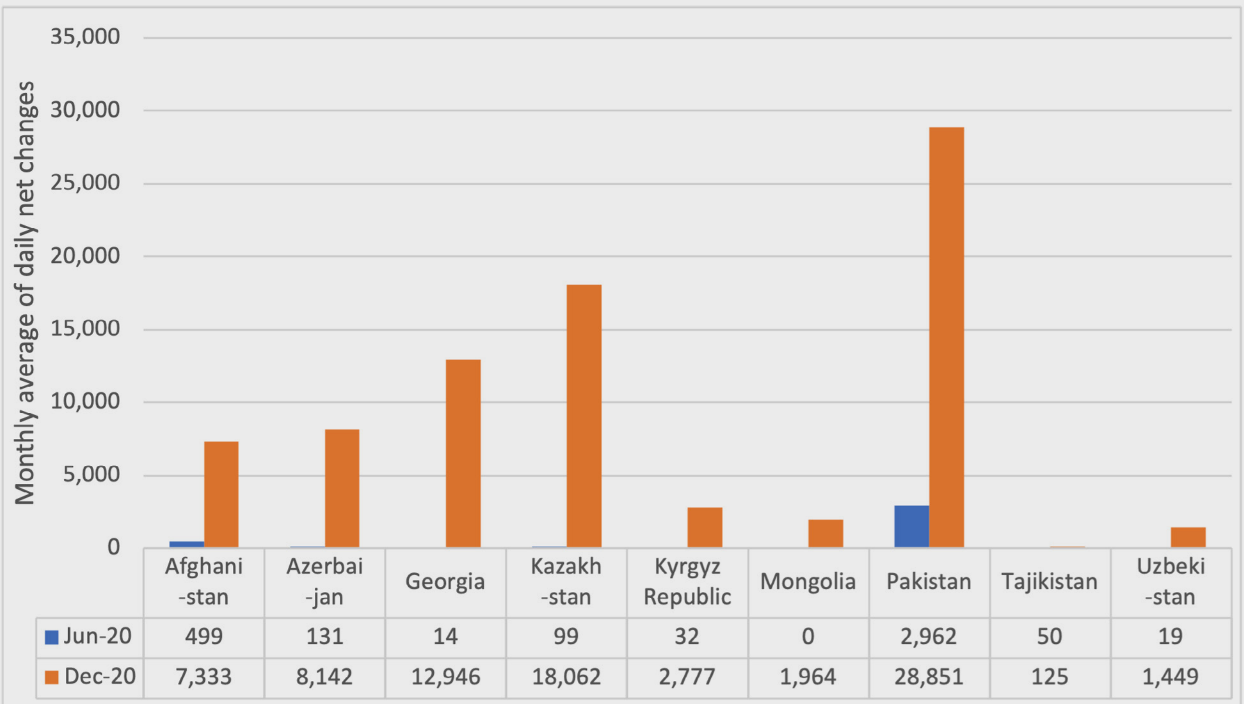
Figure 2.1. COVID-19 Cases (Daily Net Changes)



	Afghani-stan	Azerbai-jan	Georgia	Kazakh-stan	Kyrgyz Republic	Mongolia	Pakistan	Tajikistan	Uzbeki-stan
Jun-20	25,056	10,885	866	15,887	2,928	201	148,345	5,011	5,620
Dec-20	157,716	606,358	897,576	1,064,978	184,079	683,996	1,290,570	17,493	196,392

Source: Authors' own calculation using data from Hale et al. (2021).

Figure 2.2. COVID-19 Deaths (Daily Net Changes)



	Afghani-stan	Azerbai-jan	Georgia	Kazakh-stan	Kyrgyz Republic	Mongolia	Pakistan	Tajikistan	Uzbeki-stan
Jun-20	499	131	14	99	32	0	2,962	50	19
Dec-20	7,333	8,142	12,946	18,062	2,777	1,964	28,851	125	1,449

Source: Authors' own calculation using data from Hale et al. (2021)

2.3.2 Government Responses

The CAREC countries have implemented various measures, such as lockdowns, social distancing requirements, travel restrictions, school closures, and border closures; however, there is some variation by country in time of implementation, stringency, and duration of these policies. Figures 2.3-2.5 show intensity indices of the policy measures that the CAREC countries have adopted in response to the COVID-19 pandemic (Hale et al. 2021). Table 2.1 provides a description of selected indicators corresponding to each figure. These indicators are retrieved from the Oxford COVID-19 Government Response Tracker (OxCGRT) provided by the Blavatnik School of Government of the University of Oxford (2021). See Hale et al. (2021) for more details.

Table 2.1. Selected Indicators ofGovernment Response to theCOVID-19 Pandemic

Code	Indicator	Description
C1	School closing	Government requirements for school and university to close: 0 = no requirement; 1 = reduced number of individuals in a classroom (such as, hybrid in-person/online learning models); 2 = classes open for some groups (such as, exams for several days); and 3 = all classes closed.
C2	Workplace closing	Government requirements for workplace to close: 0 = no requirement; 1 = workplaces reopen under sanitation and social distancing requirements; 2 = some shops open for essential needs (such as, healthcare or groceries); and 3 = most shops closed.
C6	Stay-at-home requirements	Government requirements for people to stay at home: 0 = no requirement; 1 = clinically vulnerable groups of people strongly recommended or required to shield at home; 2 = curfews; and 3 = cannot leave the house for multiple days.

Note: more explanation of each indicator is provided in OxCGRT Coding Interpretation Guide

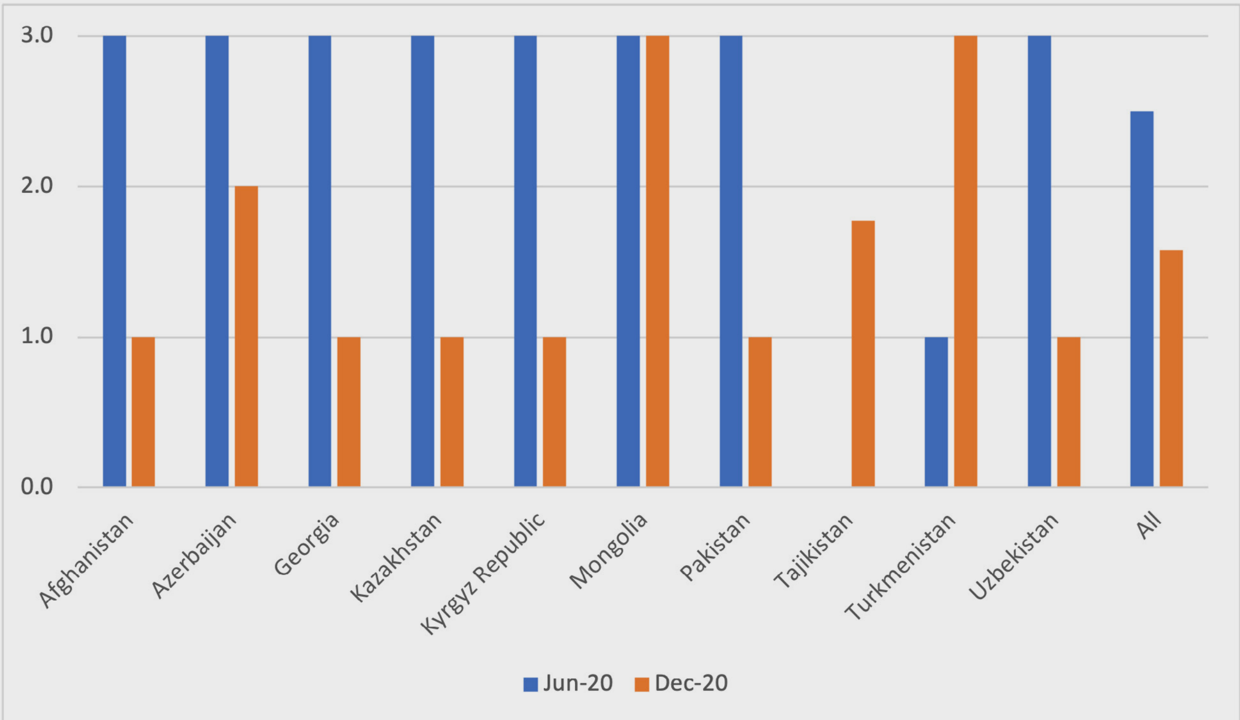
Source: Hale et al. (2021)

The monthly average index of school closure in ten CAREC countries is demonstrated in Figure 2.3, which shows that schools were closed in June 2020 (average monthly index C1 equals 3) in eight of the ten CAREC countries, excluding Tajikistan (C1 = 0) and Turkmenistan (C1 = 1). However, school closures were significantly relaxed by December 2020 (C1 = 1) in six of the ten CAREC countries. In December 2020, school closure remained high in Mongolia (C1 = 3), was only slightly relaxed in Azerbaijan (C1 = 2), and increased in Tajikistan (C1 = 1.8) and Turkmenistan (C1 = 3). On average, school closures reduced from 2.5 in June 2020 to 1.6 in December 2020.

Figure 2.4 demonstrates the monthly average index of workplace closure in ten CAREC countries. It demonstrates that the strictest workplace closure (C2 = 3) was in Afghanistan. Also, in most countries workplace closure did not change greatly from June 2020 to December 2020. On average, workplace closure was around 2 in June and December 2020.

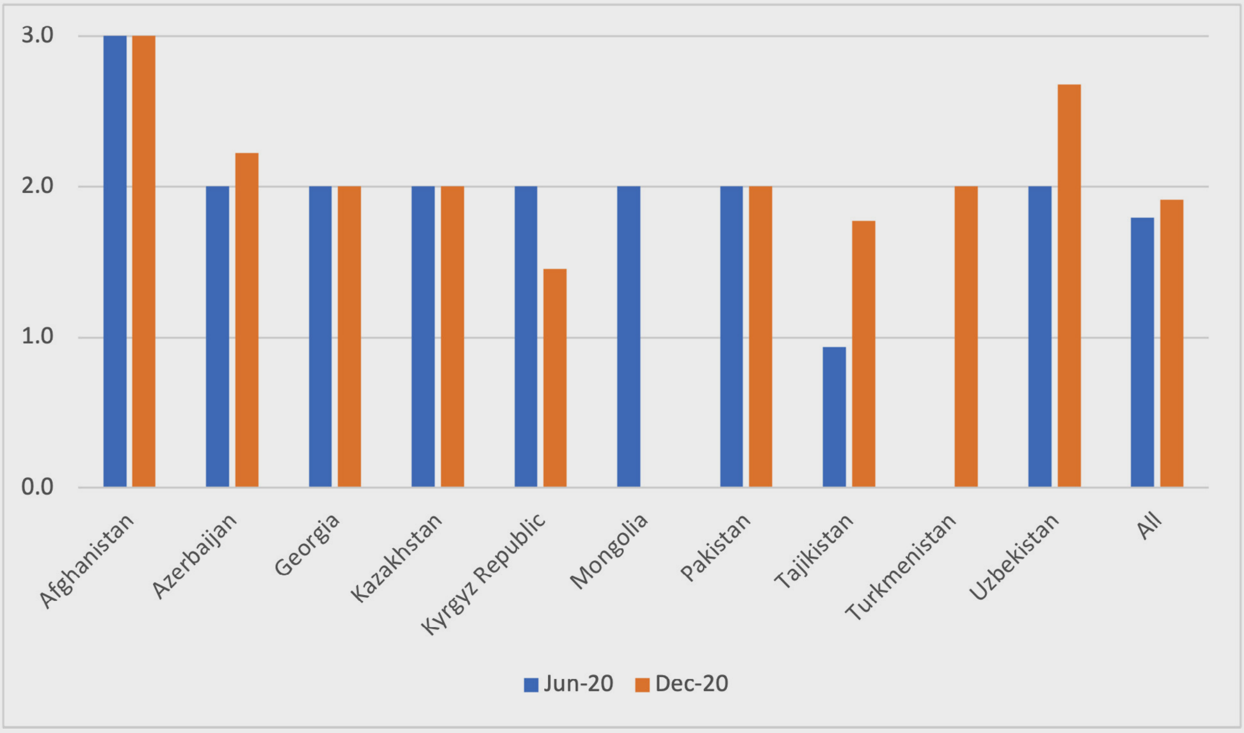
Figure 2.5 demonstrates the monthly average index of government stay-at-home requirements, which varied greatly across the 10 CAREC countries in June 2020 and December 2020. The strictest stay-at-home requirements were in Kazakhstan and Kyrgyzstan in December 2020. Requirements were relaxed in December 2020 compared to June 2020 in Afghanistan, Azerbaijan, Georgia, Pakistan, and Uzbekistan; they were more restricted in Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, and Turkmenistan.

Figure 2.3. Monthly Average Index of School Closures (C1)



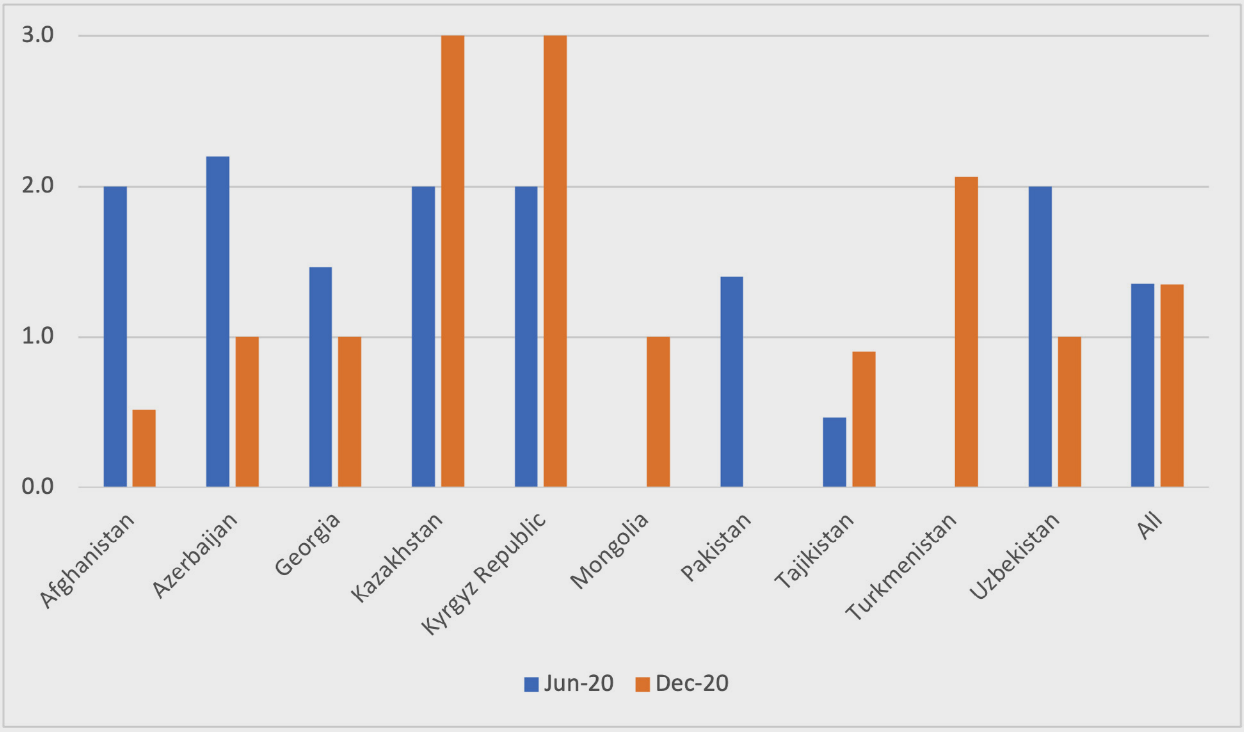
Source: Authors' own calculation using data from Hale et al. (2021)

Figure 2.4. Monthly Average Index of Workplace Closures (C2)



Source: Authors' own calculation using data from Hale et al. (2021)

Figure 2.5. Monthly Average Index of Stay-at-Home Requirements (C6)



Source: Authors' own calculation using data from Hale et al. (2021)

2.4 ADBI HOUSEHOLD SURVEY IN THE CAREC COUNTRIES

The household survey was conducted in ten out of the eleven CAREC member countries: Afghanistan, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan.

The survey was designed by ADBI and conducted by nine survey companies in the respective countries. It was implemented during May and July 2021, after which, there were pilot tests, and all the fieldworks were finished by the end of August 2021. See Azhgaliyeva et al. (2022b) for the distribution of the sample across provinces and household income groups as well as its allocation. Major characteristics of the survey are as follows:

- Computer-assisted telephone survey because of the COVID-19 pandemic
- Respondent was either household head or person who is knowledgeable in the household finance
- Length of interview was about 20 minutes (this was longer in some countries, partly owing to the screening questions)
- The questionnaire the following information :
    - Household characteristics, including gender, age, and education level of household head, number of household members, number in employment and in school, urban versus rural residence, and household income, including monthly amount and source(s) of income

- Changes in household income, employment, working hours , and household business condition in December 2020 compared with the base period of June 2020
- School attendance including distance learning during June 2020 to December 2020 and, if not, main reasons for absence
- Whether the household experienced financial difficulties during June 2020 to December 2020 and, if so, its coping measures

2.5 COVID-19 IMPACTS ON EMPLOYMENT, HOUSEHEOLD BUSINESS, AND EDUCATION

2.5.1 Impact of the COVID-19 Pandemic on Employment

Figure 2.6 presents the distribution of household head employed sector in June 2020. Overall, 16 percent of households work in the agriculture/fishery sector, 11 percent in industry/manufacturing, 11 percent in construction, 14 percent in wholesale and retail, 7 percent in transport service, 2 percent in hospitality, 15 percent in public administration, 11 percent in health and education, 6 percent in personal services, and 6 percent in other services. The distribution of the employment sector varies by country. Most (nearly one third) work in the agriculture/fishery sector in Afghanistan (32 percent), Mongolia (32 percent), and in Pakistan (25 percent). Nearly one fifth in industry/manufacturing are in Kazakhstan and Turkmenistan. The most employed in construction are in Pakistan (18 percent), Tajikistan (18 percent), and Turkmenistan (17 percent). The highest share of those working in wholesale and retail is in Turkmenistan (37 percent). The share of those working in hospitality (restaurants and hotels) is small in all countries (1 percent to 4 percent). The highest share (23 percent) of those working in public administration are in Azerbaijan, Kyrgyzstan, and Tajikistan. The highest shares of those working in healthcare and education are in Georgia (26 percent) and Kazakhstan (18 percent). The share of those working in personal services is not large; these are mainly in Kyrgyzstan (10 percent), Pakistan (10 percent), and Uzbekistan (9 percent).

Figure 2.7 shows the proportion of household members with a decline in working hours in December 2020 in comparison to June 2020. On average, 24 percent of employees in our sample experienced either losing their job (temporarily or permanently) or a workload cut in December 2020 in comparison with June 2020. Notably, 67 percent of employees in Pakistan in our sample had either lost their jobs or had to reduce their working time. This high figure is comparable with the 73.5 percent of Filipino employees who lost their jobs or had to reduce their working time in June 2020 (Morgan and Trinh 2021). In five countries, Azerbaijan, Afghanistan, Mongolia, Turkmenistan, and Georgia, the figures were high — in the range of 25 percent to 39 percent. In the remaining four countries in our sample — Kyrgyzstan, Kazakhstan, Tajikistan, and Uzbekistan — the share of employees who had either lost their job or experienced a workload cut was relatively low (5 percent to 7 percent).

Compared to Morgan and Trinh (2021), the overall share of those who either lost jobs or had reduced working time is lower in our sample of 10 CAREC member countries (excluding the PRC) in December 2020 compared to June 2020 than that of the Southeast Asian countries in June 2020 compared to before COVID. We cannot say whether employment in the CAREC countries was less affected or not, owing to the difference in timeframe. To compare the impact across the two regions we need use the same time period.

Figure 2.6. Employment Distribution, June 2020 (Percentage of Households)

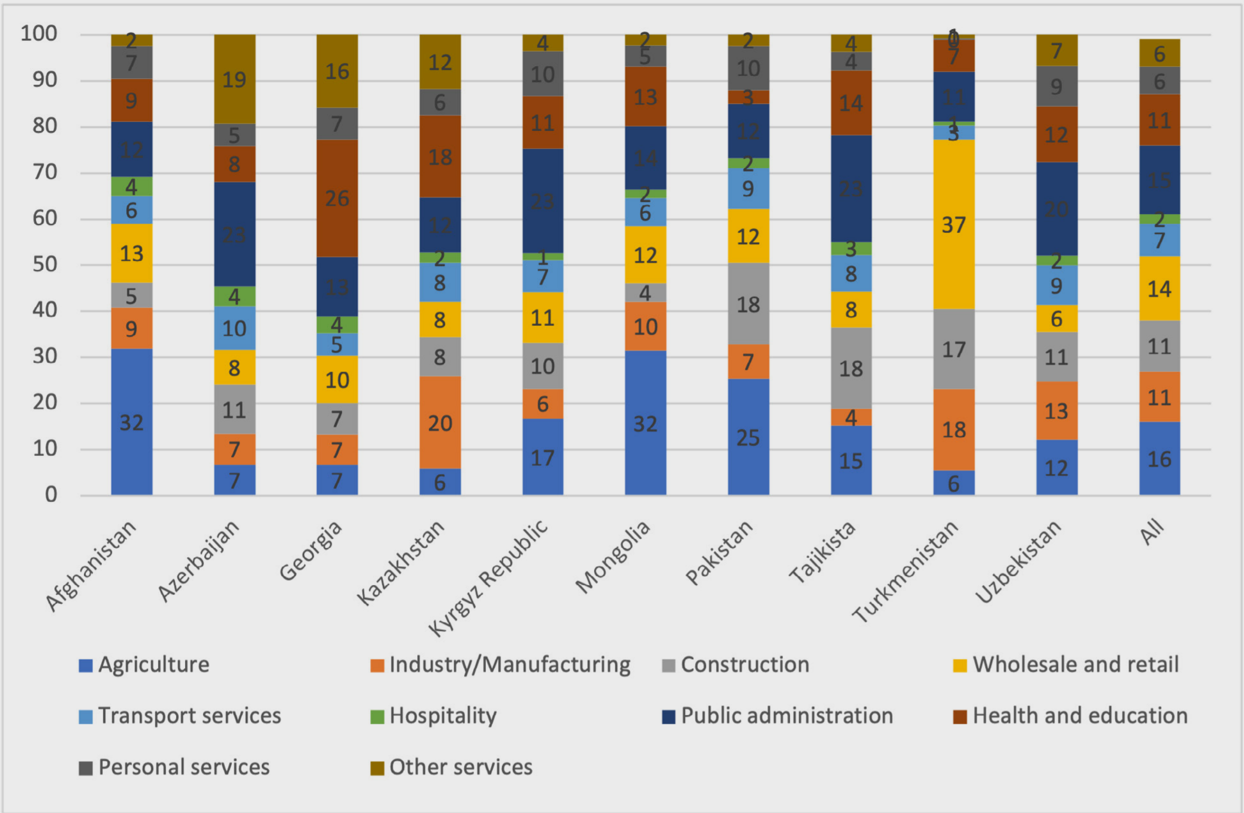
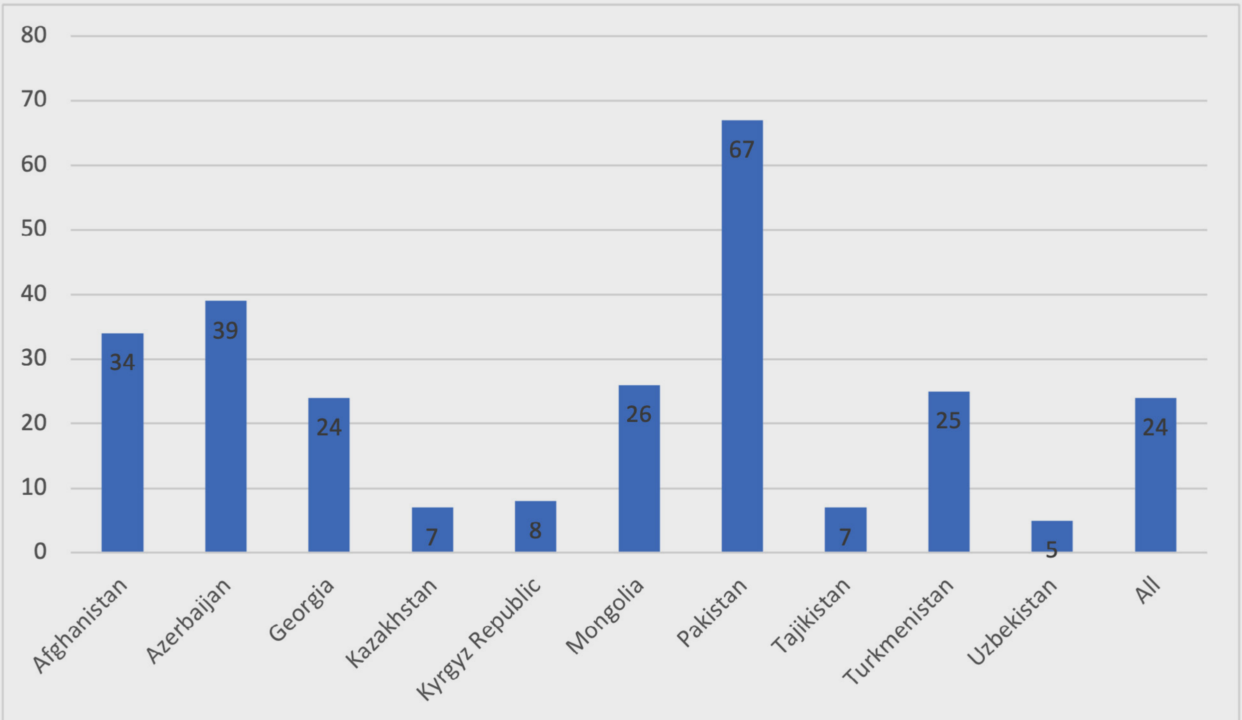


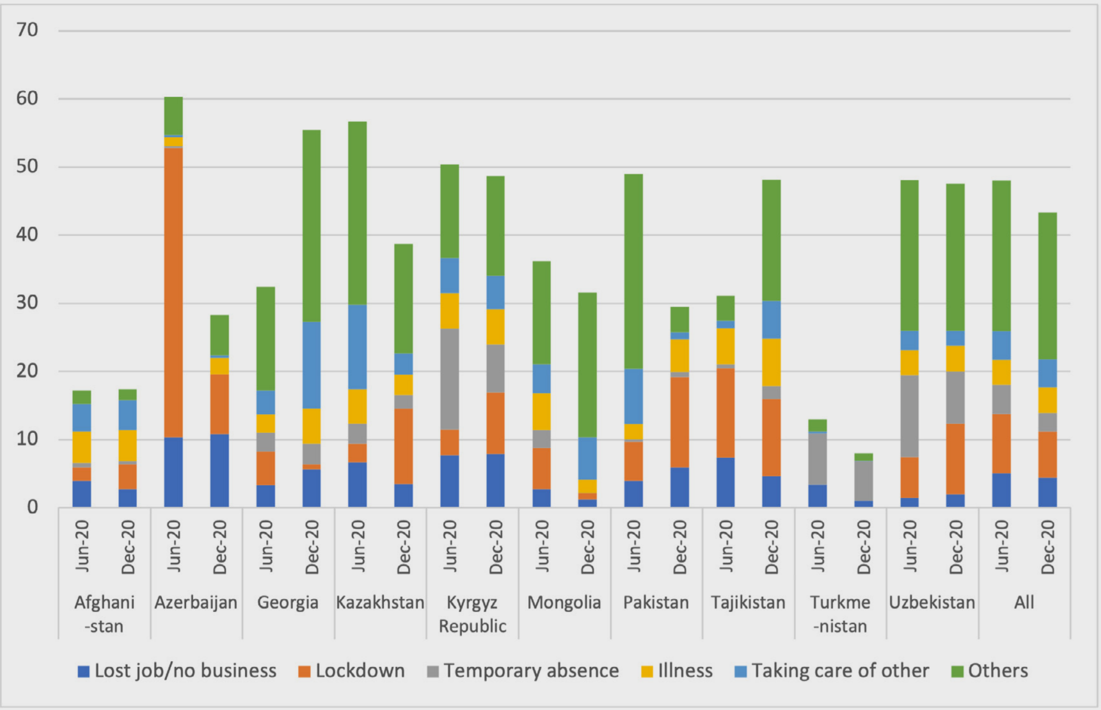
Figure 2.7. Households with Job Losses or Reduced Workload (Percentage of Households)



The reasons for the household head not working in December 2020 and June 2020 are demonstrated in Figure 2.8. Among all households, 5 percent and 4 percent had a household head who had lost their job or had no business owing to the COVID-19 pandemic in June and December 2020, respectively. Others could not go to work owing to one of the following reasons: 9 percent and 7 percent were in a lockdown area; 4 percent and 3 percent were temporarily absent from work; 4 percent were absent owing to illness; and 4 percent were taking care of others.

The reasons for household heads not working vary by country. The share of household heads who lost their jobs or had no business owing to the COVID-19 pandemic was highest in Azerbaijan (10 percent to 11 percent). The share of those missing work owing to lockdown reduced from 9 percent in June 2020 to 7 percent in December 2020. The difference was particularly large in Azerbaijan (from 42 percent to 9 percent). The share not working owing to taking care of others was high in Kazakhstan in June 2020 (12 percent) but reduced to 3 percent in December 2020. However, in Georgia it was the opposite, with the share of household heads not working owing to taking care of family members increasing from 4 percent in June 2020 to 13 percent in December 2020. Such large changes could be associated with the lockdown of schools or online education for small children.

Figure 2.8. Households with Job Losses or Reduced Workload
(Percentage of Households)



We examine the factors relating to the impact of the COVID-19 pandemic on employment (such as, losing a job during June to December 2020). Because the job loss is a binary variable, we employ a probit model and estimate the following equation:

$$JobLoss_i = \alpha_0 + \alpha_1 HH_i + \alpha_2 COVID_i + \in_i \quad (1)$$

where $JobLoss_i$ is a dummy variable that takes the value of 1 if household i lost their job during June to December 2020 and 0 if otherwise; HH_i is a set of household characteristics which includes the household head's gender, education, age, income source, and location (that is, rural vs. urban areas); $COVID_i$ indicates whether the household was located in a lockdown area (dummy); and $\in_i$ is an error term. Unlike Morgan and Trinh (2021) and Azhgaliyeva et al. (2022b), we excluded a socioeconomic or income class variable owing to a concern about reverse causality: For instance, those households whose head lost their job may fall into the lower income class. We estimate the above equation for pooled data on ten countries (with the country dummy being controled) and separately for each country except for Afghanistan because only 2.6 percent of household heads lost their job there during June to December 2020. The household head in the age bracket of '60 or above' is excluded from the regression because typically people in that wage range have already retired and their employment status remained the same during the pandemic.

Table 2.2 shows the estimation results. The first column reports the results for pooled data and the subsequent columns present results for each CAREC country. The estimated marginal effects are reported in Table A1 in the Appendix. The results suggest that female household heads are less likely to experience job loss than their male counterparts: the likelihood of a female household head losing their job is 4.2 percentage points (pp) lower than for male household heads. Nevertheless, the results vary across countries. For example, we observed a negative and significant relationship in only two countries (Kyrgyzstan and Uzbekistan), while there is a positive and significant relationship in Pakistan.

On average, education level was negatively associated with the likelihood of losing a job. A household head with a college diploma has a lower probability of experiencing job loss by 3.4 pp than those who have a qualification lower than a high school diploma (that is, secondary school and below). No significant difference was found for high school graduates. This result is consistent with the finding in Azhgaliyeva et al. (2022b), which showed that low-educated workers in CAREC countries were more likely to experience an income decline during the pandemic. The same is also observed in Kyrgyzstan, and both college and high school graduates had a lower probability of losing their job in Georgia and Uzbekistan. With the findings in Azhgaliyeva et al. (2022b), we may conclude that low-educated workers were especially affected by the pandemic.

Regarding age group, the results show that younger household heads were more likely to lose their job during the pandemic. On average those in their 20s, 30s, and 40s had a higher probability of job loss by 3.0 pp, 2.6 pp, and 2.2 pp, respectively, compared to those in their 50s. A report from the ILO and ADB (2020) shows that youth employment is hit hardest by the pandemic in the Asia and the Pacific region and stresses the necessity of adopting large-scale, targeted policy responses. Our finding provides similar results from the CAREC countries, with some differences among countries. For example, those in their 20s were severely affected in Kazakhstan, while middle-age groups (that is, 30s and 40s) were more affected in Mongolia and Tajikistan.

Source of income has a significant relationship with impact on employment. Results suggest that households with income from household business or self-employment were more likely to lose their jobs than households that did not have such income. This pattern is also observed in Azerbaijan and Mongolia. Meanwhile, households depending on wage income were less likely to lose their jobs, which is also observed in Azerbaijan, Kyrgyzstan, and Tajikistan. However, the significant and positive relationship is observed in Mongolia and Pakistan. These findings indicate that — while there are some notable differences across the CAREC countries — on average, employment in household business is more reversely affected by the pandemic than is that of wage labor. These implications further motivate study of the household business impacts in the following subsection.
We also find that being located in a lockdown area increased the likelihood of job loss,

but this significant and negative employment impact was found only in Azerbaijan. Households in rural areas were also less likely to lose their jobs. The significant relationship is also observed in Kazakhstan, Kyrgyzstan, and Pakistan.

Table 2.2. Factors Determining the Probability of Job Loss during the COVID-19 Pandemic

VARIABLES	All	Azerbaijan	Georgia	Kazakhstan	Kyrgyzstan
Job loss (mean)	0.132	0.468	0.084	0.076	0.156
	(1)	(2)	(3)	(4)	(5)
Household head female	-0.400***	-0.403	0.004	-0.195	-1.116***
	(0.101)	(0.269)	(0.287)	(0.279)	(0.305)
Household head education					
• High school graduate	-0.104	1.049	-0.628*	-0.347	-0.295
	(0.120)	(1.361)	(0.363)	(0.802)	(0.295)
• College graduate	-0.323***	1.080	-1.047***	-0.321	-0.908***
	(0.123)	(1.355)	(0.340)	(0.780)	(0.310)
Age group (base: 50-59)					
• 20-29	0.291**	0.211	0.125	0.887**	0.464
	(0.122)	(0.325)	(0.537)	(0.427)	(0.313)
• 30-39	0.257***	-0.119	0.281	0.316	0.011
	(0.095)	(0.233)	(0.362)	(0.409)	(0.246)

• 40-49	0.221**	0.290	0.077	0.137	-0.782***
	(0.095)	(0.241)	(0.333)	(0.426)	(0.281)
Income source					
• Agriculture	-0.105	-0.005	0.016	0.572	0.062
	(0.084)	(0.245)	(0.360)	(0.363)	(0.216)
• Household business	0.915***	2.699***	-0.305	-0.373	-0.085
	(0.079)	(0.192)	(0.444)	(0.633)	(0.215)
• Wage/salary	-0.394***	-0.895***	-0.017	0.032	-0.343*
	(0.080)	(0.239)	(0.324)	(0.409)	(0.207)
Rural	0.003	-0.125	-0.134	0.540*	0.394*
	(0.080)	(0.227)	(0.330)	(0.287)	(0.232)
Located in lockdown area	0.194**	1.794***	0.347	0.155	-0.395
	(0.098)	(0.380)	(0.278)	(0.326)	(0.241)
Constant	-3.817***	-3.462**	-1.725***	-2.815***	-0.697*
	(0.268)	(1.419)	(0.420)	(0.877)	(0.381)
Observations	7653	900	621	819	824

VARIABLES	Mongolia	Pakistan	Tajikistan	Turkmenistan	Uzbekistan
Job loss (mean)		0.051	0.134	0.113	0.119
	(6)	(7)	(8)	(9)	(10)
Household head female	-0.195	0.885**	-0.433	-0.039	-1.214**
	(0.301)	(0.451)	(0.303)	(0.398)	(0.476)
Household head education					
• ·High school graduate	-0.108	-0.157	0.814*	-0.171	-0.732*
	(0.292)	(0.389)	(0.416)	(0.363)	(0.437)
• ·College graduate	-0.508	-0.176	0.028	-0.078	-0.763*
	(0.328)	(0.515)	(0.444)	(0.350)	(0.399)
Age group (base: 50-59)					
• ·20-29	0.375	-0.178	0.391	-0.431	0.260
	(0.514)	(0.633)	(0.397)	(0.406)	(0.373)
• ·30-39	0.806**	0.368	0.499	0.085	0.195
	(0.324)	(0.470)	(0.309)	(0.309)	(0.284)
• ·40-49	0.656**	0.444	0.778***	-0.232	0.151
	(0.312)	(0.450)	(0.288)	(0.345)	(0.282)
Income source					
• ·Agriculture	-1.186***	0.316	0.371	-0.129	0.002
	(0.458)	(0.358)	(0.232)	(0.234)	(0.248)
• ·Household business	1.424***	0.296	-0.038	-0.028	-0.289

	(0.260)	(0.513)	(0.281)	(0.256)	(0.325)
• ·Wage/salary	0.593**	1.021**	-0.637***	0.477	-0.449**
	(0.278)	(0.448)	(0.226)	(0.487)	(0.228)
Rural	-0.420	0.891**	-0.015	-0.146	0.134
	(0.320)	(0.423)	(0.256)	(0.229)	(0.229)
Located in lockdown area		0.305	-0.084		-0.433
		(0.622)	(0.218)		(0.355)
Constant	-2.665***	-5.091***	-2.281***	-2.164***	-0.872*
	(0.416)	(0.846)	(0.538)	(0.612)	(0.461)
Observations	725	826	728	783	795

from the separate regression because only 2.63 percent of household heads experienced job loss during June to December 2020.

2.5.2 Impact of the COVID-19 Pandemic on Household Business

Figure 2.9 demonstrates the share of households that operated a business or worked on a farm at any point in 2020; on average, this figure was 26 percent. However, this result varies by country. Countries with the smallest share of household business include Kyrgyzstan (10 percent), Tajikistan (13 percent), and Kazakhstan (14 percent). Azerbaijan has the largest share of household businesses (58 percent).

Figure 2.9. Share of Households that Operate a Business or Work on a Farm
(Percentage of Households)

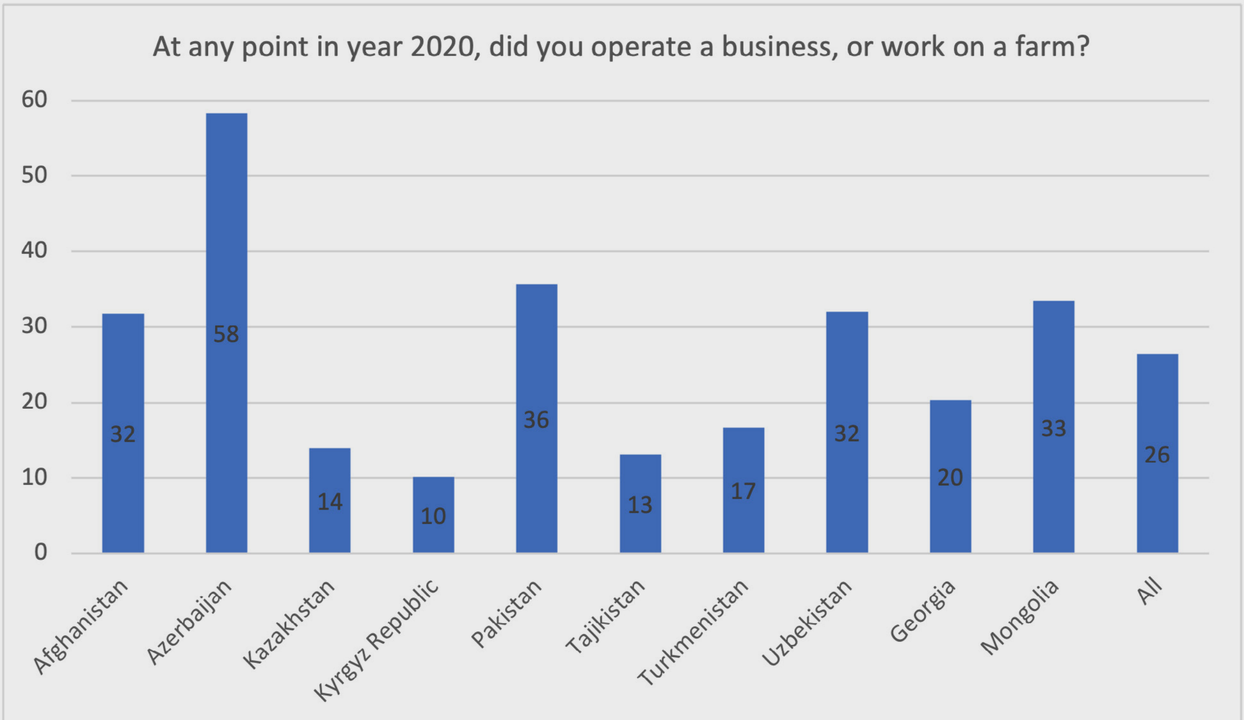


Figure 2.10 demonstrates sectors of household business. Overall, most household business is in agriculture (33 percent) and retail and wholesale (23 percent). On average, household business in agriculture is 33 percent, in industry is 8 percent, in construction is 9 percent, in wholesale and retail is 23 percent, in transport is 7 percent, in hospitality (restaurants and hotels) is 5 percent, in health and education is 4 percent, in personal services is 7 percent, and in other services is 5 percent; however, sectors vary by country. Household business in agriculture is mainly in Pakistan (55 percent), Mongolia (53 percent), Turkmenistan (46 percent), Georgia (40 percent), Uzbekistan (37 percent), Afghanistan (31 percent), and Kazakhstan (30 percent). Household business in industry is mainly in Afghanistan (21 percent). Household business in construction is mainly in Uzbekistan 27 percent. Household business in retail and wholesale is well represented in all countries from 16 percent to 39 percent. Household business in transport is mainly in Tajikistan (14 percent). Household business in hospitality is mainly in Tajikistan (17 percent). Household business in health and education is mainly in Azerbaijan (13 percent). Household business in personal services is mainly in Tajikistan (11 percent), Azerbaijan (10 percent), and Georgia (10 percent).

Figure 2.11 demonstrates the status of household businesses at the time of interview (May to August 2021). Overall, over three quarters of household businesses (76 percent) remained open in May to August 2021. The remaining 24 percent were closed, of which 17 percent were closed temporarily and 7 percent were closed permanently.

Figure 2.10. Household Business Sectors

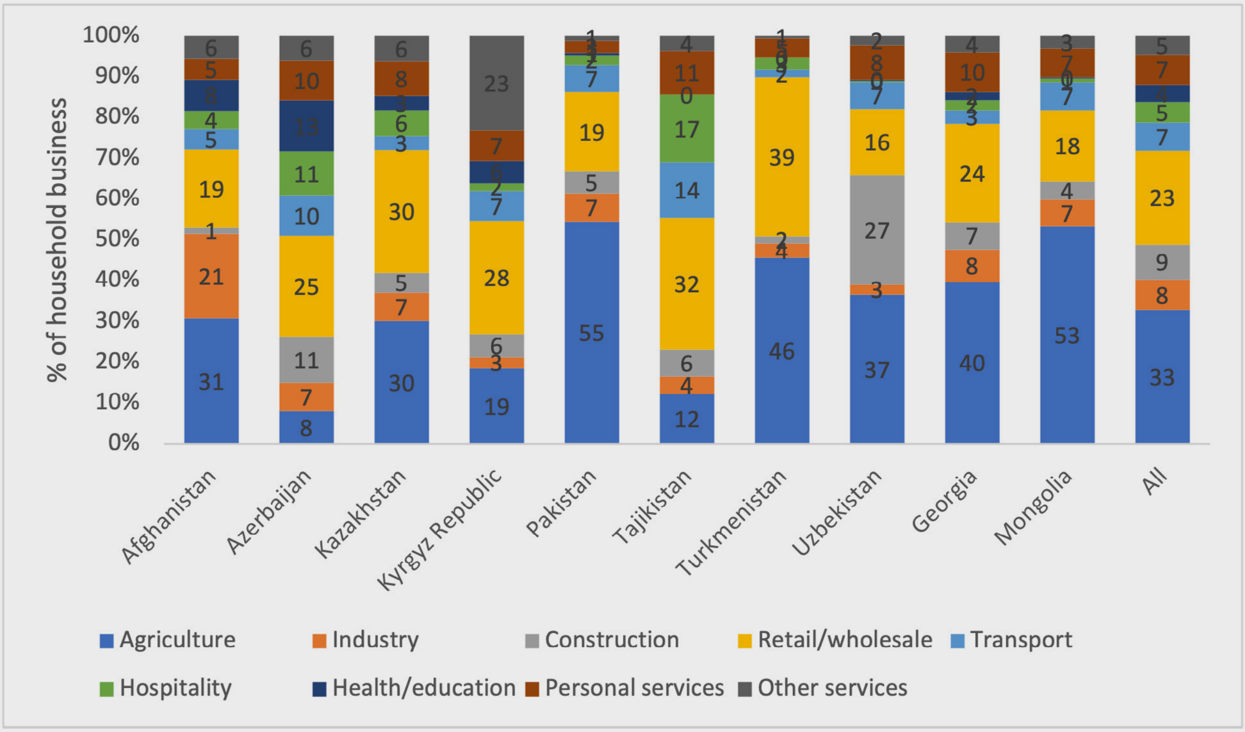


Figure 2.11. Business Status at Time of Interview (May-Aug 2021)

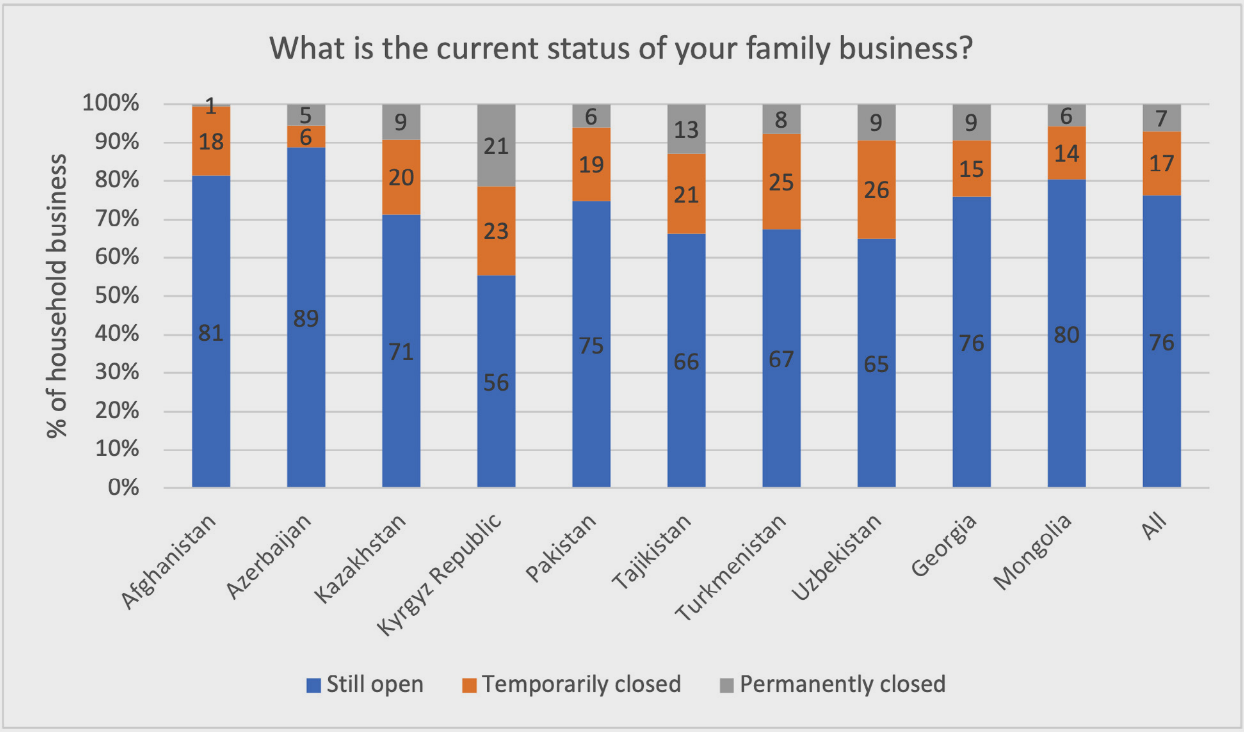


Figure 2.12 demonstrates change in income from household businesses since the beginning of 2020. Overall, most household businesses (41 percent) had lower income, 32 percent had the same income, 14 percent had no income, and 12 percent had a higher income. Income change varies by country. The highest share of household business with lower income was reported in Tajikistan (76 percent), while for the rest of the countries the share of household business with lower income varies from 27 percent to 50 percent. The highest shares of household business without income are reported in Uzbekistan (28 percent), Kyrgyzstan (22 percent), and Mongolia (20 percent). For the rest of the countries this figure varies from 6 percent to 16 percent. Household business with no income change (the same income) were reported mainly in Afghanistan (54 percent), Pakistan (44 percent), and Georgia (42 percent). For the rest of the countries this figure varies from 13 percent to 34 percent. The highest shares of household business with income increases were reported in Georgia (25 percent), Azerbaijan (23 percent), and Turkmenistan (18 percent). The lowest shares of household business with an income increase were reported in Afghanistan (1 percent), Mongolia (2 percent), Uzbekistan (3 percent), and Tajikistan (4 percent).

Figure 2.12. Change of Income from Family Business from the Beginning of 2020

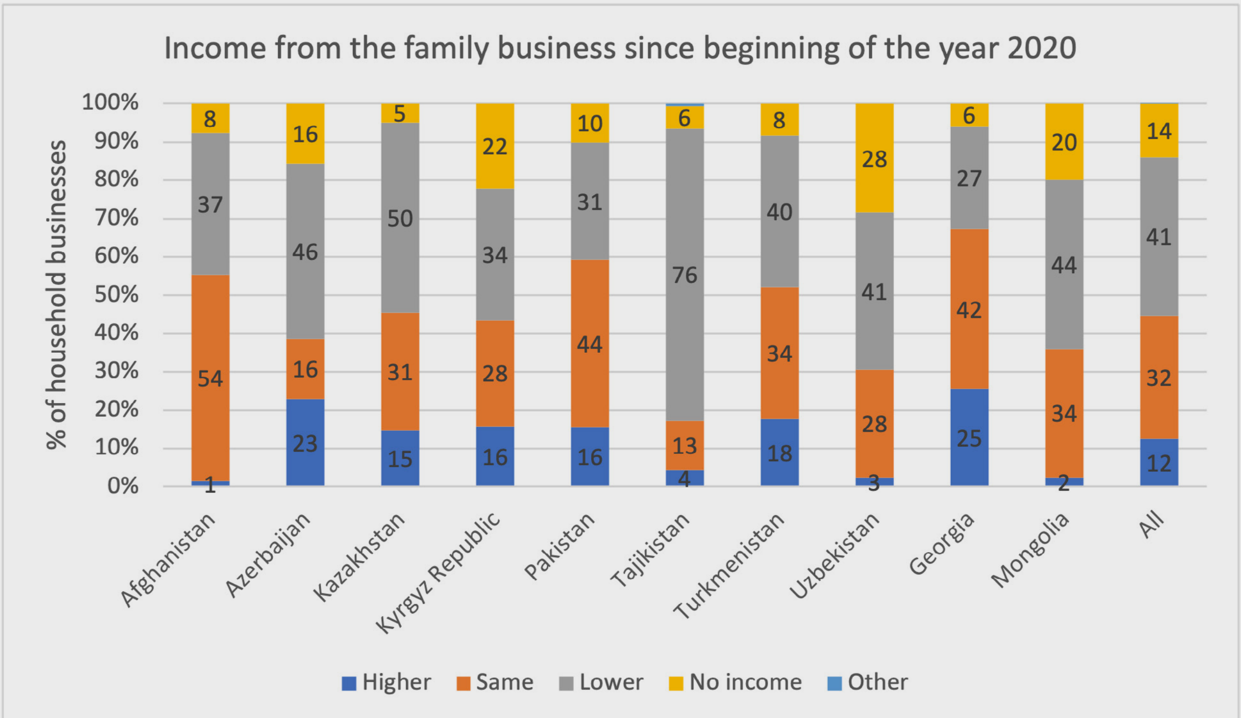


Figure 2.13 provides reported reasons for an income decline in household business. Overall, as reported, household income decline was owing to: no/fewer customers (52 percent), temporary closure owing to restrictions (30 percent), no/fewer suppliers (11 percent), and seasonal closure (7 percent). Overall, the major reported reason for household business income reduction was no/fewer customers (52 percent) and temporary closure owing to restrictions (30 percent). No or fewer customers was the major reported reason for household business income reduction in all countries (44 percent to 61 percent), except for Kazakhstan where the major reported reason for household business income decline was reported as temporary closure owing to restrictions (51 percent). Countries with the largest share of household income decline owing to temporary closure because of restrictions include Kazakhstan (51 percent), Mongolia (40 percent), and Azerbaijan (30 percent). Household business with a decline in income owing to no/fewer suppliers were mainly in Uzbekistan (24 percent), Azerbaijan (22 percent), Turkmenistan (15 percent), Kyrgyzstan (11 percent), and Pakistan (10 percent). Household business with income decline owing to seasonal closure were mainly in Georgia (32 percent), Pakistan (27 percent), Uzbekistan (18 percent), Kyrgyzstan (15 percent), and Turkmenistan (14 percent).

Figure 2.14 demonstrates the following measures taken by households to adjust ways of doing business: started or increased using a phone call/sms (20 percent), started or increased using internet/social media (15 percent), switched product (16 percent), reduced operating hours (11 percent), reduced number of workers (15 percent), reduced price/offer promotion (13 percent), and provided home delivery (10 percent).

Figure 2.13. Reasons for Reduction in Household Business Income

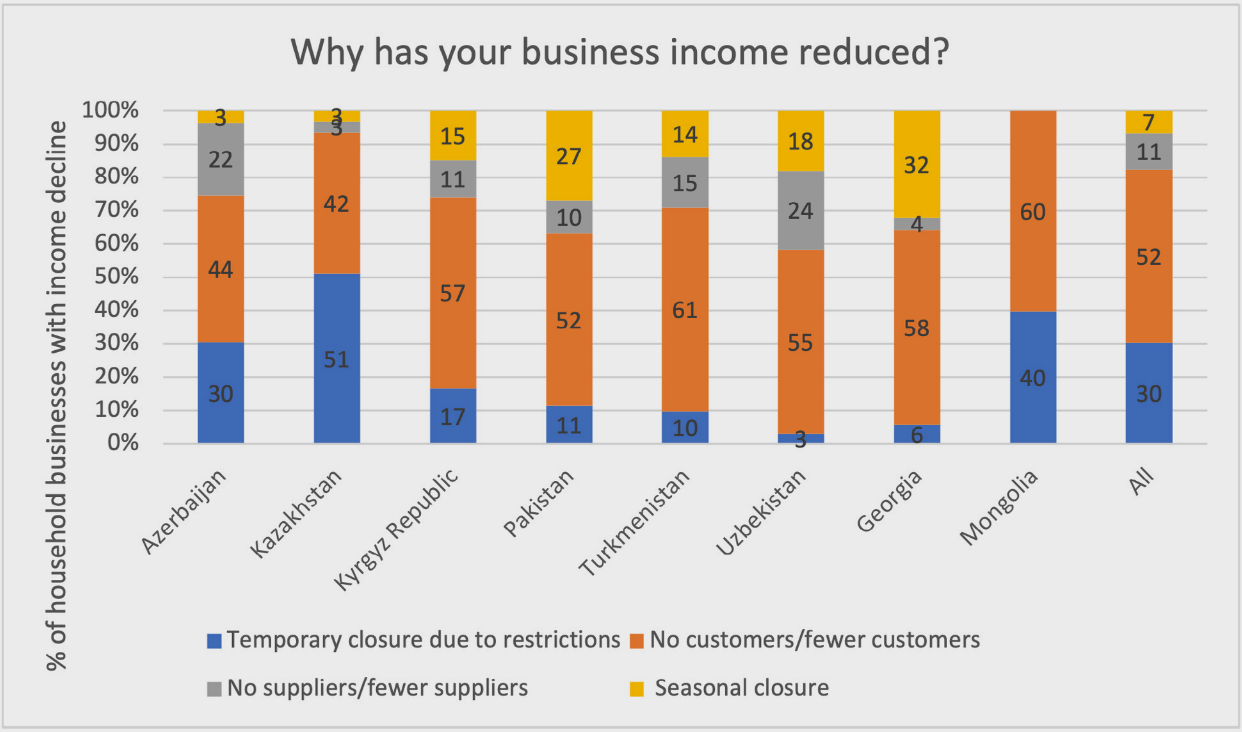
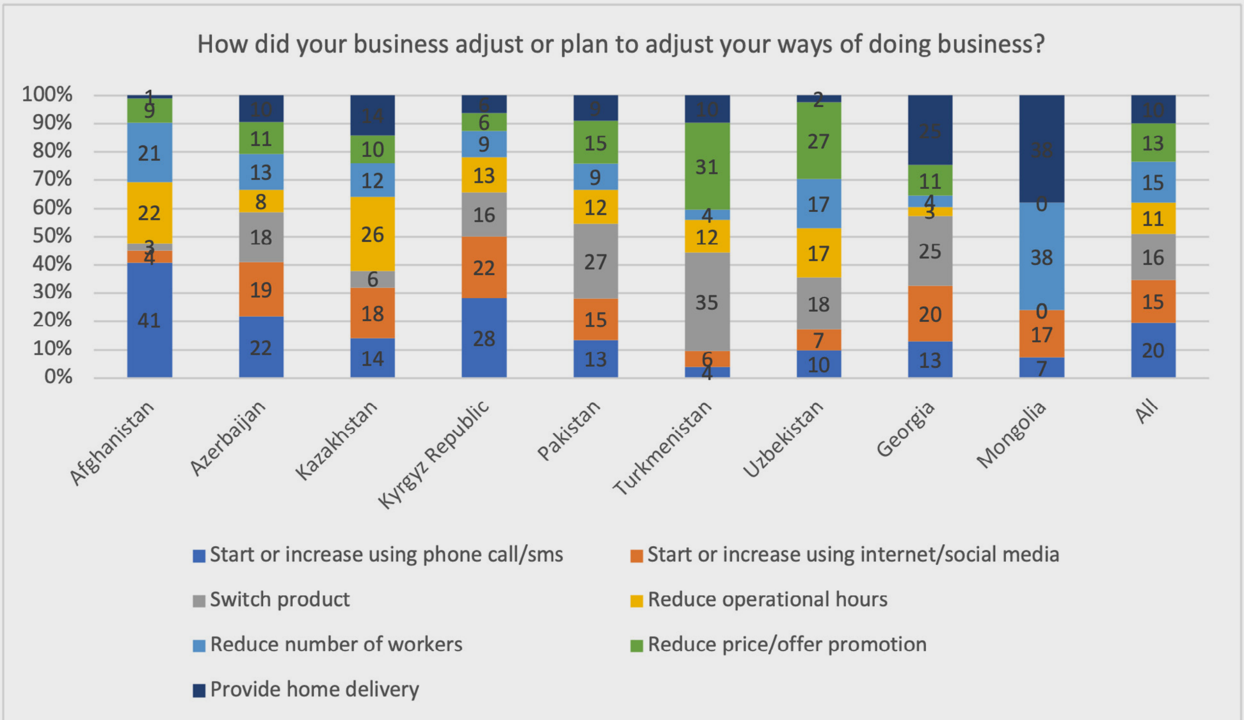


Figure 2.14. Adjustment to the Way of Doing Business (Implemented or Planned)



Lastly, we investigate the impacts of the COVID-19 pandemic on the household business condition during the pandemic. We estimate the following equation in a probit model:

$$dHBI_i = = \beta_0 + \beta_1 HH_i + \beta_2 HHB_i + \beta_3 COVID + \in_i \quad (2)$$

where $dHBI_i$ is a dummy variable that takes the value of 1 if i's household business income has declined since the beginning of 2020 and 0 otherwise. HH_i is a set of household characteristics that may relate to the pandemic impacts on household business, including the gender, education, and financial literacy of the household head, measured by four quizzes to test their understanding of financial management. We also considered whether the household received government aid during the pandemic. HHB_i is a set of household business characteristics including the use of digital technology (dummy), business adjustment to the pandemic (dummy), business sector, and location (namely, rural versus urban areas). The estimation procedure is the same as for equation (1). The sample whose household business income is null is excluded from the regression.

Table 2.3 shows the estimation results. See Table A2 in the Appendix for the estimated marginal effects. Regarding the household characteristics, while there are no significant factors that relate to the probability of experiencing a decline in business income in the combined regression, country-specific regressions suggest some notable relationships. First, female-headed households in Mongolia and Tajikistan were more likely to experience a decline in household business income. Second, the education level of the household head was not significantly related to the decline in household business income except for in Pakistan. Here, college graduates had a lower probability of experiencing an income decline compared to those without a high school diploma. Third, financial literacy lowered the probability in most countries except for Tajikistan and Uzbekistan, while significant effect was found only in Georgia and Kyrgyzstan. Last, receiving government aid had mixed results by country; in Tajikistan, this is related to a lower probability of declining business income while the situation is reversed in Pakistan. It is possible that government aid in Pakistan was provided for vulnerable sectors. In our data, only households engaging in retail; transportation services; restaurants, hotels, and cafes; and personal services sectors received government aid.

When it comes to household business characteristics, some interesting results are also found. The business adjustment to the pandemic (see Figure 2.14) significantly lowered the probability of a decline in household business income. On average, adjustment to the pandemic decreased the probability of a decline in business income by as much as 11.3 pp. This strong effect provides evidence for the need for institutional support for the household business adjustment to the pandemic. The significant and negative relationship is observed in Afghanistan and Azerbaijan. Use of digital technology is also associated with a lower probability of experiencing a decline in business income. The relationship is significant in Azerbaijan and Tajikistan, while in Kyrgyzstan it is associated with a higher probability of business income decline.

The business sector is an important determinant of the COVID-19 pandemic effects on household business. Compared to the agriculture and fishery sector, almost all sectors (except for health and education) were more affected by the pandemic. The impacts were the greatest in restaurants, hotels, and cafes (22.3 pp higher probability than agriculture and fishery), followed by construction (18.4 pp), personal services (14.8 pp), retail (14.4 pp), industry and manufacturing (14.1 pp), and transportation services (12.1 pp). Although the pandemic negatively affected household business in all sectors, there seem to be some differences in its magnitude and policy support may need to prioritize some sectors over others. Significant and similar sectoral differences in the impact of the pandemic are also observed in Azerbaijan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan, and Uzbekistan.

As expected, households in lockdown area had a higher likelihood of experiencing a decline in income for household business. The positive and significant association of lockdown with the likelihood of income decline is observed in many countries, while the opposite relationship is observed in Afghanistan. Lastly, household business in rural areas was less likely to experience income decline, which may be because of the business sector popular in rural areas (namely, agriculture and fishery).

Table 2.3. Factors Determining the Probability of a Decline in Household Business Income during the COVID-19 Pandemic

Variables	All	Afghanistan	Azerbaijan	Georgia	Kazakhstan	Kyrgyzstan
Family business income decline (mean)	0.481	0.400	0.542	0.522	0.44	0.341
	(1)	(2)	(3)	(4)	(5)	(6)
Household head female	0.167		-0.177	-0.123	-0.165	0.134
	(0.139)		(0.351)	(0.441)	(0.621)	(0.347)
Household head education						
• High school graduate	0.164	-0.427	1.741	-0.110	1.310	0.258
	(0.145)	(0.357)	(12.912)	(0.596)	(11.416)	(0.507)
• College graduate	0.159	-0.398	1.678	0.015	1.362	0.484
	(0.150)	(0.386)	(12.912)	(0.488)	(11.416)	(0.496)
Household head financial	-0.027	-0.128	-0.081	-0.413**	-0.135	0.279**
	(0.045)	(0.153)	(0.096)	(0.198)	(0.270)	(0.141)
Received government aid	-0.018	-0.569	0.278	0.130	-0.190	-0.334
	(0.121)	(0.389)	(0.256)	(0.401)	(0.553)	(0.322)

Business sector (base: agriculture and fishery)						
• Industry and manufacturing	0.619*	-0.072	0.184	0.131		1.348***
	(0.180)	(0.429)	(0.527)	(0.933)		(0.465)
• Construction	0.809*		0.344	1.145	0.497	0.592
	(0.193)		(0.482)	(1.255)	(1.273)	(0.563)
• Retail	0.634*	0.248	0.053	-0.175	0.855	0.447
	(0.130)	(0.448)	(0.427)	(0.610)	(0.850)	(0.337)
• Transportation services	0.532*	0.508	0.150	-1.418	-1.440	0.236
	(0.191)	(0.677)	(0.486)	(1.163)	(1.344)	(0.503)
• Restaurants, hotels, and cafes	0.983***	1.143	1.183**	-0.076		0.723
	(0.248)	(0.802)	(0.570)	(0.998)		(0.810)
• Health and education	0.196	0.800	-0.197	-0.856	-0.742	
	(0.231)	(0.557)	(0.456)	(1.139)	(1.466)	
• Personal services	0.648*	0.492	0.356	0.002	0.995	
	(0.201)	(0.769)	(0.518)	(0.906)	(1.059)	
Rural		-1.395***	-0.114	-1.184**	-1.542**	0.302
	(0.100)	(0.345)	(0.218)	(0.585)	(0.726)	(0.303)
Located in lockdown area	0.413*	-1.811**	2.430***	0.889**	-0.384	0.310
	(0.141)	(0.833)	(0.515)	(0.417)	(0.636)	(0.304)
Constant	-0.503	3.728***	-17.054	0.641	-13.288	-1.891**
	(0.310)	(1.148)	(12.912)	(0.995)	(11.416)	(0.950)
Observations	2278	311	486	136	84	326

VARIABLES	Mongolia	Pakistan	Tajikistan	Turkmenistan	Uzbekistan
Family business income decline (mean)	0.550	0.809	0.432	0.572	0.286
	(7)	(8)	(9)	(10)	(11)
Household head female	0.855**	0.898	1.115**	0.215	-0.290
	(0.435)	(1.328)	(0.519)	(0.607)	(0.587)
Household head education					
• High school graduate	-0.469	0.486	0.767	0.325	0.021
	(0.319)	(0.648)	(0.772)	(0.457)	(0.389)
• College graduate	0.525	2.361**	0.372	0.212	
	(0.484)	(1.202)	(0.740)	(0.454)	
Household head financial literacy	-0.008	-0.209	0.173	-0.177	0.056
	(0.128)	(0.302)	(0.206)	(0.195)	(0.188)
Received government aid		1.838**	-2.602**		
		(0.857)	(1.177)		
Business adjustment	-0.542	-0.807	0.852	-0.054	-0.430
	(0.460)	(0.590)	(0.555)	(0.524)	(0.375)
Use of digital technology	-0.442	0.362	-1.342**	0.230	0.055
	(0.351)	(0.654)	(0.660)	(0.532)	(0.370)
Business sector (base: agriculture and fishery)					
• Industry and manufacturing	1.559**	0.798	3.065**		1.453**
	(0.629)	(1.175)	(1.274)		(0.608)

• Construction	2.825**	0.089		0.657*	-0.034
	(1.155)	(1.065)		(0.358)	(0.719)
• Retail	2.093***	3.272***	0.765*	0.353	0.565
	(0.505)	(1.123)	(0.407)	(0.393)	(0.435)
• Transportation services	2.137***	1.516		-0.192	0.335
	(0.702)	(1.003)		(0.547)	(0.907)
• Restaurants, hotels, and cafes		-0.063	4.545**		0.779
		(0.842)	(1.794)		(0.990)
• Health and education					
• Personal services	2.765***	0.378	0.930	-0.134	-0.293
	(0.861)	(1.117)	(0.846)	(0.518)	(0.702)
Rural	0.016	-1.235*	0.454	0.202	0.290
	(0.458)	(0.651)	(0.448)	(0.281)	(0.361)
Located in lockdown area		2.620**	0.691*		-0.149
		(1.172)	(0.379)		(0.458)
Constant	1.003	-0.897	-1.453	0.636	-1.060
	(1.064)	(1.804)	(1.131)	(1.079)	(0.964)
Observations	269	131	154	229	192

Note: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

2.5.3 Impact of the COVID-19 Pandemic on Education

Figure 2.15 provides the percentage of households having at least one schoolgoing child (girl/boy). In Uzbekistan every sample household reported having a schoolgoing child in the household, followed by Afghanistan (82.8 percent). In Pakistan, a high percentage of households reported the presence of a schoolgoing child (79.3 percent). In Turkmenistan only 37 percent of the total household sample reported the presence of a schoolgoing child in the family.

Figure 2.15. Ratio of Households with Schoolgoing Children

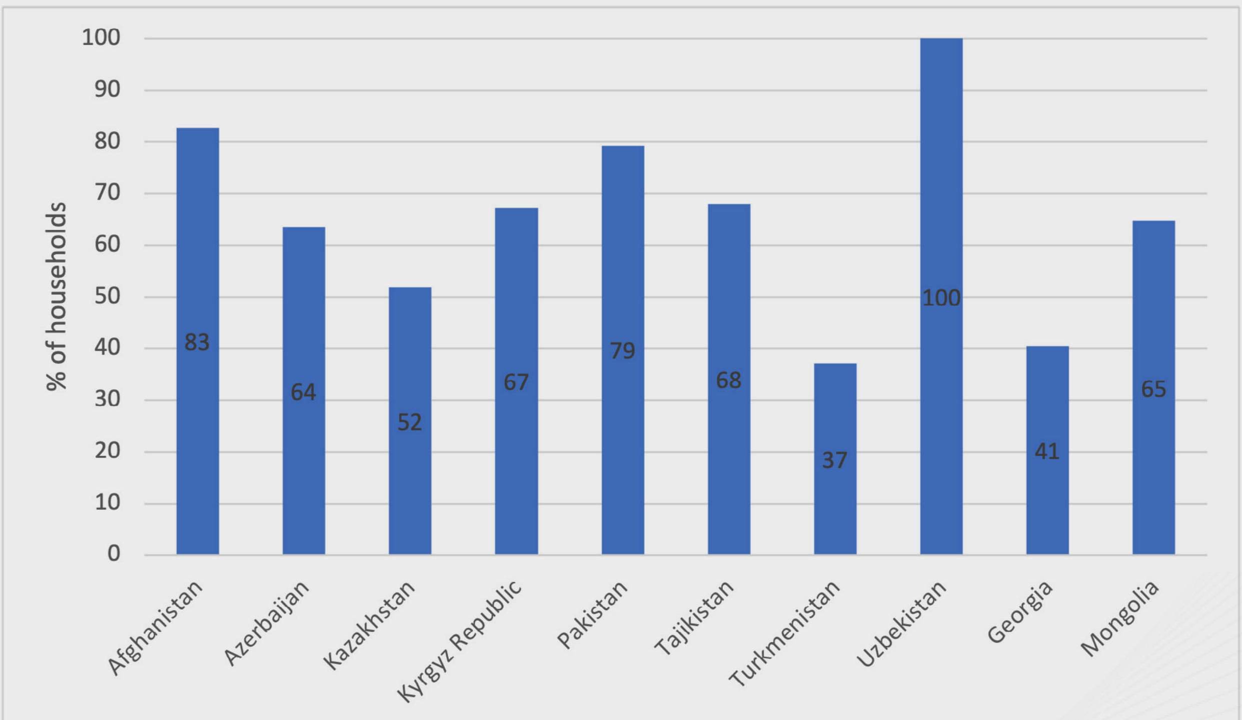


Figure 2.16 provides information on the status of online classes as reported by households with at least one child of schoolgoing age. Of households, 46.4 percent reported that schools were offering online classes for all the children in the household. Azerbaijan (93.4%), Georgia (91.6%), the Kyrgyz Republic (84.3%) and Kazakhstan (72.3%) reported a high percentage of schools offering online classes for their children. Surprisingly, in Turkmenistan no one reported the provision of online classes provided by the schools across the sample households. In Pakistan (74.8%), Afghanistan (63.5%), and Tajikistan (47.6%), a high proportion of households reported the unavailability of online classes for the participation of school-aged children in the household.

Figure 2.16. Provision of Online Classes

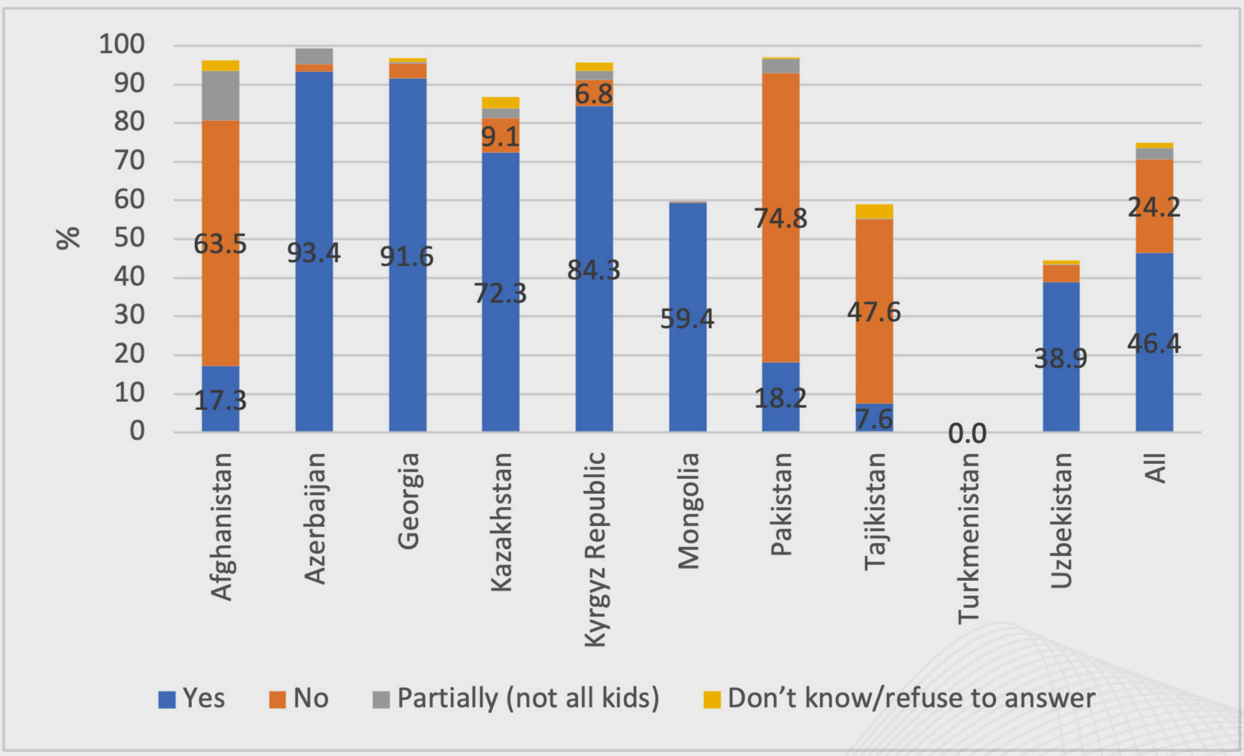


Figure 2.17 provides information on the percentage of households where children are attending online classes, if the schools are offering this. The region has an average of 84.4 percent of households reporting that their children are attending online classes. Countries such as Georgia (98.2 percent), Kazakhstan (94.2 percent), Uzbekistan (93.1 percent), and Azerbaijan (92.6 percent) reported a high rate of online class attendance, whereas Pakistan (33 percent), Tajikistan (32.1 percent), and Afghanistan (19.7 percent) reported a very high rate of absence from the online classes.

We further examine underlying factors associated with why some children could not fully take the online courses, based on child-level information. We estimate the following equation:

$$ONLClS_i = \gamma_0 + \gamma_1 CH_{ij} + \gamma_2 HH_i + \gamma_3 COVID_i + \in_i \quad (3)$$

in which $ONLClS_i$ is a dummy variable that takes the value of 1 when the children are attending all (most of) the classes and 0 if they do not take most of the classes. CH_i is a set of dummy variables related to child j of household *i*; it includes the gender of the child and his/her role in household chores, availability of computers, availability of internet and internet speed. HH_i is a set of household characteristics which includes average income; education, age, and gender of household head; household size (measured by the total number of household members); and the location of the household in a lockdown area. Because of the sample limitations, we estimate the above equation as a logit model for the pooled data of ten countries. The results of this regression analysis should be interpreted cautiously, because the sample used is limited to those children who study in schools that offer online classes.

Figure 2.17. Children Attending Online Classes

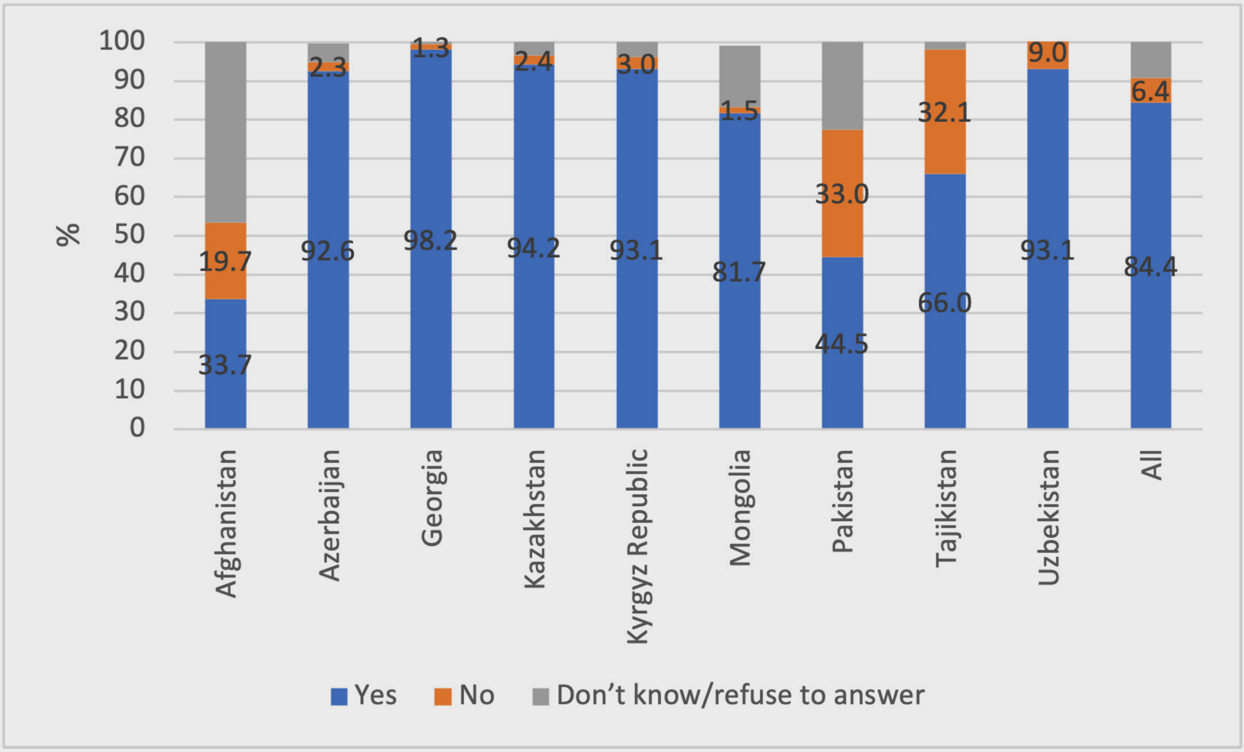


Table 2.4 presents the results for the determinants of the online course attendance. To begin with, household characteristics matter for the intensity of online class taking. Children from households whose head is well educated are more likely to take all online classes, which is consistent with the case in ASEAN (Morgan and Long 2021). The gender of the household head is uncorrelated with the intensity of the online class attendance of children; however, the age of the household head is related to the level of online course attendance. This is also consistent with the ASEAN countries (Morgan and Long 2021). Children in households whose heads are younger are less likely to take online courses; while older children are more likely to take online classes. This may be because the older the household head is (30 years to 49 years), the more resilient the household to external shocks and therefore children are given more educational resources. With regard to COVID-19-induced variables, living in a lockdown area has no significant impact on taking all online courses. Children engaged in household chores are less likely to attend all the online classes. As expected, children with no computer are less likely to attend the online classes; however, child gender does not have a significant impact on the figures.

Table 2.4. Factors Determining the Probability of Attending Online School during the COVID-19 Pandemic

Variables	(1)
Household head female	0.0373
	(0.250)
Child gender (female)	-0.0931
	(0.130)
Household head education	
• Secondary school graduate	0.381
	(0.372)
• High school graduate	0.374*
	(0.197)
• College graduate	-0.0207
	(0.143)
Household head age group (base: 60 or above)	
• 20-29	0.253
	(0.173)
• 30-39	0.424**
	(0.185)
• 40-49	0.739***
	(0.236)

• 50-59	0.0847
	(0.244)
Average household income, log	0.0112
	(0.0312)
Child engaging in household chores	-0.494***
	(0.166)
No computer	-0.674***
	(0.140)
No internet	0.171
	(0.153)
Slow internet	0.0298
	(0.158)
Located in lockdown area	-0.0987
	(0.136)
Constant	-0.208
	(0.405)

Note: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

2.6 CONCLUDING REMARKS

The COVID-19 outbreak has heavily affected households in the CAREC member countries, Afghanistan, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, PRC, Tajikistan, Turkmenistan, and Uzbekistan. The COVID-19 crisis and the resulting falls in labor demand and supply owing both to policy interventions such as lockdowns, 'social distancing,' travel restrictions, and school closures and uncertainties regarding future economic outcomes are having a severe impact on employment and education in the CAREC member countries.

In order to better understand these impacts, ADBI has conducted CATIs with households in ten CAREC countries (excluding the PRC). This chapter estimates the impact of COVID-19 on employment, household business, and education in December 2020 compared with June 2020. The samples are representative of the income classes and the rural and urban population in each country.

While the findings are mostly consistent with results on ASEAN (Morgan and Trinh 2020), there is some variation owing to differences in economic structures. We provide results for all countries combined and for each country, finding some similarities and differences across the CAREC countries. The chapter presents several interesting results.

Firstly, 24 percent of employees in the sample experienced either losing their job (temporarily or permanently) or a workload cut in December 2020 compared to June 2020. This number varies greatly by country, from 5 percent (Uzbekistan) to 67 percent (Pakistan).

Secondly, overall, there is no major difference in the reasons why household heads did not work in December 2020 compared to June 2020; however, there are differences by country. The share of those missing work owing to lockdown reduced from 9 percent in June 2020 to 7 percent in December 2020. However, in Georgia, the share of household heads not working owing to taking care of family members increased from 4 percent in June 2020 to 13 percent in December 2020. Such large changes could be associated with the lockdown of schools or online education for small children.

Our econometric analysis suggests that many different factors are related to the likelihood of losing jobs during the pandemic. On average, less educated and younger household heads were more likely to experience job loss owing to the pandemic. Households with income from household businesses or self-employment tended to experience job loss, whereas those with income from wages were less likely to lose their job, while there are notable differences by country.

Thirdly, overall, 24 percent of households answered that their businesses were closed owing to the COVID-19 pandemic, of which 7 percent were closed permanently while 17 percent were closed temporarily. More than 40 percent of household businesses had lower income in December 2020 compared to June 2020. No/fewer customers (52 percent) and temporary closure owing to restrictions (30 percent) are two major reasons for the reduction in household business income.

Regarding the factors associated with the likelihood of experiencing a decline in household business income, business adjustment to the pandemic and the household business sector are key determinants. On average, households who adjusted their business model to the pandemic were 11.3 percent less likely to experience a decline in business income compared to those who did not. Household business in some tourism-related sectors such as restaurants, hotels, and cafes were much more affected by the pandemic than others like agriculture and fishery.

Lastly, overall, only 49 percent of households with schoolgoing children in the family reported the provision of online classes offered by the schools. A large proportion of households in Pakistan (74.8 percent), Afghanistan (63.5 percent), and Tajikistan (47.6 percent) reported a lack of availability of online classes for schoolgoing children in the household. Children in many households in Afghanistan (33.7 percent), Pakistan (44.5 percent), and Tajikistan (66 percent) could not attend online classes even if their schools had adapted to online classes. Children with responsibility for household chores are less likely to attend all online classes. Also, the availability of computers for each child increases the chance of them attending online classes.

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APPENDIX

Table A1. Factors Determining the Probability of Job Loss during the COVID-19 Pandemic, Marginal Effect

VARIABLES	All	Afghanistan	Georgia	Kazakhstan	Kyrgyzstan
	(1)	(2)	(3)	(4)	(5)
Household head female	-0.042***	-0.055	0.000	-0.013	-0.146***
	(0.011)	(0.036)	(0.025)	(0.019)	(0.040)
Household head education					
• High school graduate	-0.011	0.142	-0.055*	-0.024	-0.039
	(0.013)	(0.185)	(0.032)	(0.055)	(0.039)
• College graduate	-0.034***	0.147	-0.092***	-0.022	-0.119***
	(0.013)	(0.184)	(0.030)	(0.053)	(0.040)
Age group (base: 50-59)					
• 20-29	0.030**	0.029	0.011	0.068**	0.075
	(0.013)	(0.044)	(0.048)	(0.033)	(0.052)
• 30-39	0.026***	-0.016	0.026	0.019	0.002
	(0.010)	(0.032)	(0.034)	(0.024)	(0.035)
• 40-49	0.022**	0.040	0.006	0.008	-0.090***
	(0.010)	(0.033)	(0.028)	(0.023)	(0.032)
Income source					
• Agriculture	-0.011	-0.001	0.001	0.039	0.008
	(0.009)	(0.033)	(0.032)	(0.025)	(0.028)

• Household business	0.097***	0.367***	-0.027	-0.026	-0.011
	(0.008)	(0.014)	(0.039)	(0.043)	(0.028)
• Wage/salary	-0.042***	-0.122***	-0.002	0.002	-0.045*
	(0.008)	(0.032)	(0.029)	(0.028)	(0.027)
Rural	0.020**	0.244***	0.031	0.011	-0.052*
	(0.010)	(0.050)	(0.025)	(0.022)	(0.031)
Located in lockdown area	0.000	-0.017	-0.012	0.037*	0.052*
	(0.008)	(0.031)	(0.029)	(0.020)	(0.030)
Observations	7653	900	621	819	824

VARIABLES	Mongolia	Pakistan	Tajikistan	Turkmenistan	Uzbekistan
	(6)	(7)	(8)	(9)	(10)
Household head female	-0.021	0.041*	-0.053	-0.004	-0.135**
	(0.033)	(0.021)	(0.037)	(0.040)	(0.053)
Household head education					
• High school graduate	-0.012	-0.007	0.100**	-0.017	-0.082*
	(0.032)	(0.018)	(0.051)	(0.036)	(0.049)
• College graduate	-0.055	-0.008	0.003	-0.008	-0.085*
	(0.035)	(0.024)	(0.054)	(0.035)	(0.044)
Age group (base: 50-59)					
• 20-29	0.033	-0.006	0.041	-0.039	0.029

	(0.049)	(0.021)	(0.044)	(0.036)	(0.043)
• 30-39	0.083**	0.016	0.054	0.009	0.021
	(0.033)	(0.020)	(0.033)	(0.034)	(0.031)
• 40-49	0.064**	0.020	0.093***	-0.023	0.016
	(0.029)	(0.020)	(0.033)	(0.034)	(0.030)
Income source					
• Agriculture	-0.129***	0.015	0.045	-0.013	0.000
	(0.050)	(0.017)	(0.028)	(0.023)	(0.028)
• Household business	0.154***	0.014	-0.005	-0.003	-0.032
	(0.027)	(0.024)	(0.034)	(0.025)	(0.036)
• Wage/salary	0.064**	0.047**	-0.078***	0.047	-0.050**
	(0.030)	(0.021)	(0.027)	(0.048)	(0.025)
Rural		0.014	-0.010		-0.048
		(0.029)	(0.027)		(0.040)
Located in lockdown area	-0.045	0.041**	-0.002	-0.015	0.015
	(0.035)	(0.020)	(0.031)	(0.023)	(0.026)
Observations	7653	777	900	621	819

Note: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Samples whose household head *(HH)* age is 60 or above are excluded because most heads are retired. Afghanistan is included in the combined regression but excluded from the separate regression because only 2.63 percent of household heads experienced job loss during June to December 2020.

Table A2. Factors Determining the Probability of a Decline in Household Business Income during the COVID-19 Pandemic, Marginal Effect

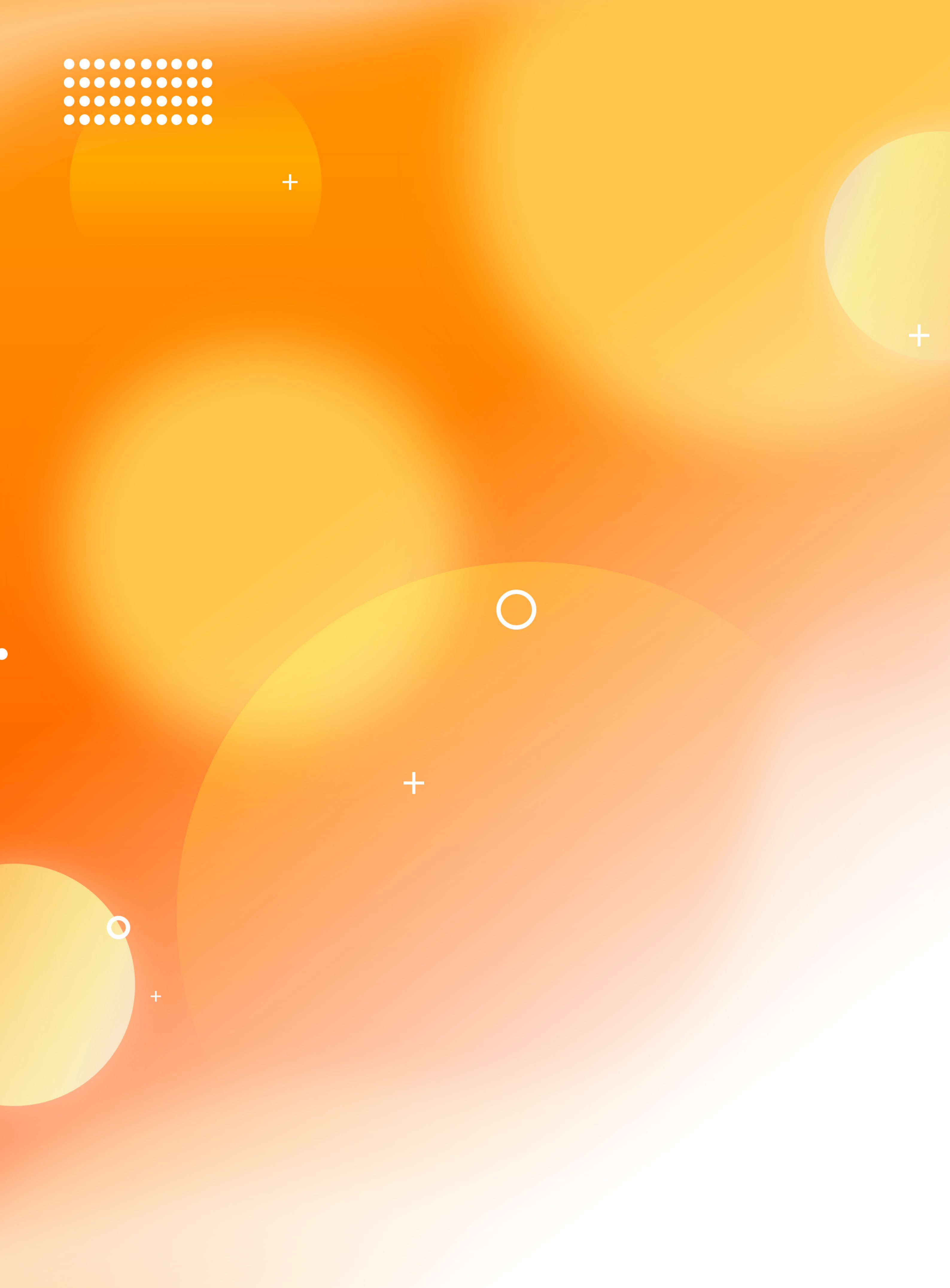
VARIABLES	All	Afghanistan	Azerbaijan	Georgia	Kazakhstan	Kyrgyzstan
	(1)	(2)	(3)	(4)	(5)	(6)
Household head female	0.037		-0.038	-0.026	-0.049	0.033
	(0.031)		(0.075)	(0.094)	(0.117)	(0.072)
Household head education						
• High school graduate	0.037	-0.073	3.728	-0.024	2.528	0.056
	(0.032)	(0.060)	(276.510)	(0.128)	(198.037)	(0.106)
• College graduate	0.035	-0.065	3.594	0.003	2.631	0.100
	(0.033)	(0.064)	(276.510)	(0.104)	(198.037)	(0.103)
Household head financial literacy	-0.006	-0.021	-0.017	-0.088**	-0.042	0.059**
	(0.010)	(0.026)	(0.020)	(0.040)	(0.051)	(0.029)
Received government aid	-0.004	-0.095	0.059	0.028	-0.028	-0.067
	(0.027)	(0.065)	(0.055)	(0.086)	(0.105)	(0.067)
Business adjustment	-0.113***	-0.209***	-0.265***	-0.011	0.071	-0.071
	(0.025)	(0.068)	(0.056)	(0.109)	(0.128)	(0.066)
Use of digital technology	-0.009	-0.091	-0.282*	-0.027	-0.030	0.128**
	(0.027)	(0.069)	(0.168)	(0.102)	(0.165)	(0.063)
Business sector (base: agriculture and fishery)						
• Industry and manufacturing	0.141***	-0.012	0.041	0.028		0.305***

	(0.041)	(0.072)	(0.116)	(0.198)		(0.104)
• Construction	0.184***		0.076	0.219	0.110	0.128
	(0.044)		(0.106)	(0.214)	(0.281)	(0.128)
• Retail	0.144***	0.043	0.012	-0.038	0.186	0.095
	(0.029)	(0.078)	(0.095)	(0.130)	(0.187)	(0.073)
• Transportation services	0.121***	0.089	0.033	-0.289	-0.258	0.049
	(0.044)	(0.121)	(0.107)	(0.203)	(0.208)	(0.107)
• Restaurants, hotels, and cafes	0.223***	0.202	0.238**	-0.016		0.159
	(0.055)	(0.142)	(0.110)	(0.214)		(0.189)
• Health and education	0.044	0.141	-0.044	-0.182	-0.150	
	(0.052)	(0.099)	(0.101)	(0.230)	(0.277)	
• Personal services	0.148***	0.086	0.078	0.001	0.215	
	(0.046)	(0.137)	(0.113)	(0.194)	(0.223)	
Rural	0.092***	-0.304**	0.520***	0.190**	-0.062	0.079
	(0.031)	(0.137)	(0.101)	(0.084)	(0.117)	(0.062)
Located in lockdown area	-0.072***	-0.236***	-0.024	-0.253**	-0.288**	0.075
	(0.022)	(0.053)	(0.047)	(0.118)	(0.128)	(0.063)
Observations	2278	311	486	136	84	326

VARIABLES	Mongolia	Pakistan	Tajikistan	Turkmenistan	Uzbekistan
	(7)	(8)	(9)	(10)	(11)
Household head female	0.164**	0.105	0.213**	0.051	-0.055
	(0.081)	(0.155)	(0.097)	(0.144)	(0.113)
Household head education					
• High school graduate	-0.079	0.057	0.153	0.068	0.003
	(0.060)	(0.075)	(0.151)	(0.106)	(0.075)
• College graduate	0.112	0.277**	0.069	0.036	
	(0.091)	(0.133)	(0.146)	(0.106)	
Household head financial literacy	-0.001	-0.025	0.036	-0.045	0.011
	(0.024)	(0.035)	(0.041)	(0.046)	(0.036)
Received government aid		0.216**	-0.577**		
		(0.094)	(0.232)		
Business adjustment	-0.106	-0.095	0.178*	-0.006	-0.082
	(0.087)	(0.067)	(0.107)	(0.124)	(0.071)
Use of digital technology	-0.072	0.043	0.255**	0.052	0.010
	(0.066)	(0.077)	(0.124)	(0.126)	(0.071)
Business sector (base: agriculture and fishery)					
• Industry and manufacturing	0.352***	0.131	0.534***	0.000	0.325**

• **Construction**	(0.126)	(0.181)	(0.132)	(.)	(0.139)
	0.538***	0.016		0.156*	-0.006
• **Retail**	(0.121)	(0.189)		(0.083)	(0.124)
	0.447***	0.337***	0.153*	0.086	0.113
• **Transportation services**	(0.086)	(0.117)	(0.080)	(0.095)	(0.089)
	0.454***	0.222		-0.047	0.064
• **Restaurants, hotels, and cafes**	(0.112)	(0.140)		(0.134)	(0.183)
		-0.011	0.632***		0.162
• **Health and education**		(0.151)	(0.080)		(0.227)
• **Personal services**					
	0.532***	0.065	0.188	-0.033	-0.047
Rural	(0.098)	(0.190)	(0.175)	(0.128)	(0.107)
		0.308**	0.142**		-0.027
Located in lockdown area		(0.129)	(0.071)		(0.087)
	0.002	-0.145**	0.093	0.047	0.056
Observations	(0.086)	(0.072)	(0.087)	(0.066)	(0.069)
	269	131	154	229	192

Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.



Chapter 3

COVID-19 IMPACT ON HOUSEHOLD INCOME

EVIDENCE FROM GEORGIA AND MONGOLIA

Kamalbek Karymshakov, Dastan Aseinov, Burulcha Sulaimanova

3.1 INTRODUCTION

Pictures from: https://rabbit.bigbigwork.com/home

The COVID-19 pandemic has impacted almost all countries and parts of population. However, societies with lower income economies faced higher social and economic pressure brought about by COVID-19 (Baena-Díez et al. 2020). The effects of the pandemic have severely affected population groups — such as young people and women — who have been in a vulnerable position facing the COVID-19 challenges (Bundervoet, Dávalos, and Garcia 2022).

The economic downturn during COVID-19 has had a significant impact on the labor market, decreasing employment and restricting labor mobility. Social distancing and lockdown measures to prevent the spread of the virus have had a substantial negative effect on sectors where females are actively employed. Moreover, increased online education practices and staying at home during the lockdown have caused females to spend more time on childcare and family work (Alon et al. 2020). Although economic recovery perspectives appeared recently to give hope for improvement, there is a risk that the recovery process will not be experienced equally by rich and lower income countries and, even, by groups of the population within a country (Sánchez-Páramo et al. 2021).
Recent empirical studies show that, during the recovery process from the COVID-19 shock, low income countries are falling significantly behind and the efficiency of government interventions to reduce inequality in developing countries is vague (Brussevich, Liu, and Papageorgiou 2022). Given the potential risk of slow recovery, continuing supply-chain disruptions, and learning losses caused by the COVID-19 restrictions, the impact of inequality may persist beyond the short-term period (Narayan et al. 2022). Moreover, Furceri et al. (2022) argue that the inequality impact of the COVID-19 pandemic can be seen to be greater than that of past economic crises.

Empirical evidence asserts about differential impacts by gender too. In their comprehensive review, Flor et al. (2022) note that women frequently reported employment loss and that pre-existing gender gaps intensified during the COVID-19 pandemic. This is supported by Hoehn-V elasco et al. (2022) who state that men recovered in employment terms faster than women. Vicari, Zoch, and Bächmann (2022), examining wellbeing at the beginning of the COVID-19 pandemic in Germany, note that there is a significant decline in the wellbeing of working mothers. Besides, children in the household are affected by the low wellbeing of parents. Analogously, Christl et al. (2022) found that labor market shock caused by the pandemic has been more evident among poor households; however, government policies were able to offset this negative effect. In general, government policy to support employment opportunities and income is reflected in the provision of tax relief, unemployment and social cash transfers, and so on. Although, the potential of developing countries to increase government budget expenditure is restricted by less fiscal space (UNESCAP 2020).

On the other hand, along with a broad consensus on the importance of government policy in the provision of economic recovery with equal opportunities, evidence in developing countries is mixed. Although there are a growing number of empirical studies on the impact of COVID-19, there is a little empirical evidence in the CAREC economies.

Among this evidence, Azhgaliyeva et al. (2022) is one of the studies on this topic for the CAREC region. Using data collected by computer-assisted telephone interviews (CATI) in ten countries from the CAREC region, they indicate that, because of the COVID-19 pandemic, households with waged income have had a higher probability of experiencing income decline. Also, households with less educated household heads were more likely to experience income decline, whereas female-headed households are found to have less likelihood. Murakami (2022), based on nationally representative monthly survey in Tajikistan before and after the outbreak of the COVID-19 pandemic, indicates that with COVID-19 household employment and income dropped, and food insecurity worsened. However, the extent of this impact varied by location, prepandemic income levels, and household size; thus, urban households faced employment and income shock to a larger extent. Larger households experienced income decline compared to smaller households, which is explained by the self-employment of large household members.

Although, these studies provide insights on the impact of pandemic, they do not focus on details of income decline such as the magnitude of income fall and evolution of income change over two (or more) periods of the survey. Moreover, more studies on other CAREC countries are needed to understand income dynamics at household level in the region.

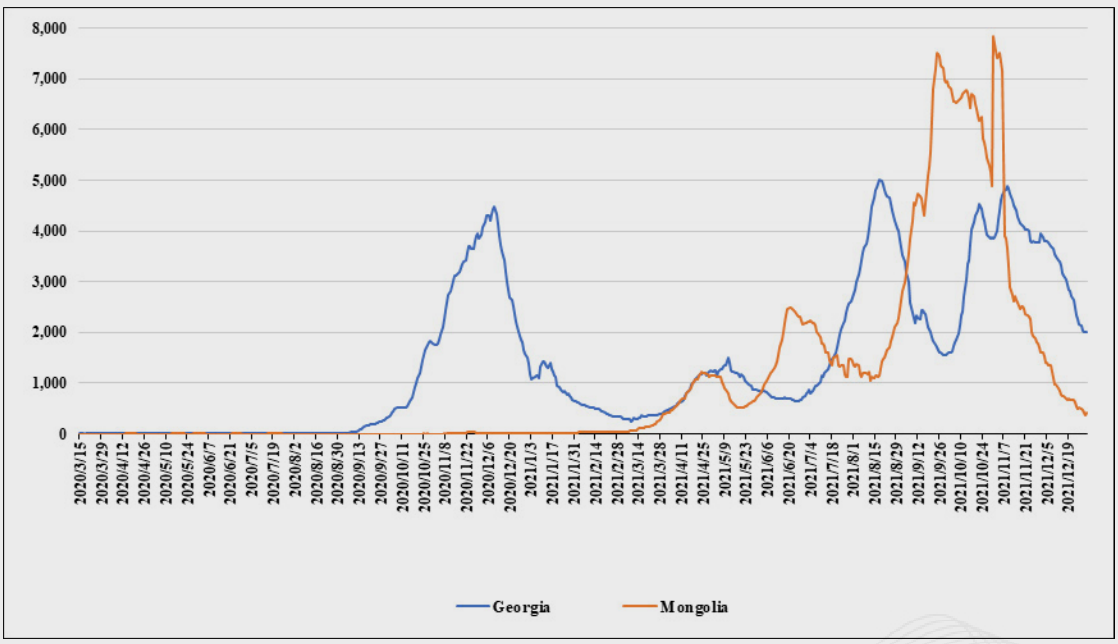
This study aims to empirically examine household characteristics associated with income decline during COVID-19 in two CAREC countries: Georgia and Mongolia. For this purpose, a binary response probit regression model is applied based on data from the two waves of the UNICEF MICS Plus household survey. The empirical model estimates probability of income decline, magnitude of income loss, and the change of income over two waves of the survey. Thus, this study enriches existing literature with empirical evidence from developing countries and sheds light on perspectives of the post-COVID recovery.

This chapter is structured as follows: the next section describes COVID-19 and macroeconomic development in two economies. Section three presents data source and descriptive statistics, and section four describes methodology. Section five presents estimation results and the last section concludes.

3.2 COVID-19 AND MACROECONOMIC DEVELOPMENT IN GEORGIA AND MONGOLIA

The first COVID-19 cases in Georgia appeared in late February 2020 and in Mongolia just before the second half of March 2020. The two countries experienced different paths of the pandemic waves in 2020 and 2021. The highest numbers of new cases in Georgia were registered in November to December 2020, achieving more than 4,000 cases by seven-day rolling average. However, Mongolia maintained a low number of new cases in 2020 and experienced a peak in September to October 2021, with more than 7,000 new cases (Figure 3.1). Although, Georgia saw another substantial increase in COVID-19 cases in August to November 2021. Therefore, based on COVID-19 case statistics, Georgia has been more exposed to the pandemic; this was also reflected in the number of deaths. After a high number of deaths in Georgia in December 2020, the resurgence was in September and November 2021, where the number of deaths reached about 80. The number of death cases in Mongolia was substantially lower — about 11 cases in July 2020, with slightly higher increases in October 2021 — around 18 cases. Also, Mongolia differed from Georgia in its progress of vaccination against COVID-19; as of 28 February, the population share vaccinated in Georgia was 31 percent, while in Mongolia it was 68 percent. [1]

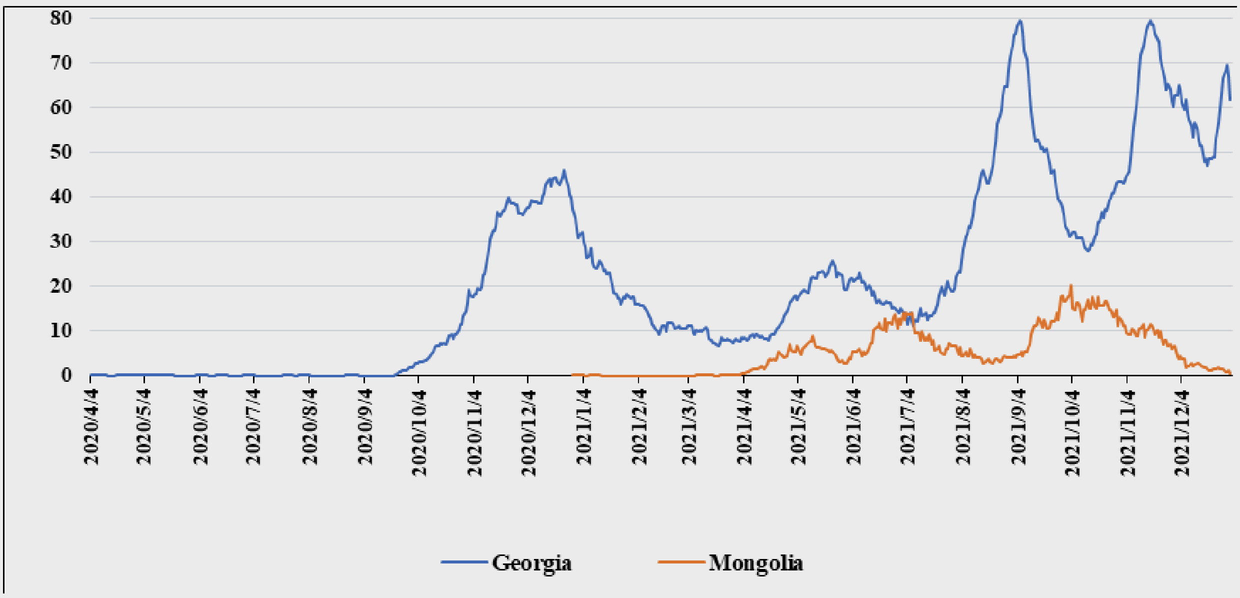
Figure 3.1. Daily new confirmed COVID-19 cases, seven-day rolling average



Source: John Hopkins University CSSE COVID-19 data. Available at: https://ourworldindata.org/coronavirus/country/georgia?country=GEO~MNG (accessed 21 February 2022)

[1] https://ourworldindata.org/covid-vaccinations

Figure 3.2. Daily new confirmed COVID-19 deaths, seven-day rolling average



Source: John Hopkins University CSSE COVID-19 data. Available at: https://ourworldindata.org/coronavirus/country/georgia?country=GEO~MNG (accessed 21 February 2022)

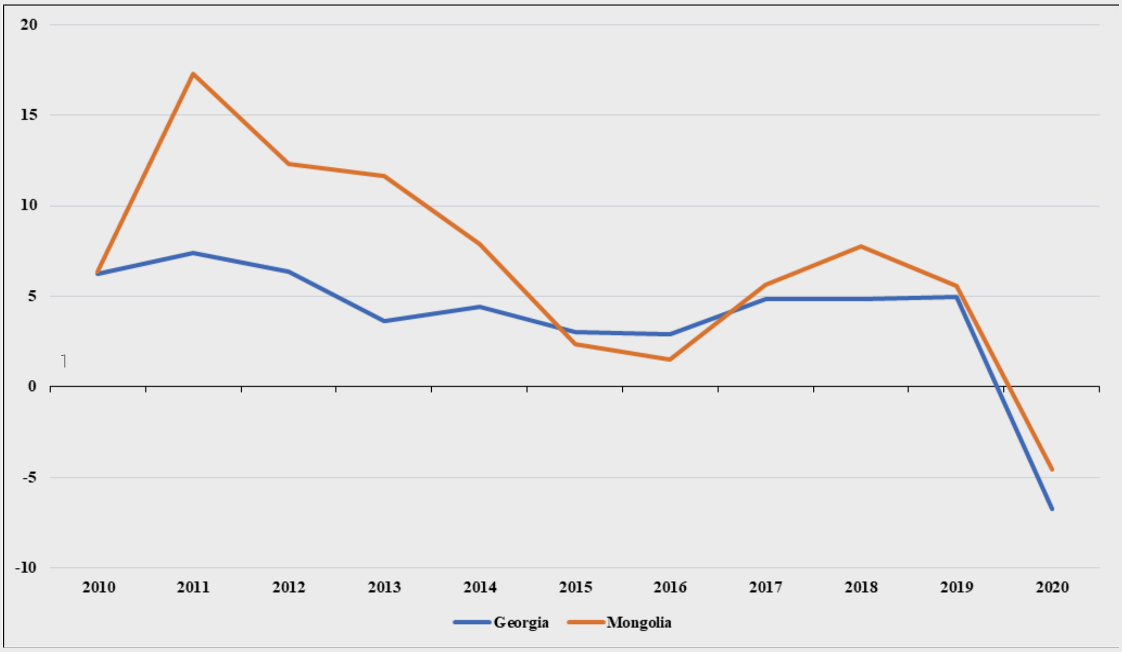
The CAREC economies saw their deepest dip in GDP owing to COVID-19 — a fall not seen since the early 1990s,[2] — and Georgia and Mongolia were no exception. The pandemic changed the economic dynamics of both countries, causing a substantial decline in GDP by the end of 2020. Contraction in Georgia and Mongolia was recorded at 6.6 percent and 4.6 percent, respectively (Figure 3.3). Preliminary estimates of economic growth for 2021 indicate recovery in Georgia and Mongolia by 10.6 percent[3] and 1.4 percent[4] , respectively.

[2] CAREC Quarterly Economic Monitor No 2, April 2021, p6. https://www.carecinstitute.org/publications/carec-quarterly-economic-monitor-no-2/ (accessed 25 February 2022)

[3] https://www.geostat.ge/en/single-news/2461/rapid-estimates-of-economic-growth-january-2022

[4] http://www.1212.mn/stat.aspx?LIST_ID=976_L05

Figure 3.3. Annual real GDP growth rates in Georgia and Mongolia



Source: World Bank, World Development Indicators

The economic decline in Mongolia appeared in the first quarter of 2020, reaching 7.3 percent year on year, and then accelerated further to 7.7 percent year on year in the second quarter of 2020 (Figure 3.4). Georgia saw the deepest slump of GDP growth in the second quarter of 2020, by 13.6 percent year on year. During the following quarters, slow economic recovery was observed in both economies: in the first quarter of 2021 growth in Mongolia was positive at 15.1 percent year on year, although decline appeared by the third quarter of 2021. Georgia experienced positive growth rates in the second and third quarters of 2021 at 31.5 percent and 9.1 percent year on year, respectively.

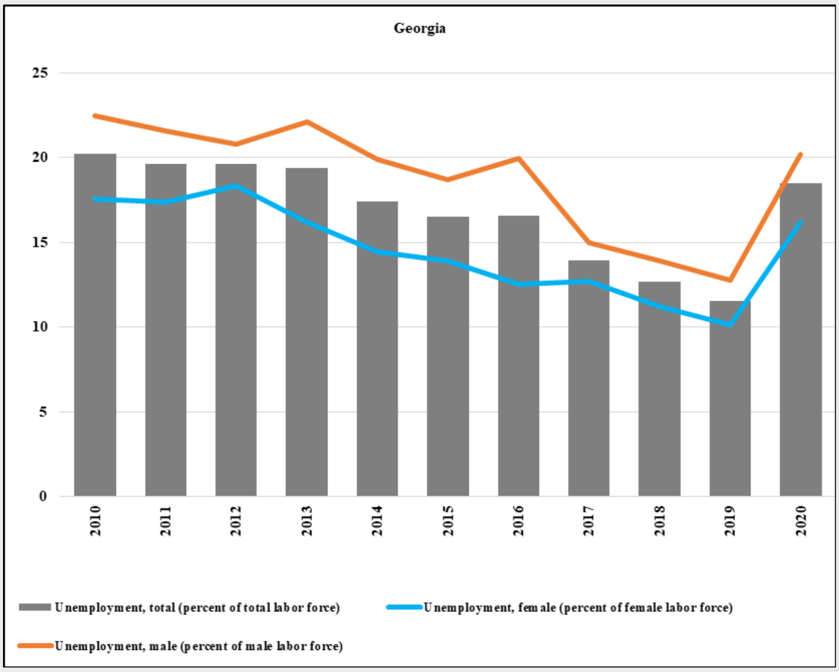
Figure 3.4. Real GDP growth in Georgia and Mongolia (year on year, constant prices)

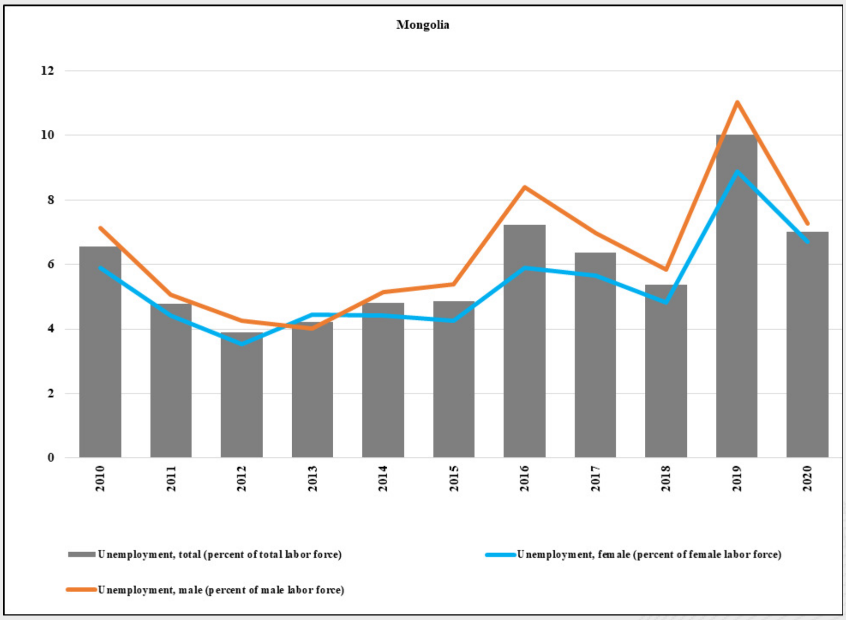
Source: National Statistics Office of Georgia, National Statistics Office of Mongolia

Decline of GDP and the following recovery process has been reflected in household employment and income. Interestingly, the unemployment statistics of these countries show that the unemployment rate in Georgia increased sharply in 2020, while in Mongolia it decreased in comparison to 2019, although still high in comparison to 2018 (Figure 3.5). The quarterly data on unemployment indicates that a general increasing trend was observed in both countries, especially in 2020. Georgia saw the highest growth of unemployment from 17 percent in the third quarter of 2020 to 22 percent in the second quarter of 2021. Mongolia experienced relatively slow growth, from 6.6 percent in the second quarter of 2020 to 8.8 percent in the first quarter of 2021. By the third quarter of 2021, the available data indicates a decrease in unemployment rates in both economies.

Figure 3.5. Annual unemployment rate in Georgia and Mongolia (2010-2020)

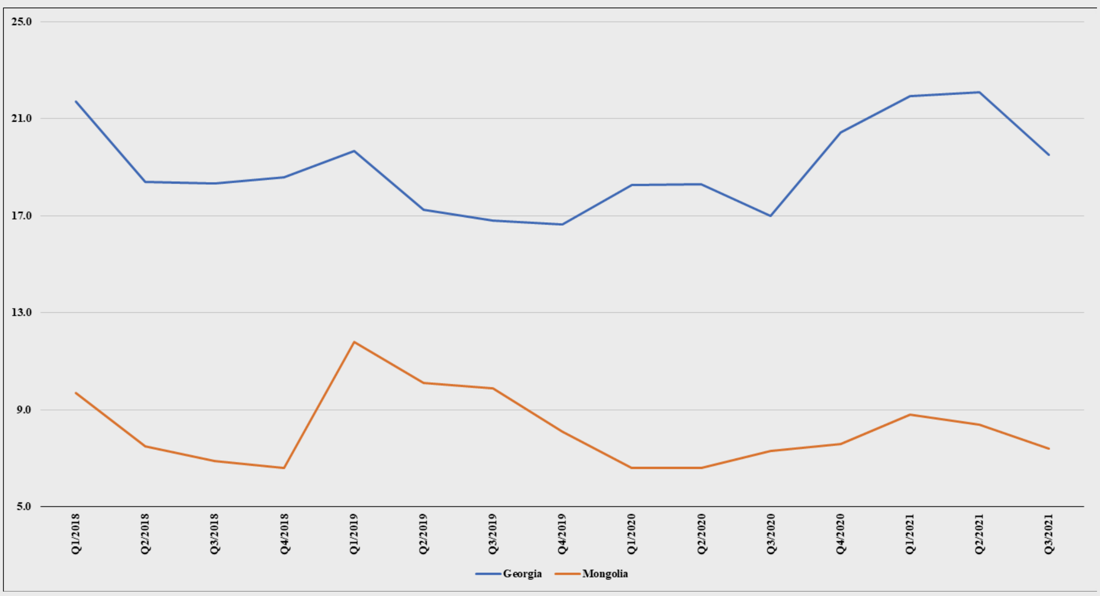
1





Source: World Development Indicators (accessed 20 February 2022)

Figure 3.6. Quarterly unemployment rate in Georgia and Mongolia

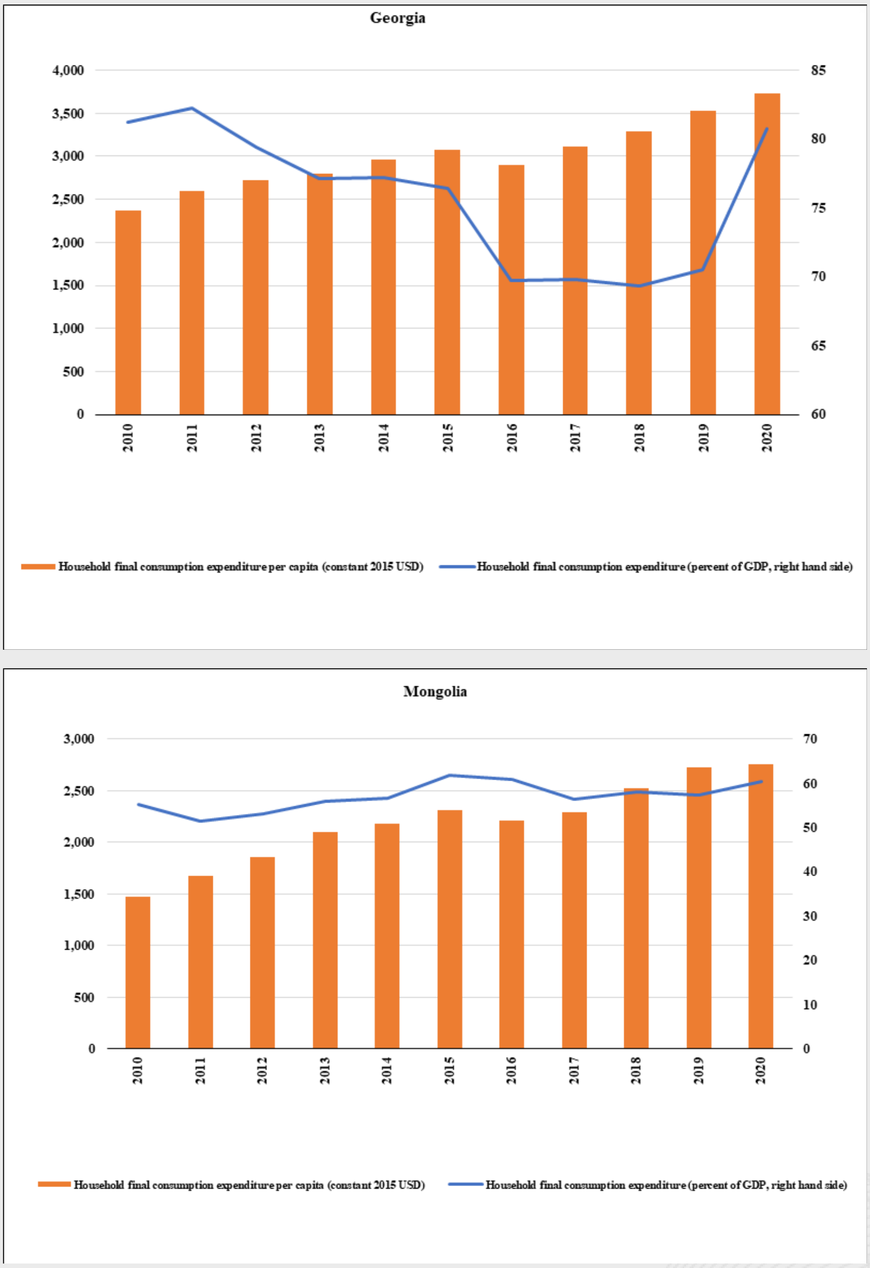


Source: National Statistics Office of Georgia, National Statistics Office of Mongolia

Despite the adverse impact of COVID-19 on the labor market, household consumption both in per capita terms and as a share in GDP increased in 2020 (Figure 3.7). This was more evident in Georgia, where per capita consumption measured on constant prices increased to USD3,728 in 2020 from USD3,532 in 2019, whereas in Mongolia consumption remained almost the same, around USD2,750. Also, as a share of GDP, Georgia saw a sharp increase in final consumption expenditure from 70 percent to 80 percent, and there was a moderate increase in Mongolia from 57 percent to 60 percent of GDP. Changes in household consumption levels are related to the economic dynamics associated with the impact of COVID-19 and government measures to combat the economic consequences of the pandemic. There is a high probability that government measures to support household loss of income and limited employment opportunities are important for sustaining levels of household final consumption.

Figure 3.7. Household final consumption expenditure in Georgia and Mongolia

1



Source: World Bank, World Development Indicators (accessed 15 February 2022)

The ADB COVID-19 Policy Database shows the monetary amounts of announced or estimated measures to combat COVID-19 (Felipe and Fullwiler 2020). According to this data, financial support provided to individuals and businesses during the pandemic in Georgia achieved USD3,235.31 million (20.11 percent), which amounts to USD869.62 per capita (Table 3.1). In Mongolia this amount was USD1,223.96 per capita. Also, in Mongolia the value of the total package as a percentage of GDP is higher than in Georgia — 29.4 percent and 20.1 percent, respectively.

Table 3.1. Value of policy response to COVID-19 measures (total package)

	Georgia	Mongolia
Total package (millions of USD)	3,235.31	3,947.48
Percentage of GDP (2020)	20.11%	29.44%
Package per capita (USD)	869.62	1,223.96

Source: ADB COVID-19 Policy Database
https://covid19policy.adb.org/policy-measures/GEO
and https://covid19policy.adb.org/policy-measures/MON (accessed 21 February 2022)

In the database, monetary and fiscal policy measures and sources of funds are specified. According to this information, the main source of funds to mitigate the risks of the COVID-19 pandemic in Georgia was the international assistance received to the amount of USD1,333 million, where almost 41.42 percent was received from the Asian Development Bank (Table 3.2). A large amount of financial assistance was directed to money markets and short-term finance, and government income support as tax and contribution rate reductions and subsidies to households. For citizens' credit repayment deferrals, various tax cuts and monetary assistances were provisioned, while for business sector property and income taxes of companies were deferred and long-term loans offered.

Government policy in Mongolia to reduce the negative impact of the COVID-19 pandemic included tax exemption on certain imported goods; exemption from income tax, personal income tax and social security contributions; increasing child benefit and unemployment benefit; and waiving utility expenses (electricity, heating, water, and waste disposal) (IMF, Policy Responses to COVID-19).[5] According to the ADB COVID-19 Policy Database, the main source of funds was the Central Bank currency swaps and repurchase agreement facility for official foreign accounts, international grants, and loans. These funds were reallocated mostly to health and income support, and long-term direct lending and liquidity support.

Following the first cases of COVID-19 in both countries, government policy was associated with strict measures to control the spread of the disease by restricting mobility, launching quarantine measures, and suspending educational processes. As mentioned earlier, COVID-19 cases were lower in Mongolia in 2020 compared to Georgia. In the later stages of the pandemic, government policy in both countries was related to the gradual lifting of restrictions and supporting the economy.

Table 3.2. Economic measures to combat COVID-19

	Georgia		Mongolia	
Measure	**Amount (local)**	**Amount (USD)**	**Amount (local)**	**Amount (USD)**
Liquidity support	3,524,208,689	1,159,000,000	1,084,000,000,000	393,249,627
Short-term lending			760,000,000,000	275,710,071
Support policies for short-term lending			324,000,000,000	117,539,556
Forex operations	3,524,208,689	1,159,000,000		
Credit creation	930,000,000	305,847,382	347,504,234,118	126,066,338
Financial sector lending/funding	600,000,000	197,320,891	240,000,000,000	87,066,338
Loan guarantees	330,000,000	108,526,490	107,504,234,118	39,000,000
Direct long-term lending			2,663,000,000,000	966,073,577
Long-term lending			2,000,000,000,000	725,552,818
Forbearance			663,000,000,000	240,520,759

[5] https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19

Health and income support	4,883,500,000	1,606,027,622	6,786,791,800,907	2,462,087,958
Health support	828,500,000	272,467,264	198,193,703,412	71,900,000
Income support	2,763,000,000	908,662,705	6,588,598,097,495	2,390,187,958
Tax and contribution rates reduction	1,495,000,000	491,657,888	890,585,175,966	323,083,292
Subsidies to individuals and households	1,178,000,000	387,406,683	1,694,156,468,941	614,600,000
Subsidies to businesses	90,000,000	29,598,134	3,353,856,452,588	1,216,700,000
No breakdown (income support)			650,000,000,000	235,804,666
No breakdown (health and income support)	1,292,000,000	424,897,653		
International assistance received	4,053,748,445	1,333,148,761	8,678,812,557,894	3,148,468,454
Swaps			6,000,000,000,000	2,176,658,454
International loans/grants	4,053,748,445	1,333,148,761	2,678,812,557,894	971,810,000
Asian Development Bank	1,679,001,132	552,170,000	1,023,578,134,741	371,330,000
Other	2,374,747,313	780,978,761	1,655,234,423,153	600,480,000

Source: ADB COVID-19 Policy Database
https://covid19policy.adb.org/policy-measures/GEO
and https://covid19policy.adb.org/policy-measures/MON (accessed 20 February 2022)

3.3 DATA

This study is based on data available from the Multiple Indicator Cluster Survey (MICS) Plus Survey on the impact of COVID-19 on the wellbeing of families and children by the United Nations Children's Fund (UNICEF). The data is collected via telephone interviews with households and represents the high frequency phone survey, which in turn provides longitudinal data.[6] Owing to the availability of the variables of our interest, our dataset covers the second and third waves for Mongolia, and the first and third waves for Georgia. The second wave for Mongolia and the first wave for Georgia were implemented in November and December 2020. While the third waves for both countries were implemented between 15 February and 28 June 2021 (Table 3.1).

To simplify the interpretation of the analysis, we redefined the wave numbers. The first wave of Georgia and the second wave of Mongolia are used as the first wave. The third waves of Mongolia and Georgia in our dataset are indicated as the second wave. For empirical purposes, households in two waves of the survey for each country were identified by their unique identification code. Therefore, our final sample consists of observations that exist in both waves. The total sample size of our dataset is 7,018 observations. The sample is distributed among the countries, Mongolia and Georgia, with 3,722 and 3,296 observations, respectively. As dataset balanced panel data, each wave includes 3,509 observations.

Table 3.3. Survey waves and sample size

	Mongolia	Georgia
Original wave number	Wave 2	Wave 1
Wave number after redefinition	Wave 1	Wave 1
Survey period	1-14 December 2020	24 November-21 December 2020
N	1,861	1,648
Original wave number	Wave 3	Wave 3
Wave number after redefinition	Wave 2	Wave 2
Survey period	15 February-1 March 2021	10-28 June 2021
N	1,861	1,648
Total (N) by country	3,722	3,296

Source: UNICEF. MICS Plus. 2020-2021.
https://mics.unicef.org/mics-plus/mics-plus-results (retrieved 23 January 2022)

[6] MICS Plus: A Step-by-Step Guide to Implementation. May 2020. UNICEF. New York. Available at: https://mics.unicef.org/files?Job=W1siZiIsIjIwMjAvMDUvMjAvMTMvMTQvMTUvOTkzL01JQ1NfUGx1c19TdGVwX2J5X1N0ZXBfMjAyMDA1MDRfdjNfMjAyMDA1MTJXZWlucGRmIl1d&sha=48d1a324494d8ad7 (accessed 2 March 2022)

Mean values of variables across the samples are given in Table 3.4. Mean values for the first wave reported in Table 3.4 revealed that more than half (53 percent to 55 percent) of interviewed households experienced a decline in income. While, in the second wave, 43 percent and 39 percent of observed households were faced with income reduction. The available job loss data for Georgia shows that during November to December 2020, 32 percent of households stated that at least one household member experienced job loss. In June 2021, this rate decreased to 13 percent, suggesting that there was some recovery during the second year of the pandemic.

As regards government support, on average, households received about 1.9 types of government benefit. However, this indicator is available only for the first wave of the sample. Households in Georgia in the first wave of the survey received an average of 2.55 government payments, while in Mongolia the average was 1.23. However, it should be noted that the amount of public assistance received does not reflect the monetary value of benefits. Indicators denoting the average number of types of internet equipment show higher mean values among households in Georgia. In addition, households in Mongolia are larger and have more children.

Table 3.4. Descriptive statistics (mean values)

Variables	Total				Mongolia			Georgia		
	N	Tota sample	Wave 1	Wave 2	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2
		mean	mean	mean	mean	mean	mean	mean	mean	mean
Decline in income (0-1)	6,984	0.463	0.533	0.393	0.486	0.541	0.431	0.438	0.525	0.352
Scale of decline in income (1-6)	2,988	3.382	3.428	3.322	3.430	3.384	3.484	3.326	3.475	3.107
Evolution of income decrease (1-4)	6,950	2.320	2.320	2.320	2.403	2.403	2.403	2.229	2.229	2.229
Number of types of internet connection	7,018	1.084	1.116	1.052	0.908	0.894	0.923	1.282	1.367	1.197
Number of types of asset household has	7,018	11.702	11.63	11.77	11.34	11.34	11.34	12.11	11.96	12.25
Gender of household head	7,018	0.758	0.760	0.757	0.813	0.816	0.811	0.696	0.697	0.695
Age of household head	7,018	53.131	52.99	53.27	47.26	47.17	47.36	59.76	59.56	59.95
Household size	7,018	3.732	3.733	3.732	4.006	3.997	4.015	3.423	3.434	3.412
Area of residence	7,018	0.536	0.535	0.537	0.581	0.580	0.582	0.486	0.485	0.486
Number of children below the age of 17	7,018	1.187	1.180	1.194	1.544	1.530	1.557	0.785	0.785	0.784
Government support	3,509		1.853			1.224		0.226	2.563	0.132
Any member of the household lost job (1-yes)	3,296								0.321	

Source: UNICEF. MICS Plus. 2020-2021.
https://mics.unicef.org/mics-plus/mics-plus-results (retrieved 23 January 2022). N: number of observations

3.4 METHODOLOGY

In this study we investigate the impact of various household characteristics on the average monthly income changes caused by COVID-19. The dependent variable in our model is a discrete variable, which takes the value 1 if income of the household is declined and 0 if it is not. Therefore, the binary response probit regression model is used (Horowitz and Savin 2001). The following probit regression model is specified:

$$P_i(y = (1| x_i)=F(\beta_0 + \beta_k x_k) \qquad (1)$$

where y_i is the dependent variable that indicates whether the average household income has decreased owing to COVID-19 or not. x_k is the set of explanatory variables that include household characteristics. F(.) is the cumulative density function of the normally distributed error term, evaluated at given values of the independent variables (Long and Freese 2014). Two waves of the survey data are used for each country. Empirical estimations are carried out for each wave sample. Therefore, a cross-sectional approach is used. One may argue that with the available two waves of the survey panel data, estimation techniques would be appropriate for analysis. However, it should be noted that fixed effects within panel data approach would not allow one to measure the impact of time-invariant household characteristics. Moreover, being the type of high-frequency household survey data, households in the survey do not demonstrate a large variability of characteristics over two waves.

Another dependent variable, the scale of income decline, is modeled as a categorical variable taking the values of 1, 2, 3, 4, 5, and 6, and reflecting the percentage decline in income in the interval 0 percent to 10 percent, 11 percent to 25 percent, 26 percent to 50 percent, 51 percent to 75 percent, 76 percent to 99 percent and 100 percent, respectively. As the categorical outcome variable is ordered, it is appropriate to use an ordered probit model. The model is specified as follows (equation 2):

$$y_i^* = x_i'\beta + e_i \quad (2)$$

y_i^* is a latent variable that is a linear combination of some predictors and error term. e_{im} is an error term that is assumed to follow a normal distribution with a mean of 0 and a standard deviation of 1, that is:

$$e_i \sim N(0,1) \quad (3)$$

This refers to the probability of outcome — that is, scale of the income decreasing — being in category m. If y_i is observed as outcome variable, then the ordered probit regression model also may be specified as:

$$y_i = m \quad \text{if} \quad y_{im}^* = \begin{cases} m & \text{if } \alpha_{m-1} < y_{im}^* < \alpha_m \\ 0 & \text{otherwise} \end{cases} \quad (4)$$

for i = 1, 2, 3, ..., N; and m = 1, 2, 3, ..., M-1; and where α_m=2,3,4,5 and 6, which are threshold parameters. This probability of each ordinal outcome variable can be considered as:

$$P(y_i=m \mid x_i)=P(\alpha_{m-1}<x_i'\beta+e_i<\alpha_m) = \Phi(\alpha_m-x_i'\beta)-\Phi(\alpha_{m-1}-x_i'\beta) \quad (5)$$

where α_m = 2, 3, 4, 5, which represents the threshold parameter. Φ(.) represents the cumulative probability in the standardized normal distribution.

Also, we alternatively estimated with the multinomial probit model (Wooldridge 2002) in which the outcome variable consists of four alternative status of income decline. We modeled the probability of the decrease of household income in Mongolia and Georgia in the two survey waves. For this purpose, the outcome variable — that is, a measure of the evolution of income decline — is created. It has four mutually exclusive potential outcomes: household income did not decrease during both survey waves (1); income decreased in wave 1, but did not decrease in wave 2 (2); income did not decrease in wave 1, but decreased in wave 2 (3); and income decreased in both waves of the survey (4). The evolution of household income is categorized as m if y^*_{im} is highest for m, that is:

$$y_i = m \quad \text{if} \quad y^*_{im} = \begin{cases} m & \text{if } y^*_{im} = \max\left(y^*_{i1}, y^*_{i2,\dots,} y^*_{iM}\right) \\ 0 & \end{cases} \tag{6}$$

$$y^*_{im} = x'_i \beta_m + e_{im} \tag{7}$$

where m =1, 2, 3, or 4; e_{im} is an error term that assumed the following multivariate normal distribution with mean 0 and covariance matrix ∑, namely:

$$e_{im} \sim N(0,\Sigma) \tag{8}$$

Then the probability of a household being in category m can be written as:

$$\begin{aligned} P(y_i=m|x_i) &= P(y^*_{im}>y^*_{i1,\dots,}\, y^*_{im}>y^*_{i(m-1)}>y^*_{i(m+1),\dots,}\, y^*_{im}>y^*_{iM}) \\ &= P(e_{im}-e_{i1})>x'_i(\beta_1-\beta_m)_{,\dots,}(e_{im}-e_{i(m-1)}) \\ &> x'_i(\beta_{(m-1)}-\beta_m),(e^*_{im}-e^*_{i(m+1)})>x'_i(\beta_{m+1}-\beta_m)_{,\dots,}(e_{im}-e_{iM}) \\ &> x'_i(\beta_M-\beta_m) \end{aligned} \tag{9}$$

According to the specification of our model, it is assumed that the explanatory variables can explain the probability of a decrease in household income owing to the COVID-19 pandemic. Explanatory variables can be divided into two groups. Household characteristics variables reflecting household size, place of residence, and number of children in a household up to the age of 17. The gender and age of the head of household are also included in the model as other household characteristics. The other group of variables includes the number of types of asset owned by the household, the number of pieces of equipment used to access the internet, the number of types of government benefit received by the household, and a dummy variable indicating whether any household member experienced a job loss (Table 3.5).

Table 3.5. Description of variables

Dependent variables	
Decline in income	Household average monthly income has declined owing to COVID-19 (1 = yes, 0 = no)
Scale of decline in income	Household average monthly income has declined owing to COVID-19 (1 = 0-10%; 2 = 11-25%; 3 = 26-50%; 4 = 51-75%; 5 = 76-99%, and 6 = 100%)
Evolution of income decrease	Categorical variable which is equal to: 1 if household income did not decrease during both survey waves; 2 if income decreased in wave 1, but not in wave 2; 3 income did not decrease in wave 1, but decreased in wave 2; 4 income decreased in both waves of the survey.
Explanatory variables	
Access to internet	Number of types of internet connection
Assets	Number of assets household has (such as household appliances, electronic or digital devices, and motor vehicles)
Gender of household head	Gender of household is (1 = male, 0 = female)
Age of household head	Household head age in years
Area of residence	If household residence area is urban (1 = urban, 0 = rural)
Household size	Number of members in the observed household
Number of children	Number of children in household aged below 17 years
Government support	Number of types of government benefit received as part of COVID-19 mitigation, such as child benefit
Losing job	If any member of the household has lost her/his job since March or December 2020 (1 = yes, 0 = no)

Source: UNICEF. MICS Plus. 2020-2021.
https://mics.unicef.org/mics-plus/mics-plus-results (retrieved 23 January 2022)

The age of the household head may be important for household income. Older household heads — owing to longer work experience — may have a relatively stable job place, a secure income level, and better management of household finances. Also, in line with previous studies, the gender of the household head might be an important factor affecting income as male household heads can secure higher and more stable incomes (Pavanan et al 2022, Chen et al 2022).

Larger household size can be associated with higher income, as more members — namely, working adults — may increase the total household income. On the other hand, job loss by working adults increases the probability of income decline too. Also, large households may include more children, but a smaller proportion of working-age adults; this, in turn, can lead to a lower household income. However, social benefit payments by government may indicate a positive correlation between the number of children and household income. Therefore, the net effect of household size and number of children on the household income trend remains vague.

Government social payments — such as, pensions, and benefits for children and elderly persons — can support household income during the economic crisis. Therefore, variable government support is used in the model indicating the number of types of government benefit received by household members. These payments are monetary or financial assistance or support from the government in the form of allowances or child money, subsidized electricity and natural gas bills, assistance to those who have lost their income or job, exemption from social security payments, cashmere allowance in the case of Mongolia, and other benefits provided by the state under social protection programs.

The number of assets that a household possesses — such as, household appliances, electronic/digital devices, and motor vehicles — is used to assess potential differences in income changes by household income level. If the household owns various assets, then the variable takes a higher value. The definition of this variable assumes that the more types of asset a household has, the wealthier the household is. It is expected that households with a higher number of assets demonstrate stronger resilience to the income shocks of COVID-19. In a similar vein, the variable reflecting the number of pieces of equipment used by households to access the internet is used. The more types of equipment used to access the internet, the wider the household's access to the internet. The variable takes a value from 0 to 5 depending on which of the following gadgets are used by household members: desktop computer, laptop, tablet, smartphone, and smart TV. If a household uses more types of equipment, then the variable takes a value close to 5. More assets may inform about the wealthier status of a household. On the other hand, households with more types of equipment are expected to have more opportunity to work remotely and be less affected by income decline. Also, a dummy variable that is equal to 1 if at least one household member has lost his/her job is included among the explanatory variables; however, this variable is available for Georgia only. Other variables to control for residential characteristics are included too.

3.5 EMPIRICAL RESULTS

The coefficient estimates for probit regression models for the nine samples are presented in Table 3.6. The marginal effects are given in Table 1A in the Appendix. Results show that the age of the household head has a negative and statistically significant effect on the probability of income decline. The results of this study are in line with the main evidence in the literature and confirm that age has a positive effect on income (Kartseva and Kuznetsova 2020; Haley and Marsh 2021; Belot et al. 2021; Midões and

Seré 2022; Bundervoet, Dávalos, and Garcia 2022; Ge et al. 2022). Our finding suggests that households with an older household head are less likely to experience reduced income owing to COVID-19. Presumably, older heads have more stable jobs and sources of income than their counterparts, as they have more working and housekeeping experience. In addition, assets accumulated during working age can now be used to generate additional income for older households. From this standpoint, younger individuals might be more vulnerable to income decline during the economic downturn.

Another important characteristic in explaining the probability of income fall is the gender of the household head. Empirical results show that households with a male household head are more likely to experience income decline. It coincides with some other empirical studies (Brewer and Tasseva 2021, Marchal et al. 2021, Azhgaliyeva et al. 2022). However, in the model results, the underlining variable is not statistically significant for some waves. For the first wave in Mongolia, it shows a statistically significant effect of male household head on income reduction, whereas this effect is not statistically significant for Georgia. This may inform us about the potential gender difference in the labor market in these two countries. Some sectors of Mongolia's economy — such as mining, construction, and transportation — are male-dominated and have relatively high importance for production (Ariunzaya and Munkhmandakh 2019). Lockdown measures and a decrease of economic activity may have a strong negative effect on these sectors, which in turn affects income decline in households. However, in the model of the subsequent wave of the survey, this effect is not statistically significant, suggesting potential adaptation of the economy and labor market to new realities.

Household size has a strong impact on income decline in all models. This effect is consistent with Murakami (2022), who notes that larger households with more adults are more exposed to job loss and income decline. Another household characteristic used in estimations is the number of children in a household aged below 17 years. Almost all coefficients of this variable are negative and significant. This might be related to the fact that households with more children are more likely to receive government benefit and, to some extent, to have a secure level of income (Kartseva and Kuznetsova 2020, Li et al. 2022).

On the other hand, the variable on government support reflecting the number of types of government benefit received by households, shows a positive impact on the probability of income reduction. Putting it another way, households receiving a higher number of types of government payment are more likely to see a fall in income. These results are consistent with Brewer and Gardiner (2020), who note the importance of the state measure for income protection. This finding can be explained by the fact that government policy to support household income during the crisis is oriented to vulnerable households. It supports the view that government support mechanisms are well-targeted (Cantó et al. 2022).

Income shock may differ by household income level. We attempt to measure this by including the number of household assets and the number of pieces of equipment used to access the internet. Assets include household appliances, electronic/digital devices, and motor vehicles. Empirical results show that in Mongolia households with a higher number of assets have a lower probability of income reduction, although this effect was evident only in the first wave of the survey. Accumulated assets can be used to smooth the consumption caused by employment and income shocks. This is in line with findings by Bundervoet, Dávalos, and Garcia (2022), who using the data for 31 countries assert that the impact of COVID-19 on vulnerable households may have been very negative as they do not have enough savings to protect against income shock. Therefore, this result indicates that the income reduction effect of COVID-19 was not equal over the households. This is consistent with previous studies arguing that households with lower income were more affected (Belot et al. 2021, Marchal et al. 2021, Almeida et al. 2021, Azhgaliyeva et al. 2022).

Table 3.6. Estimation results for probit models on probability of income reduction (coefficients)

Variables	Total			Mongolia			Georgia		
	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2
Gender of household head	0.117***	0.168***	0.066			0.051	0.119*	0.075	0.162*
	(0.041)	(0.057)	(0.059)			(0.088)	(0.062)	(0.090)	(0.089)
Age of household head	-0.014***	-0.013***	-0.015***	-0.025***	-0.026***	-0.020***	-0.009***	-0.008***	-0.008***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
Household size	0.190***	0.181***	0.187***	0.358***	0.361***	0.198***	0.124***	0.100***	0.148***
	(0.014)	(0.021)	(0.020)	(0.026)	(0.038)	(0.030)	(0.023)	(0.034)	(0.032)
Number of types of internet connection	0.083***	0.096***	0.052	-0.183***	-0.175***	0.109**	0.029	0.087**	-0.080
	(0.024)	(0.031)	(0.039)	(0.044)	(0.062)	(0.052)	(0.037)	(0.044)	(0.066)
Number of types of household asset	-0.015***	-0.017***	-0.009	0.078***	0.076***	-0.010	-0.010	-0.012	0.001
	(0.005)	(0.007)	(0.007)	(0.008)	(0.011)	(0.008)	(0.010)	(0.013)	(0.018)
Area of residence	0.036	-0.003	0.087	-0.257***	-0.250***	0.245***	-0.310***	-0.466***	-0.204**
	(0.038)	(0.053)	(0.054)	(0.063)	(0.091)	(0.075)	(0.062)	(0.091)	(0.088)
Number of children below age of 17	-0.109***	-0.145***	-0.096***	-0.247***	-0.262***	-0.120***	-0.054	-0.091	-0.054
	(0.021)	(0.030)	(0.029)	(0.034)	(0.050)	(0.039)	(0.037)	(0.057)	(0.051)
Government support		0.131***			0.028			0.107***	
		(0.023)			(0.043)			(0.038)	
Losing job							2.402***	2.163***	3.042***
							(0.102)	(0.116)	(0.272)
Wave dummy (wave 2 = 1)	-0.374***			-0.005			-0.173***		
	(0.031)			(0.052)			(0.053)		
Country dummy (Georgia = 1)	-0.432***	-0.629***	-0.477***						
	(0.087)	(0.130)	(0.124)						
Regional dummy	+	+	+	+	+	+	+	+	+
Constant	0.539***	0.340**	0.232	0.631***	0.610**	0.273	-0.335*	-0.420	-0.776**
	(0.112)	(0.157)	(0.160)	(0.170)	(0.243)	(0.214)	(0.203)	(0.298)	(0.303)
Observations	6,984	3,492	3,492	3,722	1,861	1,844	3,295	1,647	1,648
Pseudo R-squared	0.0959	0.0944	0.0899	0.176	0.174	0.104	0.327	0.362	0.279
LR	924.5	455.5	420.7	629.2	309.9	262.8	1476	824.6	597.2
Prob > chi 2	0	0	0	0	0	0	0	0	0
Log likelihood	-4360	-2185	-2130	-1477	-734.3	-1129	-1521	-727.3	-770.4

Note: Standard errors are given in parenthesis. ***, **, and * indicate the significance levels at 1 percent, 5 percent, and 10 percent, respectively.

Source: Authors' estimations based on household level MICS Plus data (UNICEF 2021) for 2020-2021. https://mics.unicef.org/mics-plus/mics-plus-results (retrieved 23 January 2022).

Interestingly, equipment used for internet access demonstrates mixed effects. In the first wave of data for Mongolia, it increases the probability of reduced income. However, in the second wave of data for Georgia, it shows a negative impact, indicating a decreasing probability of falling income. These findings can be related to the fact that internet access indicates not only overall welfare of households, but also provides an opportunity to access online education and remote working (Mubarak, Suomi, and Kantola 2020, Martínez-Domínguez and Mora-Rivera 2020). Nevertheless, the negative effect of this variable in the subsequent waves might suggest a risk related to unequal recovery from the COVID-19 pandemic.

To control the effect of household location, area of residence as rural–urban or capital–noncapital city, and dummy variables for regions in each country are included in the model. Rural and urban locations indicate different results for the two countries. In Mongolia, households in urban areas have a higher likelihood of being exposed to income reduction, which is statistically significant in both waves of the survey data and in line with Murakami (2022) and Azhgaliyeva et al. (2022). In contrast to this, urban households in Georgia compared to rural households are less likely to experience a decrease in income. Although the scope of this study does not provide detailed analysis on urban and rural populations in the COVID-19 impact, this finding suggests a different position of rural households in the face of income and job loss shock during COVID-19. Also, households residing in the capital city in both countries suffer from a decrease in income at a higher magnitude, possibly owing to the stricter measures that exist in capital cities.

Job loss owing to restrictions during the pandemic could result in a considerable drop in income. In the survey data used in this study, questions on job loss are available for Georgia only. Therefore, it was included in model estimations based on survey data for

Georgia. Empirical results show that the job loss of a household member has a strong and statistically significant impact on income reduction. This confirms the results in some studies in the literature (Beirne et al. 2020, Morgan and Trinh 2021). This effect is strong in both waves, stating that recovery from the negative impact of COVID-19, providing employment opportunities, and sustaining income level would be critical for long-term policy perspectives.

The magnitude of the drop in income is given by the results of the ordered probit model presented in Tables 3.7 and 2A. Results show that female-headed households were less likely to experience a considerable — 50 percent to 100 percent — drop in income during a pandemic. Along with the results of the previous model, indicating that households with female-headed households are more likely to see income decline, results of the ordered probit model show that they are also less likely to experience income decline at higher magnitudes. Similarly, household management by older heads and a larger size of household are associated with income decline at lower rates.

Estimated marginal effects for the number of household asset types in all models (except Wave 2 for Georgia) significantly associated with a lower rate of income decrease. In contrast to these results, the number of children and job loss are significantly associated with higher rates of income loss. For example, the loss of a job by any household member increases the probability of a decrease in income of 76 percent to 99 percent by 10.75 percentage points.

Results of the multinomial probit models (Tables 3.8 and 3A) show that, for the total sample, female-headed households are less likely to retain income. According to estimated marginal effects, households headed by elders, with more assets and children, are more likely to avoid loss of income in both waves. In contrast, households with more household members, more types of internet connection, those receiving government assistance, with at least one member losing their job, are more likely to experience a decline in income in both waves.

Table 3.7. Estimation results for ordered probit model estimates for different income reduction rate (coefficients)

Variables	Total			Mongolia			Georgia		
	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2
Gender of household head	-0.040	-0.154**	0.104	-0.053	-0.215*	0.096	0.008	-0.102	0.166
	(0.053)	(0.071)	(0.081)	(0.081)	(0.115)	(0.117)	(0.071)	(0.091)	(0.113)
Age of household head	-0.002	-0.003	-0.000	-0.001	-0.001	-0.001	0.000	-0.002	0.003
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.002)	(0.003)	(0.004)
Household size	-0.021	-0.033	0.002	-0.007	-0.020	0.014	-0.06***	-0.09***	-0.023
	(0.017)	(0.023)	(0.026)	(0.026)	(0.037)	(0.039)	(0.024)	(0.032)	(0.036)
Number of types of internet connection	-0.021	-0.037	-0.018	0.004	0.002	0.011	-0.073*	-0.060	-0.089
	(0.029)	(0.035)	(0.050)	(0.045)	(0.063)	(0.066)	(0.038)	(0.043)	(0.079)
Number of types of household asset	-0.02***	-0.019**	-0.024**	-0.02***	-0.019*	-0.022**	-0.026**	-0.024**	-0.028
	(0.006)	(0.007)	(0.010)	(0.007)	(0.010)	(0.011)	(0.010)	(0.012)	(0.022)
Number of children below age of 17	0.037	0.047	0.020	0.019	0.035	0.013	0.084**	0.141***	0.026
	(0.025)	(0.034)	(0.037)	(0.034)	(0.048)	(0.050)	(0.038)	(0.053)	(0.057)
Government support		-0.009			-0.067			-0.026	
		(0.025)			(0.041)			(0.034)	
Losing job							0.598***	0.667***	0.550***
							(0.061)	(0.081)	(0.098)
Country dummy (1 = Georgia)	-0.189*	0.035	-0.422**						
	(0.110)	(0.154)	(0.172)						
Wave dummy (1 = wave 2)	-0.12***			0.055			-0.24***		
	(0.039)			(0.054)			(0.061)		
Regional dummies	+	+	+	+	+	+	+	+	+
α_2	-2.69***	-2.76***	-2.47***	-2.41***	-2.76***	-2.19***	-2.60***	-2.78***	-2.12***
	(0.140)	(0.187)	(0.210)	(0.194)	(0.271)	(0.279)	(0.236)	(0.309)	(0.404)
α_3	-1.72***	-1.79***	-1.48***	-1.65***	-1.93***	-1.47***	-1.36***	-1.61***	-0.79**
	(0.134)	(0.177)	(0.204)	(0.188)	(0.259)	(0.273)	(0.228)	(0.296)	(0.396)
α_4	-0.35***	-0.349**	-0.178	-0.120	-0.245	-0.118	-0.099	-0.355	0.487
	(0.132)	(0.174)	(0.201)	(0.185)	(0.254)	(0.269)	(0.226)	(0.292)	(0.394)
α_5	0.238*	0.237	0.425**	0.456**	0.337	0.462*	0.536**	0.272	1.156***
	(0.132)	(0.174)	(0.201)	(0.185)	(0.254)	(0.269)	(0.226)	(0.292)	(0.395)
α_6	0.953***	0.956***	1.158***	1.043***	0.863***	1.120***	1.496***	1.240***	2.152***
	(0.133)	(0.176)	(0.204)	(0.187)	(0.256)	(0.272)	(0.231)	(0.297)	(0.414)

Observations	2,988	1,702	1,286	1,620	887	733	1,368	815	1,702
Pseudo R-squared	0.0155	0.0145	0.0268	0.00973	0.00982	0.0156	0.0505	0.0497	0.0145
LR	133.6	70.02	101.9	44.25	22.91	34.13	203.2	121.2	70.02
Prob > chi 2	0	0	0	0	0.0182	0.000176	0	0	0
Log likelihood	-4,256	-2,377	-1,851	-2,252	-1,154	-1,080	-1,911	-1158	-2,377

Note: Standard errors are given in parenthesis. ***, **, and * indicate the significance levels at 1 percent, 5 percent, and 10 percent, respectively.

Source: Authors' estimations based on household level MICS Plus data (UNICEF 2021) for 2020-2021. https://mics.unicef.org/mics-plus/mics-plus-results (retrieved 23 January 2022).

Table 3.8. Estimation results for multinomial probit models on probability: income reduction across waves (coefficients)

Variables	Total			Mongolia			Georgia		
	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2
Outcome 1: Household income didn't decrease in both waves (base outcome) Outcome 2: Household income decreased in wave 1, but not in wave 2									
Gender of household head	0.218***	0.230***	0.212**	0.230**	0.236*	0.220	0.243***	0.230*	0.216*
	(0.062)	(0.089)	(0.088)	(0.096)	(0.137)	(0.135)	(0.087)	(0.130)	(0.121)
Age of household head	-0.014***	-0.012***	-0.013***	-0.015***	-0.014***	-0.015***	-0.010***	-0.008*	-0.012***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.005)	(0.004)
Household size	0.220***	0.212***	0.206***	0.189***	0.196***	0.172***	0.196***	0.134***	0.224***
	(0.023)	(0.033)	(0.032)	(0.034)	(0.049)	(0.047)	(0.034)	(0.051)	(0.047)
Number of types of internet connection	0.129***	0.100**	0.165***	0.172***	0.164*	0.182**	0.054	0.042	0.107
	(0.037)	(0.047)	(0.060)	(0.059)	(0.084)	(0.083)	(0.052)	(0.064)	(0.093)
Number of types of household asset	-0.031***	-0.031***	-0.031***	-0.043***	-0.042***	-0.043***	-0.009	-0.022	0.005
	(0.008)	(0.010)	(0.012)	(0.010)	(0.013)	(0.013)	(0.015)	(0.019)	(0.024)
Number of children below age of 17	-0.165***	-0.204***	-0.150***	-0.164***	-0.189***	-0.146**	-0.113**	-0.091	-0.137*

	(0.033)	(0.048)	(0.046)	(0.044)	(0.064)	(0.062)	(0.055)	(0.086)	(0.075)
Country dummy (1 = Georgia)	-0.246*	-0.572***	-0.221						
	(0.131)	(0.198)	(0.185)						
Wave dummy (1 = wave 2)	0.020			0.000			0.295***		
	(0.049)			(0.069)			(0.077)		
Government support		0.160***			0.076			0.079	
		(0.036)			(0.055)			(0.056)	
Losing job(1 = yes)							2.321***	2.746***	0.235
							(0.158)	(0.178)	(0.637)
Regional dummy	+	+	+	+	+	+	+	+	+
Constant	-0.016	-0.109	-0.031	0.266	0.154	0.319	-0.978***	-1.075**	-0.765*
	(0.173)	(0.241)	(0.246)	(0.236)	(0.332)	(0.331)	(0.289)	(0.439)	(0.424)
Outcome 3: Household income decreased in wave 2, but not in wave 1									
Gender of household head	0.057	0.052	0.066	-0.067	-0.070	-0.068	0.211**	0.195	0.307**
	(0.074)	(0.106)	(0.105)	(0.109)	(0.155)	(0.154)	(0.106)	(0.153)	(0.156)
Age of household head	-0.016***	-0.016***	-0.015***	-0.024***	-0.024***	-0.022***	-0.009**	-0.009*	-0.009
	(0.002)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)
Household size	0.225***	0.224***	0.215***	0.188***	0.175***	0.188***	0.222***	0.231***	0.212***
	(0.027)	(0.039)	(0.038)	(0.040)	(0.058)	(0.056)	(0.040)	(0.058)	(0.058)
Number of types of internet connection	0.024	-0.005	0.063	0.094	0.062	0.130	-0.071	-0.063	-0.164
	(0.044)	(0.057)	(0.071)	(0.069)	(0.099)	(0.097)	(0.061)	(0.075)	(0.115)
Number of types of household asset	-0.018*	-0.015	-0.020	-0.022**	-0.020	-0.024	-0.011	-0.009	0.006
	(0.009)	(0.012)	(0.014)	(0.011)	(0.016)	(0.016)	(0.018)	(0.023)	(0.031)
Number of children below age of 17	-0.164***	-0.185***	-0.154***	-0.194***	-0.207***	-0.190**	-0.084	-0.113	-0.080
	(0.040)	(0.057)	(0.055)	(0.053)	(0.077)	(0.074)	(0.065)	(0.097)	(0.093)
Government support		0.073*			0.100			0.044	
		(0.044)			(0.065)			(0.066)	
Losing job(1 = yes)							1.939***	0.751***	3.464***
							(0.173)	(0.249)	(0.484)
Country dummy (1 = Georgia)	-0.546***	-0.683***	-0.540**						
	(0.154)	(0.234)	(0.218)						
Wave dummy (1 = wave 2)	0.011			0.004			0.194**		
	(0.059)			(0.081)			(0.091)		
Regional dummy	+	+	+	+	+	+	+	+	+
Constant	-0.135	-0.157	-0.160	0.470*	0.472	0.389	-1.516***	-1.492***	-1.706***
	(0.201)	(0.281)	(0.286)	(0.271)	(0.382)	(0.381)	(0.347)	(0.518)	(0.536)

Outcome 4: Household income decreased in both waves

Gender of household head	0.202***	0.203**	0.206**	0.275***	0.295**	0.251*	0.222**	0.170	0.296**
	(0.063)	(0.090)	(0.090)	(0.095)	(0.136)	(0.135)	(0.094)	(0.138)	(0.133)
Age of household head	-0.027***	-0.026***	-0.027***	-0.033***	-0.033***	-0.033***	-0.018***	-0.016***	-0.018***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.005)	(0.005)
Household size	0.362***	0.342***	0.357***	0.346***	0.334***	0.351***	0.315***	0.276***	0.334***
	(0.023)	(0.032)	(0.032)	(0.033)	(0.047)	(0.046)	(0.035)	(0.052)	(0.049)
Number of types of internet connection	0.155***	0.138***	0.175***	0.275***	0.280***	0.270***	0.024	0.033	-0.046
	(0.037)	(0.048)	(0.059)	(0.057)	(0.080)	(0.080)	(0.055)	(0.067)	(0.099)
Number of types of household asset	-0.023***	-0.022**	-0.023**	-0.028***	-0.029**	-0.028**	-0.023	-0.031	-0.005
	(0.008)	(0.010)	(0.011)	(0.009)	(0.013)	(0.013)	(0.016)	(0.020)	(0.026)
Number of children below age of 17	-0.204***	-0.247***	-0.190***	-0.212***	-0.224***	-0.204***	-0.159***	-0.192**	-0.164**
	(0.032)	(0.046)	(0.044)	(0.042)	(0.061)	(0.059)	(0.056)	(0.085)	(0.077)
Government support		0.196***			0.059			0.164***	
		(0.035)			(0.053)			(0.057)	
Losing job (1 = yes)							3.134***	2.850***	3.900***
							(0.158)	(0.180)	(0.478)
Country dummy (1 = Georgia)	-0.861***	-1.270***	-0.828***						
	(0.132)	(0.200)	(0.187)						
Wave dummy (1 = wave 2)	0.024			-0.002			0.499***		
	(0.049)			(0.067)			(0.082)		
Regional dummy	+	+	+	+	+	+	+	+	+
Constant	0.671***	0.564**	0.644***	0.898***	0.862***	0.882***	-1.177***	-1.287***	-1.053**
	(0.168)	(0.234)	(0.238)	(0.226)	(0.318)	(0.317)	(0.307)	(0.453)	(0.456)
Observations	6,950	3,475	3,475	3,656	1,828	1,828	3,294	1,647	1,647
LR	1,222	639.6	612.2	640	321	323.1	836.6	538.8	348.9
Prob > chi 2	0	0	0	0	0	0	0	0	0
Log likelihood	-8,247	-4,105	-4,123	-4,309	-2,155	-2,152	-3,550	-1,657	-1,739

Note: Standard errors are given in parenthesis. ***, **, and * indicate the significance levels at 1 percent, 5 percent, and 10 percent, respectively.

Source: Authors' estimations based on household level MICS Plus data (UNICEF 2021) for 2020-2021. https://mics.unicef.org/mics-plus/mics-plus-results (retrieved 23 January 2022).

3.6 CONCLUSION

This study examined household characteristics in explaining the probability of income decline experienced during the COVID-19 pandemic in two CAREC economies: Georgia and Mongolia. Two waves of the UNICEF MICS Plus household survey data were used for empirical investigations. Given the dummy variable as an indicator of whether a household income is declining, the binary response probit model was applied. Furthermore, a scale of income decline was explored using the ordered probit model.

Generally, empirical findings are in line with the results of other studies. The results show that families with an older household head are better able to deal with a decline in income, while those with a male household head are more likely to experience income decline, which is probably related to job loss practices. The estimation results underline the positive effect of government benefit payments in sustaining income. This is consistent with studies that emphasize the role of government benefit payments for income protection (Brewer and Gardiner 2020, Cantó et al. 2022).

The income level of households approximated by the number of assets shows that wealthier families are less exposed to the risk of income reduction, which indicates the unequal effect of the pandemic. Low-income households may not have enough savings to protect them from income fall (Bundervoet, Dávalos, and Garcia 2022). The empirical model on the magnitude of income decline indicated that households headed by a female were less likely to experience a considerable drop in income. To some extent, this contradicts other empirical studies that state that female-headed households are more exposed to income shocks; this might be related to the wage employment of females. Indeed, one of the main limitations of this study is that it does not include detailed information about household income sources and employment types. This would allow us to disaggregate households and examine income shock by types of household and government payments. Further research on this topic using pre- and post-COVID data would provide more evidence on income and employment shocks.

Another interesting result is that rural and urban locations show different results for the two countries: in Mongolia, households in urban areas have a higher probability of income decline; while in Georgia, by contrast, they are less likely to experience a drop in income. Although the scope of this study does not provide a detailed analysis of urban and rural populations under the conditions of the COVID-19 impact, this finding suggests that rural households hold a different position in the face of income and job loss shock during COVID-19.

The empirical findings of this study have several policy implications. First, although analysis does not include the monetary value of government benefits, evidence informs about the critical importance of government support mechanisms in sustaining household income during the crisis and the post-pandemic recovery. In the context of the post-pandemic recovery, social support policies should continue so as not to exacerbate the income shock effect. Second, the varied effects of income decline over the wealth position of households emphasize the potential risk of unequal recovery from the COVID-19 pandemic. The potential growth of inequality highlights the importance of government policy with a strong focus on inclusion and empowerment. The effects of income decline by gender and household location necessitates a focus on inclusive growth and recovery in designing government policy. Third, although this study is based on survey data during the pandemic and can therefore be considered a short-term effect of the crisis, over a longer period economic trends may indicate gradual adaptation and recovery. However, the loss of learning during the pandemic increases the probability of inequality in the longer term; this requires government measures in the field of access to education with a special focus on vulnerable groups.

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ANNEX

Table 1A. Estimation results for probit models on probability of income reduction (average marginal effects)

Variables	Total			Mongolia			Georgia		
	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2
Gender of household head	0.040***	0.060***	0.020			0.012	0.039**	0.033	0.047**
	(0.014)	(0.020)	(0.020)			(0.031)	(0.016)	(0.022)	(0.023)
Age of household head	-0.005***	-0.005***	-0.005***	-0.006***	-0.006***	-0.007***	-0.002***	-0.002**	-0.002***
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Household size	0.067***	0.065***	0.064***	0.081***	0.080***	0.068***	0.035***	0.028***	0.042***
	(0.005)	(0.007)	(0.007)	(0.005)	(0.008)	(0.010)	(0.006)	(0.008)	(0.008)
Number of types of internet connection	0.031***	0.034***	0.021	-0.045***	-0.042***	0.047***	0.000	0.012	-0.026
	(0.008)	(0.011)	(0.013)	(0.010)	(0.014)	(0.018)	(0.009)	(0.011)	(0.017)
Number of types of household asset	-0.005***	-0.006***	-0.003	0.016***	0.016***	-0.003	-0.004	-0.005	-0.001
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)
Number of children below age of 17	-0.038***	-0.052***	-0.033***	-0.056***	-0.059***	-0.041***	-0.016	-0.023	-0.016
	(0.007)	(0.011)	(0.010)	(0.008)	(0.011)	(0.014)	(0.010)	(0.014)	(0.014)
Wave number = 2	-0.135***			-0.001			-0.046***		
	(0.011)			(0.012)			(0.014)		
Government support		0.047***			0.010			0.022**	
		(0.008)			(0.009)			(0.009)	
Losing job (1 = yes)							0.625***	0.545***	0.796***
							(0.021)	(0.020)	(0.066)
Regional dummy	+	+	+	+	+	+	+	+	+
Observations	6,984	3,492	3,492	3,722	1,861	1,844	3,295	1,647	1,648

Note: Standard errors are given in parenthesis. ***, **, and * indicate the significance levels at 1 percent, 5 percent and 10 percent, respectively.

Source: Authors' estimations based on household level MICS Plus data (UNICEF 2021) for 2020-2021. https://mics.unicef.org/mics-plus/mics-plus-results (retrieved 23 January 2022).

Table 2A. Estimation results of ordered probit models on probability of income reduction (conditional marginal effects)

Percentage of household total income lost	Total			Mongolia			Georgia		
	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2
Gender of household head									
0-10 percent	0.0023	0.0074**	-0.0072	0.0035	0.0108*	-0.0076	-0.0003	0.0037	-0.0093
	(0.003)	(0.004)	(0.006)	(0.005)	(0.006)	(0.009)	(0.003)	(0.003)	(0.007)
11-25 percent	0.0075	0.0267**	-0.0210	0.0076	0.0306*	-0.0138	-0.0017	0.0206	-0.0443
	(0.010)	(0.012)	(0.016)	(0.012)	(0.016)	(0.017)	(0.016)	(0.018)	(0.030)
26-50 percent	0.0051	0.0235**	-0.0100	0.0087	0.0350*	-0.0156	-0.0007	0.0154	-0.0010
	(0.007)	(0.011)	(0.008)	(0.013)	(0.019)	(0.019)	(0.007)	(0.014)	(0.003)
51-75 percent	-0.0049	-0.0182**	0.0134	-0.0063	-0.0276*	0.0103	0.0010	-0.0116	0.0259
	(0.006)	(0.008)	(0.010)	(0.010)	(0.015)	(0.013)	(0.009)	(0.010)	(0.018)
76-99 percent	-0.0062	-0.0239**	0.0158	-0.0070	-0.0245*	0.0144	0.0014	-0.0205	0.0239
	(0.008)	(0.011)	(0.012)	(0.011)	(0.013)	(0.018)	(0.013)	(0.018)	(0.016)
100 percent	-0.0039	-0.0154**	0.0090	-0.0064	-0.0243*	0.0123	0.0004	-0.0076	0.0048
	(0.005)	(0.007)	(0.007)	(0.010)	(0.013)	(0.015)	(0.004)	(0.007)	(0.004)
Age of household head									
0-10 percent	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	-0.0000	0.0001	-0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
11-25 percent	0.0003	0.0005	0.0000	0.0002	0.0002	0.0002	-0.0000	0.0004	-0.0008
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
26-50 percent	0.0002	0.0004	0.0000	0.0002	0.0002	0.0002	-0.0000	0.0003	-0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
51-75 percent	-0.0002	-0.0003	-0.0000	-0.0001	-0.0002	-0.0002	0.0000	-0.0002	0.0005
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
76-99 percent	-0.0002	-0.0004	-0.0000	-0.0001	-0.0002	-0.0002	0.0000	-0.0004	0.0005
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
100 percent	-0.0001	-0.0003	-0.0000	-0.0001	-0.0002	-0.0002	0.0000	-0.0002	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)

Household size									
0-10 percent	0.0012	0.0016	-0.0002	0.0005	0.0010	-0.0011	0.0027**	0.0033**	0.0013
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)
11-25 percent	0.0039	0.0057	-0.0004	0.0010	0.0028	-0.0021	0.0145***	0.0181***	0.0061
	(0.003)	(0.004)	(0.005)	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)	(0.010)
26-50 percent	0.0027	0.0050	-0.0002	0.0012	0.0032	-0.0023	0.0060**	0.0135***	0.0001
	(0.002)	(0.004)	(0.002)	(0.004)	(0.006)	(0.006)	(0.002)	(0.005)	(0.001)
51-75 percent	-0.0025	-0.0039	0.0003	-0.0008	-0.0025	0.0015	-0.0084***	-0.0102***	-0.0036
	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.004)	(0.003)	(0.004)	(0.006)
76-99 percent	-0.0032	-0.0051	0.0003	-0.0009	-0.0023	0.0022	-0.0113***	-0.0180***	-0.0033
	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.006)	(0.004)	(0.006)	(0.005)
100 percent	-0.0020	-0.0033	0.0002	-0.0009	-0.0022	0.0018	-0.0035**	-0.0067***	-0.0007
	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.005)	(0.001)	(0.002)	(0.001)
Number of types of internet connection									
0-10 percent	0.0012	0.0018	0.0012	-0.0003	-0.0001	-0.0009	0.0031*	0.0022	0.0050
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.002)	(0.002)	(0.005)
11-25 percent	0.0040	0.0065	0.0036	-0.0006	-0.0002	-0.0016	0.0167*	0.0121	0.0237
	(0.005)	(0.006)	(0.010)	(0.006)	(0.009)	(0.010)	(0.009)	(0.009)	(0.021)
26-50 percent	0.0027	0.0057	0.0017	-0.0007	-0.0003	-0.0018	0.0069*	0.0090	0.0005
	(0.004)	(0.005)	(0.005)	(0.007)	(0.010)	(0.011)	(0.004)	(0.007)	(0.002)
51-75 percent	-0.0026	-0.0044	-0.0023	0.0005	0.0002	0.0012	-0.0097*	-0.0068	-0.0138
	(0.003)	(0.004)	(0.006)	(0.005)	(0.008)	(0.007)	(0.005)	(0.005)	(0.012)
76-99 percent	-0.0033	-0.0058	-0.0027	0.0005	0.0002	0.0017	-0.0131*	-0.0120	-0.0128
	(0.004)	(0.006)	(0.008)	(0.006)	(0.007)	(0.010)	(0.007)	(0.009)	(0.011)
100 percent	-0.0021	-0.0038	-0.0016	0.0005	0.0002	0.0014	-0.0040*	-0.0045	-0.0026
	(0.003)	(0.004)	(0.004)	(0.005)	(0.007)	(0.008)	(0.002)	(0.003)	(0.002)
Number of types of household asset									
0-10 percent	0.0013***	0.0009**	0.0016**	0.0013***	0.0010*	0.0018**	0.0011**	0.0009*	0.0015
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
11-25 percent	0.0041***	0.0032**	0.0048**	0.0029***	0.0027*	0.0032**	0.0060**	0.0048**	0.0074
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.006)
26-50 percent	0.0028***	0.0028**	0.0023**	0.0034***	0.0031*	0.0036**	0.0025**	0.0036**	0.0002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)
51-75 percent	-0.0026***	-0.0022**	-0.0031**	-0.0025***	-0.0024*	-0.0024**	-0.0035**	-0.0027**	-0.0043
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)
76-99 percent	-0.0033***	-0.0029**	-0.0036**	-0.0027***	-0.0022*	-0.0034**	-0.0047**	-0.0047**	-0.0040
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
100 percent	-0.0021***	-0.0019**	-0.0021**	-0.0025***	-0.0021*	-0.0029**	-0.0014**	-0.0018*	-0.0008
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)

Number of children below age of 17									
0-10 percent	-0.0021	-0.0023	-0.0014	-0.0013	-0.0017	-0.0010	-0.0036**	-0.0051**	-0.0015
	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.003)
11-25 percent	-0.0069	-0.0082	-0.0040	-0.0028	-0.0049	-0.0019	-0.0194**	-0.0284***	-0.0069
	(0.005)	(0.006)	(0.007)	(0.005)	(0.007)	(0.007)	(0.009)	(0.011)	(0.015)
26-50 percent	-0.0046	-0.0072	-0.0019	-0.0032	-0.0056	-0.0021	-0.0080**	-0.0212**	-0.0002
	(0.003)	(0.005)	(0.004)	(0.006)	(0.008)	(0.008)	(0.004)	(0.008)	(0.001)
51-75 percent	0.0044	0.0056	0.0026	0.0023	0.0044	0.0014	0.0113**	0.0160***	0.0041
	(0.003)	(0.004)	(0.005)	(0.004)	(0.006)	(0.005)	(0.005)	(0.006)	(0.009)
76-99 percent	0.0056	0.0074	0.0030	0.0025	0.0039	0.0019	0.0151**	0.0283***	0.0037
	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)	(0.008)	(0.007)	(0.011)	(0.008)
100 percent	0.0036	0.0048	0.0017	0.0023	0.0039	0.0017	0.0046**	0.0105**	0.0008
	(0.002)	(0.003)	(0.003)	(0.004)	(0.005)	(0.006)	(0.002)	(0.004)	(0.002)
Wave dummy (1 = wave 2)									
0-10 percent	0.0074***			-0.0035			0.0110***		
	(0.002)			(0.003)			(0.003)		
11-25 percent	0.0234***			-0.0078			0.0559***		
	(0.007)			(0.008)			(0.014)		
26-50 percent	0.0152***			-0.0090			0.0206***		
	(0.005)			(0.009)			(0.006)		
51-75 percent	-0.0151***			0.0065			-0.0325***		
	(0.005)			(0.006)			(0.009)		
76-99 percent	-0.0190***			0.0072			-0.0423***		
	(0.006)			(0.007)			(0.011)		
100 percent	-0.0119***			0.0066			-0.0128***		
	(0.004)			(0.007)			(0.004)		
Government support									
0-10 percent		0.0004			0.0033			0.0010	
		(0.001)			(0.002)			(0.001)	
11-25 percent		0.0016			0.0095			0.0053	
		(0.004)			(0.006)			(0.007)	
26-50 percent		0.0014			0.0109			0.0039	
		(0.004)			(0.007)			(0.005)	
51-75 percent		-0.0011			-0.0086			-0.0030	
		(0.003)			(0.005)			(0.004)	
76-99 percent		-0.0014			-0.0076			-0.0052	
		(0.004)			(0.005)			(0.007)	
100 percent		-0.0009			-0.0075			-0.0019	
		(0.003)			(0.005)			(0.003)	

Losing job(1 = yes, 0 = no)									
0-10 percent							-0.0259*** (0.005)	-0.0242*** (0.006)	-0.0307*** (0.008)
11-25 percent							-0.1378*** (0.015)	-0.1340*** (0.018)	-0.1462*** (0.028)
26-50 percent							-0.0571*** (0.010)	-0.1003*** (0.016)	-0.0033 (0.011)
51-75 percent							0.0802*** (0.010)	0.0756*** (0.012)	0.0855*** (0.018)
76-99 percent							0.1075*** (0.012)	0.1334*** (0.018)	0.0789*** (0.016)
100 percent							0.0331*** (0.005)	0.0495*** (0.009)	0.0159*** (0.006)
Observations	2,988	1,702	1,286	1,620	887	733	1,368	815	553

Note: Standard errors are given in parenthesis. ***, **, and * indicate the significance levels at 1 percent, 5 percent, and 10 percent, respectively.

Source: Authors' estimations based on household level MICS Plus data (UNICEF 2021) for 2020-2021. https://mics.unicef.org/mics-plus/mics-plus-results (retrieved 23 January 2022)

Table 3A. Estimation results for multinomial probit models on probability of income reduction (average marginal effects)

Income of household is decreased	Total			Mongolia			Georgia		
	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2	Total	Wave 1	Wave 2
Gender of household head									
In neither of the two waves (base).	-0.0552***	-0.0564**	-0.0556**	-0.0593**	-0.0625*	-0.0547*	-0.0654***	-0.0565*	-0.0794***
	(0.015)	(0.022)	(0.022)	(0.023)	(0.033)	(0.033)	(0.021)	(0.031)	(0.031)
In wave 1, but not in wave 2.	0.0335**	0.0365*	0.0311	0.0310	0.0305	0.0310	0.0344	0.0372	0.0128
	(0.014)	(0.020)	(0.019)	(0.020)	(0.029)	(0.028)	(0.021)	(0.031)	(0.028)
In wave 2, but not in wave 1.	-0.0097	-0.0110	-0.0084	-0.0317**	-0.0333*	-0.0303	0.0089	0.0081	0.0226
	(0.009)	(0.013)	(0.013)	(0.014)	(0.020)	(0.020)	(0.014)	(0.018)	(0.021)
In both waves.	0.0315**	0.0309	0.0329	0.0600**	0.0653*	0.0540	0.0221	0.0112	0.0439
	(0.015)	(0.021)	(0.021)	(0.024)	(0.034)	(0.034)	(0.021)	(0.031)	(0.032)
Age of household head									
In neither of the two waves (base).	0.0061***	0.0057***	0.0059***	0.0075***	0.0074***	0.0074***	0.0037***	0.0031***	0.0042***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
In wave 1, but not in wave 2.	-0.0002	-0.0000	-0.0001	0.0005	0.0007	0.0004	-0.0006	0.0001	-0.0010
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
In wave 2, but not in wave 1.	-0.0005	-0.0006	-0.0004	-0.0011**	-0.0012*	-0.0009	0.0000	-0.0002	0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
In both waves.	-0.0054***	-0.0051***	-0.0053***	-0.0069***	-0.0068***	-0.0069***	-0.0032***	-0.0031***	-0.0033***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Household size									
In neither of the two waves (base).	-0.0857***	-0.0820***	-0.0828***	-0.0788***	-0.0771***	-0.0777***	-0.0700***	-0.0581***	-0.0796***
	(0.006)	(0.008)	(0.008)	(0.008)	(0.012)	(0.012)	(0.008)	(0.012)	(0.012)
In wave 1, but not in wave 2.	0.0120**	0.0118*	0.0094	0.0049	0.0083	0.0004	0.0104	-0.0041	0.0157
	(0.005)	(0.007)	(0.007)	(0.007)	(0.010)	(0.010)	(0.008)	(0.012)	(0.010)
In wave 2, but not in wave 1.	0.0063*	0.0073	0.0057	0.0024	0.0008	0.0028	0.0088*	0.0127*	0.0056
	(0.003)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.005)	(0.007)	(0.008)
In both waves.	0.0675***	0.0629***	0.0677***	0.0715***	0.0680***	0.0745***	0.0508***	0.0495***	0.0583***
	(0.005)	(0.007)	(0.007)	(0.008)	(0.011)	(0.011)	(0.007)	(0.011)	(0.011)

Number of types of internet connection									
In neither of the two waves (base).									
In wave 1, but not in wave 2.	-0.0368***	-0.0297**	-0.0458***	-0.0619***	-0.0601***	-0.0643***	-0.0056	-0.0062	0.0029
	(0.009)	(0.012)	(0.015)	(0.014)	(0.020)	(0.020)	(0.013)	(0.015)	(0.023)
In wave 2, but not in wave 1.	0.0166**	0.0122	0.0224*	0.0113	0.0100	0.0127	0.0166	0.0111	0.0397*
	(0.008)	(0.010)	(0.013)	(0.012)	(0.017)	(0.017)	(0.012)	(0.015)	(0.021)
In both waves.	-0.0087	-0.0108	-0.0056	-0.0067	-0.0113	-0.0018	-0.0147*	-0.0115	-0.0279*
	(0.005)	(0.007)	(0.009)	(0.009)	(0.012)	(0.012)	(0.008)	(0.009)	(0.016)
	0.0289***	0.0283**	0.0290**	0.0573***	0.0614***	0.0533***	0.0037	0.0066	-0.0147
	(0.009)	(0.011)	(0.014)	(0.014)	(0.020)	(0.019)	(0.012)	(0.015)	(0.023)
Number of types of household asset									
In neither of the two waves (base).									
In wave 1, but not in wave 2.	0.0077***	0.0073***	0.0077***	0.0097***	0.0095***	0.0097***	0.0041	0.0066	-0.0003
	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.004)	(0.005)	(0.006)
In wave 2, but not in wave 1.	-0.0049***	-0.0050**	-0.0047*	-0.0066***	-0.0064**	-0.0067**	0.0006	-0.0022	0.0016
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.006)
In both waves.	-0.0002	0.0001	-0.0006	-0.0001	0.0002	-0.0004	-0.0001	0.0011	0.0009
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)
	-0.0026	-0.0025	-0.0025	-0.0029	-0.0032	-0.0026	-0.0046	-0.0055	-0.0022
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.006)
Number of children below age of 17									
In neither of the two waves (base).									
In wave 1, but not in wave 2.	0.0550***	0.0665***	0.0510***	0.0575***	0.0627***	0.0544***	0.0356***	0.0380*	0.0408**
	(0.008)	(0.012)	(0.011)	(0.011)	(0.015)	(0.015)	(0.013)	(0.020)	(0.019)
In wave 2, but not in wave 1.	-0.0155**	-0.0205**	-0.0135	-0.0114	-0.0157	-0.0082	-0.0108	0.0015	-0.0158
	(0.007)	(0.010)	(0.010)	(0.009)	(0.013)	(0.013)	(0.013)	(0.020)	(0.017)
In both waves.	-0.0071	-0.0066	-0.0069	-0.0108	-0.0111	-0.0112	0.0005	-0.0027	0.0022
	(0.005)	(0.007)	(0.007)	(0.007)	(0.010)	(0.009)	(0.009)	(0.011)	(0.013)
	-0.0324***	-0.0394***	-0.0306***	-0.0352***	-0.0359**	-0.0350**	-0.0253**	-0.0368**	-0.0272
	(0.007)	(0.011)	(0.010)	(0.010)	(0.015)	(0.014)	(0.012)	(0.018)	(0.017)

Wave dummy (1 = wave 2)									
In neither of the two waves (base).	-0.0060			0.0001			-0.1002***		
	(0.012)			(0.017)			(0.018)		
In wave 1, but not in wave 2.	0.0022			0.0001			0.0200		
	(0.011)			(0.014)			(0.018)		
In wave 2, but not in wave 1.	-0.0003			0.0006			-0.0091		
	(0.007)			(0.010)			(0.012)		
In both waves.	0.0041			-0.0008			0.0892***		
	(0.011)			(0.016)			(0.018)		
Government support									
In neither of the two waves (base).		-0.0485***			-0.0217			-0.0304**	
		(0.009)			(0.013)			(0.013)	
In wave 1, but not in wave 2.		0.0186**			0.0086			0.0017	
		(0.008)			(0.011)			(0.013)	
In wave 2, but not in wave 1.		-0.0050			0.0084			-0.0047	
		(0.005)			(0.008)			(0.008)	
In both waves.		0.0349***			0.0047			0.0333***	
		(0.008)			(0.013)			(0.012)	
Losing job(1 = yes)									
In neither of the two waves (base).							-0.7284***	-0.6976***	-0.7135***
							(0.037)	(0.039)	(0.132)
In wave 1, but not in wave 2.							0.2225***	0.4204***	-0.4775***
							(0.025)	(0.032)	(0.107)
In wave 2, but not in wave 1.							0.0276*	-0.1434***	0.3288***
							(0.016)	(0.022)	(0.046)
In both waves.							0.4783***	0.4206***	0.8622***
							(0.024)	(0.031)	(0.086)
Observations	6,950	3,475	3,475	3,656	1,828	1,828	3,294	1,647	1,647

Note: Standard errors are given in parenthesis. ***, **, and * indicate the significance levels at 1 percent, 5 percent, and 10 percent, respectively.

Source: Authors' estimations based on household level MICS Plus data (UNICEF 2021) for 2020-2021. https://mics.unicef.org/mics-plus/mics-plus-results (retrieved 23 January 2022)

PART II

NEW IMPERATIVES FOR GREEN ECONOMIC GROWTH

Chapter 4

CORPORATE SOCIAL RESPONSIBILITY AND SUSTAINABLE ECONOMIC DEVELOPMENT IN KAZAKHSTAN

Implications for Mongolia

Anastassiya Vorobyeva, Yelif Ulagpan, Ablay Dosmaganbetov, Aigerim Tleukhanova, Akbota Batyrkhan, Stefanos Xenarios

4.1 INTRODUCTION

Pictures from: https://rabbit.bigbigwork.com/home

The United Nations adopted the sustainable development goals (SDGs) in 2015. These goals — also called global goals — call for action towards combating poverty, protecting ecosystem services, and ensuring peace and prosperity by 2030 for all people. Ban Ki-moon, former United Nations Secretary-General, called the business a vital partner in achieving the SDGs (Sachs 2015). The private sector and firms will anticipate the SDGs through their core activities, set ambitious goals, and communicate transparently about their performance (GRI 2015). There is currently an ongoing discussion on corporate social responsibility (CSR), the achievement of SDGs and broadly sustainable performance in the corporate sector worldwide. The CSR significance has become more profound in extractive and mining sectors, where the environmental impacts and ecological footprints are higher than in other industries (OECD 2017). Kazakhstan and Mongolia are typical countries that host highly intensified extractive and mining sectors, with noticeable environmental impacts on both a local and regional scale.

In the case of Kazakhstan, the first prerequisites for the development of CSR appeared in the mid-1990s with the arrival of foreign companies on the market, demonstrating a commitment to social responsibility. Today, the awareness of the population and local companies about the basic CSR principles has increased remarkably; however, a CSR benchmark in Kazakhstan has not yet been formed (OECD 2014). A mainstream type of CSR in Kazakhstan is an investment in the socioeconomic development of the company's region Smirnova 2012). However, in most situations, CSR procedures lack transparency, making it strenuous to monitor and evaluate program aims and outcomes accurately.

In addition, one of the most significant issues in Kazakhstan is a lack of understanding of the CSR concept. According to a study on 'Corporate Social Responsibility in Kazakhstan: Situation, Problems, and Development Prospects' conducted in 2013 by the SANGE Research Center for the Eurasia Foundation of Central Asia (EFCA), CSR has excellent potential for development in Kazakhstan, but it will take much effort from both state and civil sectors. As per the study's findings, on average, 63 percent of corporate representatives in Kazakhstan demonstrated awareness of CSR, implying that the situation has improved by only 3 percent since 2008. As noted by UNDP in 2008, 60 percent of companies knew about CSR policies and the overall framework (Sange Research Center 2013). Large enterprises in Kazakhstan are generally aware of all CSR issues, whereas small businesses are the least informed (47 percent) (Sange Research Center 2013).

As for the policies regulating CSR in Kazakhstan, the country does not have a specific body regulating the relevant activities. At the same time, different CSR activities are subject to various normative legal acts. Fundamental human rights, such as the right to free and safe work, rest, and labor disputes, are enshrined in the Universal Declaration of Human Rights, the Constitution, and Kazakhstan's Labor Code. The Tax Code defines economic incentives for businesses to participate in developing the social sphere, charity, and people with disabilities. The Environmental Code regulates the use and extraction of natural resources by considering the impact of enterprises on the environment (Atameken and EFCA 2014).

Like Kazakhstan, the industrial sector is integral to Mongolia's economy. Since it transitioned to a market-based economy in the early 1990s, the mining sector (mainly mineral and coal) has become the main engine of GDP growth and foreign direct investment (FDI) (Ulagpan 2021). The significance of CSR in achieving SDGs is widely acknowledged internationally and nationally in extractive sectors like mining. This is especially the case for countries rich in natural resources, such as Mongolia and Kazakhstan. In the case of Mongolia, CSR is a relatively new and evolving concept; therefore, there is no clear Mongolian definition of CSR. The literature review reveals that CSR in Mongolia is at an early stage and broadly understood from a philanthropic perspective (that is, donations and sponsorship). In addition, according to Altanchimeg and Battuya (2019), most companies lack transparency in their environmental activities.

Despite some progress in CSR in Mongolia over the past years, there are significant challenges in implementing CSR properly in the local context. A study — interview with 49 companies, five business associations, and five non-governmental organizations (NGOs) — conducted by the Corporate Governance Development Center (CGDC) of Mongolia shows that, although almost all the surveyed companies acknowledge the importance of responsible business and are aware of the CSR term, only 13 percent stated CSR as pertinent to their business and 28 percent as a measure to take part in the environmental and social development of the country. The low level of CSR implementation is not just owing to a lack of knowledge, which results in a lack of awareness and support, but also to the country's weak legal and political environment.

Although there is a gradual rise in awareness of CSR reporting on a national level, the actual reporting is limited to only a few large-scale companies. Most small and medium-sized enterprises lack writing knowledge (CGDC 2017). CSR is perceived as a marketing tool for reporting companies on their overall strategy (namely, to boost company image and gain strategic advantages in the marketplace). On the other hand, the general public's perception of Mongolia is limited to donations to the poor and pollution reduction in the mining sector (Tudev and Lkhagvasuren 2011). In other words, the general public tends to see companies more positively or negatively based on companies' philanthropic activities rather than their broader sustainability performance (that is, not just financial, but also social and environmental).

From a much broader perspective, numerous other factors also explain the lack of reporting on CSR activities in Mongolia. Namely, the country's unstable economic situation, partly mirrored by currency fluctuations, is among the main obstacles to CSR implementation. This is hindered further by a lack of training and support from the state administration and political instability coupled with bureaucracy, lack of transparency, and risk of corruption. Also, unethical attitudes in companies and administration, lack of knowledge and support from the public and higher authorities, an unfavourable legal environment, and a lack of incentives affect the proper overall implementation of CSR in the Mongolian context (CGDC 2017).

In this regard, we explore whether policy changes are required to enhance extractive industries' CSR practices in Kazakhstan and Mongolia. We study both countries' existing CSR practices and corresponding regulatory acts. We apply indicators identified in the relevant literature review for assessing CSR initiatives while introducing qualitative approaches. The study outcomes are expected to reinforce the need to reformulate policies applicable to CSR and establish regulating bodies in both countries.

4.2 CORPORATE SOCIAL RESPONSIBILITY IN KAZAKHSTAN: CHALLENGES AND OPPORTUNITIES

The Republic of Kazakhstan (RK) is a former Soviet Republic, independent since 1991. Kazakhstan's economy has grown by 10 percent annually since gaining independence. The country's economy relies heavily on commodity exports, particularly oil and gas. Thus, the oil and gas industry is vital to Kazakhstan's economic growth and contributes to about 20 percent of its GDP and nearly 70 percent of its exports (National Energy Report 2019). The industry also accounts for almost 53.8 percent of the economy's total industrial output. The petrochemical sector has a significant role in attracting FDIs; from 2004 to 2014 this industry accounted for 22 percent of FDIs in Kazakhstan. Corporate governance (CG), management, and overall CSR policies are significant for attracting foreign investment and promoting the country's economic and social development.

Another critical pillar of the Kazakh economy is the mining and quarrying sector. In 2009, this sector (excluding oil and gas production) contributed 4.9 percent to the country's GDP. The code of Kazakhstan on geological exploration, enhanced by the subsoil and subsoil use (SSU) code, has transformed the operation of mining industries from a contractual to a licensing system since June 2018. The code applied to all mining industries except for uranium — it was still contractual. The code was modelled on the model used in Western Australia. The objective was to increase geological investigation and relieve subsoil users of administrative difficulties. According to the Fraser Institute's 2017 Annual Survey of Mining Companies, these initiatives made Kazakhstan 'the most attractive Central Asian jurisdiction in terms of investment attractiveness.' Kazakhstan ranked 24th out of 73 in 2016 (Kazakhstan Mining Law 2020).

The state balance of Kazakhstan consists of 102 types of mineral raw material reserves, including 40 solid minerals. Between 2000 and 2017, US$79 billion was invested in the mining sector of Kazakhstan. Despite the vital role in the overall development of economic growth, companies in the given sectors are accused of inadequately contributing to societal development. People expect more from the sector as economic disparity and environmental awareness grow. Governments and businesses in the former USSR's resource-rich countries have been accused of excessive mismanagement and poor transparency in operations and decision-making processes (Kalyuzhnova et al. 2007).

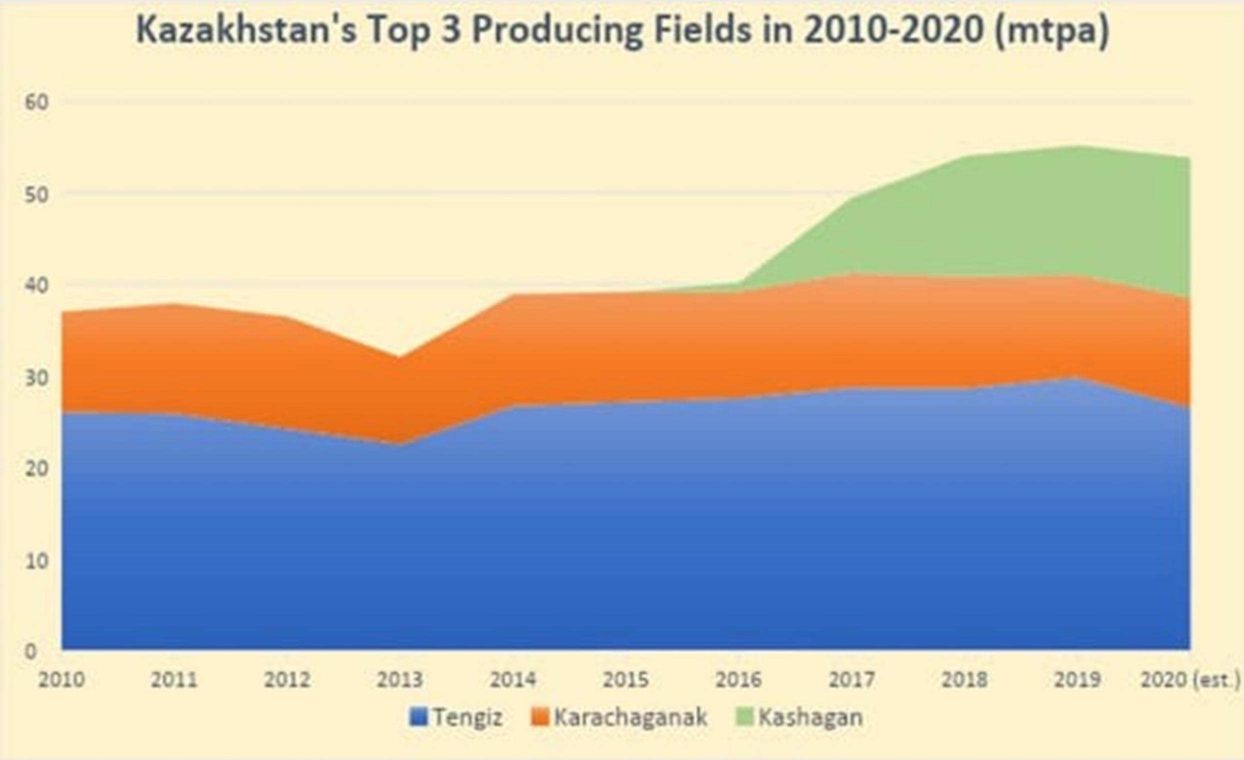
The country is characterized as a transition economy with low CSR expectations and a highly controlled economic environment. The social and environmental criteria are ill-founded, while Kazakhstan's CG is developing. The laws governing joint-stock companies, accounting and financial reporting, securities markets, banks, and banking activity present some comprehensive CG regulatory rules (EBRD 2014). In 2005 the CG code was enacted to increase accountability, transparency, fairness, and overall professionalism in CG activities on a legal and regulatory front. The role of the public sector of Kazakhstan in CSR is complex, yet it is an emerging field.

4.2.1 Mining and extractive industrial cases of corporate social responsibility in Kazakhstan

The oil and gas industry draws attention as an essential contributor to the national economy and an active CSR player. This industry supports different fields of the economy in Kazakhstan by also raising living standards. The tax revenues from the oil and gas industry have primarily supported the country's energy and electricity infrastructure, then telecommunication, transportation, construction of roads, and, more widely, the country's infrastructure.

The largest oil producer in Kazakhstan and the flagship oil and gas industry project is Tengizchevroil (TCO). The company is a joint Kazakh American venture engaged in the exploration, development, and production of petroleum and other associated products. TCO has several shareholders: Chevron (50 percent), KazMunaiGas (Kazakh national oil company with 20 percent), ExxonMobil (25 percent), and LukArco (5 percent). TCO makes up 30 percent of the national oil yield. Since 2010, Tengiz's field has been that of an essential crude oil producer, as shown in Figure 4.1. TCO regularly develops social investment programs and reports on them in its annual CSR report.

Figure 4.1. Top three producing fields in 2010-2020 in Kazakhstan (million tons per annum)



Source: Argus 2020

KAZ Minerals is another major mining company. It is a major copper producer in Kazakhstan (KAZ Minerals 2022). The company conducts responsible development and operation of mining assets in Kyrgyzstan, Russia, and Kazakhstan. The company's strategy and operating licences reflect responsible business behavior. The company aligns with the national environmental code regarding water conservation by introducing water-saving technologies in the mining fields. For instance, a new automated wash bay has been installed at the Aktogay mining area for all vehicles, including haul trucks and light vehicles. The automatic process reduces water consumption in washing by up to 70 percent compared with the previous method. Wastewater from vehicle washing is collected and treated for re-use. After a successful trial at Aktogay, similar equipment will be installed at the Bozshakol mining site. The company is also conducting a feasibility study to ensure there are sufficient water supplies at the Baimskaya copper project situated in the Chukotka region in Russia.

The other well-developed mining sector of Kazakhstan is uranium. Kazakhstan has been the world leader in natural uranium mining starting from 2009. The country has 12 percent of the world's uranium resources. The national uranium operator in the Republic of Kazakhstan is NAC Kazatomprom JSC. The company has priority rights to uranium reserves of the country (Kazatomprom 2022); it consistently implements measures to ensure productive relationships with the regions where it operates and strengthens its position as a socially responsible business. In 2019 Kazatomprom made significant progress toward improving its approach to sustainability management: the company developed a sustainability policy, which encompasses its business intentions and aspirations for sustainability. The three companies mentioned earlier — TCO, KAZ Minerals, and Kazatomprom — have been selected for the CSR review as representative cases of extractive industries in the country.

4.3 CORPORATE SOCIAL RESPONSIBILITY IN MONGOLIA: CHALLENGES AND OPPORTUNITIES

Mongolia has developed a CG code based on the principles and recommendations from major international institutions such as OECD and the International Finance Corporation (a member of the World Bank Group) within the context of the local background (Financial Regulatory Commission 2014). However, a comprehensive regulatory legal framework governing CSR is yet to be realized. Specifically, the law on minerals (which mainly regulates relations concerning licensing) and the law on subsoil are the primary legal and regulatory documents concerning the sector. However, the laws are not comprehensive enough to reflect the latest developments in the extractive industry.

There is currently no regulatory legal framework governing CSR in Mongolia; however, it is reflected in several key national policy documents. The 'Mongolia Sustainable Development Vision 2030,' approved by the 19th Resolution of the State Great Hural of Mongolia in 2016, contains a certain amount of CSR. Moreover, under the framework of the mining sector, it has explicitly set an objective to '...encourage transparent and accountable extractive industry and improve the competitiveness of the mining sector' and '...start development of large mining projects, and develop the infrastructure' by 2030 as well as '...implement projects on reliable water supply sources, and ensure full functionality of large mining projects' (Mongolia Sustainable Development Vision 2030, 2016). In addition, the head of the Cabinet Secretariat developed a 'State Policy on Corporate Social Responsibility' in 2018; however, it has not been enacted yet (Baljinnyam 2021).

In 2006, the Mongolian government approved adherence to the Extractive Industries Transparency Initiative (EITI). The 2012 resolution defined '...functions, responsibilities, and tasks assigned to central and local administrative bodies about the EITI' (UNECE 2018). The Mongolian Agency for Standardization and Metrology has issued a CSR Standard called MNS ISO 26000:2012 based on international standardization ISO 26000:2010 in 2012. However, most companies joined the initiative voluntarily, including banks and a few major mining companies with considerable foreign investment. According to the Business Council of Mongolia, larger domestic enterprises and companies with inward investments (made by investors outside the country) tend to disclose CSR information.

There has been a notable government effort to integrate environmental requirements into the legal and policy framework of the mining sector in Mongolia in the past decade. This is partly owing to international pressure and Mongolia's striving to meet its international commitments and contribute to global efforts to achieve SDGs. However, despite these efforts to green its economy and achieve environmental sustainability, it lacks specificity. A review of the mining-related sections of the primary policy documents shows that the current policy prioritizes expanding and creating a favourable investment in mining activities. Environmental aspects are not sufficiently highlighted and lack specific objectives (State Hural of Mongolia 2016, UNECE 2018). This, in turn, reflects that the country favours short-term economic benefits and interests in increasing its international competitiveness in the global market.

Although environmental legislation in Mongolia looks sound and coherent, weak law enforcement and delayed implementation pose a significant challenge. In addition, while Mongolia's commitment to global initiatives such as EITI, SDGs, and the adoption of environmental management systems has shown considerable progress on the surface, there are gaps in data availability and no systematic effort. International cooperation is vital in researching CSR implementation in Mongolia, including in the mining sector. One research survey conducted in 2018, which included 59 companies, found that while 29.3 percent have independent policies on CSR, more than half of them (67 percent) were reported to finance certain activities, and 63 percent were said to spend more than US$17,000 annually for these activities (it National Development Agency 2018). As mentioned earlier, there is no unified regulatory framework for CSR, but it is regulated by numerous relevant laws, including environmental protection, labor, tax, and land laws. Moreover, although companies have environmental policies, insufficient data disclosure is observed, particularly on environmental aspects and decision-making processes.

4.3.1 Mining and extractive industrial cases of corporate social responsibility in Mongolia

Unlike Kazakhstan, which primarily produces oil and gas, Mongolia's oil and gas sector is yet to be developed. Currently, one national oil company — Erdenes Methane — is owned by Erdenes Mongol (state-owned), which has established multiple subsidiaries and purchased stakes in many mining and non-mining projects. The oil company is mandated to explore unconventional oil and gas and aims to become a significant ecology-oriented energy producer in the region' (Bauer and Namkhaijantsan 2019). While this is a national company, other multinational companies are also interested in oil and gas exploration in Mongolia. For instance, two exploration companies (AIM-quoted Petro Matad and Elixir Energy) with links to a British multinational oil and gas company (BG Group) have begun their initial operations. Since it seems to be in its infancy, it is hard to judge; however, as far as available information on its website is concerned, there is no mention of CSR except for a vague mention of 'sustainability' phrasing.

On the other hand, the mining sector is well established in Mongolia, as the main minerals produced are coal, fluorite/fluorspar, copper, silver, gold, and other metallic ores. Although coal is primarily for domestic use (energy production), a large part (90 per cent) of Mongolia's mining exports (mainly natural resources such as iron ore, copper, and gold) goes to its southern neighbour — China (Ulagpan 2021). Mongolia's mining sector is not just an integral part of its economic growth; it has also been a critical source of FDI. While in 2019, the mining sector accounted for 67 per cent of FDI (Tsogtochir and Park 2021), it reached 71 per cent according to the latest data from the National Statistics Office of Mongolia (2021).

Major mining projects in Mongolia are located in a mineral-rich province (aimag) — Omnogovi, in the South Govi region, north of the Mongolia-China border. For the current study, three major mining projects were selected: Erdenes-Tavantolgoi (ETT) (coal), Oyu Tolgoi (gold, copper, and silver), and Tavantolgoi Joint Stock Company (TT JSC) (coal). The former one, ETT, is one of the largest reserves of untapped coking and thermal coal deposits. The latter is also one of the major copper and gold deposits globally. While state-run company Erdenes Mongol entirely owns Tavantolgoi, Oyu Tolgoi is jointly owned by Erdenes OT LLC (a subsidiary of Erdenes Mongol) on behalf of the Government of Mongolia and Canadian-based Turquoise Hill Resources, with 34 percent and 66 percent shares, respectively. Rio Tinto, an Australian multinational and the second-largest metals and mining corporation globally, shares half of Turquoise Hill's interest (66 percent) and manages OT on behalf of the partnership (Oyu Tolgoi 2017). TT JSC has been operated as a locally owned joint company since 1995 in Omnogovi aimag, which owns half (51 percent) of the total shares, and the remaining is allocated among Ajnai Corporation LLC (19.73 percent), Shandas Impex LLC (16.31 percent), and other small stakeholders (12.96 percent).

Based on the available official reports from 2003 to 2020 on the website of OT, it can be seen that CSR is implemented by supporting local development and environmental protection. For example, in environmental protection, the company aims to '...achieve a pure positive influence to offset the mining activities.' Since 2015, it has started implementing various projects to reduce GHG emissions and energy-saving initiatives, such as halting the use of diesel generators for remote infrastructures at several mine sites (Turquoise Hill 2020).

In addition, the OT firm is organizing monitoring programs (water, air, and soil quality; flora and fauna), biodiversity (antipoaching agenda), land management (rehabilitation), and community support programs such as funding for new educational and healthcare facilities, and construction of new water supply systems (Tolgoi 2017). In the case of ETT JSC, the social responsibility is focused on various community projects (cultural, educational, health, and so on) and contribution to local construction projects to some extent (Erdenes-Tavantolgoi 2020, Tavantolgoi 2020).

4.4 METHODOLOGY

We conduct qualitative analysis to compare CSR strategies of national and international extractive industries in Kazakhstan and Mongolia based on international benchmarks. The comparative analysis assesses CSR performance in the selected Kazakh and Mongolian extractive industries presented in the previous section and identifies the main bottlenecks. We employ key indicators to evaluate company performance based on the firms' CSR reports, published and internal state reports, international organizations and NGOs, and reports published by the EITI.

The EITI was also chosen as a benchmark guideline for selecting appropriate indicators for the CSR review and crosschecking our results with other similar studies. The EITI is an international network that promotes accountability and transparency among resource-rich countries worldwide. There are 52 active EITI members, including Kazakhstan and Mongolia (EITI 2022). The EITI requires its members to systematically provide data on revenue streams, taxes, contributions to socioeconomic development, environmental impact, and so on. As per the EITI standard, social and environmental development payments are designed to increase social welfare and enhance environmental awareness at local and regional levels. The contributions are made either in cash or in-kind transfers. Furthermore, companies may contribute to socioeconomic and environmental improvement voluntarily. Environmental impact is also considered one of the crucial aspects of the EITI 2019 standard, as extractive industries have significant adverse effects on the environment (EITI, 2019).

Two primary metadata sources were chosen for selecting the critical indicators for our analysis. These are the 'Guidance on Corporate Responsibility Indicators in Annual Reports' by UNCTAD (2008)' and the 'Saint-Gobain's Annual financial report and report on corporate social responsibility' (Saint-Gobain 2014). The indicators are divided into different groups, as shown in Table 4.1, related to social and economic investment, respect for human rights, promotion of diversity, and environmental considerations. Of particular interest is how international and local companies compare CSR strategies and how government policy addresses CSR issues.

We compare these indicators with the ones selected by the EITI standard to detect the relevance and validity of the selected parameters. Our findings are also compared with the outcomes of the EITI reports for the extractive industries in Kazakhstan and Mongolia to verify the robustness of our results.

Table 4.1. Indicators for corporate social responsibility assessment in the extractive industries of Kazakhstan and Mongolia

KEY CATEGORIES OF INDICATORS	DEFINITION	SOURCE
SOCIAL AND ECONOMIC INVESTMENT · REVENUES AND TAXES · PERCENTAGE OF CSR INVESTMENTS	Company contribution to the local and national economy	UNCTAD 2008
RESPECT FOR HUMAN RIGHTS AND PROMOTION OF DIVERSITY AND INCLUSION · DIVERSITY AND INCLUSION · PERCENTAGE OF LOCAL EMPLOYEES	Contribution to the gender diversification and development of human capital in local communities	UNCTAD 2008
ENVIRONMENTAL IMPACT · ENVIRONMENTAL CERTIFICATIONS	CONTRIBUTION TO THE RESTORATION OF THE NATURAL ENVIRONMENT	Compagnie de Saint-Gobain 2014

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4.5 RESULTS AND DISCUSSION

The impact evaluation findings indicate that the culture and practice of CSR in Kazakhstan have been developing more actively in the past five years. However, it is demonstrated mainly in large companies with an international profile in Kazakhstan and Mongolia. For instance, the development of CSR strategies, principles, and policies is provided by large companies on their websites for the general public. However, the theory can be very different from practice: for example, good CG can be well spent and documented on a company's website. Although, in practice, there is little information on the implementation of the activities in this direction — for example, what percentage of independent directors work in the company, how decisions are made, how company employees can get information, how community activists can reach the management and get financing for solving existing environmental or socioeconomic problems. The concern about Kazakhstani companies is caused by the fact that most CSR initiatives are focused on social issues and charity with a short-term impact. Mechanisms and practices to promote the SDGs, such as human rights protection, are poorly developed.

Official company reports in Kazakhstan are not always transparent, and, in some cases, the required data is not available. The socioeconomic-related indicator on the ratio between revenues and social tax shows that TCO has nearly threefold higher social tax than KazMineral and almost eight times higher than NAC Kazatomprom. The difference can be explained considerably by the enormous oil and gas activities undertaken by TCO in Kazakhstan.

Regarding the percentage of CSR expenditures to the company's revenue indicator, TCO and KazMinerals' annual spending for communities' social and economic development is about US$25 to US$27 million for 2020. Kazatomprom's share of revenue spent for CSR purposes is significantly lower and amounts to about US$3.6 million. However, if we look at the total revenues of all three companies and their share spent on CSR, we see that KazMinerals' contribution to CSR is the highest and equal to almost 2 percent of the revenues.

Regarding the two indicators — diversity and inclusion and the number of local employees — the findings reveal the initiatives on developing labor practices, human rights, and fair competition. The number of local employees is higher in KazMinerals than in TCO, 97 percent and 84 percent comparatively. No data on local employees in Kazatomprom is available. According to the World Bank, women represent an estimated 8 percent to 17 percent of the global mining workforce (WorldBank 2019). The number of female employees in the evaluated companies is higher than the global range. However, it is difficult to calculate the number of special needs or female employees in management positions.

Regarding the indicator on environmental certifications, TCO had adopted international standards with the American Association for Industrial Hygiene certification, while it was challenging to find data on certificates in KazMinerals. TCO undertakes environmental impact assessments (EIAs) for significant projects in Kazakhstan, and the company website has the most recent EIA on the proposed expansion project. TCO's constant monitoring reveals that air emissions are below acceptable ranges. As noted on the website, 'Our rotational villages have little impact on villages 80-100 kilometers away.' TCO stopped flaring in 2009 and has surpassed gas usage by 99 percent.

In the case of KazMinerals, environmental permits set annual emissions, water use, and water discharge. Charges are applied if levels surpass the limitations. The company's environmental, social, and governance policies show the total costs paid in case of relevant penalties (fines above US$100,000). In 2021 environmental and emissions fees were US$138,000 (and in 2019: around US$190,000.) Most of these administrative fees do not constitute fines for regulatory violations. Excess emissions charges are unrelated to environmental risk, tailings facility safety, or other environmental management systems.

In 2020, Kazatomprom invested about US$543,000 in implementing the corporate environmental and social action plan (ESAP). This plan consolidates EHS and social management systems in accordance with the requirements of the best international environmental practices and standards. The company successfully obtained a certificate from TÜV International Certification, confirming compliance with Kazatomprom's integrated occupational safety management system with DIN EN ISO 14001:2015 and DIN EN ISO 45001:2018 requirements (Kazatomprom 2020).

Kazakhstani business practices are slowly aligned with international standards as part of the current policy. It is also known that Kazakhstan seeks to join the OECD in the future, where there are guidelines on CSR policies in the industrial sector and, in particular, extractive and mining enterprises (OECD, Responsible Business Conduct, 2014). One of the recommendations of the OECD to Kazakhstan is 'the development of a comprehensive state strategy on CSR.' Thus, state support is needed to strengthen CSR engagement among Kazakhstani companies. The preliminary findings from reviewing grey literature and published reports indicate a lack of transparency on the interaction between the state and business, a deficit of existing economic measures stimulating CSR, and weak civil sector involvement.

Table 4.2. Corporate social responsibility indicator findings for selected mining and extractive companies in Kazakhstan and Mongolia

Companies	Indicators				
	Socioeconomic				Environmental
	Trade and investments		Human rights and promotion of diversity and inclusion (D&I)		
	Revenues/ social tax	Amount provided for CSR actions	D&I	Percentage of local employees	Certifications
TCO (KZ)	US$10.48 billion (2016)/ US$4.64 million	US$25 million	Satisfactory	84 percent of local employees	ACGIH
KazMinerals (KZ)	US$1.43 billion/ US$1.69 million)	US$27 million	21 percent female, 79 percent male	97 percent of local employees	N/A
NAC Kazatomprom JSC (KZ)	US$513 million	US$513 million US$3.6 million	18 percent female, 72 percent male	N/A	DIN EN ISO 14001:2015 and DIN EN ISO 45001:2018
Oyu Tolgoi(MG)	US$2.9 billion/ US$481 million	US$33.1 million(2013)	Weak	No recent data/ 90 percent (2013)	Cooper Mark; ISO; OHSAS
Erdenes-Tavantolgoi (MG)	US$1 billion/ US$148 million	US$1.5 million	N/A	No data, but local employment required by the parliament resolution	ISO 9001:2015; 45001:2018; 14001:2015
Tavantolgoi JSC (MG)	US$82 million/ US$29 million	US$769,000 (2019)	61 percent male 39 percent female	100 percent local employees	OHS AS18001

Note: KZ = Kazakhstan; MG = Mongolia; N/A = data not available; D&I = diversity and inclusion; the metric is Good-Satisfactory-Weak-Poor-Very poor; ACGIH = American Conference of Governmental Industrial Hygienists; ISO14001 = Environmental and OHSAS 18001 occupational health and safety management standards

In the case of Mongolia, companies can be rated as 'good' based on the tax payments concerning their revenues. Among the companies, it is worth noting that TT JSC contributes to the local region of Omnogovi by providing about 70 percent to 80 percent of the provincial budget, according to its latest report (Tavantolgoi Report 2020). While it is generally expected from the company, since it has local ownership, it can also indicate its direct local impact on its financial contribution. Overall, the company's financial statements have been disclosed according to the international audit and accounting standards based on EITI reports. However, according to the National Audit Office, some audit reports are undisclosed for confidential reasons, especially in the case of TT JSC (Grant Thornton 2020, 2021). It should be mentioned that the higher contribution of social tax in Mongolia compared to Kazakhstan is because the entire corporation tax amount is considered owing to the absence of a separate social tax provision in the country.

Regarding the share of CSR spending, there are no separate databases for all the chosen companies. However, it can be noted that all three spend a significant amount on social investment, as shown in Table 4.2. For instance, according to the sustainable development report (2013) by OT, the company contributed US$33.1 million to social investment in the country, of which 47 percent was oriented toward environmental projects and significant investment in education programs. Similarly, ETT and TT JSC contribute significantly to various community development projects. The common areas of investment for the companies are the education sector, scholarship programs and donations to local communities, and the provision of healthcare facilities during the pandemic. While these projects benefit society, the companies need a more strategic, holistic CSR commitment to attain long-term contributions to the regions and communities where they operate.

In terms of the 'promotion of diversity and inclusion,' this indicator needs to be improved for the case study companies and the Mongolian mining sector from a broader perspective. For instance, according to Smith and Cane (2015), of all the employed personnel (8,819), female employees made up 22.6 percent (1,990), while men constituted the majority (6,829) at OT. According to more recent data (2018), this number has declined to 16.74 percent of females in the contractor and employee groups, while men constituted 83.26 percent (Zhou 2019). At the management level, women's participation has progressed over the years. Among the cases, TT JSC can be rated 'satisfactory' concerning the total employed personnel (197) despite being small in quantity. However, a gender gap remains, as the Mongolian mining sector is still predominantly occupied by men. It remains difficult for women to participate meaningfully owing to the prevalent gender stereotypes about mining and male dominance in Mongolian society. Therefore, it is essential to address gender stereotypes and increase women's economic opportunities in the mining sector.

Regarding the environmental certifications, all the selected companies for Mongolia have adopted international standards to varying degrees. OT can be evaluated as doing better than the other Mongolian companies in implementing environmental standards. Namely, within the environmental responsibility framework, OT has implemented an EHS management system in accordance with ISO14001 environmental and OHSAS 18001 occupational health and safety management since 2010 and other international standards. The company also developed a comprehensive environmental and social impact assessment (ESIA). The first ESIA report was disclosed in 2013, demonstrating a 91 percent compliance rate. After that, in 2016, an independent audit was presented, confirming a 98 percent compliance rate. In addition, OT is one of the first operations awarded with the Copper Mark (as proof of responsible production considering 30 ESG criteria) globally.

In the case of TT JSC, the environmental management plan (reduction of negative environmental impact, rehabilitation, offsetting measures, waste management, and environmental monitoring) for 2020 was implemented with a compliance rate of 90.4 percent, which was evaluated by an authorized body (Tavantolgoi 2020). However, some data gaps and transparency issues can be spotted in environmental reports, which lack detailed information, especially in the cases of ETT and TT JSC firms.

The three case studies show apparent differences between joint venture, wholly state-owned, and locally owned companies' CSR performances depending on their structure and operational work. In the case of OT, the better outcomes may be partly explained by its global partnerships (namely, the exchange of best practices, more knowledge sharing, and quality human resources). Although the above three cases show promising outcomes and can be presented as best practices, overall analyses show that despite some progress, CSR in Mongolia is still narrow and primarily understood as a voluntary action rather than a social responsibility that must meet some standards in the majority of small and medium-sized enterprises. As noted in the previous sections, Mongolia has not yet enacted a comprehensive legal and regulatory framework on CSR at a national level. Weak law enforcement is a significant challenge for proper CSR implementation. In this sense, a solid legal framework and vigorous law enforcement will enhance the CSR policy environment in the long term. Also, in terms of transparency of mining companies, although the reporting on their finance and audit results is promising, reports on their tax payment, responsibility, and practices of shareholders and managers are relatively limited (Corporate Governance Report of Mongolia 2015). The recent government effort to complete the draft of the law on transparency in the mineral resources sector in 2020 can be seen as a step forward in strengthening accountability and transparency in the extractive industry of Mongolia. However, the proper implementation of CSR needs strong commitment, transparency, and accountability in all social, economic, and environmental aspects on an equal basis.

We compared our findings with the EITI-published reports for 2019 in Kazakhstan and Mongolia by selecting similar indicators and the same companies whenever data was available. The EITI reports almost coincided with our findings, and although sometimes the EITI metrics were different (qualitatively or numerically), they signalled the same trends.

4.6 CONCLUSION

CSR practices have great potential in Kazakhstan and Mongolia and are essential for companies operating in both countries. It is necessary to distinguish that most companies accept CSR as a mandatory issue to comply with state regulations rather than as an indispensable element for their operational activities. The development of the CSR concept in national, joint venture, and multinational companies has been interpreted through different actions in Kazakhstan and Mongolia. These actions can be related to various CSR strategies, such as hierarchical, participative, minimalist, endogenous, exogenous, or hybrid models (Buldybayeva 2014).

The indicators have shown the relevance of CSR application at the flagship companies in Kazakhstan and Mongolia in the extracting and mining industry. The main recommendation is to consider CSR an essential part of the economic development course of the countries. Both Kazakhstan and Mongolia should use CSR as an instrument for tackling environmental and socioeconomic issues and incorporate it into a new monetary policy. The other recommendation is to adopt the CSR concept on a legislative level and for local executive bodies to mandate, facilitate, partner with, and endorse CSR projects. It will help to articulate and strengthen the roles of CSR stakeholders and converge the views of the key players: the government (policies), business (CSR strategies), and civil society (initiatives and NGOs).

Since most of the risks are related to the weak regulation of the legal environment owing to the absence of a governing body and comprehensive regulatory framework on CSR, the Kazakh and Mongolian governments should focus on strengthening the legal environment of CSR. Also, there is the recommendation to incentivize socially responsible companies with successful CSR policies through tax deductions and accreditation systems. Genuine state support, solid legal framework, and political backing will ensure proper CSR implementation on a national level. Moreover, companies need to focus on the positive and negative effects on the environment and society in which they operate. Potential misinterpretations of the operational profile of the extractive industries and the CSR policies can lead to mistrust and dissatisfaction from local communities and state agencies. It is thus essential to im-prove communication and collaboration among stakeholders (such as state, business, and civil society) in the planning and designing of CSR activities in both countries. The heavy reliance of Kazakhstan and Mongolia on extractive industries indicates that CSR could provide significant potential for companies, local communities, and state agencies to implement sustainable development initiatives in the two countries.

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Chapter 5

DETERMINANTS OF CARBON EMISSION AND THE POTENTIAL ECONOMIC IMPACT OF 'GREEN' ECONOMY STRATEGIES IN CENTRAL ASIA

Kazakhstan and Uzbekistan

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5.1 INTRODUCTION

Pictures from: https://rabbit.bigbigwork.com/home

5.1.1 Definition, evolution, and theoretical background of the green economy concept

Global environmentalism and the 'green' movement related to protecting ecosystems dates back to the early nineteenth century. However, environmental activism of the 1970s was the most crucial stage in the history of the green movement and a period when humankind entered a new era of modern environmentalism. Earth science and activism of the 1970s and onwards brought more concepts connected to the effects of pollution on the earth and climate change. Since then, the green movement also spurred political interest and convinced multiple stakeholders to get involved in the green movement. The recognition that climate change happens faster than expected made research and academic topics in climate change adaptation and mitigation exciting and necessary (Pepper 1996, Doherty 2002). In recent years, the global green movement actively convinced governments to live in an eco-friendly way, use resources efficiently, and find methods to protect the earth.

The 'green economy' concept and its environmental objective lies in the 'sustainable development' discourse first popularized in the late 1980s. Since then, many concepts of what constitutes a green economy have been developed by various actors. Bina (2013) presents green economy as a response to both economies and environments in crisis. The United Nations Environment Programme (UNEP), which plays a leading role in promoting a green economy, defines the concept as improving social equity and human wellbeing while reducing environmental risks and ecological scarcities. A green economy is based on principles of sharing, circularity, collaboration, solidarity, resilience, opportunity, and interdependence.[1] Green economies are low in carbon emission, efficient and clean in production, and inclusive in consumption and product outcomes (UNEP 2010).

The Organization for Economic Cooperation and Development (OECD) uses the term 'green growth' in the same context as green economy. It emphasizes that the actual costing and proper pricing of resources are the keys to national green growth. Further, the OECD (2011) indicates that infrastructure investments in the energy, transport, and water management sectors; innovative promotion; and green jobs are vital for green growth. Lievens (2013) highlights that the green economy approach is based on four key strategies: the market as a central governance mechanism, technology, sustainable entrepreneurship, and sustainable consumption.

[1] See more on UNEP promotion of green economy at https://www.unep.org/explore-topics/green-economy/

The green economy concept is rooted in classical economic theories such as neoliberalism, free market environmentalism, and eco-modernization. The neoliberal and free market environmentalism paradigms emphasize private investment, free trade, and market-based solutions to protect the environment through market mechanisms (Dale et al. 2016). Free market environmentalism promotes the idea that free market principles should solve and prevent environmental problems. This calls for a system of environmental regulation based on private property rights, using positive incentives and market forces to encourage property owners to conserve resources (Hyder 2015).

Ecological modernization theory arose in the 1980s to advocate for technological involvement and continuous industrial development as the key to greening the economy (Glynn et al. 2017). The main aim of the eco-modernization theory is to analyze how modern society integrates and deals with environmental crises (Mol and Sannefeld 2000). Eco-modernization argues that manufacturing companies and industries become green by developing more efficient technologies, which supposedly reduce resource use (Hyder 2015). It emphasizes that industrial development is the best option for escaping ecological crises. According to Jänicke and Weidner (1997), ecological modernization theory assumes that modern human initiatives will match economic advancement with environmental improvement. Technological innovations and continuous industrial development are the keys to this theory. The theory argues that capitalists do not opt for an environmentally friendly process by their own choice; instead, they adopt the green manufacturing process forced by economic efficiency needs.

Regarding green investments, the United Nations emphasizes that public and private investments in the environment can reduce carbon emissions, enhance resource efficiency, and prevent the loss of biodiversity and ecosystems service while reducing unemployment (UN 2011). Similarly, UNEP (2011) argues that growth in income and employment in a green economy are driven by public and private investments that reduce carbon emissions and pollution. UNEP highlights that the causes of global crises affecting human wellbeing have resulted mainly from 'the gross misallocation of capital.' Therefore, it emphasizes that redirecting investments to greener renewable energy, energy efficiency, public transportation, sustainable agriculture, ecosystem, biodiversity protection, and land and water conservations will result in substantial growth and improved human living conditions.

In 2012 the United Nations General Assembly called for the green economy as an institutional framework for sustainable development and poverty eradication. Over recent years, the green economy concept has become a strategic priority for many government and intergovernmental organizations. There is also an emerging practice in designing and implementing national green economy strategies. By 2018, the Global Green Economy Index report recorded 130 countries that have embarked on a green economy and related strategies by transforming their economies into drivers of sustainability, compared to 61 in 2016.[2]

5.1.2 Green Economy in Central Asia: Kazakhstan and Uzbekistan

The CA region inherited an environmental crisis, including nuclear waste, destruction of water management, and the drying up of the Aral Sea from the Soviet Union's mode of production (Cohen 2021). The region contributes 1.44 percent of total global carbon (CO_2) emissions, with a total volume of over 500 million tonnes in 2020, as in Table 5.1. The region suffers from outstanding environmental issues like the lack of standards on pollution emissions, the increase of greenhouse gas (GHG) emissions, and the lack of development of green legislation (such as waste management and organic agriculture).

[2] The 2018 Global Green Economy Index (GGEI) measures the green economy performance of 130 countries and how experts assess that performance. Published by Dual Citizen LLC, a private US based consultancy. See the GGEI report https://dualcitizeninc.com/global-green-economy-index/index.php#interior_section_link

Kazakhstan and Uzbekistan are the main emitters of CO_2 in the region, while Kazakhstan has the highest per capita CO_2 emissions compared to the other countries in the region. A comparison in CO_2 emissions for Kazakhstan and Uzbekistan for the 30 year period 1990-2020 is provided in the Annex (Figure A1). Because of Kazakhstan's public health concerns, the country was ranked second in environmental pollution by organic substances in Central and Eastern Europe and CA (Kazbekova 2020).

Table 5.1. CO_2 emission by Central Asian countries, 2020

	CO_2 emission (million tonnes)	CO_2 per capita (tonnes)	Share in global CO_2 emission (percent)
Kazakhstan	291.34	15.52	0.84
Kyrgyzstan	11.51	1.76	0.03
Tajikistan	9.45	0.99	0.03
Turkmenistan	75.34	12.49	0.22
Uzbekistan	112.78	3.37	0.32
Total	500.41		1.44

Source: Calculated by authors using OWID data[3]

A green transition strategy that includes economic, social, and environmental dimensions is fundamental to the sustainable development of a nation. Over the past decade, CA countries adopted the green economy concept as a strategic priority to revert past environmental destructions and become greener. Renewable and efficient energy use has become a vital part of the region's transition towards a greener economy.

[3] Data is available at: https://github.com/owid/co$_2$-data

CA's economic leader, Kazakhstan, was the pioneer among the other five Central Asian countries in adopting a green economy concept in 2013 to 'green' its key economic sectors by 2050. The Kazakhstan green economy concept paper (assessed in this work) defines the green economy as an economy with high living standards and the rational use of natural resources in the present and future generations (Kazakhstan Green Economy Policy 2013). Likewise, in 2019, the most populous country in CA, Uzbekistan, adopted a strategy to transition into a green economy by 2030.

The governments of Kazakhstan and Uzbekistan adopted the green transition concept through their respective green economy and development strategies. Both countries aspire to resource-intensive, energy-efficient, and green development pathways. They also aim to diversify their energy sources with alternative, cleaner, and renewable energy sources. Kazakhstan and Uzbekistan are committed to embracing alternative energy sources, saving water, and greening their priority sectors, including agriculture, construction, and transport. Amid the global transition to renewables, the two nations strive to do away with over-reliance on fossil fuel extractive industries and hydrocarbon-dependent growth, attracting renewable energy investments. Kazakhstan and Uzbekistan are also restoring the Aral Sea (Cohen 2021).

Nevertheless, the green transition is accompanied by various challenges and barriers to pursuing the main goals. There are risks of slowing down the implementation of the green strategy owing to exogenous factors such as government measures directed towards the social protection of the population. Uzbekistan's fast-moving economic reforms consider social protection programs to be one of the priority areas.

A critical dimension of social protection is the practice of subsidized electricity and gas pricing. On the one hand, social programs that support people, especially vulnerable groups, perfectly align with national priorities. On the other hand, these policies may slow down reforms in the energy sector and the whole green transition. The government is, therefore, in a trade-off about whether to cut social programs and speed up the reforms or to keep strong social policies by subsidizing energy prices. There are some concerns such as, how businesses whose production relies heavily on cheap fossil fuel and how different income level households — again, especially vulnerable groups — will be affected.

Long-term good development interventions of the government may slow down the transition toward the green economy. For instance, it is clear that both Kazakhstan and Uzbekistan need reforms in the energy market to improve energy efficiency, but the actual speed of the reforms is not apparent yet; transitioning to a green economy is a long-term process. Lazzet et al. (2014) indicate that ensuring economic growth and food security under the transition to a green economy in Kazakhstan requires the formation of systems and regulations oriented toward the context of the transition; such institutional reforms need a longer period of time. The current green transition strategies of Kazakhstan and Uzbekistan envisage a relatively short time window — namely, 2030 for Uzbekistan and 2050 for Kazakhstan. However, the transition may take place more than 50 years into the future. Despite the approval of the transition to a green economy, both countries still have a limited long-term vision for environmental protection and climate change.

Another challenge is the cost of a green transition. To achieve green growth, countries should have sustainable technological changes. Thus, moving away from fossil fuels towards clean energy sources will require significant investments by governments, businesses, and households. The shift might be quite expensive. Another concern is that the transition will lead to a significant rise in energy bills; households and businesses are unprepared for this kind of challenge. The transition may raise overall price levels in the economy, thereby harming it owing to higher input costs and labor market because of an increased unemployment rate.

A review of existing secondary reports on the challenges in the transition towards a green economy in Uzbekistan shows an insufficient capacity for sector transformation. While Uzbekistan's green economy transition strategy for 2019-2030 identifies the role of priority sectors and mechanisms for transition, there are areas for improvement. Gaps persist in the availability of qualified human labor, legal base, and coordination among sector institutions (UNECE 2020, World Bank 2022, UNDP 2021). Most of the capacity transfer from international/donor organizations — including human and technological skills — is at an early stage. Awareness of green transition among local communities is also limited (UNECE 2020). The engagement of the private sector in the country's green economy transition is defined in the strategy; however, most of the private sector efforts are at an infant stage, including legal, technological, information, coordination, and human capacities. Likewise, the role of civil society in building a green economy requires institutional mechanisms. Currently, there are gaps in coordination, information exchange, and sufficient human and training needs of non-government organizations (NGOs). Financial capacity for green economy transition is developing in Uzbekistan, as the country made substantial progress in attracting donor funds to support the transition (UNDP, 2021). On the other hand, the long-term financial burden associated with the repayment of donor funds and its implications for the future is not clear.

Similarly, Kazakhstan exhibits a gap concerning environmental policy transparency and collaborative nature between government and NGOs. Kazbekova (2020) explains that it is hard to implement the green economy concept in Kazakhstan because the economy does not allow the establishment of a unified set of measures to implement green technologies. There is also a limited technological capacity for energy efficiency and emission reduction.

Intensive agriculture techniques, and the production of fossil fuels and mineral resources are additional examples of the many barriers to realizing the transition to a green economy in both Kazakhstan and Uzbekistan.

5.1.3 Study rationale

The paper aims to assess the determinants of a green economy in Kazakhstan and Uzbekistan through an empirical assessment of a 30 year (1990-2020) dataset. The study results indicate where to focus for a greener economy in the two countries. Such a study provides valuable insight for decision-making in green economy strategies. Analyzing the emerging green policies in Kazakhstan and Uzbekistan will serve as a lesson to the other countries in the region.

Kazakhstan and Uzbekistan are major CO_2 emitters in CA. However, both countries indicated that a transition to a green economy is vital both from an ecological perspective and for the economic growth of the nation. These national development strategy documents of these countries echo that their economic system cannot continue to treat nature as an endless resource. Instead, the countries propose to invest in green policies to boost national economic growth, innovation, and green employment in the future.
The green economy concept is optimistic about the possibility of moving toward high income and industrialized society by incorporating natural environment protection and

the efficient use of resources into the redesign of modern institutions and sectors. Thus, the green economy approach assumes no trade-off between environmental protection and economic costs; nevertheless, the argument on the economic impact of green transitions is inconclusive. Jacob et al. (2015) argue that, on the one hand, environmental focus and economic development can go together because they avoid the costs related to environmental degradation, and environmentally friendly business and technology open up economic opportunity. However, they indicate that policy interventions that bring transformation towards a green economy may threaten businesses and sectors that rely on cheap energy resources, thus developing resistance. Lievens (2013) highlights that the green economy idea is worrisome in that it will not tackle the root causes of climate change; instead, he argues that the concept may create new markets and industries, and some interventions proposed by governments could be just a form of 'green washing.' The green economy approach emphasizes substantial private investment and technological development. At the same time, countries in CA are still mostly centralized with massive state intervention, and the green economy transition is not market led. Also, the dominating economic model with fast reforms in the region may not allow for an equally green future for all. In this regard, it is difficult to claim that a green economy could achieve sustainable development in all three economic, social, and environmental pillars.

The World Bank (2012), OECD (2012), and UNEP (2011) assert that innovations and technological change form the basis for future economic growth and employment in a green economy. Green technologies are associated with higher work intensity and increased employment compared to conventional technologies. Jacob et al. (2015) highlight that, in assessing the economic impact of green economies, it is important to focus on the number of jobs created compared to an alternative allocation of funding. They also emphasize that in the longer term, economic gains are expected to come from the use of renewable energies. Similarly, Strand and Tomon (2010) and Kammen et al.

(2004) indicate that energy efficiency measures and technologies in renewable energy have higher job intensity than traditional energy economies, particularly in the areas of production and installation. Thus, the development of renewable energy has a positive economic impact. Besides being labor-intensive, renewable energies are also human capital intensive, thereby improving labor productivity. New green jobs that will be created in green economies are among the economic promises and hope for Kazakistan and Uzbekistan while these countries undergo green economy transitions. Nevertheless, it is not apparent whether the economic promise applies to the Central Asian countries or if the costs of transitioning to a green economy outweigh and compromise opportunities for the fast development of the nations.

Institutions and human capacity are limited in Kazakhstan and Uzbekistan. Jacob et al. (2015) argue that the innovation effects of green economies depend on the form of policy instruments and other contextual factors such as sector capacity to develop and use technological solutions. In addition to the policy instruments, the impact of policies depends on the configuration of actors and the sector capacities (Janicke and Lindermann 2010). Similarly, Bowem (2012) points out that labor market rigidities can hinder or delay the transition to a green economy.

This empirical research enables Kazhakistan and Uzbekistan to examine the validity of some of the several assumptions expressed as hypotheses before moving to any conclusions. This paper assesses the potential economic promise of adopted green economy interventions in the study countries through a method of descriptive analysis. The analysis provides quantifiable information on the likely speed and the long-run multiplier effect of announced green interventions. The paper questions whether green interventions announced by the governments of Kazakhstan and Uzbekistan will achieve economic sustainability. It investigates the potential economic impacts of the proposed interventions in the study countries. The assessment of strategies establishes the potential impacts of state led and financed green interventions versus a scenario in which the countries make no policy intervention. An a priori assessment of the impact of the announced interventions in the green economy strategies would increase their credibility, transparency, and usefulness.

The paper is organized into five sections. Section two describes the study methodology for both the empirical regression model and descriptive analysis of the economic impact of green strategies. Section three then presents the regression analysis findings of the determinants of CO_2 emissions in the study countries and descriptive analyses of the potential economic impact of announced green strategies. Section four presents the conclusions from the study and their implications. Finally, section five provides some policy options based on the study findings and conclusions.

5.2 RESEARCH METHODOLOGY, APPROACHES, AND DATA

The study empirically studies the relationship between CO_2 emissions (as a proxy for green economy) and GDP, international trade, energy use, population, urbanization, and forest cover. The paper then assesses the likely economic impact of the green economy strategies adopted by Kazakhstan and Uzbekistan.

5.2.1 The econometric model, variable specification, and data

The paper examines a 30 year panel of data spanning from 1990 to 2020 for Kazakhstan, Uzbekistan, and Denmark. Denmark is included in the research as a benchmark for its substantial restrictions on GHG emissions and its efforts to mitigate climate change.

The fixed effect (FE) regression model analysis includes only Kazakhstan and Uzbekistan, with data limitations on some variables. While the ordinary least squares (OLS) model can efficiently discover associations between explanatory factors and CO_2 emissions, the FE model exploits within group variations over time with a powerful ability to remove the potential omitted variable bias. The study also uses the random effects model, which allows the inclusion of time-invariant variables. The Hausman test was used to determine whether fixed or random effect models were suitable. The test reports in favor of the FE model.

In this context, CO_2 emissions depend on GDP and the square of GDP; therefore, the model specification is as follows:

$$CO^{2it} = \beta_0 + \beta_1 Yit + \beta_2 Yit^2 + \beta_3 Eit + \beta_4 X^{it} + \varepsilon^{it}$$

Where CO_2 is carbon dioxide emission; Y is GDP, E is energy use, and X is a vector of other determinants in country i at time t. The unit of measurement for some variables was in monetary terms and numbers, and the normality test of the data suggested using the logarithmic form of GDP, GDP squared, export, import, and population variables. Carbon dioxide emission is utilized as the dependent variable. The annual time series data for the model variables was obtained from the World Development Indicators (WDI) and OECD database. Table 5.2 reports descriptions of the variables and sources of the data.

Table 5.2. Empirical model: variable descriptions and data sources

Variable name	Description	Source
CO_2	CO_2 emissions (kt). Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during the consumption of solid, liquid, and gas fuels and gas flaring.	World Bank (WDI)
GDP	GDP (constant at 2015 USD rate).	World Bank (WDI)
Export	Exports of goods and services (constant 2015 USD).	World Bank (WDI)
Import	Imports of goods and services (constant 2015 USD).	World Bank (WDI)
Energy use	Use of primary energy before transformation to other end-use fuels (such as electricity and refined petroleum products). Combustible renewables and waste — solid biomass and animal products; biogas and liquids; industrial and municipal waste. Biomass is any plant matter used for fuel, heat, or electricity. (Measured in kilograms.)	OECD.org
Renewable energy	Renewable energy consumption (percentage of total final energy consumption).	World Bank (WDI)
Population	Population, total.	World Bank (WDI)
Forest	Forest area (percentage of total land area).	Food and Agriculture Organization (fao.org)
Urbanization	Urban population (percentage of total population).	World bank (WDI)

Table 5.3 lists the summary statistics of variables used for Kazakhstan and Uzbekistan. The sample shows that the average GDP over the 30 years for the two countries is USD86,868, and the mean CO_2 emission is 152 million tonnes annually. The mean share of the urban population and forest land area is 52.09 percent and 4.3 percent, respectively. The mean energy use per capita is 2,804.31 kg of oil, whereas renewable energy consumption share

varies from 0.71 percent to 2.77 percent of total energy consumption. Country-specific statistics are provided in Tables A4 and A5 in the Annex.

Table 5.3. Summary statistics, Kazakhstan and Uzbekistan, 1990-2020

VARIABLES	Number of observations	Mean	Standard deviation	Minimum	Maximum
CO_2	58	0.152	0.051	0.096	0.256
GDP	62	86,868.01	53,855.33	26,042.60	211,107
Export	57	28,084.86	20,368.16	2,490.49	60,627.67
Import	57	25,094.12	16,999.02	3,135.35	78,239.09
Energy use	49	2,804.31	1,080.32	1,419.48	4,796.14
Renewable energy	58	1.496	0.43	0.71	2.773
Population	62	21.531	6.067	14.858	34.232
Forest	62	4.302	3.175	1.142	8.375
Urbanization	62	52.097	5.078	41.365	57.671

5.2.2 Descriptive analysis of green economy strategies, method, and data

The descriptive analysis of the potential economic impact of green interventions employs a policy evaluation framework called the Global Recovery Observatory Methodology. The methodology (hereafter referred to as the Observatory methodology) is developed by the Oxford University Economic Recovery Project in partnership with the IMF, UNEP, and GIZ, as described in O'Callaghan et al. 2021. The Observatory methodology aligns with the objectives and scope of the a priori assessment of the announced green economy strategies in the current study. Though the Observatory methodology was designed to evaluate COVID-19 interventions, the method has broad applicability (O'Callaghan et al. 2021). The methodology uses a taxonomy and coding of archetypes (interventions) that are then preassigned a Likert scale value. The Observatory methodology identifies mutually exclusive archetypes and subarchetypes that have a social, environmental, and economic impact. [4] In this paper, we use the term intervention interchangeably with archetypes.

In the Observatory methodology, the potential impact of announced interventions is evaluated across three pillars: (i) environmental, (ii) social, and (iii) economic. In this study, we dwell only on the potential economic impact of the announced green strategic interventions. The potential economic impact of an intervention, following the Observatory methodology, has two metrics: (i) speed of policy implementation (SPI) and (ii) long-run economic multiplier (LEM) effect. The Observatory methodology defines the SPI as the pace at which a policy archetype can be deployed and exert its economic effect. The same methodology defines an LEM effect as the change in national income that results from a financial injection/intervention (O'Callaghan et al. 2021).

Some scholars also employed O'Callaghan methodology in their research (O'Callaghan and Murdock 2021, Hans et al. 2021, Johnstone 2022, Funke et al. 2021, Köppl and Schratzenstaller 2022). Hans et al. (2021) investigated that economic stimulus investment to combat the COVID-19 epidemic promotes low-carbon transition. In May 2021, 26 emitters announced approximately 2,500 actions, representing around 65 percent of world GHG emissions in 2018. Their results indicate that the majority (35 percent) of expenditure with potential GHG emission consequences was spent on initiatives that maintained the status quo in different nations when low carbon options existed. Their evaluation demonstrates the various degrees to which emitters have wasted the chance for a green recovery. Besides, O'Callaghan and Murdock (2021) mentioned that a green

[4] See more on UNEP promotion of green economy at https://www.unep.org/explore-topics/green-economy/

recovery accounted for less than a fifth of total fiscal expenditure in 2020, despite evidence that ecologically restorative fiscal policies are among the most effective instruments for economic recovery. Funke et al. (2021) monitored the climate impact of fiscal policy lessons from tracking COVID-19 responses. The report assesses the different contributions of trackers along with their strengths and flaws, and draws lessons for future climate policy assessments. The report concludes that, although trackers produced meaningful ratings of (usually low) greenness and boosted awareness, their techniques varied widely, with some fundamental and inevitable shortcomings. The Global Recovery Observatory's open-source stimulus expenditure data is used to investigate green recovery practices (Johnston 2022). It shows that the world developed nations (G7, G20, and BRICS) all invest more cleanly in response to COVID-19. Nevertheless, compared to the G7's potential norm entrepreneurial role, both individually and collectively the study provides vital insights into the paths and challenges to the Global Green New Deal norm dissemination throughout plurilateral summit institutions.

The main data for the assessment of the green economy strategy part of the study is the list of green interventions announced by the governments of Kazakhstan and Uzbekistan in the last decade. The study inspected, classified, and assessed the multiple interventions in each country's respective green economy strategy document (available from the website). [5] The strategic document content is multifold, with each policy document having several measures. Summaries of the policy documents are presented in Table A1 in the Annex.

To assess the potential economic impact of the interventions, we first taxonomized the green economy interventions of Kazakhstan and Uzbekistan individually. The announced interventions include a large number of incentive and investment measures.

[5] The concept for transition of the Republic of Kazakhstan to Green Economy by 2050 is available at: https://www.oneplanetnetwork.org/sites/default/files/kazakhstan_concept_for_transition_of_the_republic_of_kazakhstan_to_green_economy.pdf

The strategy for the transition of the Republic of Uzbekistan to a green economy in the period of 2019-2030 is available at https://lex.uz/ru/docs/4539506

We classified and coded the respective country's green economy interventions following the Observatory methodology relevant architype codes (based on O'Callaghan et al. 2021). The Annex lists archetype codes and descriptions for each country's intervention in Tables A2 and A3.

Next, we assigned a Likert scale value for each country's coded intervention across the economic impact metrics (LEM and SPI mentioned earlier). The current paper uses the Likert values from the Observatory methodology (as in O'Callaghan et al. 2021). The values are preassigned based on empirical evidence, extensive literature review, and consultations with leading experts. The Observatory methodology assesses the potential economic impact of interventions on a three-point Likert scale (ranging from -1 [regress in economy]; 0 [little net change], and +1 [improvement in economy]). The Likert assessment for the identified interventions is provided in Tables A2 and A3 in the Annex.

Finally, we descriptively analyze the mean potential economic impact of the identified mix of green interventions and present the finding using charts and narratives. The analysis of the current paper of the potential economic impact of green interventions is descriptive and provides a general but valuable picture. The economic impact study is not a substitute for detailed ex-post policy analysis or impact assessment.

5.3 RESULTS

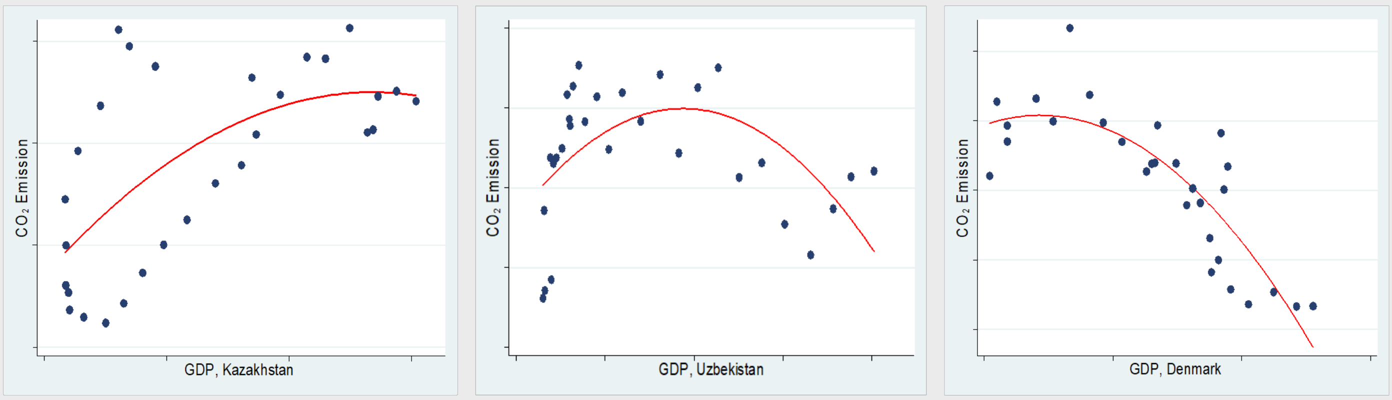
5.3.1 Correlation between CO_2 emissions and GDP values

Annual CO_2 emissions by country over the 30 years (Figure A1 in the Annex) demonstrate that the least CO_2 emission rate was observed in Denmark for almost three decades (1990-2018), despite GDP growth. In Kazakhstan, emissions had a decreasing pattern until 2000, and then significantly changed in the opposite direction. This pattern is similar to the changes in GDP levels of the country over time. Uzbekistan has a relatively stable level of emissions with slight variations. The CO_2 emissions per capita among the study nations for the 30 years are provided in Figure A2 (in the Annex). In Uzbekistan, it is around 0.005 units with a slightly decreasing pattern. Uzbekistan's low per capita emission is owing to the higher population growth rate in Uzbekistan relative to Kazakhstan and Denmark. [6] In Kazakhstan, per capita CO_2 emissions decreased until 2000, followed by a sharp increase. In Denmark, CO_2 emissions per capita have a decreasing pattern in the long term. The variability in CO_2 emissions by country is depicted in Figure A3 (in the Annex). Over time, the variations of CO_2 emissions are higher in Kazakhstan and Denmark relative to Uzbekistan.

Using the 30 year panel data, Figure 5.1 illustrates the correlation between CO_2 and GDP in the selected CA countries compared to Denmark. The linear term of GDP is positive and the nonlinear term is negative, which proves the presence of the inverted U-shaped association between economic growth and CO_2 emissions.

[6] The average population growth rate during 1990 to 2018 in Uzbekistan was 1.74 percent, Kazakhstan 0.46 percent, and Denmark 0.41 percent.

Figure 5.1. Correlation between CO_2 and GDP



Source: Authors using the dataset

The correlation figure suggests that the sign of GDP is expected to be positive, and the square of GDP is negative in the regression analysis. The positive sign for GDP indicates that the higher the economic growth, the higher the CO_2 emissions. On the other hand, a negative sign in the square of GDP indicates a turning point where the relationship is inverted, and further higher economic growth leads to a reduction in CO_2 emissions. The correlation between CO_2 and GDP for all three countries confirms this statement.

5.3.2 Determinants of CO_2 emissions

Table 5.4 compares the effect of determinants of CO_2 emissions employing the fixed effects (FE), random effects (RE), and ordinary least squares (OLS) models for Kazakhstan and Uzbekistan, based on our preferred base model that uses FE techniques. [7] The estimates show that GDP positively affects CO_2 emissions, suggesting that GDP growth generally increases emissions, which is significant with a 45.32 t value (column 1). However, the square term of GDP is negative and statistically highly significant at a level of 95. It confirms that countries with increased income invest more in sustainable environmental projects. A study by Grossman and Kruger (1995) notes that if the square of GDP is statistically insignificant, then a rise in GDP will lead to an increase in pollution-related emissions. If statistically significant, however, it shows that countries with increasing incomes invest more in green energy, thereby contributing to reductions in CO_2 emission in the long run.

The FE model also shows that a 1 percent increase in population growth, energy use, and urbanization in Kazakhstan and Uzbekistan increases CO_2 emissions by 1.146 units, 0.0003 units, and 0.071 units, respectively. In contrast, the use of green energy has a negative association with CO_2 emissions. If renewable energy consumption expands by 1 percent, it will reduce CO_2 emissions by -0.063. An increase in forest cover also reduces CO_2 emission by -0.516 units.

Table 5.4. Determinants of CO_2 emissions: FE, RE, and OLS models [8]

VARIABLES	(1) FE Kazakhstan, Uzbekistan	(2) RE Kazakhstan, Uzbekistan	(3) OLS Kazakhstan, Uzbekistan
GDP	4.120**	1.064	1.064
	(45.32)	(0.58)	(0.65)

[7] Hausman test reports that the FE model is preferred.

[8] The Hausman test reports that the FE model is preferred.

GDP2	-0.245**	-0.069	-0.069
	(-50.58)	(-0.68)	(-0.74)
Export	-0.054	0.040	0.040
	(-4.93)	(0.96)	(0.70)
Import	-0.045	-0.074***	-0.074
	(-2.10)	(-12.11)	(-1.59)
Population	1.146**	0.768***	0.768*
	(35.47)	(2.78)	(1.78)
Energy use	0.0003***	0.0003***	0.0003***
	(699.67)	(70.25)	(10.54)
Renewable energy	-0.063*	-0.061***	-0.061***
	(-8.14)	(-6.07)	(-2.79)
Forest	-0.516***	-0.034	-0.034
	(-98.53)	(-1.10)	(-0.76)
Urbanization	0.071**	0.021	0.021
	(18.14)	(0.77)	(1.05)
Constant	-24.748***	-6.033	-6.033
	(-396.00)	(-0.60)	(-0.81)
Observations	44	44	44
R squared	0.932	0.932	0.989

Notes: The dependent variable is $LnCO_2$. GDP, GDP2, export, import, and population are in the natural log form. Robust t-statistics in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

The RE (column 2) and OLS (column 3) regression model estimates in Table 5.4 show that, generally, renewable energy has a negative effect on CO_2 emissions, and population and energy use have a positive effect. The RE model also suggests that exports of goods increase CO_2 emissions, while import has a negative association.

Table 5.5 below demonstrates the OLS model results for each country. The table reports statistically significant variables only. The results show that high total energy use has an environmentally detrimental effect in Kazakhstan and Denmark (0.0003), compared to Uzbekistan. In contrast, renewable energy contributes to emission reduction in all three countries: Kazakhstan, Uzbekistan, and Denmark (-0.085, -0.117, and -0.014, respectively).

Urbanization shows a negative impact on the environment in Uzbekistan. A 1 percent increase in urbanization in Uzbekistan increases CO_2 emissions by 0.169 unit.

Table 5.5. Determinants of CO2 emissions: OLS models

VARIABLES	(1) OLS Kazakhstan	(2) OLS Uzbekistan	(3) OLS Denmark
Energy use	0.0003***	0.0003	0.0003***
	(3.37)	(1.65)	(12.90)
Renewable energy	-0.085**	-0.117***	-0.014*
	(-2.34)	(-3.88)	(-2.04)
Urbanization	0.188	-0.169**	0.019
	(0.38)	(2.97)	(0.39)

Notes: Regressions include all variables from Table 5.3. Only statistically significant observations are reported. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

5.3.3 Assessment of announced green interventions

Kazakhstan's green economy strategy as of 2013 focuses on seven intervention sectors. These are (i) water management, (ii) green agriculture, (iii) energy-efficient buildings, (iv) renewable sources of energy, (v) green transport, (vi) waste management, and (vii) building human capacity and regulations for GE transition. We identified a total of 61 interventions across the seven pillars in Kazakhstan's green economy strategy document that are matched and mapped to 21 subarchetype codes provided by the Observatory methodology. The 21 standardized interventions are then assigned Likert scale values (-1, 0, 1) based on preassigned values in the Observatory methodology, as in Table A2 in the Annex.

Uzbekistan's strategy for green economy transition as of 2019 focuses on eight sectors: (i) energy efficiency and diversification into renewable sources, (ii) green construction, (iii) green transportation, (iv) smart irrigation in the agriculture sector, (v) solid waste management, (vi) Aral Sea restoration and green spaces, (vii) green research and development, and (viii) human capacity and regulation. We identified 114 announced interventions that are matched to 28 subarchetypes provided in the Observatory methodology. Each of the 28 subarchetypes is assigned a Likert scale value (-1,0,1) as in Table A3 in the Annex.

5.3.3.1 Speed of policy implementation(SPI)

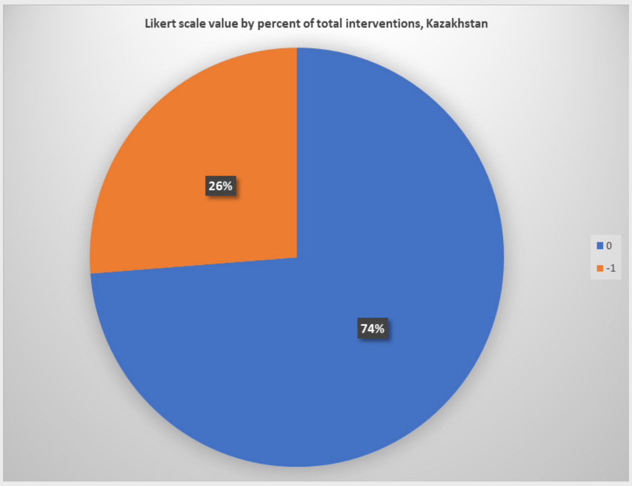
The SPI for Kazakhstan announced green interventions are evaluated to likely have a negative Likert scale assessment in 26 percent of cases (Figure 5.2a). This shows an expected delay in the implantation of a quarter of the announced interventions, having a regressive effect on the economy. At the same time, above 70 percent of the interventions have zero Likert scale values and thus a likely implementation speed that has a neutral impact on the economy.

For Uzbekistan, the speed of implementation of the announced green interventions is evaluated to have a negative Likert scale value in 39 percent of cases (Figure 5.2b). This shows an expected implementation lag in implementing over one third of the total announced interventions. In contrast, more than half of the interventions (61 percent of cases) have zero Likert scale values and thus implementation speed with a neutral impact on the economy.

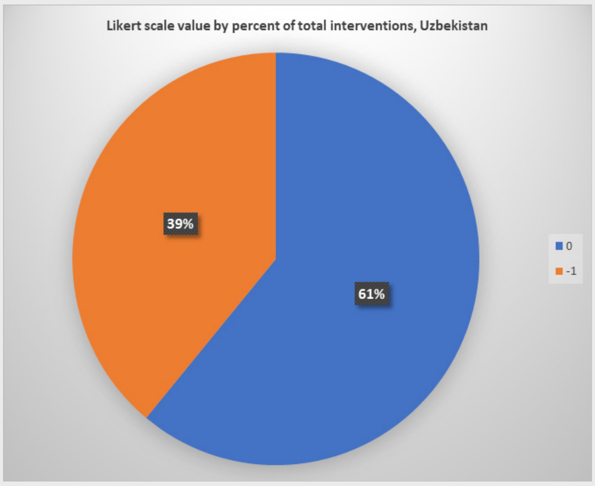
Both Kazakhstan and Uzbekistan economies are unlikely to benefit from a fast (positive Likert scale value) SPI of green interventions. Instead, in both countries, economic loss is expected owing to a likely delay in the implementation of announced interventions. The speed of implementation of announced interventions is likely to be better in Kazakhstan compared to Uzbekistan.

Figure 5.2. The potential impact of speed of policy implementation, by country

5.2a. SPI in Kazakhstan (N = 61)



5.2b. SPI in Uzbekistan (N = 114)



Source: Authors' calculation

Note: A Likert scale of -1 is expected delay in implementation and 0 is neutral speed of implementation.

5.3.4 Long-run multiplier effect

Kazakhstan's 56 percent of the 61 announced green interventions have a positive long-run multiplier effect in the economy, while 44 percent of the interventions have an overall negligible long-run multiplier effect on the country's economy (Figure 5.3a).

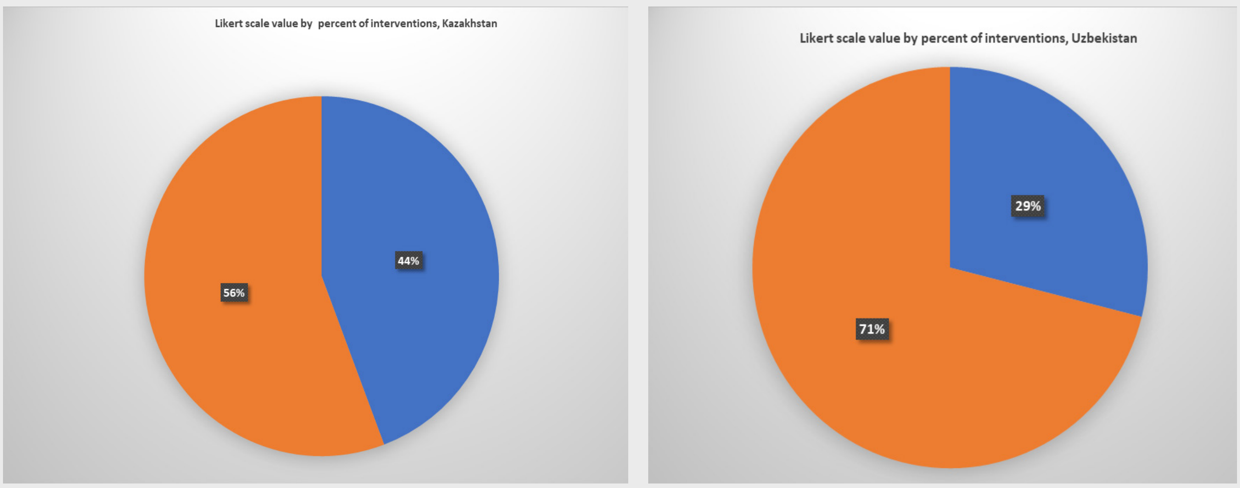
On the other hand, Uzbekistan's 71 percent of the total 114 announced green economy interventions have a likely positive and increased multiplier effect, while 33 interventions (29 percent) may likely have only a little impact on the long-run economy.

Interventions in both countries either have expected positive long-run multiplier effect in their economy or little net change in the long run [Likert scale value 0, 1] (Figure 5.3). This means that the interventions announced by both countries are expected to contribute to an increase in the long-run economy of the countries. Uzbekistan's interventions are expected to have a more long-run multiplier effect than Kazakhstan's. This means Uzbekistan will create more green jobs and income by implementing the green interventions in the country's green economy strategy.

Figure 5.3. Potential long-run multiplier impact of announced green interventions, by country

5.3a. Kazakhstan (N = 61)

5.3b. Uzbekistan (N = 114)



Source: Authors' calculation

Note: A Likert scale of 0 is a negligible long-run multiplier effect and 1 is a positive long-run multiplier effect in the economy.

5.4 DISCUSSION AND CONCLUSION

The current work used mixed quantitative and qualitative research methods to analyze the correlation between GDP and CO_2, the effect of determinants of CO_2 emissions, and to assess the potential economic impact of announced green economy strategies for Kazakhstan and Uzbekistan.

Our econometric analysis findings confirm that CO_2 emissions rise as the economy in both Kazakhstan and Uzbekistan grows. However, CO_2 starts declining after GDP reaches a certain threshold. These results are consistent with the findings of Zambrano-Monserrate et al. (2016) and Pao and Tsai (2011). The results suggest that nations with high GDP per capita are more likely to encourage sustainable development and economic growth. Tawiah et al. (2021) show that countries with high income can fund green initiatives. The results also suggest that both Kazakhstan and Uzbekistan should direct investments in mainly green energy production in pursuing green growth policies. The RE model suggests that Uzbekistan's exports of goods increase CO_2 emissions, while imports have a negative association. The result implies that, while increased trade openness is vital for any nation's economic wellbeing, internationalization may also hinder a country's efforts to achieve its environmental objectives. The pollution haven theory (Walter and Ugelow 1979) claims that foreign investment and commerce facilitate the transfer of pollution-intensive enterprises from one country to another. As a result, foreign investment and trade relate to poor environmental quality in the host nation (Beradovic, 2009). Some studies state that trade is asymmetrically related with carbon emissions. Increasing exports produces an increase in carbon emission while increasing imports causes a decrease in carbon emission (Tawiah et al. 2021). This was also the case in our study.

Urbanization contributes to increased carbon emissions in Uzbekistan, possibly owing to the high level of unplanned urbanization (ADB 2021). The poor city planning in Tashkent and other cities in Uzbekistan is also consistent with the World Bank (2022) paper, also highlighted in section 1.2. As the rural population moves to the cities, energy consumption increases. Also, growing cities require excessive land use for urbanization, which results in forest losses. However, planned urbanization structure correlates with lower urban CO_2 emissions (Li et al. 2021). With adequate planning and laws in place for carbon emission and city development, the economic advantages of urbanization may be reached without harming the environment. Also, land use planning helps minimize carbon emissions and hence the effect of urbanization on climate (Li et al. 2021).

The analysis of green transition strategies for both Kazakhstan and Uzbekistan show that the interventions are relevant and address the empirical challenges. The analysis of the potential economic impacts of announced green interventions shows that, despite promising interventions, the economic gain from the speedy implementation of announced interventions in both Kazakhstan and Uzbekistan is likely to be negligible. On the other hand, Kazakhstan is likely to lose less than Uzbekistan from an expected regressive speed of policy implementation.

The assessment revealed that the announced green interventions by both countries are expected to bring more economic benefits in the long term. However, Uzbekistan is likely to gain more from the long-run multiplier effect of the interventions than Kazakhstan, possibly owing to the nature of the announced interventions (in the Annex).

In summary, the green economy policies in both countries have an economic impact in the long run, which can therefore be an incentive for investing in the transition now.

This means that the green strategies are likely to have an impact on economic growth and employment generation, while addressing resource efficiency and environmental protection in the long run. In other words, green policies will boost growth, innovation, and green employment as investments in the renewable energy sector rise and priority sectors are decarbonized.

5.5 POLICY OPTIONS

This section provides policy options and recommendations to tackle the challenges facing the green economy transition (identified in sections 1.2 and 4).

• Both Kazakhstan and Uzbekistan need to implement development strategies that result in greater GDP and have the resources to provide green growth incentives as high economic growth encourages green transition. The adopted green economy strategies of both countries will improve economic wellbeing while reducing environmental risks. The introduction and expansion of modern, energy-saving technology and green innovation will upgrade existing high-emission sectors. Consequently, carbon emissions will be lowered while the economy continues to thrive.

• In the long term, the green economy goals of Uzbekistan should include population and urbanization projection. Population and urbanization can increase owing to high fertility rates or migration. Increased population growth results in higher consumption, including consumption of energy, which means CO_2 emissions will increase. Also, rapid population growth makes it more difficult for Uzbekistan to afford the increase in public expenditure per capita, making it challenging for the government to invest in green interventions.

- Uzbekistan needs a strategy for sustainable and green cities. Such an urbanization strategy and capacity building will pave the way for green governance and the planning of large and medium-size cities in Uzbekistan.

- Both Kazakhstan and Uzbekistan need to continue paying attention to energy use (mainly for electricity generation and heating). Energy use has a more detrimental effect in Kazakhstan because per capita energy use is two times more than in Uzbekistan.

- Increased forest cover decreases CO_2 emissions. Therefore, both countries should invest in afforestation programs as part of a long-term green solution. The programs need to increase their forest area with trees that are compatible with the local environment and are the most carbon-absorbing species.

Transition to a green economy is vital for the sustainable development of both countries. For transition to happen, the following criteria need to be met:

- Kazakhstan and Uzbekistan should gradually transition to competitive energy markets by shifting to clean energy sources. Expansion to renewable energy is the best alternative to the dominant economic model that uses primarily fossil fuel energy. Renewable energy will reduce environmental risks and economic loss in the future. Governments can support renewable energy by providing grants and loans to investors in that sector.

• To achieve the anticipated green growth, Kazakhstan and Uzbekistan must continue to encourage contextual legislative structure, enabling regulation and green technical standards to speed up the implementation of announced interventions. The governments should actively encourage private investors to enter the carbon-neutral economy. Another critical approach to minimizing carbon emissions is to continue raising public awareness and providing access to energy-efficient technology.

• To hasten the transition in Uzbekistan, approaches that include active engagement and investment of the civil society, private sector and green specialized NGOs, and the local communities are equally as important as state engagement. Fostering public-private partnership and supportive policies for green investment attracts finances for green initiatives.

• Public awareness using mass media is vital in Uzbekistan to mobilize and engage different layers of the population. Such green awareness campaigns are a long-term green investment in human capital.

• Green transition is a long-term evolution and vision; accordingly, the study recommends that planning and mapping of resources, stakeholders, and capacity building should be made for much longer horizons in both Kazakhstan and Uzbekistan.

• To meet the desired outcomes of the green economy transition in Uzbekistan, specific support is needed for reskilling and training the responsible government agencies for longer-term decarbonization. Capacity building is also needed for the key private sector personnel in the green transition process.

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ANNEX

Table A1. Summary of the green economy strategies for Kazakhstan and Uzbekistan studied in this paper

COUNTRY	Kazakhstan	Uzbekistan
Year the strategy was adopted	2013 (1st in CA)	2019
Strategy period	2013-2050 (37 years)	2019-2030 (11 years)
Policy title	CONCEPT for the transition of the Republic of Kazakhstan to a green economy	Presidential resolution # 4477 on the strategy for the transition of the Republic of Uzbekistan to a green economy for the period to 2030.
Objectives Of the strategy	To enable Kazakhstan to enter the top 30 developed countries of the world by 2050. Recover its water and land resources by 2030.	To increase the energy efficiency of the economy; diversify to renewable energy; introduce green criteria for public investment; Pilot green economy projects; training and retrain personnel on green economy.
Expected economic growth	3 percent increase in GDP per annum from 2013	Higher middle-income country by 2030.
Situation at the time of strategy adoption	Inefficient use of resources. Forecast to run short of water resources. One third of the agricultural lands are degraded. More than 10 million ha of potentially arable land abandoned or lower land productivity. Toxic and radioactive industrial waste a serious problem. Inadequate system of tariffs and pricing for energy.	zbek strategy does not provide a situation analysis of baseline.
Loss in the economy owing to inefficiency	USD7 billion per annum by 2030.	
Intent	Solid political momentum for change. Cost competitiveness of green technologies is improving very rapidly. The global promises of a green economy to stimulate development, social stability, and the creation of jobs.	The obligations of the Paris Agreement (ratified in 2015). Fast reform momentum.
Investments required for the transition to a green economy	1 percent of GDP per annum (equivalent to USD3 billion to USD4 billion).	

Targets	GDP energy intensity will decrease by around 25 percent by 2030 and around 40 percent by 2050 versus the 2013 level.	A decrease in GHG per unit of GDP (by 10 percent from the 2010 level (revised to 35 percent at the COP 26); Increase in energy efficiency/decrease in the carbon intensity of the GDP (twofold by 2030; Development of renewable energy sources (more than 25 percent of the total electricity generation by 2030); Access to modern, inexpensive, and reliable energy supply (100 percent of the population and sectors of the economy); Modernization of the infrastructure of industrial enterprises (increasing energy efficiency by 20 percent); Introduction of drip irrigation technologies (1 million ha); An increase in the yield of irrigated crops (20 percent to 40 percent); Achieving land degradation neutrality (LDN) and land use plan; Increase the average productivity of agricultural food products (20 percent to 25 percent)
Approaches for transition to a GE	Sustainable water use to completely close the water gap by 2050. Sustainable and high-productivity agriculture. Energy saving and energy efficiency in priority industries. Renewable energy/power source. Waste management.	Saving water in agriculture. Alternative and renewable energy source. Green transport. Green building. Technical capacity building.
Institutions to oversee the implement of the strategy	Council	Interdepartmental (interagency) council led by the MoEPR.

Table A2. Taxonomy and Likert value of announced interventions in the green economy strategies, Kazakhstan

SUBARCHETYPE CODEA[a]	Description of archetype	Frequency of announced interventions	Potential economic impact measured using Likert scale[b] (-1 = regress), (0 = little net change), and (+1 = improve)	
			Speed of implementation	Long-run multiplier effect
μ**4**	Water way protection and enhancement	6	0	0
λ**1**	Green retrofitting programs	6	0	1
θ**5**	Local utility investment	6	0	1
ψ**4**	Other sectoral R&D programs	6	-1	1
μ**5**	Agricultural uplift	5	0	0

X1	Green worker retraining	5	0	0
V2	Modernization and transition investments	4	0	1
λ**3**	Other building upgrade support	4	0	1
π**2**	Large scale infrastructure	3	-1	1
μ**2**	Tree planting and biodiversity protection	3	0	0
δ**1**	Public transport expansion	2	-1	1
η**2**	Nuclear energy generation	2	-1	0
μ**1**	Green space investment	1	0	0
η**1**	Renewable energy generation	1	-1	1
θ**3**	Clean housing investment	1	0	1
θ**1**	Urban development program	1	0	0
ε**3**	Refurbish coal mines and gas fields	1	-1	0
ε**4**	Refurbish transmission of fossil energy	1	-1	0
T1	Electric vehicle (fleet) exchange program	1	0	0
T2	Electric vehicle subsidies	1	0	0
δ**5**	Cycle and walking infrastructure	1	0	1
Total = 21		61	0 = 45 -1 = 16	0 = 27 1 = 34
Average			-0.26	0.56

Note: a are codes adopted from O'Callaghan et al. (2021); b are Likert scale values based on O'Callaghan et al. (2021)

Table A3. Taxonomy of archetypes/interventions and Likert value for economic impact variables according to Observatory methodology, Uzbekistan

SUBARCHETYPE CODE[a]	Description	Frequency of announced interventions	Potential economic impact measured using Likert scale[b] (-1 = regress), (0 = little net change), and (+1 = improve)	
			Speed of implementation	Long-run multiplier effect
V2	Modernization and transition investments	15	0	1
η**1**	Renewable energy generation	11	-1	1
V3	Support to innovative industries for green technology	9	0	1
λ**1**	Green retrofitting	9	0	1
ψ**1**	Energy sector R&D	8	-1	1
X1	Green worker retraining	6	0	0
μ**2**	Tree planting	6	0	0
V1	Clean energy market participation	4	0	1
ψ**2**	Agriculture R&D	5	-1	1
ψ**3**	Industrial R&D	5	-1	1
μ**5**	Agricultural uplift	4	0	0
μ**3**	Ecological conservation initiatives	3	0	0
μ**4**	Waterway protection	3	0	0
ψ**4**	Other sectoral R&D programs	3	-1	1
λ**3**	Building upgrade support	3	0	1
η**4**	Upgrade electric grid	3	-1	1
η**8**	Carbon capture and storage	2	-1	

η9	Initiatives to clean dirty energy	2	-1	0
θ1	Urban development programs	2	0	0
δ6	Initiative to improve dirty transport	2	-1	0
θ5	Local utility investment	2	0	1
T2	Electric vehicle subsidy	1	0	0
T1	Electric vehicle transfer (fleet) program	1	0	0
δ1	Public transport expansion	1	-1	1
λ2	Solar support	1	0	1
γ1	Road construction	1	-1	1
γ2	Automobile support	1	-1	0
θ3	Clean housing investment	1	0	1
Total = 28		114	0 = 70 (61 percent) -1 = 44 (39 percent)	Zero = 33 (29 percent) One = 81 (71 percent)
Average			-0.39	0.71

Note: a = are codes adopted from O'Callaghan et al. (2021)
b = source of Likert scale value is O'Callaghan et al. (2021)

Table A4. Summary statistics, Kazakhstan (1990-2020)

VARIABLES	Number of observations	Mean	Standard deviation	Minimum	Maximum
CO_2	29	189,654.14	47,731.895	111,870	256,340
GDP	31	120,853.39	52,626.995	58,532.031	211,107
Export	31	44,785.881	11,022.67	26.918.938	60,627.672
Import	31	37,097.626	13,039.213	20,103.949	78,239.094
Energy use	25	3,658.637	853.639	2,324.548	4,796.144
Renewable energy	29	1.718	0.431	1.154	2.773
Population	31	16.25	1.177	14.858	18.754
Forest	31	1.189	0.043	1.142	1.28
Urbanization	31	56.575	0.546	55.9	57.671

Table A5. Summary statistics, Uzbekistan (1990-2020)

VARIABLES	Number of observations	Mean	Standard deviation	Minimum	Maximum
CO_2	29	113,920	8,330.951	96,130	125,390
GDP	31	52,882.635	27,218.752	26,042.596	107,981.99
Export	26	8,172.098	5,024.655	2,490.489	18,454.111
Import	26	10782.219	7181.359	3135.352	26494.666
Energy use	24	1914.38	235.622	1419.478	2294.824
Renewable energy	29	1.275	0.3	0.71	1.771
Population	31	26.812	3.977	20.51	34.232
Forest	31	7.416	0.677	6.187	8.375
Urbanization	31	47.619	3.27	41.365	51.15

Figure A1. Annual CO_2 emissions, by country

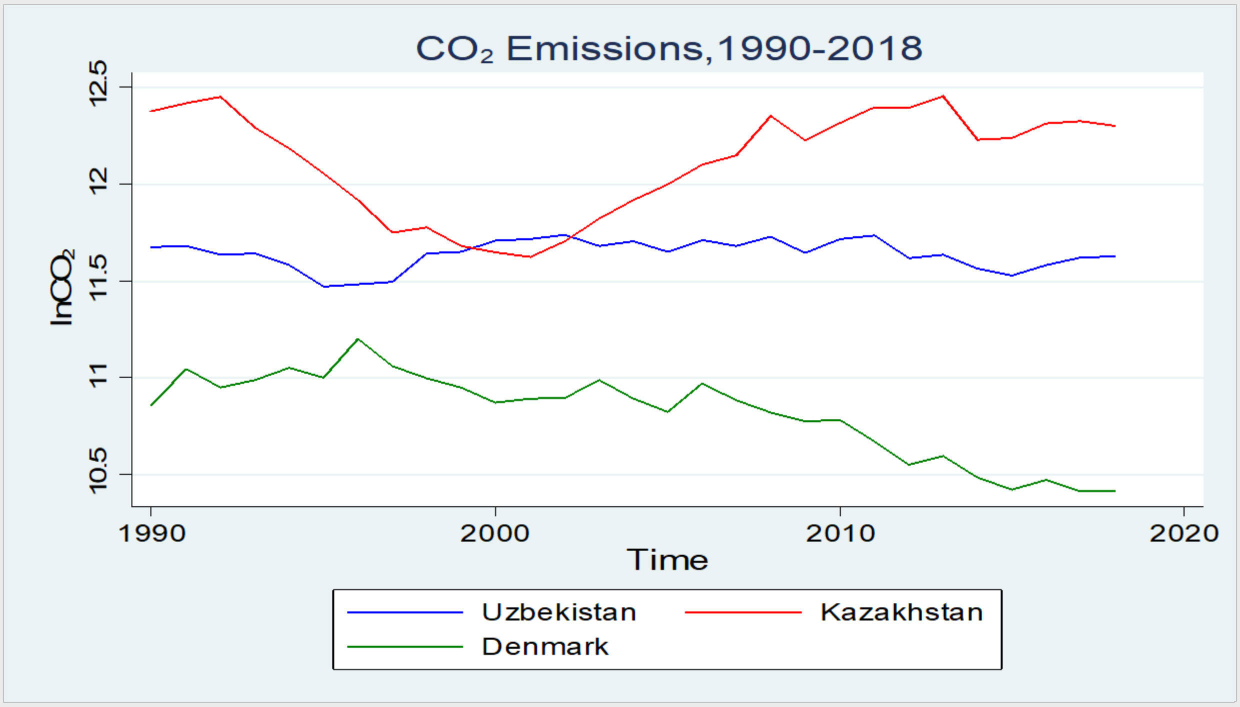


Figure A2. CO_2 per capita emissions, by country

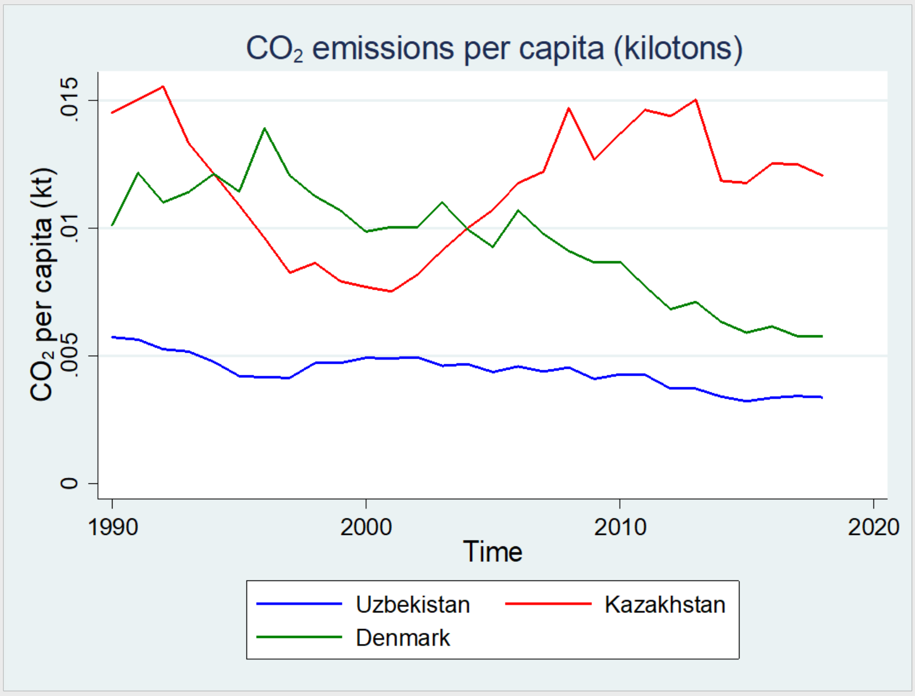
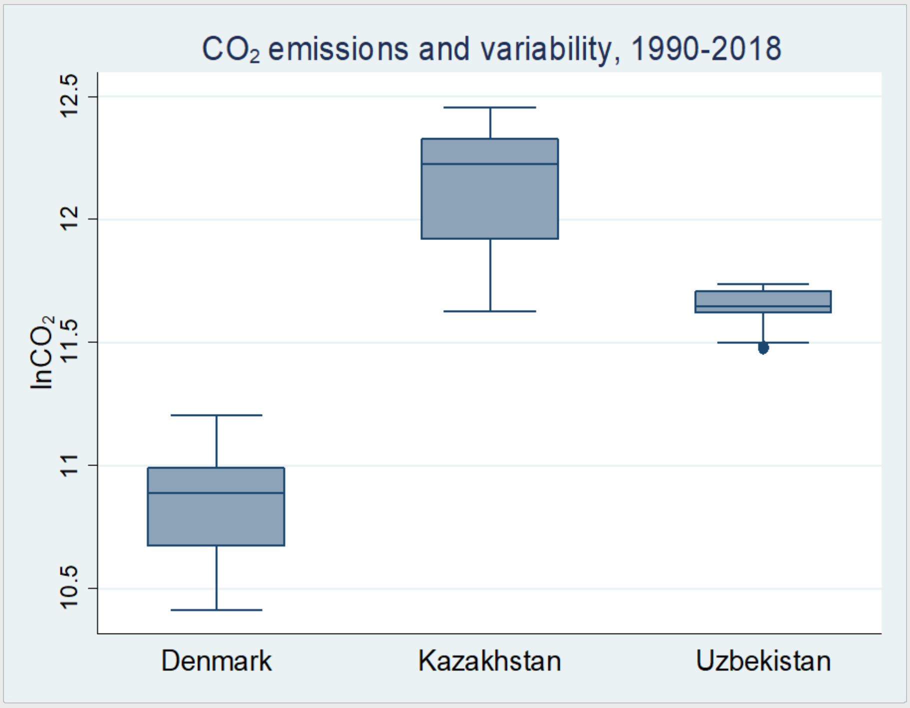


Figure A3. CO_2 emissions and variability



PART III

CLIMATE CHANGE RISKS FOR AGRICULTURE AND FOOD SECURITY

Chapter 6

AGRICULTURE PRODUCTIVITY AND RESILIENCE TO EXTERNAL SHOCKS:

An empirical study of selected CAREC countries

Iroda Amirova and Etenesh B. Asfaw

6.1 INTRODUCTION

Pictures from: https://rabbit.bigbigwork.com/home

The agriculture productivity of most Central Asia Regional Economic Cooperation (CAREC) member countries has been challenged by climate change and other external economic and health shocks over the last two decades (ADB 2019; White et al. 2014; Young et al. 2019). The paper's main objective is to assess the CAREC countries' agriculture resilience to external shocks based on an evaluation of the changes in their agriculture productivity. Here we focus on two external shocks: the global financial crisis (GFC) of 2008 and the recent COVID-19 pandemic.

The study covers eight CAREC countries: Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan, and Uzbekistan. China, Afghanistan, and Turkmenistan were not considered among the CAREC countries in the analysis. We omitted China because, unlike the other CAREC countries, it has a big economy; thus, comparing other countries with China might not result in insightful conclusions. Besides, China is overly studied compared with the other countries. On the other hand, Turkmenistan and Afghanistan were omitted because data is unavailable for these countries. Even if available, the data is not consistent for the 20 years under study.

Exploring the agricultural productivity and resilience to shocks of the selected CAREC countries is essential in three major respects. First, agriculture comprises a large share (on average 15 percent) of the national economy of the selected CAREC countries and is above the world average of 4.3 percent (WB, 2022). Second, the agriculture sectors in the selected CAREC countries have undergone a series of policy, institutional, and structural changes over the last three decades. Third, the percentage of the rural population is high (average above 50 percent), which is above the world average percentage (44 percent), and farm jobs remain the major employment opportunities in rural areas of the study countries (WB, 2021).

Since the 1990s, agricultural reforms in the CAREC countries largely consisted of the transition from the socialist legacy to a market-oriented system (especially for the former Soviet Union countries). As a result, the policy reforms in the region transformed the institutional structures of agriculture with new production patterns, including land reform, farm reorganisation, irrigation and water management, price reform, and the development of market institutions (ADB, 2019). The agriculture sector in the CAREC countries is currently diverse, with more high-value agriculture such as horticulture and oilseed production compared to the older agricultural policies that emphasized wheat and cotton production. Wheat is the main agricultural product in the region and an essential crop for regional food security (ADB, 2019). Smallholders dominate the livestock and horticulture production (Lerman and Sedik, 2009). Also, the current agricultural policies of the member countries focus more on modern supply and value chains (Morgan et al., 2019).

In general, the proportion of arable land to the total land area in the CAREC countries is low. Land reforms that redistributed agricultural land from large enterprises to smaller farms led to the emergence of smallholder farming. Accordingly, the average arable land size per person in the region has decreased from 2.13 ha in 1992 to 1.65 ha in 2016. The limited arable land resulted in smaller farmland area per person in the study countries, on average less than (2 ha/person), except for Kazakhstan (15 ha/person) (ADB, 2019; FAO, 2021; WB, 2021).

The GFC of 2007-2008 that originated in developed countries caused a considerable economic slowdown in many countries, including the CAREC member countries. The financial crisis was transferred to the CAREC countries through higher interest rates, sharp changes in commodity price, and reductions in investment, trade, migration, and remittances (Lin and Martin 2010). The GFC hit the economies of the CAREC member countries, which had mostly just recovered from the macroeconomic and institutional problems since the transition in the 1990s. Thus, the risks from the economic shocks reversed the region's gains and exposed it to economic and social vulnerabilities.

The economic slowdown caused by the GFC hit the global agricultural sector, which experienced considerable difficulties owing to the price swing and to low investment (Lin and Martin 2010). Kadlecikova et al. (2012) indicate that the slow economic growth during the GFC influenced the agriculture sector in most countries in Central and Eastern Europe and in Central Asia. The crisis led to a stagnation in demand for agricultural commodities, a decline in public agriculture expenditure, high input prices, fluctuating food prices that rose and then dropped, and reduced food security. The recent global pandemic crisis in 2020 had similar economic effects in many countries. The pandemic triggered income decline, expenditure changes, and financial difficulty in priority sectors, including agriculture. Uncertainty, lockdowns, and mobility restrictions resulted in a drop in demand and supply chains for agricultural commodities. Also, food prices were volatile and high in most CAREC countries (Djanibekov et al., 2021).

The chapter explores the dynamics in the agricultural TFP change for the selected CAREC countries. It then relates the TFP dynamics to the concept of agricultural resilience to shocks using the analytical framework developed by Zawalińska et al. (2021). It is valuable to understand how and why agricultural resilience varies across the selected CAREC countries to draw lessons for similar shocks in the future. This topic is especially relevant when the world is experiencing the COVID-19 pandemic coupled with the recent Russian-Ukrainian war that triggered a global economic and political crisis. Our analysis focuses on differences in the sources of TFP changes. This, in turn, is instrumental in deriving informed policy options that facilitate better-targeted actions. There is limited empirical evidence on agricultural resilience linked to agricultural TFP changes for the CAREC member countries. This study contributes to the growing knowledge about the relationship between agricultural resilience and TFP change in the agriculture sector.

The temporal dynamics in agricultural TFP changes are presented for 20 years from 2000 to 2020. The study results are aggregated and presented across four periods:

(i) before the GFC, between 2000 and 2007;
(ii) during the GFC, between 2008 and 2009 (referred to as external shock 1);
(iii) after the GFC but before the COVID-19 pandemic, between 2010 and 2019;
(iv) 2020, the year of the global COVID-19 pandemic (referred to as external shock 2).

Only 2020 was considered, owing to limited data for 2021.

The chapter is structured into five sections hereafter. Section two provides the conceptual and analytical framework for the study. Section three discusses the methods and data used. Section four presents and discusses the study results. Finally, section five offers conclusions and policy options for building agricultural resilience capacity to shocks.

6.2 CONCEPTUAL AND ANALYTICAL FRAMEWORK

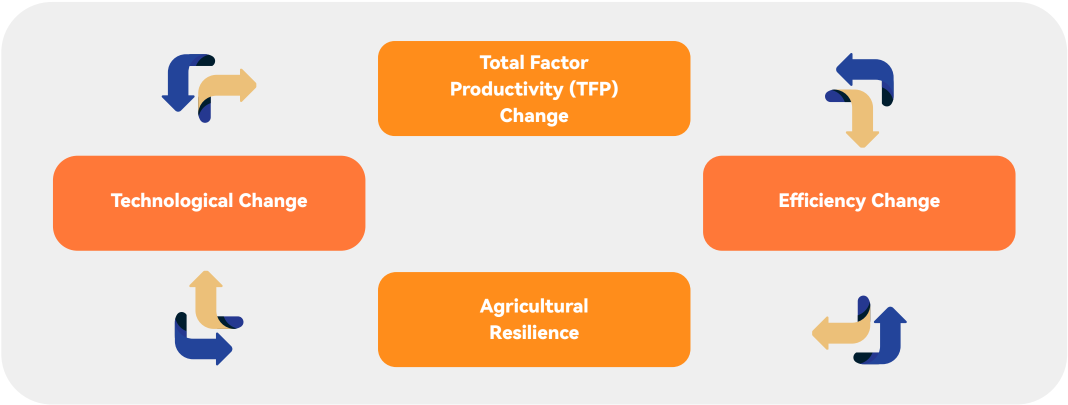
The chapter uses the concepts of agricultural total factor productivity (TFP) and agricultural resilience. In this section, the focus is on the link between the two concepts.

A country's agricultural TFP is an index that gauges the comprehensive agricultural productivity performance, which, in turn, provides insight into the overall efficiency of the agricultural sector production (Conradie et al. 2009). In this chapter, agricultural TFP measures aggregate agricultural output (here, agricultural value-add) per unit of aggregate input (here, labor, land, and capital). The literature on TFP allows the decomposition of the TFP dynamics into technological changes (TCs) and technical efficiency changes (ECs) to distinguish them from the drivers of TFP changes (Coelli and Rao 2005, Cechura et al. 2015, Zawalińska et al. 2021). TC, in our case, is the part of TFP that measures whether the agricultural sector in the studied country is generating technical innovation; it is expressed as the shift in the production frontier in a production function graph. The EC component in the TFP index measures production quality or efficiency. Graphically, it is the extent to which the (agricultural) sector productivity moves toward (or away from) the best practice production frontier; hence, EC can also be interpreted as a catching up or falling behind effect (Chen et al. 2008).

Resilience is the capacity of a system to absorb shock and retain its structure, function, and identity while going through changes (Holling 1973, Walker et al. 2004). Thus, a resilient agriculture system will continue to provide vital services such as food production even when challenged by severe shocks (Lin 2011). The FAO defines agricultural resilience as the ability of people, communities, or systems confronted by crises to withstand damage and recover rapidly.

It is possible to relate TFP changes to the resilience framework owing to the decomposition of the TFP performance into TCs and ECs (Zawalińska et al. 2021). There is a two-way relationship between agricultural system resilience and agricultural TFP change, as illustrated in Figure 6.1 On the one hand, the system's resilience improves the TFP reflected in an enhanced technological or efficiency change. On the other hand, a productive agricultural system positively affects agricultural resilience through externalities and feedback (Zawalińska et al. 2021).

Figure 6.1. Framework linking agricultural TFP with agricultural resilience: two-way relationship



Source: Adapted from Zawalińska et al. 2021

Zawalińska et al. (2021) differentiate between an agricultural system's 'potential resilience' and 'revealed resilience.' They explain that potential resilience is built before a shock period and is manifested in three capacities known as robustness, adaptability, and transformability of the sector (defined in Table 6.1). On the other hand, revealed resilience is measured by observed productivity changes after the shock.

The chapter explores the revealed resilience of the CAREC countries' agriculture sectors to the GFC in 2008 and the COVID-19 crisis in 2020 against their potential resilience capacities (Table 6.1). The current perspective of resilience could be classified as narrow. However, this is done to employ the chosen analytical framework. The authors are aware that there are many more approaches to resilience (some of them are reviewed by Xu and Kajikawa, 2018).

To address the objective of the current study, we calculate the CAREC countries' agriculture TFP changes and assess the TFP and the TC and EC composition changes (if it declines, grows, or stays the same) at times of shock. In doing so, we link and provide the relationships of the three agricultural potential resilience capacities (robustness, adaptability, and transformability) with the actually revealed resilience of the systems. Table 6.1 illustrates the link between the two concepts: productivity and resilience. It provides an easy-to-follow framework to relate agricultural TFP and composition changes to resilience to shock.

Table 6.1. Agricultural TFP and resilience capacities

Resilience capacities	Definition	Relation between the resilience capacity and changes in TFP and its composition
Robust agriculture	When the system has the ability to maintain the essential functions without significant changes to its internal components and processes, despite the presence of external shocks (Urruty et al. 2016).	- If TFP is non-declining (stays the same or grows). - The TC and EC components of the TFP are maintained in similar proportions as before the shock.
Adaptable agriculture	When the agriculture system is able to adapt internal elements and processes in response to changing external circumstances and thus continue to develop along the previous trajectory while maintaining all vital functions (Folke et al. 2010).	- If TFP is non-declining and the TC and EC composition shows substantial changes—such as, TFP that was driven by TC becomes driven by EC—thus, the system adapts its TFP.
Transformable agriculture	When the existing system is unsustainable or dysfunctional, then the system needs to develop or incorporate new elements and processes that alter the operational logic to maintain essential functions (Walker et al. 2004).	- If TFP is declining and the components of the TFP have no substantial contributions to the TFP growth, the system is not robust, so the system needs to adapt. If the TFP is declining even when the TFP adapts and the composition changes, a more extensive adaptation is needed, leading to a transformation of the system.

Source: Adapted from Zawalińska et al. 2021

If we create a range for resilience capacities, robustness is the capacity illustrating the highest resilience, and adaptability follows after. If neither robustness nor adaptability fits the classification, then the system is not resilient and needs transformation.

6.3 METHODS AND DATA

6.3.1 Method

This study uses the Malmquist Productivity Index (MPI) method that uses the data envelopment analysis (DEA) frontier to estimate the agriculture TFP changes for the selected countries over some periods, as described in Färre et al. 1994. The detail of the DEA frontier technique for our Malmquist Index (MI) formula construction is presented in Appendix 6.1.

The MPI estimates the TFP change between two data points. In our case, these data points mean two time periods of a particular CAREC country; hence, the index measures the productivity change over time. The index is calculated by taking the ratio of the distance of each data point relative to a common technology (Coelli and Rao 2005). While estimating the Malmquist TFP index via the DEA method, we assume that each period's best practice production frontier will be constructed as a reference production technology. These measures capture productivity performance relative to the best practice in the sample. The best practice in the sample represents a 'world frontier' (Färe et al. 1994). Our selected eight CAREC countries define the world in the current study. Therefore it is worth mentioning that the estimated TFP values and, hence, resilience discourses of these eight CAREC countries are relative to their sample.

The MPI is further decomposed into TC and EC. When the MPI or any of its decomposition is less than one (1), it means a deterioration in performance. In contrast, an index greater than one (1) signifies performance improvement, and an index equal to one signifies stagnation. Even if other productivity estimation methods that enable similar decomposition exist, they require the specification of a functional form for the technology change. In contrast, we use the MPI approach, which uses DEA, for our study with multiple inputs and outputs, which is nonparametric (Färe et al. 1994).

The MPI is based on the concept of the production function of the maximum possible output production, with respect to a set of inputs (here, capital and labor). The production set assumes for each time *t*, an *Nx1* input vector and an *Mx1* output vector. The closed production set (1) gives the possibilities for a multi-input *(x)* and multi-output production *(y)* process. Following Färe et al. (1994), we assume the standard properties of production sets such as convexity and disposability. *P (x)* is the production technology where the set of all agriculture output vectors *(y)* can be produced by employing the input vectors *(x)*, at time *t*, as illustrated in the expression (2) below. Assuming that for each time t, the $x^{t-s} \in R^N_+$ are transformed into $y^{t-st-s} \in R^M_+$, the production possibility set is given in equation (3) where S^{seq}_t denotes sequential production technology. Output sets which are defined through S^{seq}_t are expressed as in equation (4). Using the DEA approach, the distance function (d^t) is as in equation (5) with λ as the smallest factor, with which output vector y^t is deflated in the order it can be produced with the given input x^t vector with the technology available at time *t*. Based on Färe et al. (1994), we consider the distance function equation (6) as the output-oriented Malmquist TFP index formula. The MI formula in (6) can, however, be decomposed into two components TC and EC as in (7), assuming constant return to scale (CRS).

It is possible to relate TFP changes to the resilience framework owing to the decomposition of the TFP performance into TCs and ECs (Zawalińska et al. 2021). There is a two-way relationship between agricultural system resilience and agricultural TFP change, as illustrated in Figure 6.1. On the one hand, the system's resilience improves the TFP reflected in an enhanced technological or efficiency change. On the other hand, a productive agricultural system positively affects agricultural resilience through externalities and feedback (Zawalińska et al. 2021).

$$S^t=\{(x^t,y^t):x^t \text{ can produce } y^t\} \quad (1)$$

$$P(x)=\{y^t:(x^t,y^t)\in S^t\} \quad (2)$$

$$S_t^{seq}=\{(x^{t-s},y^{t-s}):x^{t-s} \text{ can produce } y^{t-s}\} \text{ with } s=0,1,2,\ldots,t-1 \quad (3)$$

$$P_t^{seq}(x)=\{y^{t-s}:(x^{t-s},y^{t-s})\in S_t^{seq}\} \quad (4)$$

$$d^t(x^t,y^t)=\inf\{\lambda:(\frac{y^t}{\lambda})\in P_t^{seq}(x)\} \quad (5)$$

$$m=\{x^t,y^t,\ x^{t+1},y^{t+1}\}=\left[\frac{d^t(x^{t+1},y^{t+1})}{d^t(x^t,y^t)}\times\frac{d^{t+1}(x^{t+1},y^{t+1})}{d^{t+1}(x^t,y^t)}\right]^{1/2} \quad (6)$$

$$m(x^t,y^t,\ x^{t+1},y^{t+1})=(TC)\times(EC) \quad (7)$$

$$\text{Where } TC=\left[\frac{d^t(x^{t+1},y^{t+1})}{d^{t+1}(x^{t+1},y^{t+1})}\times\frac{d^t(x^t,y^t)}{d^{t+1}(x^t,y^t)}\right]^{1/2} \text{ and } EC=\frac{d^{t+1}(x^{t+1},y^{t+1})}{d^t(x^t,y^t)}$$

We constructed the MPI for the eight countries' agriculture sector directly from our input and output data using the DEA technique on STATA. The application in STATA enables users to measure productivity changes over time. We used the 'dea' command to estimate the MPI using DEA in STATA 14. The syntax of the command is as follows: dea ivars = ovars, rts(vrs) ort(i), where input variables (ivars) were capital (net capital stock) and labor (number of persons employed in agriculture), while output variable (ovar) was the gross agricultural outcome in USD constant price. Land was excluded from the estimations because the land data for 2020 was not available in our dataset, and in general land use data does not alter very much as it is a relatively fixed asset.

After we estimated the eight CAREC countries' agriculture TFP performance for the 20 years, we aggregated the TFP, TC, and EC result in an average of four periods. We then employed the resilience analytical framework developed by Zawalińska et al. (2021) to derive and interpret the implications of the TFP estimates for the revealed resilience during shocks, referring to Tables 6.1 and 6.2. As stated above, the TFP index changes and decomposition (TC and EC) are interpreted as increasing if an index value is above one. If TFP changes and its decomposition (TC and EC) index are equal to one, it means the performance is stagnant, and below one means a decline in performance.

Table 6.2. Categories of agriculture sector TFP performance and revealed resilience to shocks

	No composition change in TFP	**Composition changes in TFP**
TFP non-declining	Robust agriculture.	Adaptable agriculture.
TFP declining	Not robust enough. Need to adapt its TFP.	Not adapted enough. Need to transform.

Source: Adapted from Zawalińska et al. 2021

6.3.2 Data

The study utilises a mix of datasets from 2000 to 2020 drawn from the databases of the FAO and World Bank, and national statistics of the selected CAREC countries to estimate the TFP indices and composition. Table 6.3 provides more detailed information on the variables used in the TFP analyses.

The descriptive statistics, including the sample means, standard deviations, and annual growth rates of the input and output variables for 2000-2020 by country, are presented in Appendix Table A1. We provide the summary statistics for the per capita input ratios (land/labor and capital/labor) in Appendix Table A2. We provide details on the intensity of input use across the eight CAREC countries in the Appendix (Figures A3, A4, and A5). Our datasets indicate that among the eight CAREC countries, Pakistan has the highest number of agricultural laborers in its economy, followed by Uzbekistan. The datasets also show that Pakistan and Kazakhstan are the leading countries in arable land endowments, while Georgia and Tajikistan are the countries with the smallest land endowments. Kazakhstan has the highest average land per capita. Pakistan, Uzbekistan, and Kazakhstan are the top three leading countries in their average total capital investments in agriculture. Nevertheless, Mongolia has the highest per capita capital investment.

Table 6.3. Variables, descriptions, and sources of data used to calculate agricultural TFP

Variable name	Type	Description	Source(s)
Agricultural value-added	Output	The net output of a sector after adding up all outputs and subtracting intermediate inputs. In the current work, we use this estimate measured in millions of USD.	FAO (2021).
Agricultural labor	Input	1,000 agricultural labor persons.	World Bank (2021), national statistics websites of Azerbaijan, Georgia, and Kyrgyzstan.
Land	Input	rable land in 1,000 ha.	FAO (2021).
Capital (net capital stock in agriculture, forestry, and fishery)	Input	The net capital stock is the sum of the written-down values of all the fixed assets still in use. It is described as the net capital stock in agriculture, forestry, and fishery in constant millions of USD.	FAO (2021).

6.4 RESULTS AND DISCUSSION

6.4.1 Agriculture TFP performance for 2000-2020

6.4.1.1 Average changes in TFP and composition

The estimates for the annual average and cumulative TFP index changes and compositions for the eight CAREC countries for 2000-2020 are presented in Table 6.4 and visualised in Figure 6.2. The average annual TFP performance and composition estimates are aggregated into four periods, including the two shock periods (in red font) in Table 6.4. The countries' agriculture TFP change estimates and the source of the changes is explained as follows:

Azerbaijan's average TFP change (TFPCH) over the 20 years was positive and mainly sourced from TC. Azerbaijan was also doing well in catching up with the best practice production frontier, as the respective efficiency index (EC) was non-declining and increased after the third period. However, Azerbaijan's agriculture TFP declined during both shocks, triggered mainly by declines in the TC component. The finding is consistent with a study showing that Azerbaijan's agriculture investment declined during the GFC, as the government diverted to other sectors and foreign investment declined (Mikayilov 2009). Again in 2020, Azerbaijan experienced compounded crises in addition to the pandemic, including the oil price crisis and failed reforms that affected the agriculture sector investment (Ibadoghlu 2020). Specifically, Ibadoghlu indicates that agriculture was not included in the list of economic sectors supported by the government crisis stimuli, and farmers were not entitled to benefit while agriculture production and exports declined.

Georgia's cumulative average TFP change in the observed 20 years was small, next to that of Pakistan. The TFP change was almost perfectly correlated with the index's TC component, which was, on average, below 1. This implies that the small Georgian agriculture productivity changes came from its technological innovations until the COVID-19 pandemic. The Georgian agriculture TFP grew very slightly during the first shock period but declined during the pandemic owing to declines in TC and was below 1. The efficiency component of the TFP on average declined during the period between the GFC and the pandemic shocks, but increased during the pandemic. Paresashvili et al. (2021) characterize the agriculture sector in Georgia as traditional with an absence of modern technological opportunity and an underdeveloped supply chain. A small share of the public budget goes towards funding agriculture. Also, the sector suffers from ambiguous regulatory laws, low compatibility with international market standards, and an underdeveloped insurance system in agriculture (ibid). Papava and Vakhtang (2020) also indicate that the Georgian government's investment in the agriculture sector was not a priority during the pandemic.

Kazakhstan's agriculture TFP grew until the GFC, mainly driven by EC. The agriculture TFP slightly declined during the first shock but was above 1, and it increased consistently after the shock. The TFP decline during the first shock was derived mainly from the decline in technical efficiency (EC) while TC increased. Kazakhstan's TFP increased before and during the second external shock, primarily sourced from the increase in the EC component in the TFP when the TC component declined but was 1. Kazakhstan has devoted substantial public funds to the agricultural sector since early 2000, including during the GFC period. The sector budget is dominated by price support, financing, and innovations (Petrick and Pomfret 2016). Agriculture has been a critical factor in economic diversification, although it accounted for only a small share of GDP. The sector remained a priority development area during the 2020 pandemic. The country experienced steady per capita agricultural production growth in the second decade of our observation.

Kyrgyz Republic's average agricultural TFP increased during the GFC and declined to below 1 in the decade before the pandemic. The TFP change was sourced mainly from TC; hence, all trends in the TC were accordingly reflected in its TFPCH. The country had the lowest cumulative EC. During the second shock, the EC component increased and the TFP was above 1, while the TC further declined below 1. Neither of the external shocks disturbed the country's agricultural productivity performance. After independence, the Kyrgyz Republic rapidly liberalized its economy, including the agriculture sector (Ruziev and Majidov 2013). Nevertheless, Undeland (2010) argues that the fact that the country was not fully integrated into the global economy saved it from getting hurt during the GFC. During the GFC, the government focused on controlling food prices and increasing domestic production. Agriculture is the largest economic sector in the Kyrgyz Republic , and it acts as a shock absorber for the entire economy during times of crisis. The sector relies on labor intensive production (Ruziev and Majidov 2013).

Mongolia's agriculture TFP was doing well during the 20 years, mostly sourced from technical EC. The agriculture sector performed well in terms of efficiency, unlike its TC, which most of the time declined. Mongolia had the highest cumulative EC over the 20 years. Although agriculture TFP was handled well during the GFC, the TFP performance declined below 1 during the pandemic shock owing to significant declines in TC. Although agriculture is an important component of the Mongolian economy, particularly for its self-sufficient food targets, the share of agriculture in the economy declined after 2005 (Khongorzul 2007). The animal subsector and meat exports are an important component (60 percent) of Mongolian agriculture. The sector suffers from a lack of modern technology and climate change challenges (Takahashi et al. 2019).

Pakistan's agricultural TFP index was stagnant and lacked innovation for a long time.

The average TC component index of the TFP was below 1 over the 20 years. The TFP was determined mainly by its non-increasing EC component. Thus, during the 20 years, the production frontier of Pakistan's agriculture sector did not shift upwards. However, the average TFP increased after 2010, and has since been catching up with its best practice frontier by increasing technical efficiency. However, Pakistan has an overall negative cumulative TFP change. During the pandemic shock, the TFP increased above 1, driven by positive changes in the EC. Pakistan shares the challenges regarding low agriculture productivity faced now by many developing and highly populated countries, although the sector is the largest employer in the economy. With high population pressure, growth in agriculture came from labor inputs and not from TFP components. Political and macroeconomic instability and an unstable policy environment (in terms of rules, taxes, and tariffs) contributed to the limited agriculture productivity in Pakistan (Ahmed 2020).

Tajikistan's average TFPCH over the 20 years was positive. The TFP increase until 2010 was sourced mainly by the TC component and then, after that, the EC was a contributor to the TFPCH. Tajikistan moved closer toward the best production frontier by increasing its TC during the GFC shock. However, the country did not generate innovation during the COVID-19 shock (TC value is less than 1). The TFP improvement during the COVID-19 pandemic shock was sourced from EC. Tajikistan has the highest cumulative TFP and TC performance in the 20 years. It benefited from investment from the post-civil war international organisations in the agriculture sector after 1998 (Ruziev and Majidov 2013). The share of agriculture in the economy has increased gradually, and smallholder farms dominate the sector, with a poor permanent link to the upstream market and limited access to finance and technology (Skakova and Livny 2020).

Uzbekistan's TFPCH increased over the 20 years and was triggered only by the index's technical efficiency (EC) component. The TFPCH and EC were perfectly correlated throughout the years, including during the shock periods. The country's agricultural sector was moving towards its potential productivity frontier (catching up) as the EC was continuously increasing, including during the shock periods. On the other hand, the agricultural sector did not generate innovations, as the TC component of the TFPCH was constantly equal to one (1) — therefore it remained stagnant during the 20 years studied. Uzbekistan slowly and cautiously reformed and integrated its agriculture into the global economy after the transition (Ruziev and Majidov 2013). Uzbekistan acted swiftly to protect the agriculture sector from the pandemic crisis through investments from the anti-crisis fund and several policy measures to increase resource use efficiency. The most important policy document to counter the negative impacts of COVID-19 on the agriculture and food sector during 2020 was Presidential Decree No. 4700 (1 May 2020), titled 'Providing food security during the coronavirus pandemic, rational use of available resources, and government support for agriculture.'

Table 6.4. Annual average and cumulative TFP changes and decomposition for the CAREC countries (2000-2020)

	Total Factor Productivity Change (TFPCH)					
	2000-2007 average	2008-2009 average	2010-2019 average	2020	2000-2020 average	2000-2020 cumulative
Azerbaijan	0.974	0.965	1.030	0.954	1.023	6.882
Georgia	0.968	1.022	1.035	1.003	1.010	0.607
Kazakhstan	1.067	1.033	1.061	1.120	1.064	12.852
Kyrgyzstan	1.041	1.084	0.997	1.012	1.022	6.786
Mongolia	1.037	1.033	1.096	0.977	1.063	10.175
Pakistan	0.995	0.997	1.000	1.061	1.001	-0.841
Tajikistan	1.080	1.112	1.051	1.098	1.070	16.759
Uzbekistan	1.037	1.041	1.022	1.139	1.035	6.730

Technical Efficiency Change (EC)

	2000-2007 average	2008-2009 average	2010-2019 average	2020	2000-2020 average	2000-2020 cumulative
Azerbaijan	0.951	0.950	1.013	0.825	0.997	2.1474
Georgia	0.952	1.000	1.020	0.864	0.988	-1.166
Kazakhstan	0.989	1.026	1.041	1	1.024	4.5627
Kyrgyzstan	1.030	1.080	0.982	0.871	1.003	4.8791
Mongolia	0.972	0.956	1.056	0.839	1.006	-2.069
Pakistan	0.935	0.923	0.979	0.969	0.958	-10.49
Tajikistan	1.050	1.109	1.036	0.946	1.043	12.221
Uzbekistan	1	1	1	1	1	0

Technological Change (TC)

	2000-2007 average	2008-2009 average	2010-2019 average	2020	2000-2020 average	2000-2020 cumulative
Azerbaijan	1.022	1.017	1.017	1.157	1.028	4.624
Georgia	1.018	1.026	1.017	1.162	1.024	2.005
Kazakhstan	1.078	1.007	1.021	1.12	1.040	8.385
Kyrgyzstan	1.010	1.003	1.017	1.162	1.020	1.975
Mongolia	1.064	1.081	1.038	1.165	1.058	12.274
Pakistan	1.064	1.081	1.022	1.095	1.046	10.389
Tajikistan	1.029	1.003	1.017	1.162	1.027	4.404
Uzbekistan	1.037	1.041	1.022	1.139	1.035	6.730

Figure 6.2 shows the dynamics in the average TFP performances and TC and EC compositions in the eight countries.

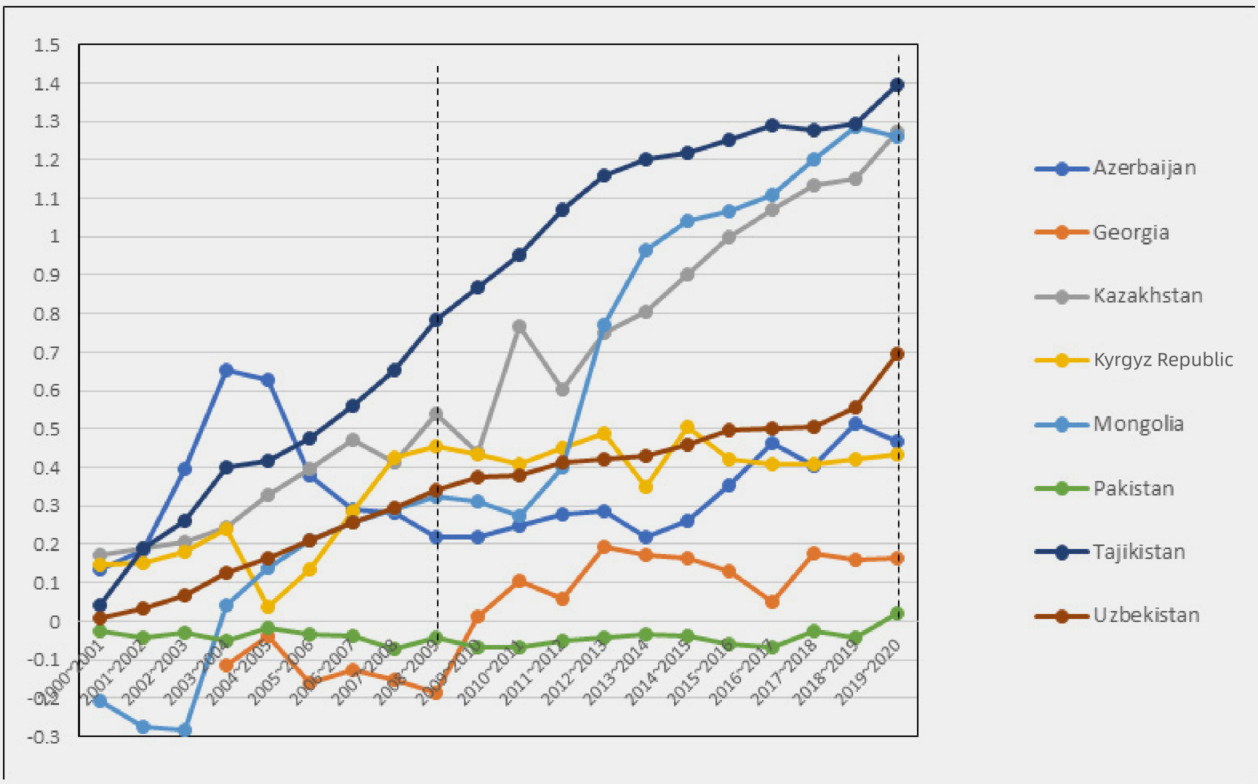
Figure 6.2. Average TFP, TC, and EC changes for selected CAREC countries (2000-2020)

Source: Author's construction

6.4.1.2 Cumulative TFP changes

We observed diverse cumulative TFP performance across the eight studied countries (see Figure 6.3).

Figure 6.3. Average TFP, TC, and EC changes for selected CAREC countries (2000-2020)



Source: Authors' construction

Tajikistan, followed by Kazakhstan and Mongolia, had the highest cumulative TFP performance (above ten) in the 20 years. Azerbaijan, Kyrgyz Republic, and Uzbekistan had similar cumulative TFP changes (almost seven). Georgia had the least (sluggish but positive) cumulative TFP change in the 20 years, while Pakistan had a negative cumulative TFP change. The disparities in the CAREC countries' cumulative TFPs widened over time.

Labor intensity increase coupled with farm reforms explain Tajikistan's productivity improvements. The upward movements in the cumulative agriculture TFP for Kazakhstan and Mongolia (until the pandemic) can be explained by the land and capital intensity in their sectors that increased in the second half of the 20 years (see Figures A3 and A4 in Appendix 6.2). Despite this, the agriculture sector contributes a relatively small portion to the economies of Kazakhstan and Azerbaijan; Kazakhstan's agriculture TFP remained steady and increased, while Azerbaijan's agriculture productivity remained sluggish in the last decade.

6.4.2 Agriculture TFP performance linked to resilience to shocks

We categorise the eight CAREC countries based on estimates of their agricultural TFP performance and changes in their TFP composition across the four phases (see Table 6.5). The combination of 'non-declining TFP' and 'no composition change in TFP' represents the countries and phases with a robust agricultural system. The combination of 'non-declining TFP' and 'composition change in TFP' represents phases and countries with an adaptable agricultural system. The combination of 'declining TFP' and 'no composition change in TFP' represents the countries and phases with insufficiently robust systems that must adapt to the emerging circumstances. Furthermore, the combination of 'declining TFP' and 'composition change in TFP' represents phases and countries that are not adaptable enough and hence need to transform their agricultural systems to become resilient.

Table 6.5. The interfaces between agriculture resilience to shocks and TFP changes during shock periods in the study of CAREC countries

Phases	Productivity performance	Countries with no composition change in TFP	Countries with composition changes in TFP
Phase 1	non-declining TFP	Kazakhstan, Kyrgyz Republic, Tajikistan, Uzbekistan	Mongolia
	declining TFP	Azerbaijan, Pakistan	
Phase 2 (shock 1)	non-declining TFP	Georgia, Kyrgyz Republic, Mongolia, Tajikistan, Uzbekistan	Kazakhstan
	declining TFP	Azerbaijan, Pakistan	
Phase 3	non-declining TFP	Kazakhstan, Pakistan, Tajikistan, Uzbekistan	Azerbaijan, Georgia, Mongolia,
	declining TFP		Kyrgyz Republic
Phase 4 (shock 2)	non-declining TFP	Pakistan, Uzbekistan	Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan
	declining TFP	Azerbaijan	Mongolia

Source: Authors' construction

The assessment of countries' agriculture resilience for the shock periods through their TFP changes and TC and EC composition is further illustrated in Table 6.6.

During the first shock (GFC), the TFP change for all countries was above one (1), did not decline, and had a robust agriculture system, except for Kazakhstan, Azerbaijan, and Pakistan. With this, they demonstrated their agriculture system's ability to maintain the essential functions without significant changes to the sector's internal components, functions, and processes, despite external disturbances. On the other hand, Kazakhstan altered its TC to maintain non-declining TFP (above 1). By doing so, it illustrated the agricultural system's ability to adapt internal elements and processes in response to changing external circumstances and continue to develop along the previous trajectory while maintaining all vital functions. Azerbaijan's agricultural productivity declined below 1, showing it was not robust enough to resist the external shock; it needed to adapt its TFP to be resilient. Pakistan's agricultural TFP was stagnant and below one during the first shock period; it needed to change its TFP composition.

Table 6.6. Assessment of revealed resilience to shocks related to TFP and composition changes

	Azerbaijan	Georgia	Kazakhstan	Kyrgyzstan	Mongolia	Pakistan	Tajikistan	Uzbekistan
2008-2009 GFC	TFP<1 TC<EC need to adapt or transform	TFP>1 TC<EC robust	TFP>1 TC>EC adaptable	TFP>1 TC>EC robust	TFP>1 TC<EC robust	TFP<1 TC<EC need to adapt or transform	TFP>1 TC>EC robust	TFP>1 TC<EC robust
2020 COVID-19	TFP<1 TC<EC need to adapt or transform	TFP>1 TC<EC adaptable	TFP>1 TC<EC adaptable	TFP>1 TC<EC adaptable	TFP<1 TC<EC need to transform	TFP>1 TC<EC robust	TFP>1 TC<EC adaptable	TFP>1 TC<EC robust

Source: Author's elaboration

During the second shock (COVID-19 crisis), all countries except Azerbaijan and Mongolia revealed resilience by staying robust or adaptive with their TFP composition. Georgia's TFP declined but was above one by adapting its EC. All countries altered their EC component of the TFP composition to maintain non-declining TFP. Thus, changes in their technical efficiency in production were the source of all the TFP increases during the pandemic. The EC may have come from the efficient use of agricultural resources and anti-crisis interventions during the pandemic crisis. Except for Kazakhstan and Uzbekistan, which had a TFP index of one, the TC component of TFP declined and was less than one for all countries. Azerbaijan and Mongolia faced a declining TFP of less than one. At the same time, Mongolia's agricultural system was not adaptable enough and thus required transformation. Azerbaijan's agriculture sector needed to adapt its TFP in both shocks, while Kazakhstan's was adaptable, and Uzbekistan's agriculture sector was robustly resilient to both shocks.

Adaptation in the TFP change through innovations (TC) (as in Kazakhstan during the GFC) and increased EC regulations for efficient use of resources (as in Georgia, Mongolia, and Uzbekistan) can be a reason for non-declining TFP and resilience to shocks. More so, policies that increased technical ECs (for using labor and land efficiently) announced by governments during shock periods, as in the case of Uzbekistan during the pandemic, may have paid off to increase the TFP and resilience of the agriculture system.

6.5 CONCLUSION AND POLICY OPTIONS

This chapter empirically assessed eight CAREC agriculture systems and revealed resilience to shocks based on their TFP performances. The paper used the MPI method initiated by Färe et al. (1994) to estimate the agriculture TFP and TC and EC composition changes. The decomposed TFP estimation, in turn, enabled the assessment of the revealed resilience to shocks manifested in the TFP changes and its components, as initiated by Zawalińska et al. (2021).

Zawalińska et al. linked TFP with resilience during crisis times. For such inference, they found supportive evidence from the Polish farming sector by comparing different directions of farming with each other. We linked productivity with resilience by following Zawalińska et al. (2021). However, unlike Zawalińska and colleagues, we compared the countries' aggregated agriculture sectors. By narrating the two concepts — TFP changes and resilience to shocks — the paper produces evidence-based policy options to enhance sectoral resilience. Moreover, we contribute to the pool of knowledge with additional insights regarding the varied geography of CAREC countries. Besides, as Zawalińska et al. (2021) suggested for further studies, we studied the effect of the ongoing COVID-19 pandemic on the resilience capacity of the agricultural sector across eight CAREC countries. This study can be furthered by increasing years of observation as external shock 2 (pandemic) is now coupled with another external shock: the war in Ukraine.

From our empirical study, we draw four main conclusions:

· First, although the agricultural TFP changes of the eight CAREC countries varied across the studied 20 years, the average changes were positive.

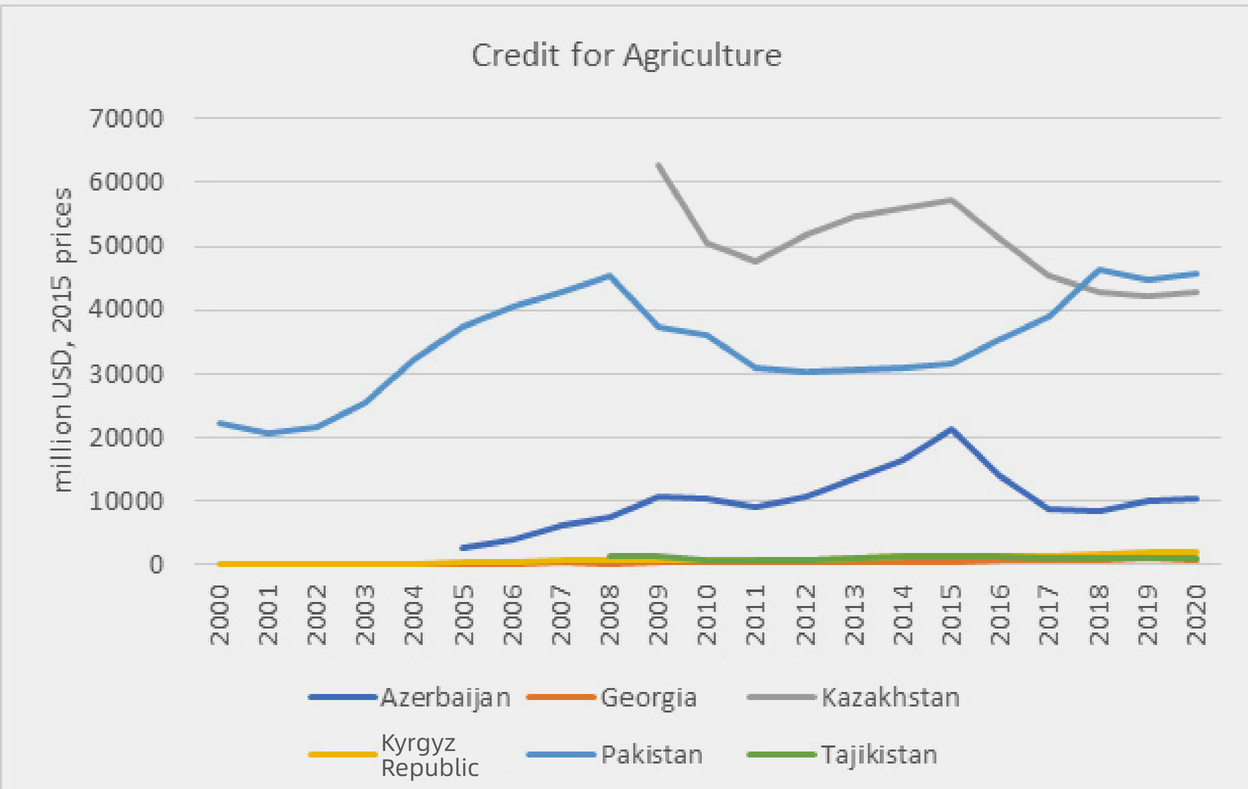
· Second, we observed diversity in the extent of cumulative TFP performance across the eight countries, and the cumulative TFP disparities widened after the second period — 2010.

· Third, except in a few of the studied countries like Tajikistan and Kyrgyzstan, whose changes in technological innovation triggered agricultural TFP growth, the TFPCH in the studied CAREC countries was sourced only from technical efficiency (EC) change. According to Färe et al. (1994), 17 developed OECD countries, on average, experienced growth owing to innovation (TC) rather than improvements in efficiency (EC) between 1979-and 1988. In this way, the 'world frontier' of productivity was always shifted upwards in OECD states. CAREC states, on the other hand, are not pushing the frontiers of agricultural productivity.

· Fourth, countries showed varied revealed resilience during and between the two shocks. Most countries that showed resilience during shocks maintained their TFP growth by increasing efficiency. During the COVID-19 crisis, none of the countries' TFP changes was driven by innovation, as the TC indices were one or below 1. Similar agricultural resilience to crises was detected in the Czech Republic during the global financial crises (Machek and Špička 2013). Machek and Špička found that agricultural productivity does not necessarily follow the domestic economic cycle, implying that global crises hitting the economies do not necessarily affect agricultural productivity and hence the resilience of the sector.

Food has relatively lower price elasticity of demand; hence, the demand for food quantity did not abruptly drop during the crisis periods despite changes in prices, in contrast with the case for products with higher value added (Potori et al. 2011). This, in turn, kept the demand for agricultural products stable and did not push down production, contributing to the sector's productivity-driven resilience. Moreover, during both crises, most CAREC countries' history of credit for the agriculture sector was positive, as Figure 6.4 shows.

Figure 6.4. Credit for agriculture (2000- 2020), CAREC Countries



Source: FAO, 2022

Uzbekistan revealed the highest resilience to shocks among the eight CAREC states, as it revealed robustness during both crises considered. Countries such as Azerbaijan and Mongolia revealed a deterioration in resilience from GFC to the pandemic. Georgia, Kyrgyzstan, and Tajikistan became adaptable during the external shock from being robust in the first crisis. Kazakhstan is the only country in our sample that stayed adaptable during both crises.

Although the current study provided positive messages on resilience to shocks, we must acknowledge certain drawbacks. Because of the data constraints, the TFP estimations did not consider fertilizers, the agricultural input that experienced abrupt price increases during the crisis. Therefore, the inclusion of fertilizers into analyses in future research might complement the current study well and further enhance the practicality of the recommendations. Moreover, the eight CAREC countries were considered as the 'world' while estimating the productivity frontier; hence, the productivity estimates of all countries in the study are inflated. Re-conduction of the analyses with more countries could benefit further studies, as such analyses would give more realistic estimates of productivity at a country level. The estimates for the four observation periods are also averages for the aggregated years; hence, the results ignore the variations across the years in the group.

Moreover, even when the agriculture system of the studied countries is robust or adaptable, the agriculture of these countries might be struggling with sustainability. The reasons behind this are: a lack of incentive mechanisms inducing farmers to invest in productivity and sustainability enhancing solutions; and dysfunctional institutional settings causing the vicious circle of low water use efficiency, biophysical constraints, and deteriorated irrigation infrastructure, as summarized in Amirova (2022).

Based on the study findings and conclusions, we provide policy options to increase the studied countries' agricultural productivity and resilience capacities before and during external shocks as follows:

Azerbaijan needs to acknowledge the value of agriculture functions during shocks and invest in technological innovations in the agriculture sector during crises. Georgia needs to focus on an accelerated increase in its sluggish agricultural productivity performance from small lands. As land fragmentation (land/labor) rises in Georgia over time, the country should invest in intensive and efficient land use. It should also benefit from potential investments in productive technological innovations and improved skills of smallholders.

Kazakhstan needs to keep up its high agriculture TFP performance. The country will need to study ways to use the relatively large land/labor and limited water resources efficiently in the long run. It will need to invest in agricultural technology innovations amid external shocks. Similarly, Kyrgyz Republic needs to preserve the positive changes gained in the agriculture sector from ECs during the pandemic, which calls for policies to maintain and increase production efficiency. The country also needs more technological investment in agriculture productivity to reverse the declining trend over the last decade. The Kyrgyz agriculture TFP can also gain from the development of transport and logistics for the integration of regional transport systems (UN 2022).

Mongolia, the most capital intensive among the eight countries, will need to redirect investment in productive technologies and institutional innovations to build the resilience of the sector dominated by the animal subsector. It should also continue investing in technical efficiency and the sustainable use of land resources vulnerable to climate change. More research needs to be conducted to understand and learn from the determinants of the country's agriculture TFP decline during the pandemic shock; it could be owing to a drop in the investment relations it has with neighboring China and Russia.

Pakistan, with negative cumulative TFP over the last two decades, needs to accelerate productivity. The sector should consider the efficient use of its agricultural resource: land and labor. The country should invest in innovations and policies to increase the productivity of smallholder farmers in harsh environmental conditions. The agriculture sector of Pakistan may need to attract private and foreign aid investment for agricultural technologies and infrastructure projects to increase the TC component.

Although doing well, Tajikistan and Uzbekistan should maintain their TFP gains over the last decade. Although Tajikistan remains the poorest country in Central Asia, the country has proven resilient to diverse shocks. It should keep up the recently revealed highest cumulative TFP (among study countries). The country would benefit from increased momentum in technological reforms to use scarce land resources efficiently. Policies for harnessing increased productivity from diversified agriculture systems are essential. Uzbekistan should maintain and fasten its promising agriculture reforms to improve the TFP that has risen sharply in recent years. Attention to efficient labor and land use and investments in smallholder farms are vital. The country should continue investing in agricultural productivity amid external shocks, including environmental risks.

In summary, the agricultural systems of the studied countries are too diverse to suggest general policy options. Nevertheless, all countries should strive for the right strategies and capital investment to boost their TFP both before and during shocks to build agriculture resilience. As agricultural development increasingly becomes vulnerable to harsh weather and other climate-related shocks, governments should support green innovations in the sector. All the CAREC countries should also invest in the sustainability of land and water resources. This is more important for countries like Mongolia and Pakistan, which are most susceptible to climate change effects.

Farmers need supported access to information, inputs, technical skill, and modern technology to increase their productivity. Smallholder farming is an important sector in most of the countries studied. Thus, agricultural policies focusing on small farmers' technical capacities throughout the region are vital.

Incentives to build resilience must include measures that inject capital into the sector. Investment in public goods and innovations — such as agricultural research and extension, energy use, proper storage, post-harvest management, transportation, processing facilities, and market infrastructure — can stimulate a TC in the sector (Barrett et al. 2019).

To increase technical efficiency, governments should continue to invest in agriculture knowledge. Evidence-based research, accurate and accessible data, and information exchange are all vital for increased agricultural TFP and resilience (Jin and Huffman 2016).

Improving trade logistics will help the countries with diversified agriculture to increase productivity and gain access to product markets. Creating the physical infrastructure and the accompanying institutional and regulatory frameworks will help countries in the study build resilience (Jin and Huffman 2016).

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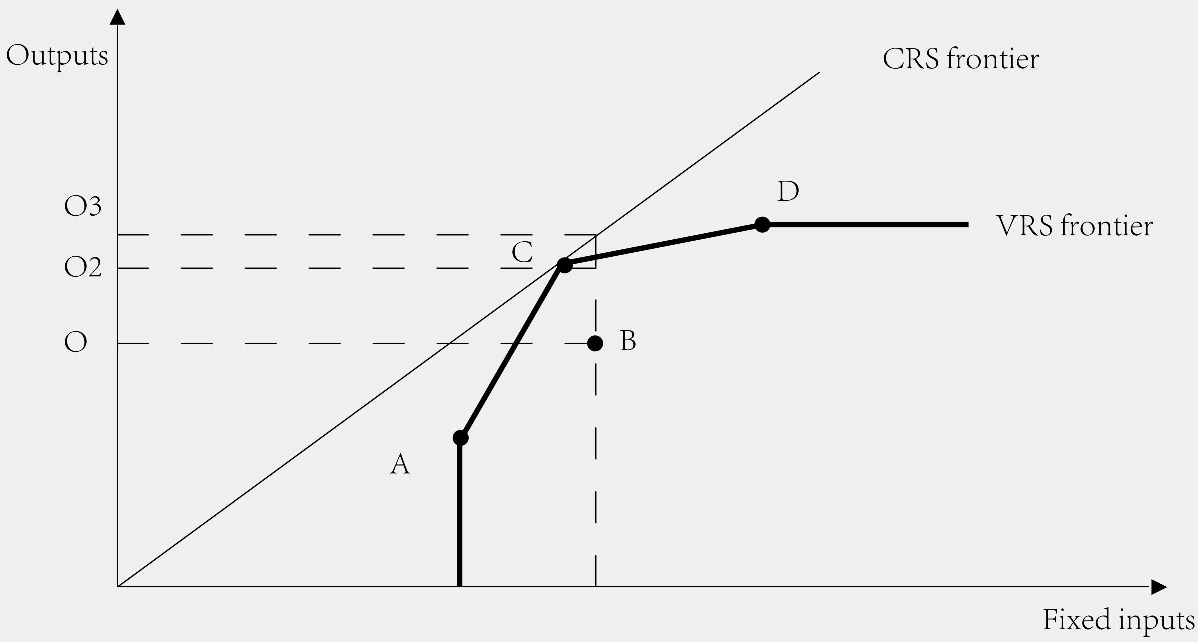
APPENDIX

1. The Malmquist Index using DEA frontier

The Malmquist Index (MI), named after Professor Sten Malmquist, is a bilateral index that can be used to compare the production technology of two economies or periods. The Malmquist Index that uses the data envelopment analysis (DEA) method is the most prevalent method used in TFP assessment since the seminal work of Färe et al. (1994).

Data envelopment analysis (DEA) is a linear programming methodology developed by Charnes et al. (1978), which uses input and output quantity data and constructs a linear surface over the data points. The DEA technique solves a sequence of linear programming (LP) to construct the linear frontier surface. In our case, the program solves one LP per country per period. The method produces each country's degree of technical inefficiency. Such inefficiency degree implies the distance between the observed data point and the linear frontier (slack) (Coelli and Rao 2005). The linear frontier surface will differ upon the model's scale assumption. There are two scale assumptions: constant returns to scale (CRS) and variable returns to scale (VRS). CRS reflects the fact that output will change proportionally to the input change. Meanwhile, VRS encompasses both increasing, constant, and decreasing returns to scale. Figure A1 accordingly illustrates the frontier surface based on CRS and VRS assumptions in time t for input *(x)* and output *(y)*.

Figure A1. CRS and VRS frontiers, input oriented DEA



Source: Cooper et al. 2007

The frontier in Figure A1 defines the full capacity constrained with the fixed number of inputs. If it is CRS, then the frontier is demarcated by point C. All other points that fall below C, in turn, show points that underutilize (are inefficient users of) inputs. On the other hand, if it is VRS, the linear frontier surface is demarcated by points A, C and D. In this case, only point B is below the frontier and hence referred to as the one underutilizing the input capacity.

In the current work context, the points A to D on the frontier represent the TFP of the selected CAREC countries at a certain period, with gross agricultural production (million USD) being the output and agricultural labor, capital (million USD), and land (ha) being input variables.

2. Agriculture input and output in the CAREC countries

Table A1. Summary statistics for input/output variables in selected CAREC countries, 2000-2020

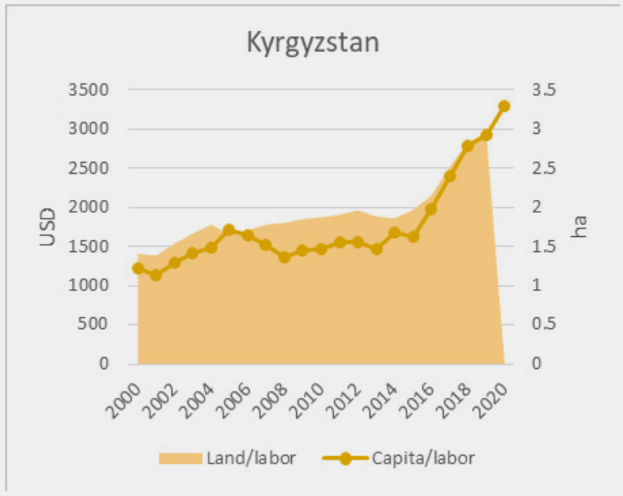
	Output			Input								
	Agricultural value added (million USD)			Labor (1,000 agricultural persons)			Land (cropland 1,000 ha)			Capital (net capital stock in 2015 constant million USD)		
	Mean	Standard development	Average growth rate (%)	Mean	Standard development	Average growth rate (%)	Mean	Standard development	Average growth rate (%)	Mean	Standard development	Average growth rate (%)
2000-2020												
Azerbaijan	2803	135	4.63	1624	19	0.66	2146.4	23.5	0.71	4930	263	2.04
Georgia	1060	27	1.33	812	25	-2.74	512.1	13.9	-4.48	850	6.77	0.36
Kazakhstan	7771	302	4.06	2067	99	-3.26	29200.0	124.3	-0.05	6720	208	-2.19
Kyrgyz Republic	862	21	2.28	726	31	-3.91	1367.4	5.2	-0.22	1190	26.4	0.78
Mongolia	1118	99	5.27	387	9	-1.04	1251.9	15.9	0.67	2540	165	4.26
Pakistan	57024	1806	2.33	23900	700	2.02	31200.0	124.1	-0.06	88600	2010	1.60
Tajikistan	1359	114	7.32	955	14	0.94	871.7	2.2	-0.20	1910	23	0.01
Uzbekistan	19235	1344	5.43	3503	31	0.22	4570.7	35.3	-0.44	12700	892	5.38

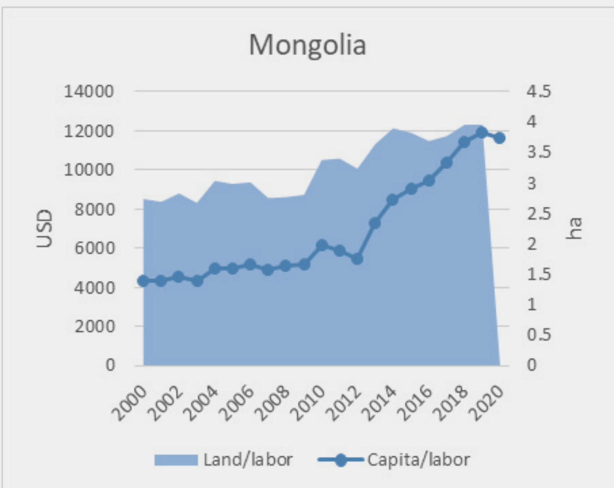
2000-2007															
Azerbaijan	2200	86	5.79	1537	6	0.00	2066	2	0.11	3720	363	1.14			
Georgia	980	28	-1.15	956	6	-1.64	572	7	-10.92	883	9	2.12			
Kazakhstan	6471	237	6.34	2417	22	-0.37	28700	132	-0.73	7600	119	-1.96			
Kyrgyz Republic	776	10	2.40	849	34	-3.89	1386	11	-0.71	1230	36	-0.60			
Mongolia	732	51	3.30	414	9	0.15	1178	1	0.01	1950	27	1.78			
Pakistan	48636	1410	2.72	20400	588	3.27	31400	175	-0.31	80300	583	0.72			
Tajikistan	846	51	8.17	888	15	2.03	878	1	-0.21	1990	17	-1.27			
Uzbekistan	13127	709	6.38	3523	15	0.00	4747	27	-0.56	8820	369	5.31			
2008-2009															
Azerbaijan	2683	46	4.80	1609	11	1.72	2094	7	0.54	5040	310	10.07			
Georgia	895	30	-5.43	828	32	-8.13	566	8	-1.65	862	14	-2.63			
Kazakhstan	7595	470	3.50	2351	26	-1.21	28700	50	-0.03	7120	26	0.06			
Kyrgyz Republic	835	27	3.79	740	11	-2.03	1352	1	-0.09	1040	19	-3.88			
Mongolia	1021	18	4.15	434	1	0.78	1209	10	1.73	2220	22	3.54			
Pakistan	55658	957	2.65	23900	65	3.01	30300	18	-1.19	84300	512	1.13			
Tajikistan	1152	57	9.20	949	6	0.97	878	7	0.65	1880	21	-1.81			
Uzbekistan	17069	483	5.27	3315	45	-2.60	4587	19	-0.80	11000	289	4.92			
2010-2019															
Azerbaijan	3249	122	3.78	1689	15	0.91	2213	32	1.16	5750	102	1.06			
Georgia	1126	22	3.67	752	19	-2.10	477	12	-2.46	834	5	0.25			
Kazakhstan	8717	290	2.58	1765	124	-5.70	29600	109	0.43	6020	200	-2.81			
Kyrgyz Republic	928	22	1.90	637	33	-4.30	1357	2	0.10	1190	38	2.68			
Mongolia	1407	121	6.86	358	7	-2.24	1312	9	0.93	3020	219	6.14			
Pakistan	63169	1319	2.00	26300	293	0.94	31200	150	0.34	95200	2130	2.31			
Tajikistan	1760	96	6.35	1002	6	0.17	866	3	-0.36	1870	33	1.26			
Uzbekistan	23945	1072	4.79	3526	51	0.93	4444	12	-0.29	15800	798	5.53			

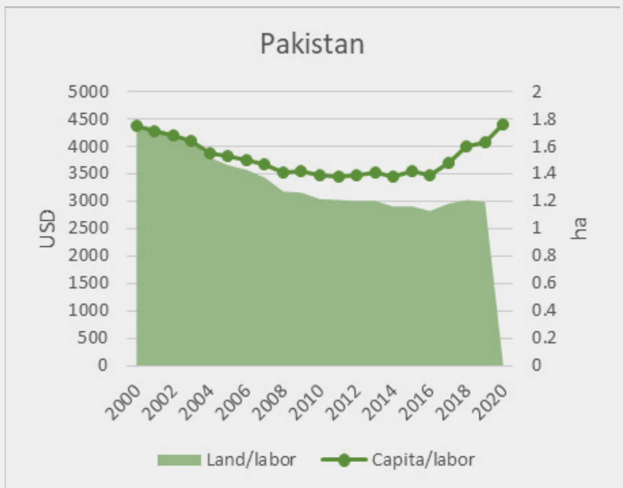
2020												
Azerbaijan	4049	-	2.89	1647	-	-5.78	-	-	-	6360	-	8.29
Georgia	1245	-	3.65	687	-	7.65	-	-	-	897	-	3.34
Kazakhstan	10346	-	5.60	1274	-	-0.58	-	-	-	4870	-	-9.08
Kyrgyz Republic	1050	-	1.09	411	-	-11.17	-	-	-	1350	-	-0.09
Mongolia	2041	-	6.17	366	-	8.62	-	-	-	4250	-	5.69
Pakistan	70820	-	2.67	24800	-	-5.46	-	-	-	109000	-	2.36
Tajikistan	2432	-	8.80	952	-	-2.00	-	-	-	2080	-	-0.94
Uzbekistan	28782	-	2.96	3166	-	-11.58	-	-	-	20300	-	5.60

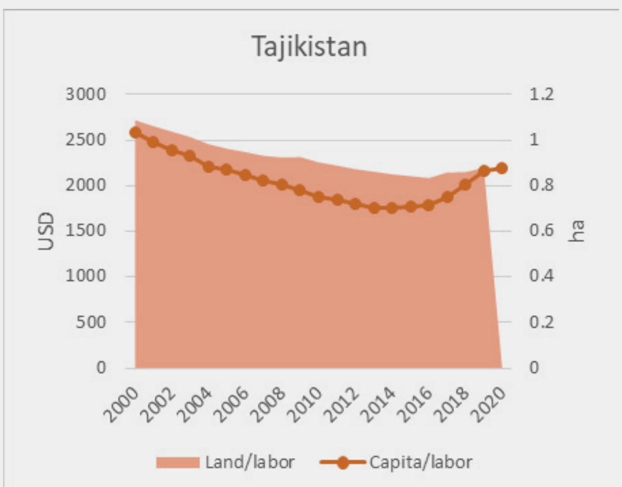
Table A1. Summary statistics for input/output variables in selected CAREC countries, 2000-2020


Kazakhstan
USD
ha
4500
4000
3500
3000
2500
2000
1500
1000
500
0
25
20
15
10
5
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Land/labor
Capita/labor


Kyrgyzstan
USD
ha
3500
3000
2500
2000
1500
1000
500
0
3.5
3
2.5
2
1.5
1
0.5
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Land/labor
Capita/labor


Mongolia
USD
ha
14000
12000
10000
8000
6000
4000
2000
0
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Land/labor
Capita/labor


Pakistan
USD
ha
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Land/labor
Capita/labor


Tajikistan
USD
ha
3000
2500
2000
1500
1000
500
0
1.2
1
0.8
0.6
0.4
0.2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Land/labor
Capita/labor

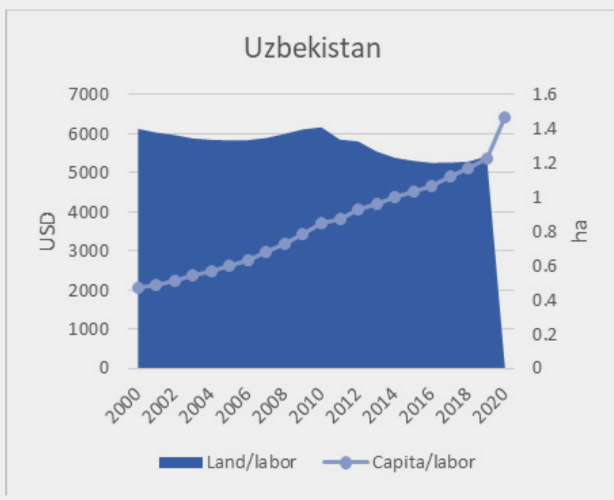
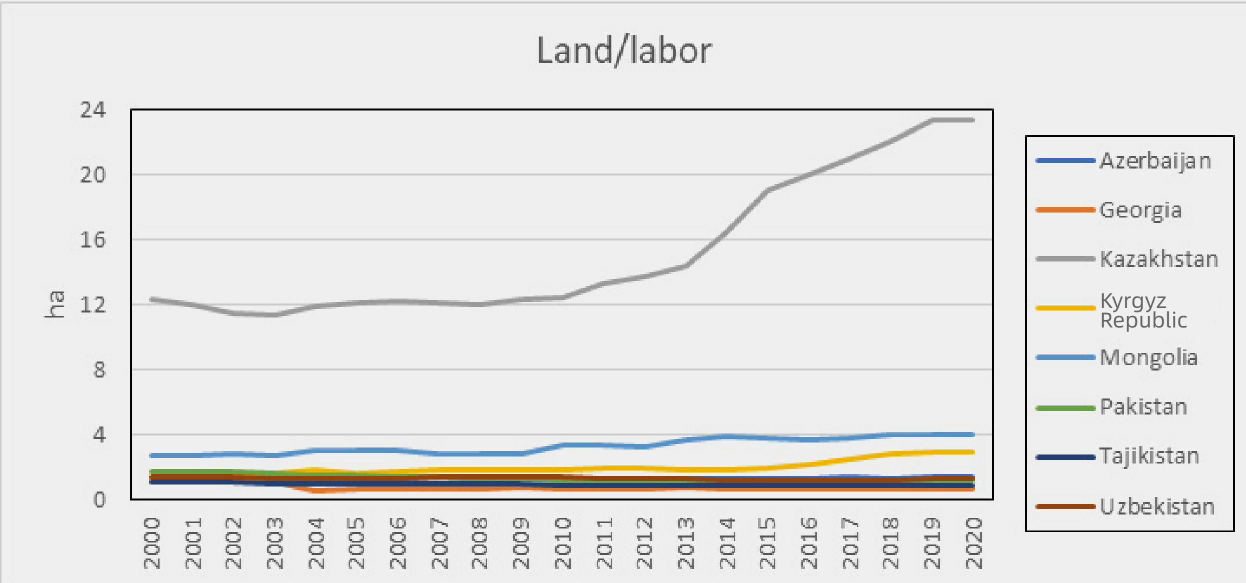

Uzbekistan
USD
ha
7000
6000
5000
4000
3000
2000
1000
0
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Land/labor
Capita/labor

Table A2. Summary statistics for input ratios

	Land/labor		Capital/labor	
	Mean (ha/person)	Average growth rate (%)	Mean (ha/person)	Average growth rate (%)
2000-2020				
Azerbaijan	1.32	0.07	3016	1.40
Georgia	0.70	-1.68	1018	3.21
Kazakhstan	14.91	3.53	3315	1.25
Kyrgyz Republic	1.95	4.12	1709	5.13
Mongolia	3.28	2.19	6776	5.94
Pakistan	1.33	-1.97	3736	-0.33
Tajikistan	0.92	-1.11	2018	-0.88
Uzbekistan	1.31	-0.62	3625	5.18
2000-2007				
Azerbaijan	1.34	0.13	2424	1.17
Georgia	0.81	-6.29	870	3.32
Kazakhstan	11.90	-0.32	3143	-1.56
Kyrgyz Republic	1.65	3.57	1460	3.49
Mongolia	2.85	0.30	4735	2.05
Pakistan	1.55	-3.45	3959	-2.46
Tajikistan	0.99	-2.19	2250	-3.23
Uzbekistan	1.35	-0.55	2506	5.32

2008-2009				
Azerbaijan	1.30	-1.07	3137	8.40
Georgia	0.68	7.06	1042	5.99
Kazakhstan	12.20	1.21	3028	1.30
Kyrgyz Republic	1.83	1.99	1406	-1.81
Mongolia	2.79	0.94	5113	2.73
Pakistan	1.27	-3.99	3531	-1.76
Tajikistan	0.92	-0.31	1981	-2.75
Uzbekistan	1.38	1.85	3310	7.72
2010-2019				
Azerbaijan	1.31	0.26	3406	0.17
Georgia	0.64	-0.20	1118	2.58
Kazakhstan	17.56	6.69	3493	3.20
Kyrgyz Republic	2.19	4.94	1944	7.66
Mongolia	3.67	3.76	8537	9.29
Pakistan	1.19	-0.53	3620	1.45
Tajikistan	0.86	-0.51	1864	1.14
Uzbekistan	1.26	-1.16	4471	4.58
2020				
Azerbaijan	-	-	3862	14.94
Georgia	-	-	1306	-4.01
Kazakhstan	-	-	3825	-8.55
Kyrgyz Republic	-	-	3291	12.47
Mongolia	-	-	11610	-2.70
Pakistan	-	-	4405	8.26
Tajikistan	-	-	2187	1.08
Uzbekistan	-	-	6422	19.43

Figure A3. Combined illustration of land/labor ratio across the eight CAREC countries



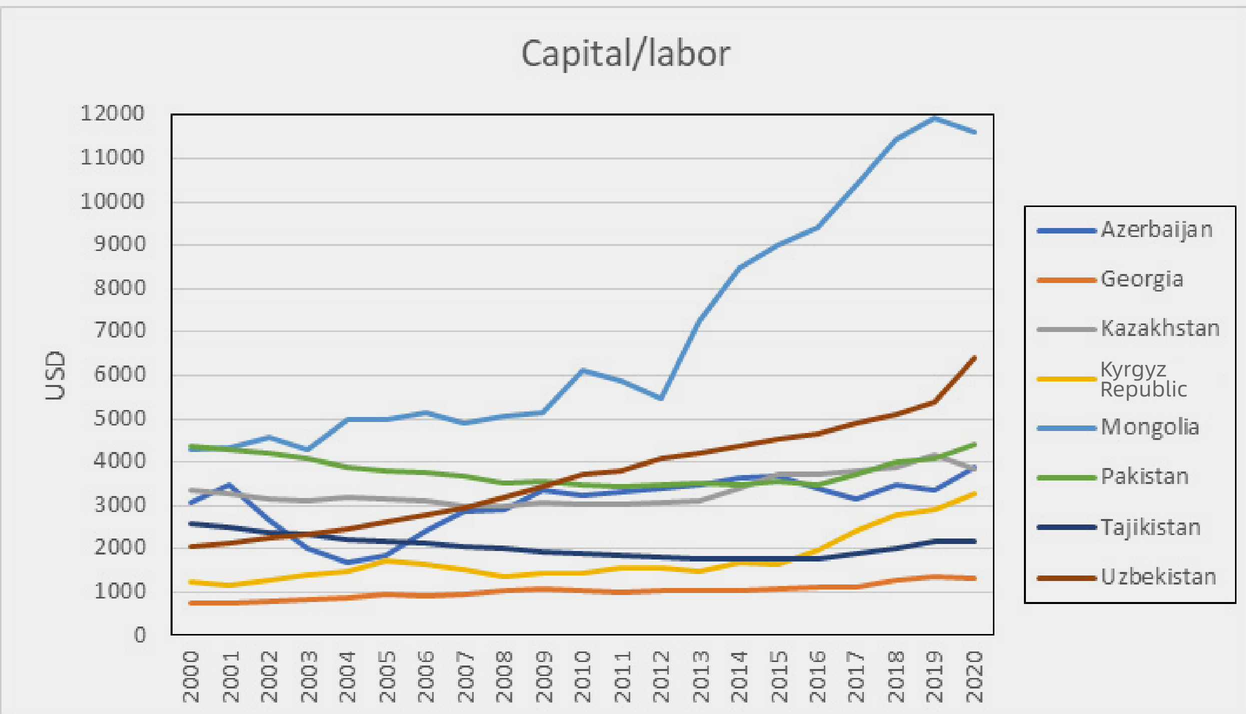
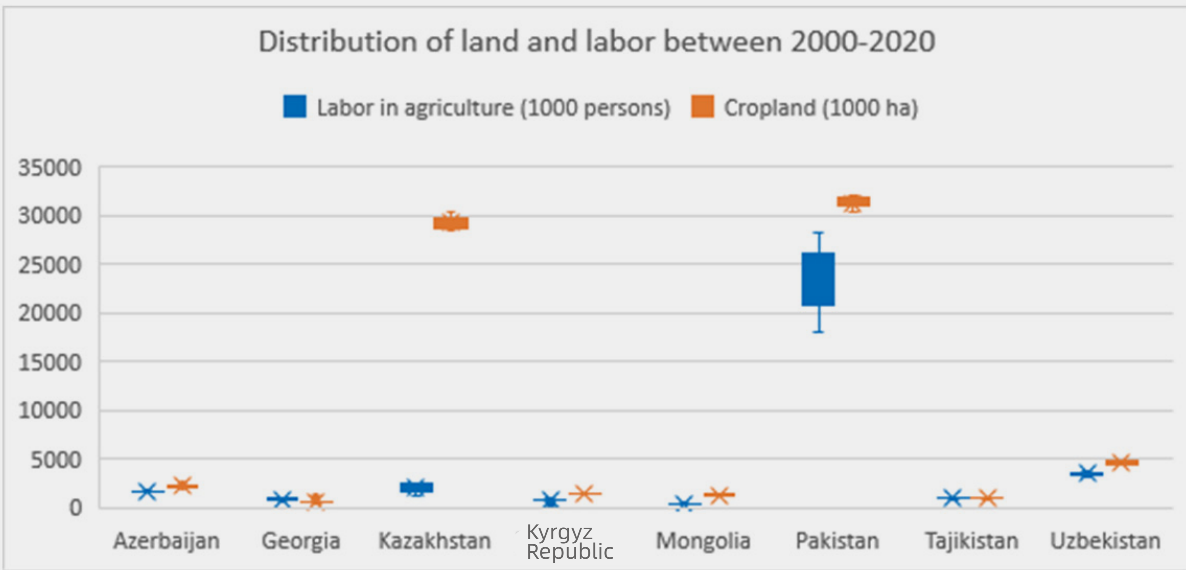


Figure A5. Distribution of labor and land changes between 2000-2020



Chapter 7

SUSTAINABLE LAND-USE RESOURCES IN DROUGHT-PRONE REGIONS OF KAZAKHSTAN

and Implications for the Wider Central Asian Region

Zhanel Sembayeva, Lilia Mussina, Madina Kazbek, Ablay Dosmaganbetov, Stefanos Xenarios

7.1 INTRODUCTION

Pictures from: https://rabbit.bigbigwork.com/home

Kazakhstan is one of the ten territorially largest states in the world, with a distinctive geopolitical position in the European-Asian subcontinent. Kazakhstan is third in the world in per capita land endowment after Australia and Canada (Committee on Land Resources Management of the Ministry of Agriculture of the Republic of Kazakhstan [CLM] 2022). The country's total area is 272.5 million hectares, of which the agricultural land is 219.6 million hectares (81 percent). Rangelands are the predominant land type, accounting for 184 million hectares (84 percent), while arable land accounts for 26.7

million hectares (12 percent) and about 9 million hectares (4 percent) of other land types.

Being at the crossroads of Europe and Asia, Kazakhstan benefits from an advantageous geographic location through growing investments and developing national and interregional transport and trade corridors. On the other hand, the uneven water distribution within the country aggravates pressure in the water-scarce regions. Furthermore, Kazakhstan still suffers from water mismanagement, soil erosion and degradation, and other environmental consequences resulting from agricultural mismanagement from the Soviet period, which partly continue today. Nearly 70 percent of agricultural machinery in Kazakhstan is at the end of its lifecycle and requires replacement (Government of Kazakhstan 2021a). The situation is exacerbated owing to inadequately skilled labor, lack of access to the commercial credit market — especially for long-term investments — and dependence on government collateral. In addition, the growing demand for imported food products has made Kazakhstan a net importer of agricultural products since 2004 (Privacy Shield Framework 2021).

Sustainable land management is an essential component of the sustainable development goals (SDGs) to ensure food security. The concept of sustainable agricultural development was introduced by the Food and Agriculture Organization of the United Nations (FAO 2011). This concept outlines the principles of increasing resource use efficiency and the conservation, protection, and improvement of natural resources as the essential foundations for the transition to sustainable production. These provisions are highly relevant for Kazakhstan because, despite the considerable amount of arable land (26.7 million hectares), only 11 percent can be considered suitable for sustainable agriculture (CLM 2022). As for pastures, out of 184 million hectares, only 3.2 percent can be classified as compliant with sustainable farming and 61.5 percent with some potential, while at least 14 percent of pastures are completely or highly degraded (CLM 2022).

Significant effects of climate change are observed in almost all regions of Kazakhstan through weather extremes, especially drought, and land erosion and degradation problems throughout the country. In particular, the northern country regions like Kostanay, Akmola, and North Kazakhstan are subject to climate change effects, where extreme aridity has recently been observed. Early warming (by seven to ten days) in these regions in the spring of 2019 led to decreased soil moisture and a decline in crop yields (Vasiliyev 2020). According to the national hydrometeorological service of the Republic of Kazakhstan (Kazhydromet), precipitation was only 63 percent of the established norm in those days. Also, the average temperature exceeded the mean annual value by 5.5℃ in the North Kazakhstan region (Vasiliyev 2020). In turn, in 2020, there was no precipitation for 60 days in the Akmola region. This trend changed only by the end of June 2020, when the monthly precipitation norm increased and provided an opportunity to improve harvesting potential.

There was also an increase in weather extremes — mainly drought — in the south and southwest of Kazakhstan, resulting in decreased surface water flows and depletion of groundwater reserves. The southern and western Kazakhstan regions Kyzylorda, Mangystau, and Turkestan experienced severe heatwaves from 2018 to 2021 (Reliefweb 2021). The extensive droughts entailed a water scarcity problem with drying soil up to 50cm, which caused a significant harvest shortage. The drought invoked massive deaths of domestic animals, especially in southwestern areas, owing to the lack of nutrition and water supply. It is estimated that about 2,000 heads of animal husbandry perished in these regions, although the actual number could be higher as some livestock was not officially registered. According to local authorities, residents are unwilling to register livestock to avoid tax payments, although taxes are not levied on registered livestock (Vladimirskaya 2021). The agricultural and livestock impacts have affected harvesting and animal production nationally, mainly in the country's southern and southwestern regions (IFRC 2021).

According to a United Nations Development Program (UNDP) report (2018), about 13 percent of the population in Kazakhstan lived in zones that were at high risk of drought in 2018, while a World Bank and ADB report (2021) projected more intense drought effects in CA and Kazakhstan than in other Asian countries. Various estimations predict that, without the introduction of adaptation measures, the wheat yield in Kazakhstan is likely to be reduced by up to 50 percent by 2050 (Word Bank and Asian Development Bank 2021). Also, the annual land degradation is expected to cost from US$1 billion to US$6 billion (Tokbergenova et al. 2018).

Undoubtedly, drought aggravated by climate change negatively affects the socioeconomic conditions of the population. Poor agricultural land management can lead to a poverty trap for marginalized farmers. Poor land quality leads to low agricultural productivity, hampers profitability, and restricts off-farm employment opportunities, undermining self-sufficiency and rural livelihoods (Ahmadzai et al. 2021, Manandhar et al. 2018). The SDGs propose transformative actions that embrace sustainable and climate-resilient agriculture principles by pursuing food and nutrition security. Investment in agricultural and rural development is required to attain the SDGs of eradicating poverty and hunger by 2030 and feeding an increased population by 2050.

Evidence suggests that a trade-off approach in seizing SDGs should be sustained to avoid negative consequences. Indicatively, SDG 2 target-level interaction assessments (Mollier et al. 2017) prove that attaining SDG 2 'zero hunger' contributes to the achievement of SDG 1 'end poverty in all its forms everywhere' since ensuring food and nutrition security is an integral component of reducing poverty and extreme poverty. However, the SDGs must be attained in a balanced way to maintain a sustainable impact. For instance, intensifying measures towards SDG target 2.3 — 'double the agricultural productivity and incomes of small-scale food producers' — may exhaust natural resources and deteriorate climate vulnerability. Consequently, the SDG 1.5 target—'build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events' — will hardly be met. The joint attainment of SDG targets 2.3 and 2.4 — 'ensure the establishment of sustainable food production systems and agricultural practices' — will be considered for achieving target 1.5 — 'towards a sustainable increase in agricultural productivity and food security.'

Food security is pursued in Kazakhstan through the domestic production of some types of meat and dairy products and fruit and vegetables in the off-season periods. However, there is an upward trend in the prevalence of malnutrition (SDG 2.1.1), although its level does not yet exceed the threshold set by FAO (5 percent) standards. Economic affordability of food, as an integral element of food security, is the share of the population's expenditure on food in the structure of consumer spending. In Kazakhstan, the percentage of food products in households in 2020 reached 58 percent on average, which significantly exceeds the FAO threshold of 35 percent (1.7 times). However, there was a significant rise in the prices of staples from 2019 to 2022, negatively affecting food security. The food price increase began in 2019 during the outbreak of the coronavirus pandemic and continues today owing to the worsening geopolitical situation in the region. Also, it is essential to note that the population with income below the subsistence minimum was 4.3 percent in 2019.

Significant income differentiation remains in urban and rural areas. The share of the population with income below the subsistence minimum was 2.7 percent in urban areas and 6.6 percent in rural ones, where more than 40 percent of the population resides. The poverty level in rural areas is 2.4 times higher than in urban areas. Thus, sustainable agriculture requires a balanced approach to promote sweeping changes that contribute to poverty reduction, food and nutrition security, sustainable management of natural resources, and inclusive growth. The contributions of government and public institutions, based on political will, investment policies, and partnerships, are critical to a more efficient, equitable, and sustainable agricultural system.

In the last years, Kazakhstan developed national and international strategic programs and policies such as the National Project for the Development of the Agro-Industrial Complex of Kazakhstan for 2021-2025; the national project 'Green Kazakhstan 2021-2025'; and the Concept for the Development of the Agro-Industrial Complex for 2021-2030 aimed at sustainable agricultural development. Also, the country became part of international conventions, such as the Land Degradation Neutrality (LDN) Program to End Soil Degradation and Drought Control by 2030. Kazakhstan adopted the Paris Agreement by providing a nationally determined contribution (NDC) for greenhouse gas emission reductions to 15 percent to 25 percent by 2030 compared with 1990. Nevertheless, the state mechanism faces significant challenges in the timely and comprehensive implementation of national measures and international obligations, as there is a lack of coordination in the actions and areas of responsibility of the relevant agencies and ministries. Also, intense periods of drought are becoming more frequent, burdening the implementation of adequate adaptation measures. According to a CAREC study, Kazakhstan, along with Azerbaijan, Georgia, and Mongolia, will be the most affected nations by drought in the CAREC region, owing to projected changes in the frequency and intensity of drought (Umirbekov et al. 2020). Grain and wheat yields will be decreased by 14-45 percent by 2050 in Kazakhstan owing to increased evaporation rates and high temperatures in the northern wheat-growing areas. Accordingly, the food security of Central Asia will be at risk as Kazakhstan is the leading supplier of wheat and flour products in the region (Umirbekov et al. 2020). International organizations such as FAO and UNDP support Kazakhstan in developing a strategic framework for sustainable land resource use and food security to handle the most vulnerable problems by attaining the SDGs.

This chapter analyses how the drought-vulnerable regions in Kazakhstan confront environmental pressures on land use and food systems by also pursuing relevant SDG indicators. We review the geographic and climate features of the country by focusing on the impact of drought on agriculture. In turn, the national and global programs related to drought hazards are overviewed through the perspective of SDGs on a national level. The concluding remarks indicate the current progress towards sustainable land use and food systems in Kazakhstan and the remaining challenges.

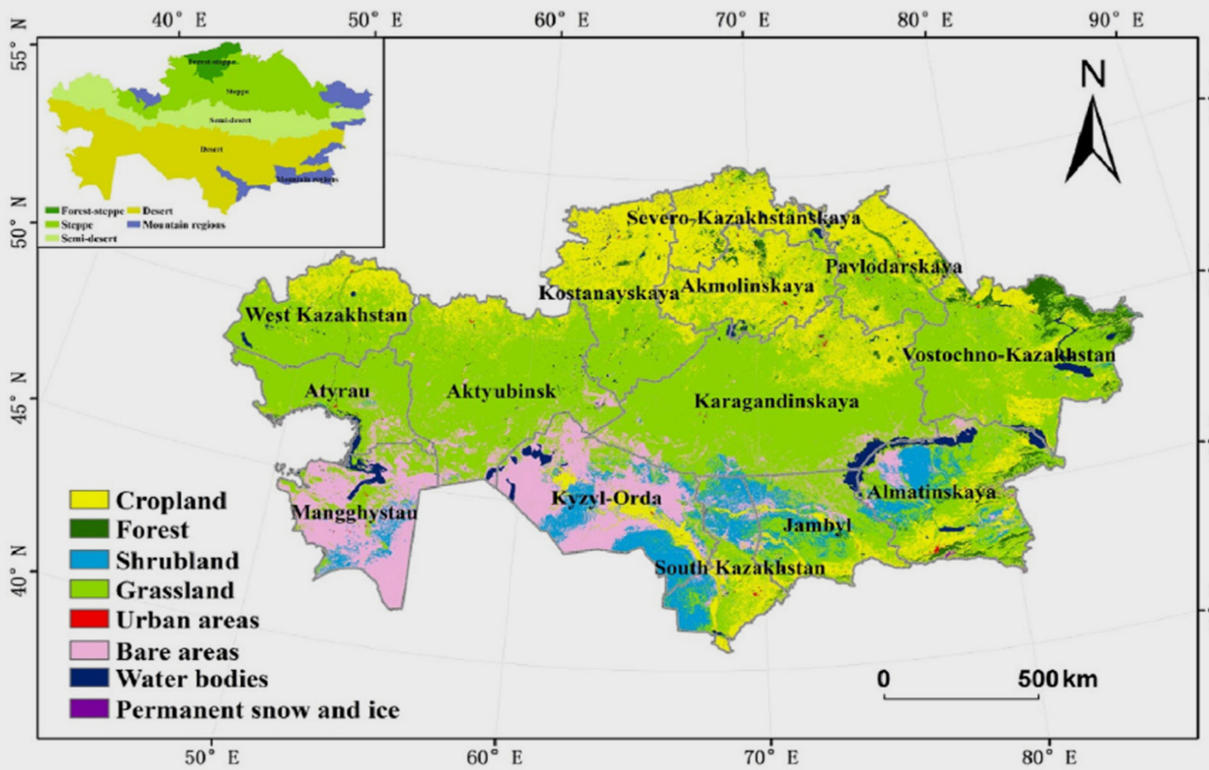
7.2 CASE STUDY DESCRIPTION

7.2.1 Geophysical and land-use features

Kazakhstan is characterized by a continental climate chaperoned by diametrically cold, dry winters and hot, dry summers. The continental climate intensifies from west to east and from south to north. The annual precipitation varies significantly with alternating dry years and depends on the type of terrestrial ecosystem: for the plains in the north, the precipitation reaches up to 350mm per year; for semi-arid terrains in the south, the precipitation reaches 100mm per year. In the mountainous alpine regions, the annual rainfall rises to 900mm per year (Yan et al. 2020).

Kazakhstan's ecoregions and land use are diverse: in the north, there are moderately humid to dry steppes; in the west, there are dry steppe and desert regions; the southern area hosts deserts and semi-arid areas, and forests and alpine grasslands broadly cover the southeast and eastern mountainous regions. Grassland is the most typical land cover in central Kazakhstan, as shown in Figure 7.1. Owing to the steep rise in livestock numbers since the middle of the 20th century, most grasslands and semi-arid zones have been extensively used for grazing. The northern parts have been used mainly for grain cultivation.

Figure 7.1. Spatial land cover distribution in Kazakhstan



Source: adapted from 'Social institution changes and their ecological impacts in Kazakhstan over the past hundred years,' Yan et al. 2020

Bare land is the third most common land cover type in Kazakhstan and is situated mainly in the southwest of Mangystau and adjacent areas of the Aral Sea. Over the past 20 years, the cultivated land area has remained unchanged, with only slight adjustments in the crop structure. Table 7.1 provides an overview of land cover types in the country.

Table 7.1. Land cover types in Kazakhstan in 2015

Class I name	Class II name	Area, km^2	Percentage of the total area
cultivated land	alpine grassland desert grassland semi-desert grassland typical grassland forest grassland	12.83×10^4 52.67×10^4 47.46×10^4 31.44×10^4 1.09×10^4 62.69×10^4	4.71% 19.33% 17.42% 11.54% 0.40% 23.01%
shrub		17.25×10^4	6.33%
forest land		5.90×10^4	2.16%
urban construction land		0.38×10^4	0.14%
bare land		34.26×10^4	12.57%
water area		6.41×10^4	2.35%
ice area		0.11×10^4	0.04%

Source: Adapted from 'Social institution changes and their ecological impacts in Kazakhstan over the past hundred years,' Yan et al. 2020

According to the Bureau of National Statistics (2021), in 2020, the cultivated area included 15.9 million hectares of grain crops; 2.9 million hectares of oilseeds; 3.2 million hectares of forage crops; 459,900 hectares of vegetables, melons, and potatoes; and 141,600 hectares of industrial crops (sugar beet, cotton, tobacco). Kazakhstan is one of the world's largest grain exporters to more than 70 countries (Privacy Shield Framework 2021). According to the Bureau of National Statistics, the main sales markets at the end of 2021 were Uzbekistan, Tajikistan, Afghanistan, Iran, China, Italy, Turkey, and the Russian Federation. In 2020, Kazakhstan ranked ninth in worldwide wheat exports (United Nations Statistics Division 2021). In 2021, the International Grain Council (2021) forecasted wheat and barley production in Kazakhstan for 2021 to 2022 at 12 million tons and 2.5 million tons, respectively.

7.2.2 Drought-prone regions of Kazakhstan

The latest hydrometeorological projections for Kazakhstan's northern regions show an increase in the aridity of the climate. Until recently, the north and eastern territories did not exhibit significant risks of droughts owing to relatively high precipitation rates. However, the aggravated effects of climate change (increase in evaporation rate and temperature) in the northern regions have increased vulnerability to drought and require prompt adaptation measures. In the western regions, semi-arid and arid landscapes are dominant, while the southern territories are more prone to dry climatic conditions. However, the trespassing of some river networks (such as the Syrdarya and Chu rivers) in the south provides a considerable water supply for vegetation in these areas (Xenarios et al. 2022).

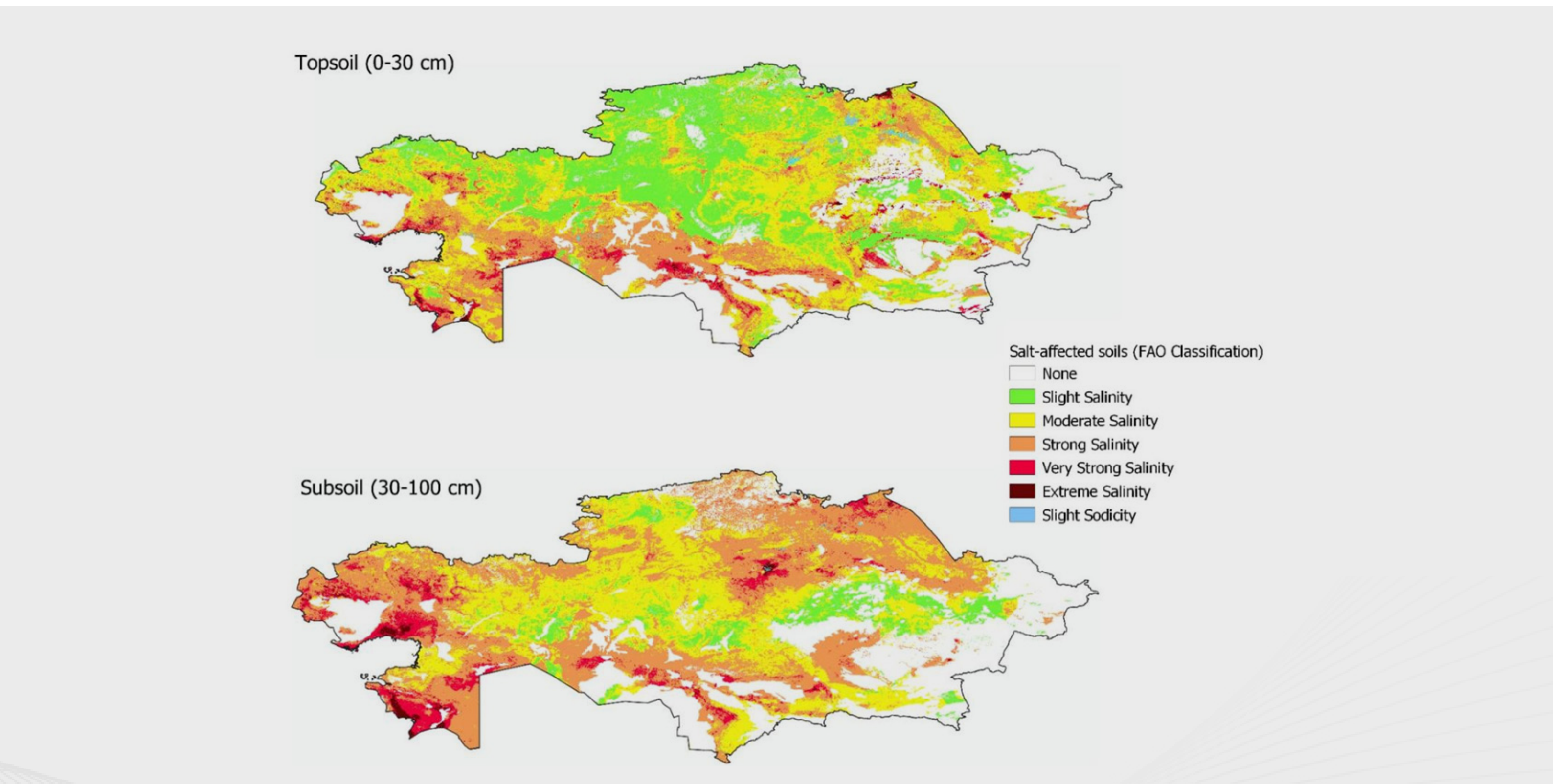
One representative agricultural area impacted by droughts in south Kazakhstan was the Kyzylorda region, situated in lowland areas on the eastern part of the Aral Sea. The sandy massifs of the Aral desert characterize the north and south parts of Kyzylorda. Another drought-prone region in south Kazakhstan is Turkestan, divided by the Karatau ridge, while in the northern part, there are the Betpakdala desert and the sandy area of Moiynkum. In the south, there is the Shardara steppe and the western outskirts of the Talas Alatau. The other drought-prone southern region, Zhambyl, is located on the eastern continuation of the Betpakdala desert and the Moiynkum sands. In the east of the Zhambyl region are the Aitau and Zheltau mountains, Lake Balkhash, and the Karatau and Talas Alatau ridges in the south. All three regions share common borders with Uzbekistan and Kyrgyzstan. The perennial deep-rooted vegetation that traditionally grows in these areas is resistant to drought; only the more ephemeral part of the vegetation is sensitive to drought (Rashid and Isakohdzhayev 2021). Most farmers own land plots of up to 50 hectares, as shown in Table A1-1. In addition, Tables A1-2 and A1-3 present types of land use and the main challenges of land productivity.

The climate in southern Kazakhstan is arid and continental. The average temperature in winter varies from -2°C to -13°C; in summer, the average temperature ranges from 22°C to 26°C. However, heatwaves above 40°C can last for more than a week and occur several times in summer. The average annual rainfall in the Kyzylorda and Turkestan regions is less than 150mm. In the Zhambyl region, the average rainfall increases from 200mm to 400mm from north to south owing to the mountain ranges' location in the country's south and southeast (Institute of Geography and Water Security 2006a).

Sands and sandy pastures occupy a considerable territory of the Kyzylorda region; they are deserted, unproductive lands with homogeneous, slightly saline, brown and grey-brown soils and meadow marsh with slightly saline soils. In the Turkestan and Zhambyl regions, there are also piedmont-foothill desert steppe lands with light, ordinary grey soil and light chestnut soil, while brown and grey-brown soils are also found. The Turkestan region also has highly productive lands endowed with black dirt. The agricultural development of these lands is challenged by the current drought conditions (Rashid and Isakohdzhayev 2021).

One of the main problems for the agricultural economy of Kazakhstan relates to the overexpansion of agricultural land during the Soviet era (Funakawa et al. 2000). Owing to the massive water withdrawal of farming needs, mainly from the two largest rivers in CA — Syrdarya and Amuradarya — the ecological state of the Aral Sea has deteriorated. The crops cultivated in the southern regions (cotton, sugar beet, yellow tobacco, rice, orchards, and vineyards) are primarily determined by the volume of water from surface freshwater systems (Tokbergenova et al. 2018). Over the decades, intensive irrigation water use owing to rising groundwater levels and inadequate drainage has led to widespread secondary salinization of soils and watercourses. In Kazakhstan, 33 percent of irrigated lands are subject to salinization, especially in the southern agricultural areas, which challenges agricultural land use (Zan et al. 2022). Subsoil analysis data (30cm to 100cm) shows that salinization covers both non-irrigated lands and rangelands (FAO 2022a). Figure 7.2 presents the soil salinity at topsoil and subsoil levels in the country.

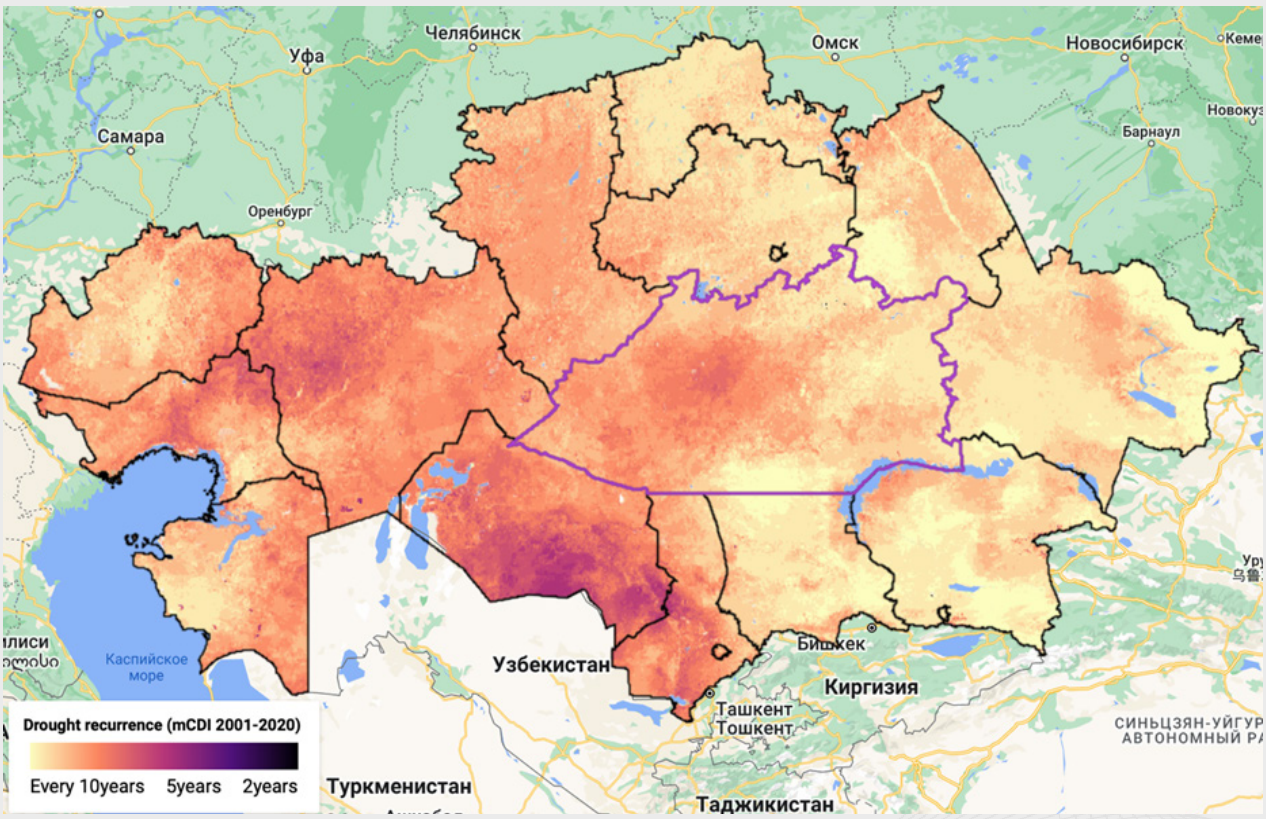
Figure 7.2. Soil salinity of Kazakhstan



Source: adapted from the 'Topsoil and subsoil salinity map of Kazakhstan' by FAO 2022a

The salinized areas gradually become abandoned fields devoid of vegetation. Also, desertification and soil degradation have contributed to the instability of land use in the Aral Sea area and its surroundings. Indicatively, in Kyzylorda province, 30 percent to 40 percent of soils in irrigated areas have experienced deprivation of soil organic matter (Low et al. 2015). The desiccation of the Aral Sea increased the temperature in the vicinity and the frequency of 'dry' cyclones (Aleksandrova et al. 2014). The Aral desiccation also contributed to the recurrence of droughts in the southern areas, as shown in Figure 7.3.

Figure 7.3. Drought recurrence in Kazakhstan (Modified Combined Deficit Index [mCDI] 2001-2020)

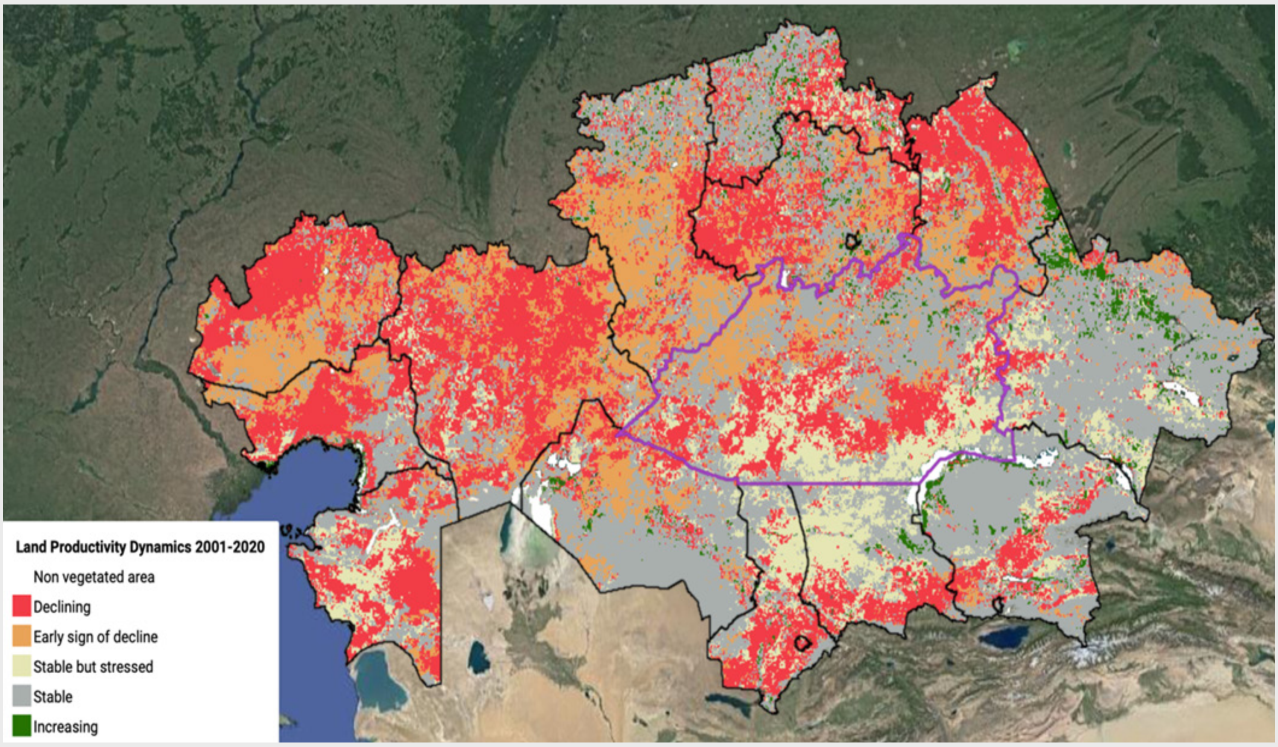


Source: adapted from FAO-GEF Earth Engine Apps by FAO 2022b

In 2020, drought intensification was observed throughout the country: central and eastern regions experienced moderate to severe drought, while in western and southern Kazakhstan, drought intensified even more (Rashid and Isakhodzhayev 2021). The intensity and duration of dry periods in the growing season have increased from the north to south and east to west parts of the country.

Soviet agricultural management practices have also contributed to the current aggravation of drought impacts. In the southern regions of Kazakhstan, an excessive expansion of agricultural land was aimed at the water-demanding cotton and rice plantations in areas with high evaporation rates (Assubayeva et al. 2022). Also, in Kazakhstan's northern and central regions, a large-scale Virgin Lands Campaign was carried out. The grassland soil surface structure was degraded during these campaigns, resulting in a humus content of 5 percent to 30 percent (Yan et al. 2020). The large-scale aggressive land exploitation in the entire country has led to extensive land degradation, as shown in Figure 7.4.

Figure 7.4. Land productivity dynamics 2001-2020



Source: adapted from FAO-GEF Earth Engine Apps by FAO 2022b

Agricultural land productivity across the country is three to four times lower than in many other countries with similar geophysical features (FAO 2016). About 4.75 kilograms of mineral fertilizers are applied per 1 hectare of arable land, equal to 1/12 of the actual needs (Kazakhstan Today 2015). Organic fertilizers are used in limited quantities in irrigated agriculture, primarily for potato and vegetable cultivation. The application of pesticides per 1 hectare has increased by 1.6 times: from 0.409kg in 2013 to 0.640kg in 2020 (Bureau of National Statistics 2022b). In 2022, only about 19.4 percent of agricultural land is not subject to degradation and desertification processes, and 43 percent of irrigated land requires reclamation. About 13 percent of the land is susceptible to wind and water erosion (CLM 2022). An overview of land degradation and erosion is shown in Table 7.2.

Table 7.2. Land areas subject to wind and water erosion in Kazakhstan

Indicators	2005	2010	2015	2021
Total agricultural land area (thousands of hectares)	222,625	222,408	222,143	214,192
Farming land under water erosion (thousands of hectares), (percentage of total agricultural land)	4,989 (2.2%)	4,989 (2.2%)	4,950 (2.2%)	4,950 (2.3%)
Farming under wind erosion (thousands of hectares), (percentage of total agricultural land)	25,493 (11.5%)	25,493 (11.5%)	24,168 (10.9%)	24,168 (11.3%)

Note: Data adapted from the Bureau of National Statistics' five-yearly report (2019) and consolidated report on the state and use of land of Kazakhstan for 2021 (CLM 2022)

Drought is affecting not only the traditionally dry southern and western regions of Kazakhstan but also the northern, central, and eastern regions are becoming more arid, making them more vulnerable to climate change and less productive owing to the lack of measures to combat drought. Heatwaves severely damaged about 1,407,000 hectares of cultivated land in traditionally precipitated areas in northern regions in 2012 and 2014. Also, owing to the droughts in 2014, 95.6 percent of crops were impacted in the Aktobe region (Khobdinsky district) and 18 percent in the Pavlodar region. In the Turkestan drought-prone region, due to to a heatwave in 2012, 50 percent of livestock breeders went bankrupt without feeding reserves, and the wheat and barley harvests were destroyed. A catastrophic situation also occurred in 2019 in the Kostanay region, where only 400kg/hectare to 500kg/hectare of grain could be harvested, which is much lower than the region's average level (Rashid and Isakohdzhayev 2021).

Climate change and increasing drought challenge agricultural land productivity, harming the national economy. Moreover, the turbulent political and socioeconomic world situation may exacerbate the preconditions for food insecurity in the CAREC region (Xenarios et al. 2020). In 2021, Kazakhstan's adjusted seeded area was 1.5 percent more than in 2020 (23 million hectares). However, the 2021 yield figures for main export-oriented crops, such as grain (including rice) and legume crops, decreased by as much as 19 percent. The gross harvest of grains (including rice) and pulse yields decreased by 18.4 percent compared with 2020, and oilseeds decreased by 4.9 percent (Bureau of National Statistics 2022a). More detailed statistics on crop yields and seeded and harvested crop areas are available in Tables A2-1 and A2-2.

7.3 LAND USE AND DROUGHT RELEVANCE WITH SUSTAINABLE DEVELOPMENT GOALS IN KAZAKHSTAN

Conserving resources for developing sustainable food systems and agriculture management is essential from a long-term perspective, as most natural resources ensuring food security have reached their carrying capacity limits (FAO 2021a). An additional burdening factor is the intensity of weather extremes, driven mainly by climate change. A compromise between ensuring the nutritional value of food produced, crop productivity, and building climate change resilience is required. The above situation is highly relevant to the agrifood systems of Kazakhstan, which is located in the zone of so-called risky farming owing to various global environmental challenges (CLM 2022).

Climate change aggravates land degradation in Kazakhstan by amplifying extreme events, soil erosion, and loss of vegetation. The average annual air temperature across Kazakhstan from 1976 to 2020 has increased by 0.32°C every ten years (MEGNR 2021). By 2085, according to the prevalent climate scenarios, the humid zones may shift significantly to the north (Ministry of Environmental Protection of the Republic of Kazakhstan 2009). In this case, the northern regions of Kazakhstan will be in the semi-arid zone, while the arid zone will occupy a larger area, as already demonstrated by some studies (Rashid and Isakohdzhayev 2021, FAO 2022b). The deficiency of water resources will lead to the degradation of pastures and severe impacts on crops, including spring wheat, one of the country's primary export commodities (Ministry of Environmental Protection of the Republic of Kazakhstan 2009).

To reduce the risks of climate change and its impact on the degradation of agricultural land, the United Nations Convention has made a significant attempt to combat desertification (UNCCD) through land degradation neutrality (LDN). UNCCD defines land degradation neutrality as 'a state whereby the amount and quality of land resources, necessary to support ecosystem functions and services and enhance food security, remains stable or increases within specified temporal and spatial scales and ecosystems' (UNCCD 2022). The concept of land degradation neutrality is based on maintaining a balance between land degradation processes and measures to restore it. To achieve soil neutrality, restoring as many soils as are degraded is necessary.

Another attempt to measure the progress of sustainable agriculture in Kazakhstan is conducted through various SGD-related indicators. The indicators 2.4.1 'proportion of agricultural area under productive and sustainable agriculture,' 15.3.1 'percentage of land that is degraded over a total land area' (LDN indicator), 6.4.1 'change in water use efficiency over time,' and 6.4.2 'level of water stress: freshwater withdrawal as a proportion of available freshwater resources' were aimed at ensuring rational use of land and water resources were introduced.

SDG indicator 2.4.1: sustainable agriculture

Indicator 2.4.1 considers the balance of three components of sustainable production: economic, environmental, and social. It links the themes of productivity, profitability, resilience, land and water use, decent work, and wellbeing, reflecting the multifaceted nature of sustainable agriculture. Kazakhstan has made specific efforts to implement SDG 2.4.1 in the national context. However, national indicators do not fully reflect the content of this indicator as per international standards. Table 7.3 provides an overview of the targets, challenges, and recommendations for improving SDG 2.4.1 in Kazakhstan.

Table 7.3. Performance of SDG indicator 2.4.1 in Kazakhstan's food and agricultural systems

SDG indicator	2.4.1 'Proportion of agricultural area under productive and sustainable agriculture'
SDG target	By 2030 ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, help maintain ecosystems, strengthen capacity for adaptation to climate change, extreme weather, drought, flooding, and other disasters, and progressively improve land and soil quality
Current status in Kazakhstan	Partly established as follows: 2.4.1. the share of implemented precision farming technology in the total sown area (drip irrigation, sprinkling)—monitoring—is held by only two indicators. In comparison, the international standards require the monitoring of 11 sub-indicators: 1. Farm productivity per hectare 2. Profitability 3. Mechanisms to reduce sustainability risks 4. Prevalence of soil degradation 5. Changing water use in water availability 6. Fertilizer pollution risk management 7. Pesticide risk management 8. Use of practices that support agrobiodiversity 9. Agricultural wage levels 10. Food insecurity experience scale (FIES) 11. Land tenure and secure tenure rights
Recommendations	The national methodology should be aligned with the global methods, and the indicators should be monitored continuously. A 'sustainable land resources management' concept should be included in policy documents, and the notion of 'responsible land user' should be implemented.

Monitoring of indicator 2.4.1 in the national Kazakhstani SDG system is carried out according to only two national indicators. Thus, the methodology differs from international standards. Hence it does not allow us to fully track the progress of the sustainable development of the agricultural sector in Kazakhstan.

SDG indicators 6.4.1 and 6.4.2: sustainable water use

FAO has made some noticeable attempts to incentivize the better monitoring of SDG 6 in Kazakhstan and ensure water and sanitation are available for all. Various globally approved SDG targets, such as target 6.4, have been proposed to improve water use efficiency significantly in all sectors by 2030. The global indicators for improving sustainable agriculture are 6.4.1. 'change in water use efficiency over time, by economic activity' and 6.4.2. 'level of water stress: freshwater withdrawal as a proportion of available freshwater resources.' These indicators have been incorporated into the country's monitoring system.

The monitoring findings on water use efficiency (6.4.1) demonstrate that the indicators have improved regarding water productivity (water consumption per production unit). Still, the use of water resources in Kazakhstan has low efficiency compared with other countries, given that Kazakhstan uses three times more water per dollar of GDP compared with Russia or the United States and six times more than Australia. While 13,222m^3 million were used for irrigation in 2017 (Bureau of National Statistics 2019), agricultural water losses are as high as 66 percent (World Bank and Samruk Kazyna 2018). Water-saving techniques supply only 7 percent (95,800 hectares) of irrigated land. The projected average volume of water withdrawal for agricultural needs is 21km^3 per year (Government of Kazakhstan 2018). In the case of indicator 6.4.2, there has been a 2.6 percent increase in water stress since 2016, although this is not yet critical on a national level. However, there is significant pressure in the southern regions, where 80 percent of irrigated land is located (Bureau of National Statistics 2019).

SDG indicators 6.4.1 and 6.4.2: sustainable water use

The UN has also stressed the need to assess SDG 15 to protect, restore, and promote the sustainable use of terrestrial ecosystems and sustainable forest management to combat desertification, prevent and reverse land degradation, and halt biodiversity loss. To measure the progress of 'combating desertification and restoring degraded land and soil, including land affected by desertification, droughts and floods, and creating a land degradation neutralized world' by 2030 (SDSN 2022), indicator 15.3.1 was developed. This indicator is customarily monitored through the combined use of three sub-indicators: land cover, land productivity, and carbon stocks above and below ground. Unfortunately, these sub-indicators have not been implemented in Kazakhstan's monitoring system, and no targets have been set to achieve them by 2030.

Instead, the global indicator 15.3.1. is interpreted through a national indicator named 'area of eroded land in the composition of agricultural land as a percentage of the total land area.' The scale of combating desertification and restoring degraded lands has been underestimated as the national SDG-related statistics present only 13.7 percent of eroded lands, which corresponds to the misrepresentation of the indicator. Thus, achieving neutrality against the deterioration of agricultural land by 2030 becomes a challenging task. Efficient use of land resources cannot be achieved without a permanent system of control and monitoring of the qualitative and quantitative state of the land and its usage. Despite proclaimed statements from national agencies, sustainable agricultural production processes and carbon neutrality in land degradation are not yet prioritized in the national policy of the farming sector.

7.4 INITIATIVES TO ALLEVIATE THE EFFECTS OF DROUGHT IN KAZAKHSTAN

7.4.1 Drought management in the Central Asian region

Incorporating SDGs related to agriculture and the environment with efficient monitoring is essential for developing sustainable and more efficient approaches in Kazakhstan. In addition to SDG monitoring, which reflects the interconnectedness of sustainable development's environmental, economic, and social elements, it is necessary to establish a set of institutional and technical measures in the land, soil, and water resources management. Approaches such as sustainable land management (SLM), sustainable management of soil resources and integrated water resources management (IWRM) should be integrated at both agricultural and food systems scales to identify solutions to land degradation and droughts in Kazakhstan and CA countries (Rashid and Isakohdzhayev 2021).

Climate change is a significant stressor in Kazakhstan's agricultural lands and the CA region, bringing an increasing number of aggravated environmental, social, and economic challenges. All CA countries in the region are prone to drought; however, the intensity, frequency, and impact vary from country to country. From 1930 to 2014, Turkmenistan turned out to be the driest country in CA, followed by Uzbekistan, Tajikistan, and Kyrgyzstan, with a lower frequency of drought and Kazakhstan in the bottom line. In Kazakhstan, drought frequency in the northern and northeastern regions is traditionally lower than in the central and western areas (Rashid and Isakohdzhayev 2021). It is also essential to add that the CA region generally accounts for 31 million hectares of land degraded by human activities — 2 percent of the total area of degraded land worldwide (FAO 2021a). Increasing drought, land degradation, soil erosion and salinization, and water scarcity can undermine the region's water, energy, and food security (FAO 2017).

CA countries have signed and ratified major international environmental conventions such as the Convention on Biological Diversity, the Framework Convention on Climate Change (along with the Kyoto Protocol and Paris Agreement, and submitted nationally determined contributions), the Convention to Combat Desertification, and the Convention on the Protection and Use of Transboundary Water Resources and International Lakes (by Kazakhstan, Uzbekistan, and Turkmenistan), which determine the national and regional development of the CA countries according to the SLM and IWRM principles (FAO 2021b, FAO 2022c, FAO 2022d). CA countries have systematically used the SDG targets mentioned in the previous section to mainstream international frameworks and conventions by aligning with relevant standards. In Table 7.4, we outline crucial SDG indicators related to agriculture and the environment in the CA region by reviewing the integration into national policies.

Table 7.4. Integration of SDGs 2, 6 and 15 through relevant indicators in national programs of the Central Asian countries

# SDG indicator	Global SDG indicator	National SDG indicator: Kazakhstan	National SDG indicator: Kyrgyzstan	National SDG indicator: Uzbekistan	National SDG indicator: Tajikistan	National SDG indicator: Turkmenistan
2.4.1	Proportion of agricultural area under productive and sustainable agriculture	(2.4.1.1) Proportion of land under precision farming of the total sown area	(2.4.2.1a) Share of arable land fertilized with mineral fertilizers, organic fertilizers	Proportion of agricultural area under productive and sustainable farming practice	Proportion of agricultural area under sustainable farming practices	N/A
		Correspondence of the national indicators and measures to international standards				
		-Two national indicators replaced the global indicator -National indicators do not correspond to the global indicator, and national methodology differs from the global methodology -Monitoring is conducted and accessible to the public	-Two national indicators replaced the global indicator -National indicator does not correspond to the global indicator -National methodology differs from the global methodology -Monitoring is conducted and accessible to the public	-National indicator corresponds to the global indicator -Monitoring is not accessible to the public	-National indicator corresponds to the global indicator -Monitoring is not accessible to the public	N/A
		Integration of SDGs into national programs and strategies of the CA countries to combat drought				
		1. The concept of development of the agro-industrial complex for 2021-2030; indicators are not integrated 2. National project for the development of the agro-industrial complex of Kazakhstan for 2021-2025; one indicator is integrated, alignment with international standards is needed	1. State Irrigation Development Program of the Kyrgyz Republic for 2017-2026; indicator is not integrated; however, the 'improvement of lands' is identified 2. Concept of the green economy 'Kyrgyzstan is a country of the green economy'; indicators are not mentioned; however, emphasis is given to water-saving irrigation methods (drip, discrete, and spraying)	1. The Agricultural Development Strategy of the Republic of Uzbekistan for 2020-2030; some components of the indicator are integrated; however, alignment is needed 2. Concept for the Development of Water Resources for 2020-2030 in Uzbekistan; some components of the indicator integrated through 'the total area of land covered by water-saving technologies for irrigating crops is up to 2 million hectares, including drip irrigation technologies—up to 600,000 hectares'	National Climate Change Adaptation Strategy of the Republic of Tajikistan for the period up to 2030; indicator is not integrated	National strategy of Turkmenistan on climate change; indicator is not integrated Information not available for other national policies

# SDG indicator	Global SDG indicator	National SDG indicator				
		Kazakhstan	Kyrgyzstan	Uzbekistan	Tajikistan	Turkmenistan
6.4.1	Change in water use efficiency over time	Change in water use efficiency over time, by economic activity	(6.4.1.2) Losses of water during transportation through the territory	Water consumption for a unit of GDP (m3/US$ GDP)	Dynamics of changes in water use efficiency	N/A
		Correspondence of the national indicators and measures to international standards				
		-National indicator corresponds to the global indicator -Monitoring is conducted and accessible to the public	-Global indicator is replaced with a national indicator -National indicator does not correspond to the global indicator -National methodology is different from the global methodology -Monitoring is conducted and accessible to the public	-Global indicator has been replaced with a national indicator -National indicator does not correspond to the global indicator -National methodology is different from the global methodology -Monitoring is not accessible to the public	-National indicator corresponds to the global indicator -Monitoring is not accessible to the public	N/A
		Integration of SDGs into national programs and strategies of the CA countries to combat drought				
		1. National 'Green Kazakhstan' project for 2021-2025; indicators are not integrated; however, one of the components has been identified—'reduction of irrigation water losses by 4km³' to achieve the task 'improving productivity through economical use of water'	1. Strategy for the development of drinking water supply and sanitation systems in settlements of the Kyrgyz Republic until 2026; indicator is not integrated 2. State Program for the Development of Irrigation of the Kyrgyz Republic for 2017-2026; indicator is not integrated	Concept of environmental protection of the Republic of Uzbekistan until 2030; indicator is not integrated, however, one of the components has been identified as "Reducing the loss of water resources by 2%."	Water Sector Reform Program of the Republic of Tajikistan for 2016-2025; indicator is not integrated	National strategy of Turkmenistan on climate change; indicator is not integrated Information not available for other national policies

# SDG indicator	Global SDG indicator	National SDG indicator				
		Kazakhstan	Kyrgyzstan	Uzbekistan	Tajikistan	Turkmenistan
6.4.2	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	(6.4.2.1) Total water withdrawal	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
		Correspondence of the national indicators and measures to international standards				
		-National indicator corresponds to the global indicator -Monitoring is conducted and accessible to the public	-Global indicator is replaced with national -National indicator does not correspond to the global indicator -National methodology is different from the global methodology -Monitoring is conducted and accessible to the public	-National indicator corresponds to the global indicator -Monitoring is conducted and accessible to the public	-National indicator corresponds to the global indicator -Monitoring is not accessible to the public	-National indicator corresponds to the global indicator -Monitoring is not accessible to the public
		Integration of SDGs into national programs and strategies of the CA countries to combat drought				
		National project 'Green Kazakhstan' for 2021-2025; the indicator is different with a focus only on the industrial sector	1. Strategy of drinking water supply and sanitation systems in settlements of the Kyrgyz Republic until 2026; indicator is not integrated 2. State Program for the Development of Irrigation of the Kyrgyz Republic for 2017-2026; indicator is not integrated	The concept of development of the water sector for 2020-2030 in Uzbekistan; indicator not integrated	Water Sector Reform Program of the Republic of Tajikistan for 2016-2025; indicator is not integrated	National strategy of Turkmenistan on climate change; indicator is not integrated Information not available for other national policies

# SDG indicator	Global SDG indicator	National SDG indicator				
		Kazakhstan	Kyrgyzstan	Uzbekistan	Tajikistan	Turkmenistan
15.3.1	Percentage of land that is degraded over a total land area	The area of eroded land in the composition of agricultural land as a percentage of the total land area	(15.3.1.1) Area of arable land for reasons of non-use: salinization and waterlogging, lack of watering owing to a malfunctioning irrigation network prone to natural disasters (landslides, mudflows)	The ratio of the area of degraded land (irrigated and non-irrigated) to the total land area	Land area degraded as a percentage of total land area	Rate of land degradation
		Correspondence of the national indicators and measures to international standards				
		-Global indicator replaced by a national indicator -National indicator does not correspond to the global indicator, and the national methodology is different from the global methodology -Monitoring is conducted and accessible to the public	-Global indicator replaced with national -National indicator does not correspond to the global indicator, and the national methodology is different from the global methodology -Monitoring is conducted and accessible to the public	-National indicator corresponds to the global indicator -Monitoring is not accessible to the public	-National indicator corresponds to the global indicator -Monitoring is not accessible to the public	-National indicator corresponds to the global indicator indicator -Monitoring is not accessible to the public
		Integration of SDGs into national programs and strategies of the CA countries to combat drought				
		1. The concept of development of the agro-industrial complex for 2021-2030; national indicator is integrated, needs alignment with global indicator 2. National project for the development of the agro-industrial complex of Kazakhstan for 2021-2025; national indicator is integrated, needs alignment with global indicator	Concept of Green Economy 'Kyrgyzstan is a country of the green economy'; indicator is not integrated	1. Agriculture Development Strategy of the Republic of Uzbekistan for 2020-2030; indicator is not integrated; there is another indicator, 'reduction of land with high rates of salinity' 2. The concept of development of the water sector for 2020-2030 in Uzbekistan; indicator is not integrated, there is a broad objective 'reduction of saline land areas on irrigated land areas, including the reduction of highly and moderately saline irrigated land areas'	State program for the development of new irrigated lands and the restoration of lands retired from agricultural use; indicator is not integrated	National strategy of Turkmenistan on climate change; indicator is not integrated Information not available for other national policies

All countries in the CA region prepared their first voluntary national review of SDGs by 2020. Kazakhstan developed the second review in 2022, and Turkmenistan plans to present its second review in 2023 (Sustainable Development Knowledge Platform 2022). This demonstrates a certain political will in the efforts to fulfil national obligations under the Paris Agreement. However, as Table 7.4 shows, sustainable land and water management is not always a priority in national policies, despite the increasing droughts in the region. Moreover, the progress of SDG nationalization in the five CA countries is not homogeneous. Kazakhstan and Uzbekistan seem to take the lead in integrating SDGs 2, 6, and 15 into the national statistics and monitoring systems.

Nevertheless, the SDG indicators are not always integrated into the objectives of the national development programs and strategies for agriculture and water management in both countries. Next comes Kyrgyzstan, whose nationalized SDG indicators 2, 6, and 15 are also monitored and tracked in country statistics. However, national programs seldom contain target indicators corresponding to the SDGs. Tajikistan has nationalized indicators for the three SDGs, but monitoring and trend reporting on indicators are not always publicly available. Accordingly, SDG indicators 2, 6, and 15 are not integrated into national policies. Finally, a fully-fledged Turkmenistan analysis is unfeasible owing to the lack of information on national indicators (except for 6.4.2 and 15.3.1). National monitoring and trend reporting on indicators are not publicly available in Turkmenistan. National development programs and strategies have also not been available by state agency statistics or government platforms (Gasanov and Gasanova 2020).

The comparative review shows that Kazakhstan, like Uzbekistan, holds a confident leading position in the CA region on implementing the SDGs in national statistics and monitoring. Still, progress must be made on the methodological development of sustainable development indicators and their respective consolidation in national strategies and programs for developing agriculture and water sectors. Turkmenistan and Tajikistan should improve access to national data on the SDGs and monitor SDG adaptation and integration into relevant national strategic programs and plans on drought events (Xenarios et al. 2021). Monitoring and integrating targets for sustainable land and water resource usage in Kazakhstan is an example of Tajikistan, Kyrgyzstan, and Turkmenistan in developing drought and climate-resilient agriculture. Kazakhstan is one of the leading countries in the effort and commitment to incorporate the SDGs into national policies. However, better-customized plans should include sustainable agriculture implementation practices in climate-driven weather extremes.

7.4.2 State-driven initiatives on drought and agriculture in Kazakhstan

The main strategic document of Kazakhstan, 'Kazakhstan 2050,' emphasizes the exhaustibility of natural resources as a national challenge by stating that the country must follow the path of effective management of natural resources for sustainable economic growth. Strategic measures to combat desertification are outlined in the Concept for Kazakhstan's Transition to a Green Economy by 2050 through the introduction of sustainable land management practices (such as prevention of land degradation and restoration of degraded land; prevention of further overgrazing; efficient use of water; rational use of resources) (Government of Kazakhstan 2013).

In recent years, Kazakhstan agreed to abide by several global agreements. In 2016, Kazakhstan ratified the Paris Agreement and committed to reducing greenhouse gas emissions to 15 percent to 25 percent by 2030 as its nationally determined contribution. In 2020, President Tokayev stated at the UN Climate Ambition Summit that Kazakhstan would achieve carbon neutrality by 2060. Currently, Kazakhstan is elaborating the 2060 Long-Term Low-Carbon Development Strategy, aiming to accomplish sustainable agriculture across 75 percent of arable land by 2045. Moreover, in 2017 Kazakhstan joined the Global Land Degradation Neutrality Target Setting Program. Under the program, the country pledges to achieve a neutral balance of land degradation by 2030 by scaling up irrigated land areas by 40 percent (2 million hectares) (LDN TSP 2018).

Furthermore, in 2021, the Government of Kazakhstan developed a new set of strategic documents to fulfil its international commitments. Nine national projects were developed to address strategic changes in all country sectors. Two of these projects outlined the sustainable approach to environmental and agricultural development against drought and land degradation crises as follows:

1) The National Project for the Development of the Agro-Industrial Complex of Kazakhstan for 2021-2025 and the associated Concept for the Development of the Agro-Industrial Complex for 2021-2030 were developed by the Ministry of Agriculture (MoA), pay considerable attention to land degradation and drought issues. The national project applies a customized version of the SDG 15.3 target to ensure the doubling of the land area using water-saving technologies (drip irrigation, sprinkling) (Government of Kazakhstan 2021b). The concept provides measures to combat pasture degradation, strengthen control over the agrochemical state of soils, and introduce modern methods for monitoring land-use processes using space monitoring and remote sensing (Government of Kazakhstan 2021a).

2) The national project Zhasyl Kazakhstan for 2021-2025, supervised by the Ministry of Ecology, Geology, and Natural Resources (MEGNR), determines four main directions for development. The project targets 'increasing productivity through economical use of water' and alleviating drought and water stress. The objective is to reduce water losses during irrigation which will be achieved by constructing additional irrigation sources — for example, nine new reservoirs in Akmola, West Kazakhstan, Zhambyl, Kyzylorda, and Turkestan regions until 2025, with a storage volume of 1.7km^3 (Government of Kazakhstan 2021c).

In 2017, the Government adopted the Law on Pastures, which ensures the application of the sustainable use of pastures similar to the obligatory pasture rotation requirement. The law should mitigate the desertification impacts of overgrazing and facilitate the partial achievement of target SDG 15.3 on sustainable land use and drought combat strategy by 2030 (UNECE 2019). Also, in 2021, Kazakhstan adopted a new Environmental Code, which arranges a specific priority for mitigation and adaptation measures to protect lands from depletion, degradation, desertification and sustainable water resources management.

Attempts have also been made to improve agricultural water efficiency in the country. A state program for water resources management until 2030 has been initiated to 'improve the efficiency and rational use of water' through increasing the area of irrigated land up to 3 million hectares, the construction of 38 new reservoirs, and the introduction of water-saving incentivizing tariffs for the restoration and development of the water management irrigation infrastructure by 2030 (MEGNR 2020). In addition, Kazakhstan supports implementing foreign advanced water-saving technologies such as drip irrigation techniques developed in Israel to adopt best practices against drought.

7.4.3 Internationally driven initiatives on drought and agriculture in Kazakhstan

Kazakhstan is engaged with various international organizations on drought policy improvements in the country and, more broadly, in the CA region. According to the Ministry of Foreign Affairs of the Republic of Kazakhstan (2018), in 2018, Kazakhstan was a member of 160 international organizations and participated in executive bodies and international treaties, many related to environmental and climate aspects. More than 30 bilateral agreements on environmental protection and climate change were developed with the World Bank (WB), The Global Environment Facility (GEF), the Green Climate Fund (GCF), the United Nations Development Program (UNDP), the Asian Development Bank (ADB), the

UN Environment Program and its European and Asian Offices, the FAO, the United Nations Commission on Sustainable Development, UNESCO, the European Environment Agency, the International Union for Conservation of Nature, and the World Center for Monitoring and Conservation of Nature (Institute of Ecology and Sustainable Development 2020). Drought-related challenges have been of particular concern since the early 1990s when Kazakhstan joined the United Nations Convention to Combat Desertification (UNCCD) and adopted the Program on Combating Desertification for 2005-2015. A series of other initiatives were deployed later on — such as the Subregional Action Program for the Central Asian Countries on Combating Desertification within the UNCCD Context, the National Action Plan for Prevention and Mitigation of Consequences of Sand and Dust Storms (FSD) for 2021-2024, and the National Action Plan to Combat Desertification and Strategic Measures to Combat Desertification until 2025.

In partnership with international organizations, donors, and development banks, Kazakhstan is actively developing projects to address environmental problems and climate change in agriculture and water management. In 2012, the United Nations Development Program (UNDP), one of the first UN agencies in Kazakhstan, launched the 'improving the resilience of the wheat sector in Kazakhstan to climate change to ensure food security in CA' project, which produced climate-smart agricultural (CSA) tools such as 1) an integrated internet-accessible geographic information system (webGIS/geoportal) and 2) a drought early warning system. Also, the project built technical capacity for national monitoring and analysis of drought using remote sensing technologies in agriculture. Furthermore, UNDP developed 'strategic measures to combat desertification in Kazakhstan until 2025' (UNDP 2015) and proposed recommendations to improve the national action plan to combat desertification. Among the extensive portfolio of UNDP projects in Kazakhstan, it is worth noting the regular GEF Small Grants Program, which aims to provide grant support to address issues related to climate change (mitigation and adaptation) and land degradation (sustainable land and water management)

(UNDP 2020). Also, from 2012 to 2016, 15 loans worth 370 million euros were approved by the European Bank for Reconstruction and Development (EBRD) for Kazakhstan's municipal and environmental infrastructure and energy. About 30 percent of the loans were directed to the sustainable development of agriculture (South Kazakhstan Water Supply Project, Ust-Kamenogorsk Water, Semey Water).

Also, regional projects on the mitigation and adaptation of climate change, droughts, and sustainable water resources management were developed and implemented in Kazakhstan by the World Bank (Climate Adaptation and Mitigation Program for Aral Sea Basin, second irrigation and drainage improvement project, Modernization of the Kazhydromet network) (WB 2022); Asian Development Bank (Irrigation Rehabilitation Sector Project, Developing the Central Asia Regional Economic Cooperation Water Pillar, Supporting Environmental Safeguards in the Central and West Asia Region, Water Resources Management and Land Improvement Project) (ADB 2022); and GIZ (sustainable and climate-sensitive land use for economic development in Central Asia, Developing a National Policy Resilient to the Impact of Climate Change in Kazakhstan).

Drought management policies are also the priority area of FAO's work in Kazakhstan. FAO supports Kazakhstan in developing a national land degradation decision support system, which will integrate validated indicators through participatory processes to identify vulnerable areas affected or potentially affected by drought. The FAO's support aims at a more efficient land-use system through remote sensing, field data surveys (geobotanical, soil, water) and expert knowledge (FAO 2017). Moreover, land degradation and droughts are addressed in the 'investment in sustainable pasture management and increasing forage crop productivity' (2017-2019) project to develop pasture forage production and improve degraded pasture lands (FAO 2020). Also, the GEF-7 Sustainable Forest Management Impact Program on Dryland Sustainable Landscapes — whose two components are: 1) 'FAO-GEF Partnership for Sustainable Agriculture and the Environment' program implemented by FAO and 2) Kazakhstan Resilient Landscapes Restoration Project implemented by the World Bank in Kazakhstan — aims to maximize the effectiveness, efficiency, and sustainability of investments in drylands and achieve LDN status in the country (GEF 2021).

Despite significant mitigation efforts, severe and medium-level droughts have been repeatedly recorded from 1966 until today (Ministry of Energy of the Republic of Kazakhstan 2017). The water shortages have a detrimental effect on national agriculture by impacting the most grain-producing regions of Kazakhstan. Joint work of the Ministry of Energy of the Republic of Kazakhstan, UNDP, and GEF revealed that severe droughts could reduce yields by at least 50 percent on average in most grain-producing lands of West Kazakhstan, Aktobe, Karaganda, and Kostanay regions. The frequency and intensity of severe drought can variably increase from 5 percent to 70 percent, depending on the geomorphological features of the area (Ministry of Energy of the Republic of Kazakhstan 2017).

More robust mitigation and adaptation measures against drought, land degradation, and water stress are needed for Kazakhstan's drought-prone and ecologically vulnerable areas and Central Asia. The FAO-GEF Central Asian Countries Initiative for Land Management (CACILM-2) (2017-2024) is one of the noteworthy initiatives to recover and protect agricultural land, combat land degradation, and improve the living standards of rural populations in Central Asia. The uniqueness of the ongoing project is the focus on integrated natural resources management (INRM) in drought-prone and salt-affected agricultural production landscapes in Central Asia and Turkey. The project contributes to UNCCD and UNFCC (United Nations Framework Convention on Climate Change) objectives. Currently, fieldwork is conducted in 18 zones in arid, saline, and soil-degraded regions of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan (Institute of Ecology and Sustainable Development 2020).

In Kazakhstan, CACILM-2 focuses on improving drought-prone and salt-affected areas, scaling up SLM practices, and developing land degradation assessment and monitoring (Institute of Ecology and Sustainable Development 2020). The project activities are concentrated in pilot sites in the northern (Kostanay, Akmola, and Pavlodar regions), southern (Almaty, Zhambyl, Kyzylorda, and Turkestan regions), and central Kazakhstan (Karaganda region). The measures for adopting CSA practices and monitoring their progress have been developed; the drought-mitigation tools and technologies, disaster risk management (DRM) and IWRM principles, and cultivation of drought-resistant crops have been introduced on more than 350,000 hectares — of which about 20,000 hectares have already benefited until 2021 from the improved employment opportunities and the provision of drought- and salt-resistant seeds.

The CACILM-2 project has produced four vulnerability maps which enhance the knowledge base and skills to avoid, reduce, and reverse land degradation neutrality (LDN) in Kazakhstan by 2021. These maps encompass a land degradation map (the whole Kazakhstani territory covered — 272.5 million hectares); a salinity map (Zhambyl and Kyzylorda region, the overall area covered — 40 million hectares); drought vulnerability map (Kostanay region — 19 million hectares); and soil carbon organic map (Zhambyl region — 14 million hectares). By 2021, several strategies for disaster risk management and innovative integrated natural resources management technologies were upscaled in several Kazakhstani areas (240 hectares). CACILM-2 findings demonstrated that resource-saving soil protection technologies are cost-effective and can also be beneficial in the longer term. More information is presented in Tables A3-1 and A3-2.

CACILM-2 is an example of a working project that (i) proved the cost-effectiveness of resource-saving soil protection technologies and (ii) produced vulnerability maps that contribute to disaster risk prevention management for drought-prone regions. International programs such as CACILM-2 and national development projects support sustainable land-use resource systems and present evidence-based improvements; however, these often remain on a local scale and are planned for a short-term period. Insufficient implementation mechanisms on a local level and institutional inadequacies hamper the development of sustainable agriculture in Kazakhstan. Upscaling and long-term program initiatives are required with the engagement of state agencies to incentivize sustainable agriculture in the drought-prone lands of Kazakhstan.

7.5 POLICY, GOVERNANCE, AND INSTITUTIONAL GAP ANALYSIS

Despite the measures taken within the framework of approved programs to improve the efficiency of land use and projects implemented with the support of international organizations, Kazakhstan has not yet been able to build an adequate, sustainable system of land management. The leading institutional barriers at a national level are a) uncertainty of responsibility and authority for SLM and insufficient coordination among implementing agencies; b) absence of a specialized working body for SLM, which collects and analyzes current information and performs the necessary management decisions; and c) lack of experienced and qualified personnel. As also outlined in the Strategic Measures to Combat Desertification in the Republic of Kazakhstan until 2025 (UNDP GEF 2015), the measures should correspond to the formulation of a comprehensive national policy, legislative and institutional frameworks, economic incentives, knowledge, and capacity building, as well as monitoring and research programs on land administration.

At a local level, a severe obstacle to SLM is the challenging access to relevant knowledge and technologies, credit resources, limited availability of information resources, and shortage of reliable scientific research. Moreover, programs are dominated by top-down approaches and technical solutions, while the active role of the land user is rarely considered. The land tax system is based on land classifications and soil quality but without considering the land market values and incentives for adopting SLM initiatives. There are currently limited ways to encourage farmers to use land resources carefully: indicatively, the guarantees of the long-term rights of resource users; simplified access to resources; updated equipment; access to financial resources; and state support programs. Currently, the Kazakh government proposes a mechanism of mutual farmer obligations, as well as the principle of accountability for the insurance of crops when receiving state subsidies. These measures aim to improve the effectiveness of subsidies and the efficient use of land resources.

Also, one of the FAO proposals was to better implement the National Project on the Development of Agro-Industrial Complexes until 2030 through the 'responsible land user' scheme. The idea is that farmers adopt voluntary obligations to create a standard of best agricultural practices, use resource-saving technologies, fulfil social obligations, and increase all production indicators. Responsible land users can be the flagships of farming reform, motivating other agribusiness participants to sustainable agricultural production and replicating their experience. This initiative could contribute to Kazakhstan's better endorsement of SDG indicator 2.4.1.

As for SDG indicators 6.4.1 and 6.4.2, which review the efficiency of water use and the level of pressure on water resources, the assessments are not feasible without sufficient and reliable data sources. In Kazakhstan, indicators 6.4.1 and 6.4.2 are not included in strategic documents as targets (as shown in the analysis in Table 7.4); however, water stress is steadily increasing in cultivated land, especially in the southern regions.

Existing national water accounting and monitoring systems do not meet the requirements of rational and integrated water resources management. By 2020, the state hydrometeorological network will lag behind the standards of developed countries regarding hydrometeorological data coverage. Only 352 hydrological posts operate in Kazakhstan; the number of hydrological posts for the country's vast territory should be 511 to increase the reliability of hydrological assessments (MEGNR 2020). There is also an inconsistency in water law enforcement, which generally leads to the deterioration of the situation at all levels of water sector development. Therefore, improvement of the current water legislation is required; the existing water code was adopted in 2003, and over the 16 years of its application, it has been amended 62 times — about three times per year.

The existing monitoring of land resources in Kazakhstan also needs to be improved to create a better quality of land management, as demonstrated in Table 7.4. The monitoring should be enhanced through the clarifying indicators used in land degradation, actualization and timely updating of the cartographic component, increasing stationary observation points for soil quality, improvement of remote sensing data, and public data access. Notably, the recently approved Concept for the Development of the Agro-industrial Complex of Kazakhstan until 2030 (Government of Kazakhstan 2021b) stresses the following gaps in the land management system in Kazakhstan:

Gaps in the land management system in Kazakhstan

· Lack of coordination and limited monitoring over the use and protection of agricultural land;
· Deterioration of land quality, absence of a unified service and platform for qualitative (soil, geobotanical, agrochemical) land registration, failure to meet the requirements for survey frequency because of lack of funding;
· Shortage of single-source information about vacant land plots in electronic format;
· Low rates of involvement of unused agricultural lands that could be cultivated;
· Weak mechanisms of dividend payments and prohibition of exit while being pledged in second-tier banks of conditional land shares;
· Inconsistency of the methodological approach in assessing the state of land resources with the requirements of the LDN classification (SDG indicator 15.3.1) inhibits comparative analysis and assessment with other countries.

Some measures have been adopted to expand organic production in Kazakhstan and increase sustainable resource use by achieving neutrality in land degradation. Technologies of organic farming significantly mitigate the harmful effects on the soil by reducing the intensification of the use of chemical fertilizers and pesticides. Kazakhstan has recently acquired some experience producing organic wheat, flax, and vegetable products. However, the weak legislation, tax regimes, and lack of certification systems hinder the country's potential.

The earlier targets are closely related to SDG 15 to achieve an LDN world by 2030 and SDG indicator 15.3.1, which measures the area of degraded land as a percentage of land area. In fact, in the action plan for implementing the concept for the development of the agro-industrial complex of the Republic of Kazakhstan for 2021-2030, indicator 15.3.1 is presented; however, it is not aligned with the global methodology and is not well integrated, as noted in Table 7.5.

It is also emphasized that the national SDG indicators 2.4.1, 6.4.1, 6.4.2, and 15.3.1 should be aligned with international methodology and integrated into national policies. There is a need to bring the national methods in line with global standards, develop target values for achievement by 2030, and develop an action plan with a quality monitoring process. Moreover, it is necessary to strengthen the indicators and principles of sustainable management of natural resources through legislative and strategic initiatives. Table 7.5 gives a brief overview of the institutional, governance, and policy gaps and recommendations for the better integration of SDG-related indicators.

Table 7.5. Policy, governance, and institutional gaps on SDGs in Kazakhstan and recommendations

Policy, governance, and institutional gaps	Recommendations	Beneficiary SDGs
-Top-down approach to sustainable land management -Overlooked role of farmers and users in sustainable land management and decision-making processes	Introduction of the responsible land user institution to contribute to the Concept of Agro-Industrial Complex Development	2.4.1. 'Proportion of agricultural area under productive and sustainable agriculture
Lack of institutional and legal enforcement and consistency	Improvement of the current strategic water policy and water legislation	6.4.1 'Change in water use efficiency over time and 6.4.2 'Level of water stress: freshwater withdrawal as a proportion of available freshwater resources'

Methodological inconsistency in the assessment of the state of land resources and the requirements for the LDN classification	Improving the methodology and adopting monitoring for LDN indicator	15.3.1. 'Percentage of land degraded over a total land area'

7.6 CONCLUSION

Sustainable land and water resources are supported in Kazakhstan to mitigate the consequences of drought and land degradation. Sustainability is sought to be achieved in the country through strategic and national documents such as 'Kazakhstan 2050,' Concept for Kazakhstan's Transition to a Green Economy by 2050, State Program for Water Resources Management, Environmental Code, Law on Pastures, National Project for the Development of the Agro-Industrial Complex of Kazakhstan for 2021-2025, the Concept for the Development of the Agro-Industrial Complex for 2021-2030, and the Zhasyl Kazakhstan project. Also, internationally driven projects contribute to LDN and enhance agricultural resilience to drought. As mentioned, the interregional CACILM-2, GEF Small Grants program, and FAO's Resilient Agroforestry and Rangeland Management project effectively implement integrated natural resources management in drought-prone regions and improve ecological conditions and local livelihoods.

Moreover, to mitigate and adapt measures against drought, the Government of Kazakhstan designs and implements national strategies and action plans. Also, SDG-customized indicators are introduced to confront significant agri-environmental challenges. The Concept for the Development of the Agro-Industrial Complex for 2021-2030 is the main guideline in Kazakhstan to mainstream SDGs toward sustainable agricultural and food systems in the country. However, it still does not comprehensively address the needs on a local level since essential methodological and monitoring inconsistencies are presented in land-use planning. Overall, it is acknowledged that Kazakhstan is known internationally as a country with an active position towards committing its national obligations for achieving neutrality in carbon and land degradation; however, current state programs and international support to combat drought and land degradation in the country are still insufficient. More institutional changes are required to improve the effectiveness of the national anti-drought strategies.

According to prevalent climate change scenarios, in fewer than 60 years, global warming will provoke a massive degradation of pastures in Kazakhstan, leading to a decline in the export performance of dominant crops. The country should strive to transform energy-intensive agriculture into a balanced farming regime, the main feature of which is the optimal balance between energy consumption, yields, and environmentally sustainable agricultural production. By following the best practices of neighboring states like Uzbekistan and Tajikistan, Kazakhstan must develop an agricultural adaptation strategy based on climate change monitoring for the agroecological suitability of lands. The implementation of the strategy should be guided by mid- and long-term indicators related to a local context, gender aspect, and age disaggregation ('leaving no one behind' principle). The strategy's targets must also foresee a regional context and contribute to the common goal of building a resilient and sustainable future for the broader CA region. More substantial incentives must be realized to stimulate climate-smart organic agriculture and drought-resistant crops.

Moreover, LDN targets, although accepted on a national level, must be implemented in the national short- and long-term development programs, the corresponding target of which should be elaborated in the agricultural adaptation strategy. The critical focus of the program should be strengthening sustainable land management, where a land-farmer-government interaction is followed. Responsible use of land and water resources and trustworthy farmer-government activities should be prioritized by integrating transparent and efficient legislation, tax, and monitoring systems. The national strategy should focus on the capacity development of methodological and monitoring platforms and hydrometeorological services, as these are key for building preventive and early warning systems. Efficient and timely monitoring is essential for achieving sustainable targets and goals. As Table 7.4 shows, Kazakhstan has considerably endorsed sustainable land use and management practices via the trustworthy monitoring of SDG indicators. However, improved monitoring of the water resources management and environmental protection — learned from Uzbekistan's experience — should be studied and upscaled for Kazakhstan and other drought-prone CA areas.

Current practices of agricultural intensification have proven to be unsustainable. High-intensity land and water use are depleting the productive capacity of land and water systems, causing severe land degradation and deteriorating the quality of ecological services. Incorrect planning for intensive livestock production can lead to adverse environmental consequences, including soil and vegetation erosion, water and marine pollution, and the unsustainable use and conversion of vast rangelands. Hence, upscaling environmentally responsible and climate-smart production and implementing the concept of LDN can be a powerful tool in combating desertification and the degradation of farmland.

The strategy for creating sustainable agrifood systems should be based on the climate-smart use of land resources such as agroecology; soil-protective and resource-conserving agriculture; organic agriculture; agroforestry; the organization of mixed crop-livestock farms; the introduction of capacity-building institutions; and the implementation of sustainable livestock management practices in line with the Global Agenda for Sustainable Livestock and Sustainable Use.

Also, emphasis is needed on the development and conservation of livestock genetic resources based on the Global Plan of Action for Animal Genetic Resources; improvement of rangeland management measures that will contribute to the development of forage production and improvement of pasture productivity; the restoration of grasslands and other rangelands to enhance soil carbon sequestration; the prevention of the infiltration of invasive species; control of the expansion of rangelands and forage crops at the expense of forested lands; and building food systems based on a principle of a circular economy.

Land use management in the drought-prone regions of Kazakhstan presented in this study could be a helpful example for CA countries to follow, thereby developing national planning and policies for agricultural land management and droughts. National and regional efforts should be oriented toward implementing an integrated approach to sustainable resource use, addressing the main threats associated with land degradation, water scarcity, poverty, and gender inequality, and developing comprehensive monitoring of SDG indicators.

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Annex 1. Farming allocation, land use, and degradation challenges in Kazakhstan

Table A1-1. Land cultivated by individual farmers or farm enterprises (as of 1 July 2020)

	No. of farms or farm enterprises	Numbers of farmers or farm enterprises (no.) and hectares (ha)													
		up to 50 ha		51-200 ha		201-500 ha		501-1,000 ha		1,001-10,000 ha		10,001-20,000 ha		over 20,000 ha	
		Farmers (no.)	Area (ha)	Farmers (no.)	Area (ha)	Farmers (no.)	Area (ha)	Farmers (no.)	Area (ha)	Farmers (no.)	Area (ha)	Farmers (no.)	Area (ha)	Farmers (no.)	Area (ha)
Republic of Kazakhstan	133,965	80,458	981,190	20,841	2,499,256	13,227	4,909,828	8,265	6,762,480	10,902	29,389,999	215	3,139,278	57	3,603,519
Akmola	3,356	263	8,298	1,158	141,005	922	316,347	480	357,056	528	1,198,294	5	62,710	-	-
Zhambyl	11,937	7,431	126,577	2,438	276,165	1,104	371,204	491	361,702	462	1,133,427	9	114,397	2	53,492
Kostanay	3,560	260	9,724	1,170	165,732	860	372,954	535	491,531	715	2,131,236	13	225,125	7	389,845
Kyzylorda	2,972	878	22,120	1,021	121,033	577	199,069	266	196,150	223	531,349	4	53,648	3	72,894
North Kazakhstan	2,431	239	9,035	980	117,196	541	201,705	315	258,722	351	927,840	4	93,002	1 -	21,973 -
Turkestan	48,292	43,340	408,476	3,571	391,383	961	326,784	286	213,806	131	287,976	3	41,596		

Source: Adapted from 'Statistical Compilation 2016-2020,' by Bureau of National Statistics (2021)

Table A1-2. Agricultural land use in Kazakhstan (thousands of hectares as of November 2020)

	Total area of agricultural land	Agricultural land uses								
		Arable land	Perennial plantations	Deposits	Hayfields	Pastures	Forest area	Swamps	Underwater	Other
Republic of Kazakhstan	108,563	25,807	62	1,853	2,225	75,599	1.3	131	200	2,684
Akmola	10,848	5,958	1,6	292	152	4,419	0	2.5	6.5	17
Zhambyl	4,705	782	3.7	0	120	3,665	0.1	2.7	7.2	125
Kostanay	10,441	6,177	1,4	85	130	3,907	0	31	23.7	86
Kyzylorda	2,788	177	0.6	40	37	1,998	0	2.1	3.6	531
North Kazakhstan	7,342	4944	0.8	57	17	2,084	0.2	44	66.2	129
Turkestan	4,308	865	28	102	69	3,127	0.2	0.1	7.4	109

Source: Adapted from 'Statistical Compilation 2016-2020,' by Bureau of National Statistics (2021)

Table A1-3. Impacts on agricultural areas in the Kazakhstan's regions (thousands of hectares, as of November 2020)

	Agricultural land uses							
	Crushed	Saline	Salty	Eroded	Deflated	Waterlogged	Marshy	Other
Republic of Kazakhstan	3,848	4,898	179,132	15,341	1,137	7,655	24,436	262,918
Akmola	410	242	6,422	478	68	382	561	14,612
Zhambyl	0	252	7,003	2,242	30	352	1,217	11,938
Kostanay	237	344	11,294	302	137	443	599	19,600
Kyzylorda	62	109	11,856	5,155	13	2,366	4,349	24,099
North Kazakhstan	107	34	3,271	597	91	363	352	9,804
Turkestan	125	95	8,866	590	1.7	158	820	11,609

Source: Adapted from 'Statistical Compilation 2016-2020,' by Bureau of National Statistics (2021)

Annex 2. Seeded and harvested area and land productivity for Kazakhstani crops for 2021

Table A2-1. Spring and winter wheat, cereals (including rice) and legumes, and oilseeds across the Kazakhstan regions

Region	Spring and winter wheat			Cereals (including rice) and legumes			Oilseeds		
	Seeded area (hectares)	Harvested area (hectares)	Productivity (kg/hectare)	Seeded area (hectares)	Harvested area (hectares)	Productivity (kg/hectare)	Seeded area (hectares)	Harvested area (hectares)	Productivity (kg/hectare)
Akmola	3,977,882	3,872,252	870	4,585,629	4,463,168	870	270,545	258,563	550
Aktobe	327,028	323,270	560	444,486	435,634	580	68,818	65,667	610
Almaty	137,438	136,404	1,570	486,101	479,012	2,840	133,829	133,429	1,960
Atyrau									
West Kazakhstan	175,144	163,664	750	248,734	232,323	710	121,916	113,694	590
Zhambyl	169,002	165,681	1,150	402,791	392,623	1,400	59,186	58,430	800
Karagandy	769,961	760,635	920	949,722	936,453	920	25,859	25,759	630
Qostanay	3,643,252	3,590,833	720	4,088,835	4,007,146	710	607,098	529,306	450
Kyzylorda	11,531	11,230	920	97,136	96,782	4,770	6,727	6,624	940
Mangystau		637,780			865 675				
Pavlodar	638,223	2,428,433	1,110	871,851	2,991,515	1,990	271,059	268,159	810

North Kazakhstan	2,440,384	196,321	1,180	3,015,426	294,611	1,160	959,946	895,859	800
Turkestan	206,071	421,370	1,150	305,172	593,348	1,150	85,657	85,076	730
East Kazakhstan	425,094	1,720	1,590	599,614	1,720	1,650	487,655	484,004	1,380
Nur-Sultan city	1,720			1,720					
Almaty city		9,772	400		10,702	390			530
Shymkent city	9,845	3,872,252	750	10,825	4,463,168	830	4,083	3,413	550

Note: In the case of blank cells, no data is provided
Source: Adapted from 'Statistics on Agriculture, Forestry, Hunting and Fishing' by Bureau of National Statistics (2022b)

Table A2-2. Potato, open ground vegetables, gourd, sugar beet, cotton, and tobacco crops across the Kazakhstan regions

Region	Potato			Open ground vegetables		Gourd	Sugar beet		Cotton (CT) and tobacco (TB)		
	Seeded area (hectares)	Harvested area (hectares)	Productivity (kg/hectare)	Seeded area (hectares)	Harvested area (hectares)	Harvested area (hectares)	Harvested area (hectares)	Productivity (kg/hectare)	Seeded area (hectares)	Harvested area (hectares)	Productivity (kg/hectare)
Akmola	15,223	15,050		2,355	2,333	2					
Aktobe	6,384	6,378	16,570	4,595	4,573	1,109					
Almaty	40,608	40,518	19,490	33,319	33,316	4,465	6,902	24,900			
Atyrau	1,974	1,972		2,801	2,797	1,252					
West Kazakhstan	3,924	3,922	14,800	3,510	3,510	1,719					
Zhambyl	11,446	11,445	23,390	43,226	43,218	14,627	5,156	31,090			
Karagandy	16,446	16,338	24,030	3,335	3,223	26					
Qostanay	9,050	8,790	18,920	2,307	2,305	256					
Kyzylorda	3,809	3,808	14,450	6,045	6,045	8,453					
Mangystau	1.1			353	347	468					
Pavlodar	15,329	15,329	28,900	6,890	6,829	2,042					
North Kazakhstan	19,748	19,526	17,980	5,630	5,612						
South Kazakhstan	20,129	20,127	N/A								
Turkestan	31,195	30,675	20,430	42,868	42,868	70,790			109,971 (CT) 334 (TB)	109,971 (CT) 334 (TB)	2,640 (CT) 3,410 (TB)
East Kazakhstan	74	66	22,820	9,116	9,096	4,679	0.1				
Nur-Sultan city	108	108	9,620	217	17						
Almaty city	346	346	13,420	202	202						
Shymkent city				2,059	2,058	91					

Note: In the case of blank cells, no data was available

Source: Adapted from 'Statistics on Agriculture, Forestry, Hunting and Fishing' by Bureau of National Statistics (2022b)

Annex 3. Activities and interim results of the CACILM-2 project in Kazakhstan

Table A3-1. Project components of CACILM-2

Project component	Region	Year	Indicator	Land area, hectares	Interim improvement	Outcome
Introduction, cultivation, and distribution of drought- and salt-tolerant crops:	Almaty	2020	Pasture crops: 1) wheatgrass (agropyron desertorum)	5	All varieties of perennial pasture crop tested in 2020-2021 in the semi-desert zone, where the average annual rainfall is 200-250mm, showed a good result	Field trials and demonstration of drought- and salt-tolerant pasture crops of 4 genotypes in the Almaty region (South-Eastern Kazakhstan) on a total area of 35 hectares (5 hectares—2020, 30 hectares—2021)
Supporting drought- and salt-tolerant pasture crops and propagation of improved native species		2021	2) hair (psathyrostachys [elymus] juncea) 3) izen (kochia prostrata [L.]) 4) sainfoin (onobrychis arenaria)	30		
Implementation of soil protection technologies	Almaty	2020	Oats, barley, Sudan grass, millet, sorghum, and African millet	7.5	Satisfactory results are shown from oats, barley, Sudanese grass, millet	No data available
		2021	Sudan grass, sorghum	2	No data available	
Combat salinization and rehabilitation of degraded irrigated lands in the Kyzylorda region: **Effects of introducing sugar sorghum into rice crop rotation**	Kyzylorda	2021	Before the introduction of sugar sorghum: degree of salinity pH humus amount of salts (%)	47 (demo sites of four peasant farms)	After the introduction of sugar sorghum: degree of salinity improved pH decreased humus increased amount of salts (%)—no consistent result	Sugar sorghum improves the physical and chemical composition of soil in saline lands
Rehabilitation of degraded lands through strip-sowing of perennial in the Almaty region	Almaty	2021	Harvesting of grain barley, oats, millet, Sudanese grass, Mohar, Alfalfa, sainfoin, wheatgrass	18	10-hectare demo site: 3 tons of hay harvested from Sudanese grass and 3 hectares under mohar 8-hectare demo site: 6 tons of hay harvested from Sudanese grass; the oats did not give a crop	The regrowth of perennial grasses in the first year of life, such as alfalfa, sainfoin, and wheatgrass, was satisfactory

* Soil analysis results are demonstrated for depths 0-20cm

Table A3-2. Project cost savings through convention and resource-saving interventions

Conventional practices		Resource-saving interventions			
		1st year of implementation		Future implementation	
OPERATIONS	**US$/ hectares**	**Activities**	**US$/ hectares**	**Activities**	**US$/ hectares**
PLOUGHING	16		0	-	-
	-		19	Herbicide treatment	20
CULTIVATION	12		12	-	-
DISKING	10		-	-	-
SEED THINNING	6		-	-	-
SOWING (SEEDS, FERTILIZER)	163		163	Direct sowing	163
HERBICIDE TREATMENT	21		21	Herbicide treatment	10
INTER-ROW CULTIVATION	11		-	-	-
FERTILIZATION	76		76	Fertilization	76
2-ROW CULTIVATION	11		-	-	-
HARVESTING	9		9	Cleaning	9
TOTAL	337		322		278

Note: The US$ is estimated on the exchange rate of 1US$ = 477 KZT equivalence as of 23 August 2022

Source: Adapted from Regional FAO/GEF project 'Integrated natural resource management in drought-prone and saline agricultural production landscapes in Central Asia and Turkey,' by Iskandarova K.A., Meldebekova, Ainebekova B.A. (2021). World Soil Day Conference FAO, Astana.

PART IV

E-COMMERCE DEVELOPMENT IN CAREC

Chapter 8

TOWARDS E-COMMERCE DEVELOPMENT IN THE CAREC REGION

Ghulam Samad and Soo Hyun Kim

8.1 INTRODUCTION

Pictures from: https://rabbit.bigbigwork.com/home

The importance of e-commerce is predominantly illustrated for developing and leapfrogging the economy. However, the COVID-19 pandemic amplified the significance of e-commerce development in the CAREC region. During the pandemic, consumers and businesses transitioned to online platforms to utilize the benefits of lesser trade barriers. Unfortunately, e-commerce infrastructure and regulations are unevenly distributed across the CAREC region; therefore, most of the region did not tap into the associated benefits for consumers and businesses.

Digital literacy and affordability are the two main barriers to the widening gap across the CAREC region. Similarly, financial transactions have yet to adopt digital payment systems to cope with the growing number of online transactions. The digital payments landscape is promoted across the CAREC region; however, the lack of availability of e-commerce infrastructure, lax regulations, insufficient appropriate logistics for the integration of warehouse and delivery, and a trust deficit between internet users and potential online buyers are some of the fundamental challenges that hamper the proliferation of e-commerce across the region.

Unfortunately, barriers exist at micro and macro levels to the development and use of fintech (financial technology) in the CAREC region. At micro level, there is insufficient collateral or guarantee, a lack of relationship with financial institutions, and insufficient credit or performance history. At macro level, fintech development and usage hinges on the overall level of financial systems and how local firms are integrated.[1] To develop fintech in the CAREC region, the focus should be on building a fintech foundation, enhancing information and communication technology (ICT), and digital infrastructures to ensure a regulatory quality to facilitate trade finances and cross-border paperless trade.

Under the CAREC Trade Integrated Agenda 2030,[2] a number of trade facilitation initiatives were launched — in particular, mutual recognition of sanitary and phytosanitary (SPS) e-certification. In this context, the Common Agenda for the Modernization of Sanitary and Phytosanitary Measures for Trade was endorsed by CAREC ministers in 2015. ADB and the CAREC Institute's (2021)[3] joint study explores most of the CAREC countries that have a legal basis for the recognition of phyto certificates and exchanges of electronic certificates. 'However, there are varying degrees in terms of provisions for allowing electronic exchange and international data storage including electronic certificates of

[1] 'Financial Inclusion in the CAREC region: Promoting Fintech to Meet Underserved Needs in Trade Finance.' ADB and CI Joint Study. Not yet published.

[2] https://www.carecprogram.org/?publication=carec-trade-agenda-2030-strategic-action-plan

[3] https://www.adb.org/sites/default/files/publication/720191/adb-brief-184-agri-trade-central-asia.pdf

ePhytos (UNESCAP 2021).' Uzbekistan is the best-case scenario that transitioned fully to e-certification. The People's Republic of China (PRC) is integrated with HUB via national ePhyto system. Unfortunately, for the rest of the CAREC countries, the transition to ePhyto certification requires digital capacities (technical languages), legislative reforms to recognize ePhyto certificates, and regional cooperation.

The key challenge for e-commerce enactment, fintech proliferation, and ePhyto certification is the inconsistent regulatory environment prevailing in the CAREC countries. The ADB and CAREC Institute (2020)[4] highlighted that the CAREC countries 'update their legislative framework, ensure conformity with internationally recognized standards, and harmonize laws and approaches among themselves.'

The next sections briefly present each one of the four parts of the chapter separately: e-commerce infrastructure, fintech inclusions, ePhyto certification, and e-commerce regulations. To tailor and align the discussion, each section provides a separate conclusion at the end of the section instead of just one conclusion at the end of the chapter. Section 2 discusses e-commerce infrastructure and its key components. Financial inclusion to promote financial technologies is discussed in section 3. The readiness of sanitary and phytosanitary (SPS) certification is presented in section 4. Finally, section 5 elaborates on e-commerce regulations in the CAREC region.

[4] 'https://www.carecinstitute.org/wp-content/uploads/2020/04/2-CI-Policy-Brief-e-Commerce-Framework-in-CAREC-25-Apr-2020.pdf

8.2 E-COMMERCE INFRASTRUCTURE

The use of digital technology has become crucial in expediting and providing a conducive work environment by replacing manual work at the workplace. During the COVID-19 pandemic, a significant amount of reliance was placed on e-commerce. Countries with a reasonable e-commerce infrastructure and regulatory environment benefited from the use of e-commerce. An internet infrastructure, payment systems, logistics, and an e-commerce market are all necessary for the proficient functioning of e-commerce.

8.2.1 Internet infrastructure

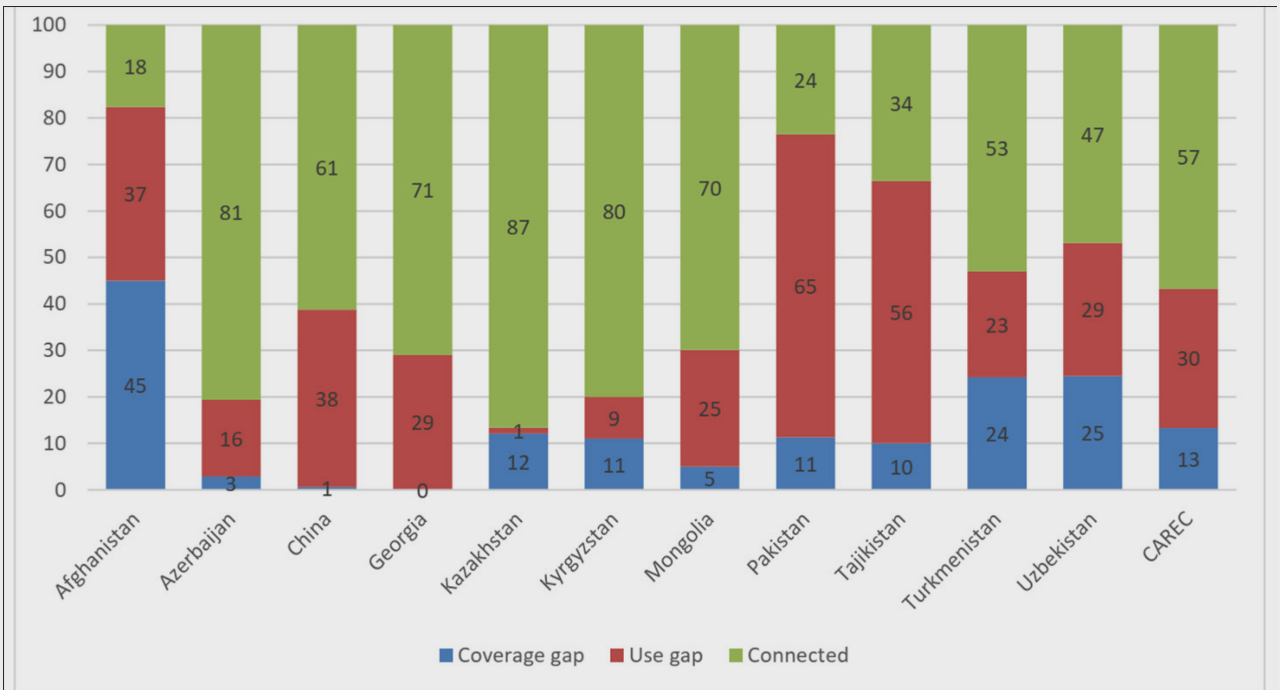
Internet infrastructure plays an important role in the facilitation of e-commerce development; it was vital during the COVID-19 crisis. Internet infrastructure consists of wireless networks, fiber optics, data centers, cloud computing, and other critical ingredients for e-commerce services. The ADB and CAREC Institute (2021)[5] explore the gap concept to discern the relationship between having no access to the internet, having access to the internet but not using it, and using the internet.

Figure 8.1 shows the different types of use gap among CAREC countries. Internet access in Afghanistan is almost 55 percent; however, it has the lowest rate of internet users among the CAREC member countries, followed by Pakistan and Tajikistan, while Azerbaijan and Kazakhstan have the highest number of internet users. The coverage gap is very high in Afghanistan — 45 percent — followed by Turkmenistan and Uzbekistan. Surprisingly, 65 percent of Pakistan's population does not use the internet, which is the highest use gap in the CAREC region. Moreover, the CAREC region lags behind in critical data

[5] https://www.carecinstitute.org/wp-content/uploads/2021/05/CI-e-commerce-infra-policy-brief-May-2021-1.pdf

infrastructure — for example, international bandwidth, internet exchange points (IXPs), data centers, and cloud services.

Figure 8.1: Coverage and use gap, 2019



Note: Coverage based on mobile broadband signal (that is, at least 3G).
Source: UN SDG database, national surveys.

8.2.2 Payments

The payment mechanism connects users and businesses within and across countries. Demand[6] and supply-side payment infrastructure[7] are of critical importance for payment systems. As per the CAREC policy brief,[8] the growing number of order placements is becoming difficult to handle along with the increased number of payments owing to a very slow process in the case of international transactions. According to the World Bank's FINDEX report (2017),[9] the demand for bank accounts has drastically increased over time in the CAREC region; one of the reasons for this is the mobile phone penetration. Figure 8.2 shows the mobile phone penetration and bank accounts in the CAREC region; it indicates that mobile phone penetration in Pakistan is only (approximately) 53 percent of the population. Overall, mobile phone penetration among CAREC member countries ranges from 53 percent to 98 percent, while there is a considerable difference found for availability of bank accounts.

In Turkmenistan, 40 percent of the population have a bank account; comparing this among CAREC member countries, the figures are much lower for Afghanistan and Pakistan. Domestically, it is possible to make online payments via mobile app or using a debit card, but this does not meet the international criteria in all CAREC countries. It is also observed that the demand for debit card ownership has increased. Fear of the COVID-19 pandemic motivates people to use online shopping channels and make digital payments to reduce physical interaction. China has the highest smartphone usage; the smartphone penetration is also directly related to the different bank apps.

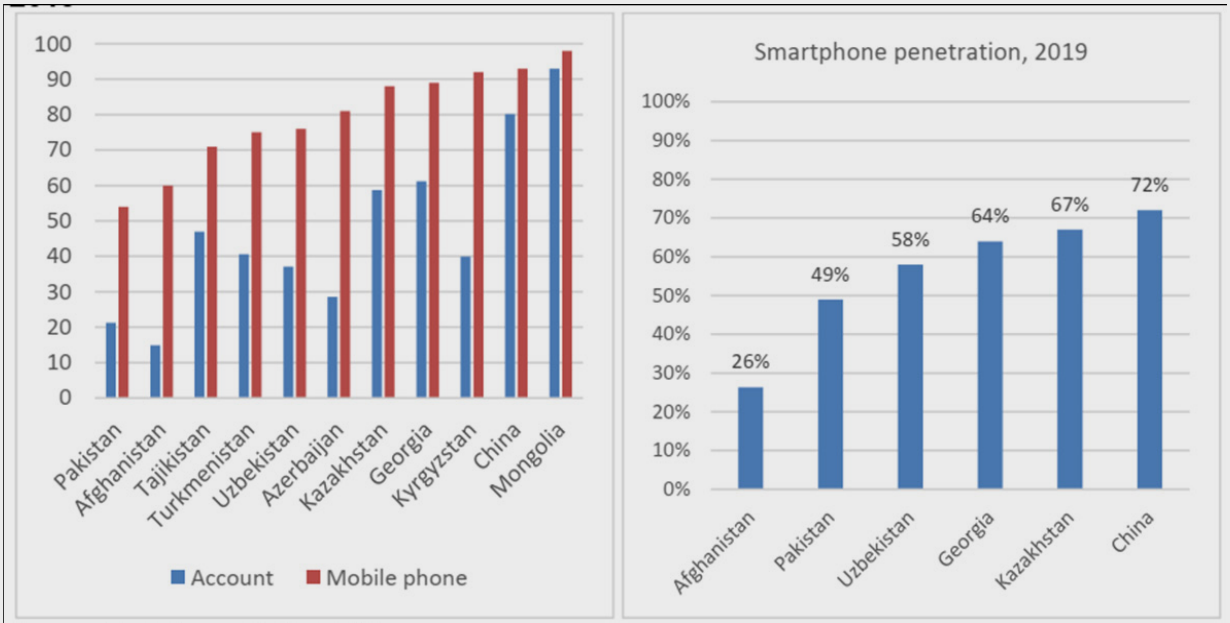
[6] Physical payment cards and mobile phone based payment apps.

[7] Telecommunication links between webshops and banks, automated teller machines, point of sale terminals, and software to handle processing.

[8] https://www.carecinstitute.org/wp-content/uploads/2021/05/CI-e-commerce-infra-policy-brief-May-2021-1.pdf

[9] https://globalfindex.worldbank.org

Figure 8.2: CAREC mobile phone and account penetration 2017 and smartphone penetration 2019



Source: World Bank, MTN, GSMA.

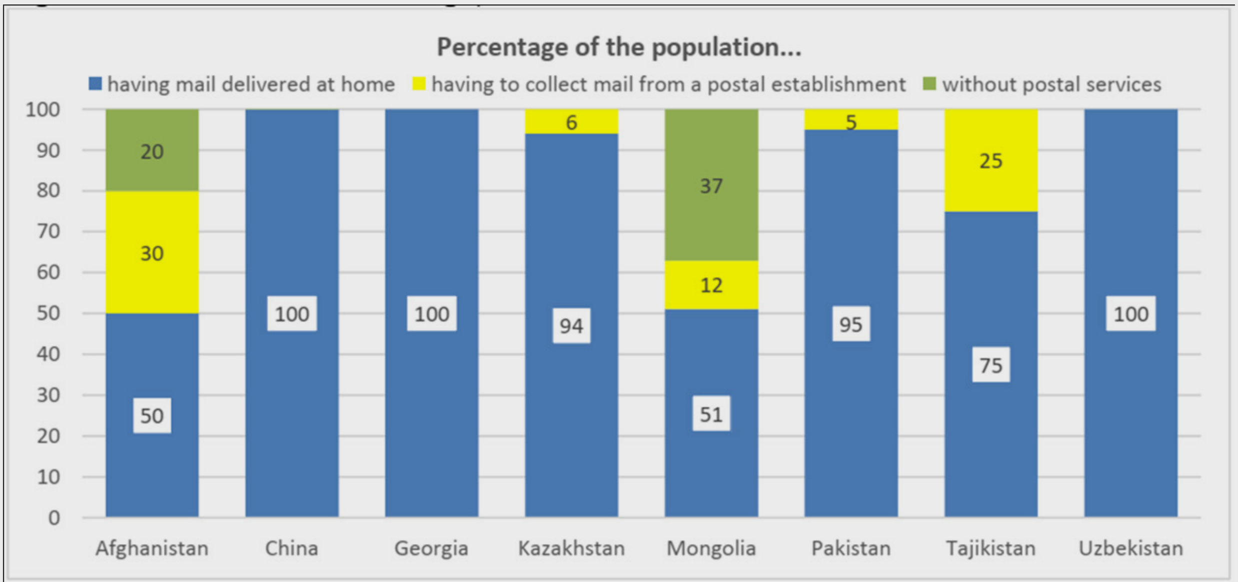
8.2.3 Logistics

E-commerce logistics is complex; the process is divided into different parts, such as service providers, consolidators, delivery operators, and reverse logistics. Challenges present themselves at every stage; the bureaucratic process suffocates the effective operation of cross-border trade. The critical part of the e-commerce process is fulfilment and delivery, which requires a custom procedure to be transparent and efficient for cross-border e-commerce. Customers expect to receive the order in a timely fashion; along with the other logistics, it requires a network of postal coverage in a country. The delivery service needs to be efficient, reliable, and resilient. According to the Universal Postal Union[10] published by the Integrated Index for Postal Development, the China postal service scores 66 out of 100 in the index.

Figure 8.3 shows that more than 90 percent of the population in all CAREC countries have a mail delivery system, except for Tajikistan, Afghanistan, and Mongolia. In Afghanistan and Mongolia, only 50 percent of the population has a postal delivery system; the other half of the population has no mail system owing to the poor security situation and clusters of low population groups scattered over large territories — all of which created insurmountable obstacles for the postal system. Similarly, limited storage facilities — and limited integration of the storage facilities to the delivery networks — prevail in the CAREC region. Large corporations like Alibaba have established storage facilities and delivery networks. Pakistan and Kazakhstan are the other CAREC countries where logistic platforms exist. The rest of the CAREC countries have yet to achieve large inventories and delivery integration to e-commerce.

[10] The index provides a benchmark performance score (from 0 to 100) for 170 countries (Universal Postal Union (UPU). 2020. 'Postal Development Report 2020.' https://www.upu.int/en/Publications/2IPD/Postal-Development-Report-2020)

Figure 8.3: Postal network coverage, 2019 or latest available

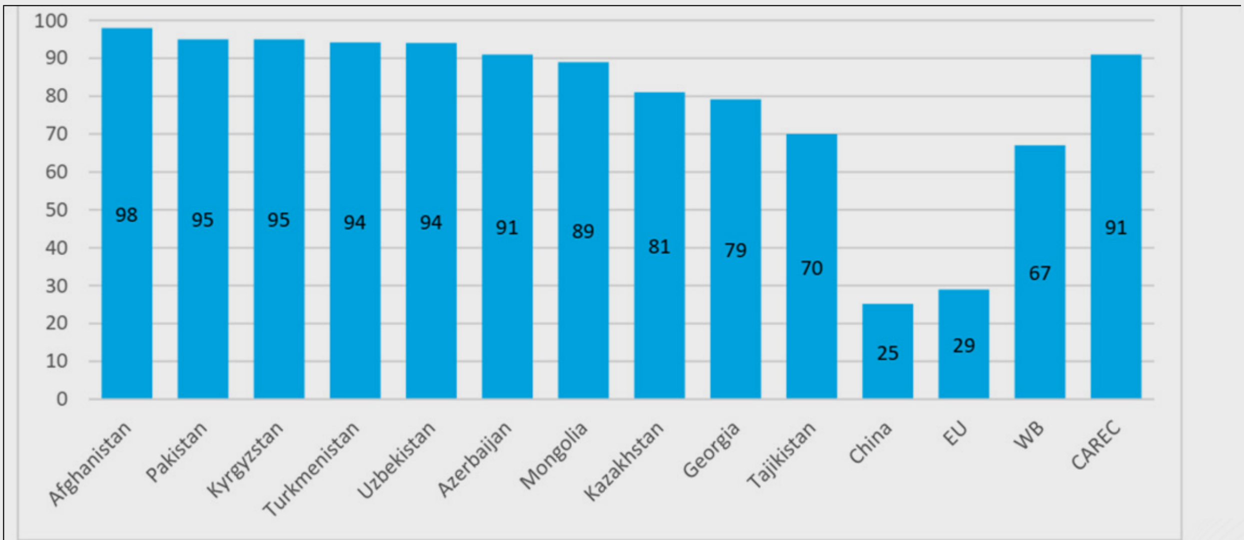


Note: No data for Azerbaijan, Kyrgyzstan, or Turkmenistan.
Source: UPU.

8.2.4 E-commerce market

To establish a working e-commerce market it is necessary to examine the internet infrastructure, payment mechanism, and other necessary logistics with a broader lens. The success of online sales and purchases depends on a well-functioning internet, payment system, and the necessary logistics. However, the presence of all these ingredients individually do not mean people will purchase and pay online; Figure 8.4 shows the number of internet users who do not purchase online in CAREC countries; only 2 percent of users in Afghanistan shopped online via the e-commerce market, while 98 percent do not use the internet for shopping online. Around 75 percent use the internet for online shopping in China.

Figure 8.4: Proportion of internet users who do not shop online



Note: EU=European Union. WB = West Balkan median (Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia). The CAREC average refers to the median country value.
Source: National agencies, World Bank FINDEX, and Eurostat.

8.2.5 Conclusion

Overall, e-commerce infrastructure in the CAREC region has made progress, but it is uneven progress. The different indicators and subindicators discussed have not developed at the same pace or been adopted at the same time; therefore, some of the CAREC countries are leading the way and some are lagging behind. In 2020, UNCTAD published a B2C e-commerce index to measure a country's readiness for e-commerce. The B2C index is constructed by compiling different proxies for infrastructure as mentioned earlier. The success of e-commerce depends on the different indicators (online shopping, account ownership, internet users, and postal service reliability) as shown in Table 8.1. Table 8.1 shows the e-commerce ranking for the CAREC countries; Georgia and China ranked first and second respectively in the CAREC region, while their respective global rankings of 47 and 55 identify their readiness for e-commerce.

The e-commerce index identifies the strengths and weaknesses of each country: security of internet servers, number of the population with a bank account, number of internet users, and reliability of postal service. The average B2C e-commerce index indicates that 56 percent of the population in the CAREC region use the internet, which shows that this region is performing best, while the other indicator estimations show a relatively less good performance than that of internet use.

Table 8.1: B2C e-commerce index

2020 Rank	Economy	Share of individuals using the internet (2019 or latest)	Share of individuals with an account (15+,2017)	UPU postal reliability score (2019 or latest)	UPU postal reliability score (2019 or latest)	(2020 index value)	index value change (2018-19 data)
47	Georgia	71	61	64	98	73.6	0.5
55	The PRC	61	80	54	85	70.1	1.3
60	Kazakhstan	87	59	63	64	68.2	-0.4
61	Mongolia	76	93	60	31	65.0	736
65	Azerbaijan	81	29	49	82	60.0	-1.8
97	Kyrgyzstan	80	40	47	11	44.3	8.0
107	Uzbekistan	30	37	50	30	37.0	-8.4
116	Pakistan	24	21	35	50	32.5	1.2
121	Tajikistan	36	47	36	1	30.0	4.3
143	Afghanistan	18	15	29	7	17.1	-1.1
	Median	**66**	**43**	**49**	**40**	**52**	**0.1**
	Average	**56**	**48**	**49**	**46**	**50**	**0.9**

Note: No data available for Turkmenistan.

Source: UNCTAD (2021).

Country-level B2C e-commerce performance is also shown in Table 8.1. At an index value of 73.6 and a global ranking of 47, Georgia performs highest in the index for B2C e-commerce in the CAREC region. Georgia is followed by the PRC (index 70.1, rank 55) and Kazakhstan (index 68.2, rank 60). Working up from the baseline of the table, Afghanistan, Tajikistan, and Pakistan are the main low-performing CAREC countries as per the B2C e-commerce index, where their respective index values are 17.1 (rank 143), 30.0 (rank 121), and 32.5 (rank 116).

Improved internet infrastructure, widened financial inclusion, expansion of logistics and integration with delivery systems, and the development of the e-commerce market are all critical factors for the success of e-commerce in the CAREC region.

8.3 FINANCIAL INCLUSION TO PROMOTE FINTECH

Financial inclusion is the ability to have access to financial services in a country; it also refers to the procedure of how easily an individual or an MSME can own and operate a bank account at an affordable price with reliable services. As per the World Bank definition, '[F]inancial inclusion means that individuals and businesses have access to useful and affordable financial products and services that meet their needs — transactions, payments, savings, credit, and insurance — delivered responsibly and sustainably.' Whereas fintech is the use of technology for financial services; the use of digital financial services in combination with the internet, mobile phone, cloud services, digital IDs, and other applications (ADB and CAREC Institute 2021).[11] Financial inclusion for the promotion of financial technologies requires alternative financing firms, financial development, corresponding banking relationships, and regional integration.

8.3.1 Alternative finance landscape

Lack of trade financing creates barriers for traders at domestic and international levels (Korinek et al. 2010; Auboin & Engemann 2014). If financing is not available, international trade transactions are abandoned (Kim et al. 2019). Unavailability of financing brings a time lag to international transactions and delays the payments. There is a huge surge of global trade recovery; the adequate facility of trade finance is becoming more difficult as businesses are growing. In 2017 the unmet demand for trade finance was US$1.5[12] trillion and this figure is expected to rise to more than US$2.4 trillion by 2025 (WEF and Bain & Company 2018).

The People's Republic of China, Mongolia, Pakistan, and Kazakhstan have domestic-based alternative finance platforms (see Figure 8.5); however, the remaining countries rely heavily on foreign firms. The People's Republic of China facilitates more than half of the global alternate finance industry (US$304.5 billion); the size of the PRC's alternate finance market volume was US$215.4 billion in 2018, while 61 percent of SMEs are equipped with online facilities and use fintech (Ernst & Young 2019).

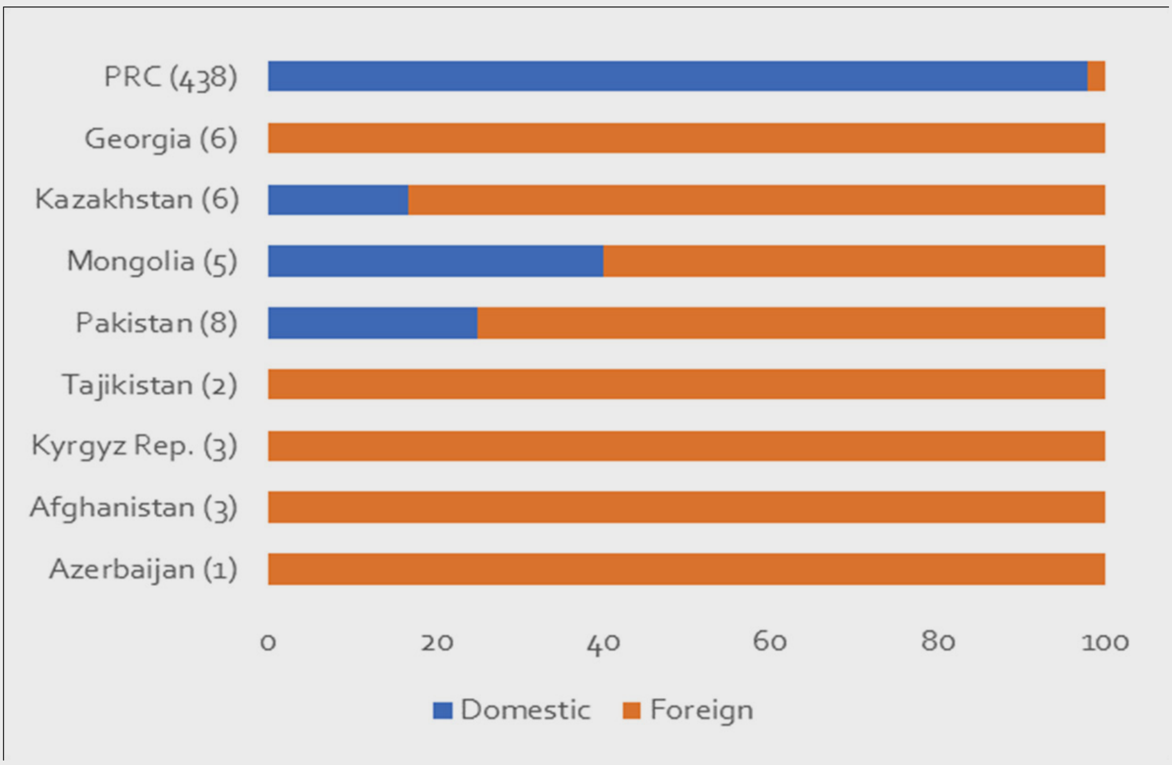
The size of the alternative finance market in CAREC is not well concentrated. The volume of Georgia's alternate finance market was worth around US$193 million in 2018. Georgia is followed by Kazakhstan and Mongolia. Whereas Afghanistan and Azerbaijan recorded the lowest volume of alternate finance markets at US$0.18 million and US$0.002 million respectively. Low financing creates hurdles for inclusive financing, which eventually leads to a budding fintech ecosystem in the CAREC region. [13]

[11] Not yet published.

[12] 40 percent of which are from Asia and the Pacific (ADB & UNESCAP 2019).

[13] 'Financial Inclusion in the CAREC Region: Promoting Fintech to Meet Underserved Needs in Trade Finance.' ADB and CI Joint Study. Not yet published.

Figure 8.5: Alternative financing firms operating in the CAREC region, 2018

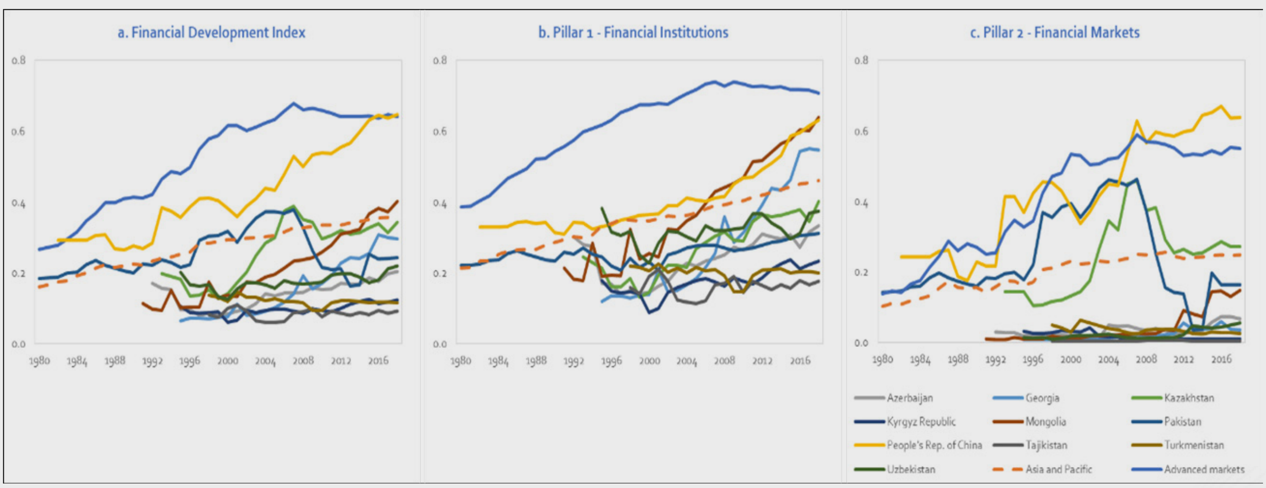


Source: Financial Inclusion in the CAREC Region, ADB-CAREC Institute (2021)

8.3.2 Financial development

The development of financial institutions is required for the efficient functioning of trade finance (Auboin & DiCaprio 2017). Similarly, when corporations and firms are associated with unhealthy banks, the finance rejections would be higher (Amiti & Weinstein 2011). Figure 8.6 advocates a dire need for improved financial development in the CAREC region, except for the PRC. The PRC has made significant improvements in the financial markets and become a global leader in fintech with a huge number of consumers (Ernst & Young 2019). Following the PRC, Mongolia and Georgia are performing quite well in terms of financial development.

Figure 8.6: Financial development in the CAREC region vis-à-vis advanced markets

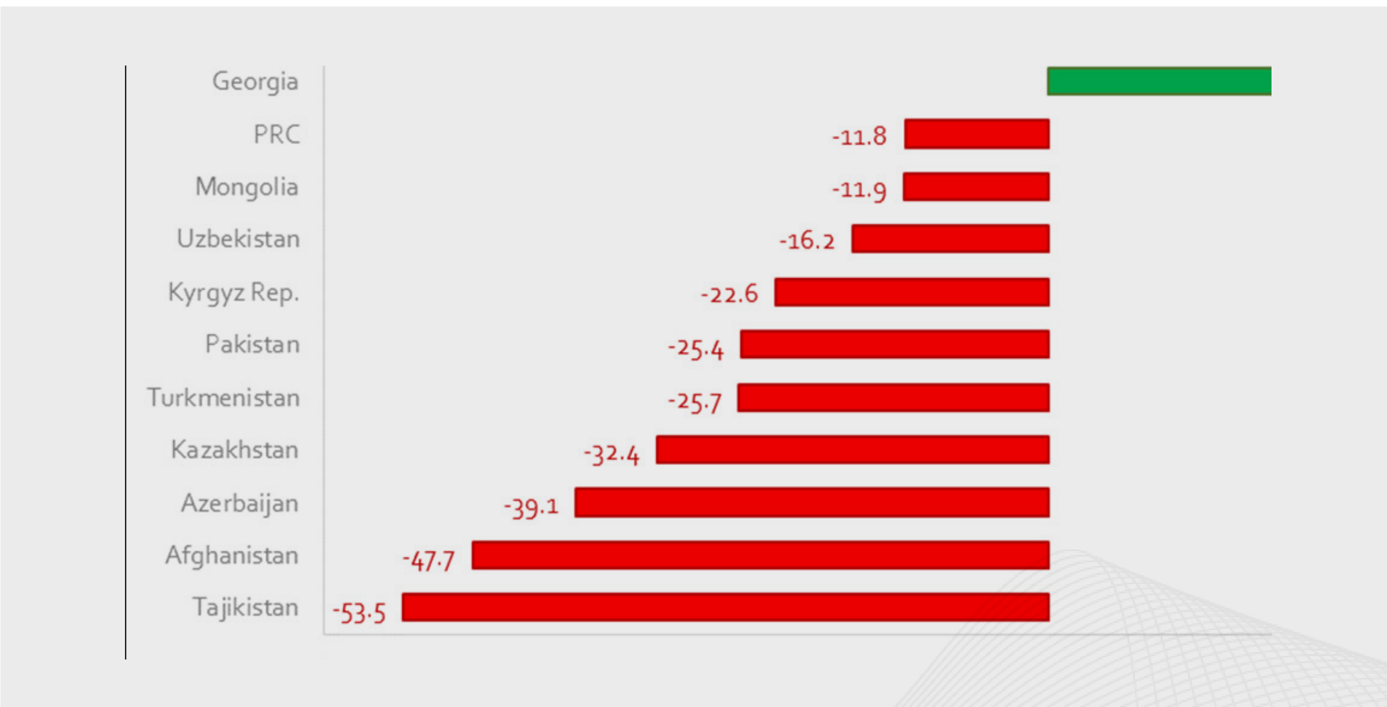


Source: International Monetary Fund. Financial Development Index Database. https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B (Accessed November 2020)

8.3.3 Correspondent banking relationships

The traditional banking sector in the CAREC region remains slow owing to the weak financial market framework. The correspondent banking landscape required for international trade is limited in Central Asia compared to the regional players in East Asia and Southeast Asia. Also, the growth in corresponding banking relationships is reduced, which puts the CAREC region at a disadvantage. Figure 8.7 exhibits changes in the number of correspondent banking relationships among CAREC member countries. It shows that Tajikistan has declined 53.5 percent of the correspondent banking relationships from 2011 to 2019, followed by Afghanistan and Azerbaijan. Whereas Georgia endured the global trend and has gained 20 percent of the correspondent banking relationships for the same period. The correspondent banking relationships bring risks for many CAREC countries in terms of having access to safe and low-cost payments across the region.

Figure 8.7: Changes in the number of correspondent banking relationships between 2011 and 2019 in CAREC member economies



Source: Bank for International Settlements. CPMI quantitative review of correspondent banking data. https://www.bis.org/cpmi/paysysinfo/corr_bank_data.htm (Accessed November 2020)

8.3.4 Conclusion

To improve financial inclusion, which would eventually promote financial technologies, the CAREC member countries need to focus on the fintech foundations by developing their regulatory (cybersecurity, data governance, and privacy protection) and digital technology infrastructure. Similarly, there is a requirement for the facilitation of fintech in supply-chain finance to be promoted.

8.4 SPS — E-CERTIFICATION

Sanitary and phytosanitary (SPS) measures[14] ensure food, animal, and plant safety as per international SPS standards. Phytosanitary certificates are the documents that designate the health obligations of tradable goods. E-phytosanitary certification has accelerated the movement of tradable goods across the border via electronic/digital gadgets. International trade products such as agriculture, fishery, food, or forestry products require SPS measures to provide the assurance of protection from pests, disease or contaminants, additives, and toxins. These measures are based on the international standards of the International Plant Protection Convention (IPPC), the World Organisation for Animal Health (OIE), and the Codex Alimentarius Commission (CAC).

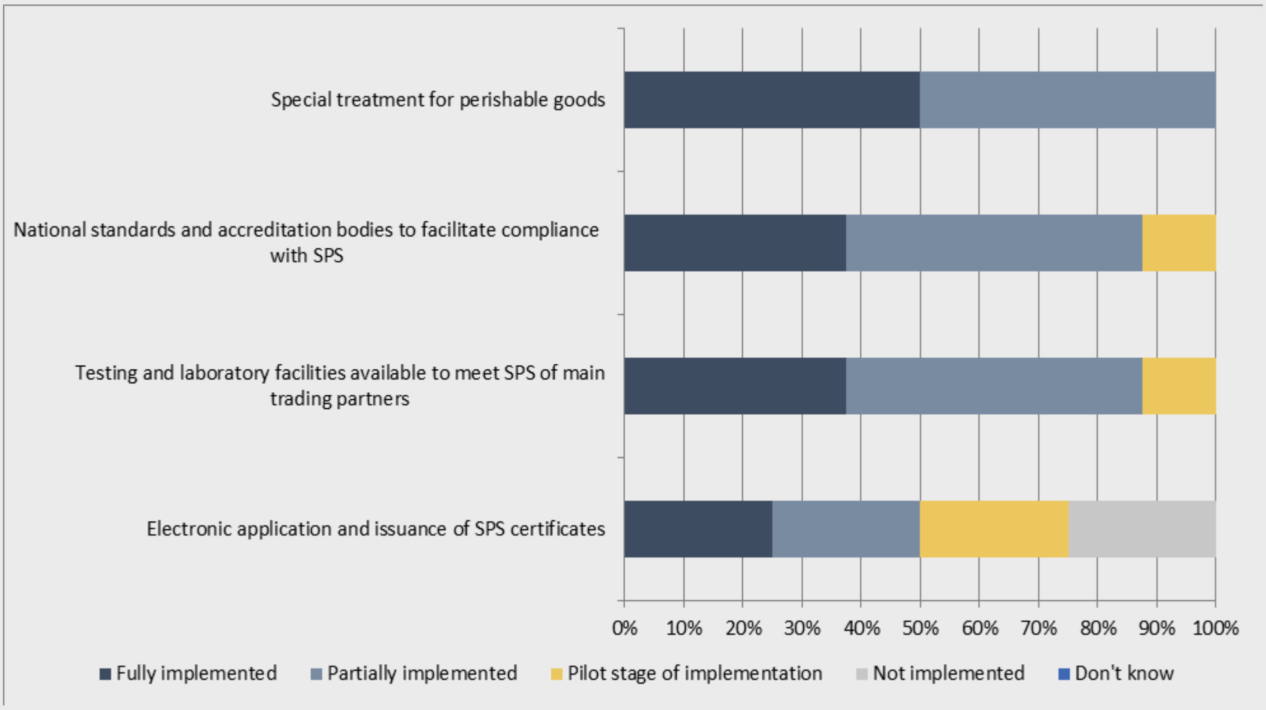
CAREC countries have continued to implement SPS and other agricultural trade facilitation measures, according to the results of the 2021 United Nations Global Survey on Digital and Sustainable Trade Facilitation. According to UNESCAP 2021,[15] 'All CAREC countries have fully or partially implemented special treatment for perishable goods. Measures of national standards and accreditation bodies to facilitate compliance with

[14] https://ec.europa.eu/europeaid/sectors/economic-growth/trade/sanitary-and-phytosanitary-measures_en

[15] https://www.unescap.org/sites/default/d8files/knowledge-products/CAREC_report_2021_Low%20res.pdf

SPS and testing and laboratory facilities available to meet the SPS of main trading partners have been fully or partially implemented in over 80 percent of the countries. In contrast, electronic application and issuance of SPS certificates have not been implemented in over 40 percent of the countries, making it the least implemented measure in this subgroup' (Figure 8.8).

Figure 8.8. State of implementation of 'agricultural trade facilitation' measures in CAREC countries



Source: Digital and Sustainable Trade Facilitation in CAREC, UNESCAP 2021

8.4.1 Uses of ePhytosanitary system

Paper-based documentation brings complications to cross-border trade, including delay clearance, cost, risk of loss, entry process, and other costs. The electronic exchange of trade-related data and cross-border paperless trade could enhance trade competitiveness and address these challenges, thereby heralding an increase in small shipments associated with cross-border e-commerce and the digital economy. UNESCAP 2021 posits 'that most trade cost reductions are associated with paperless trade measures rather than conventional trade facilitation measures. Implementing both binding and non-binding WTO TFA measures could result in a 4 percent to 9 percent decrease in trade costs. In contrast, digital trade facilitation measures enabling the seamless electronic exchange of trade data and documents across borders could reduce about 17 percent in a full implementation scenario.' Global, regional, and subregional initiatives, such as the Framework Agreement on Facilitation of Cross-Border Paperless Trade in Asia and the Pacific, could enable countries to reap the benefits of digital trade facilitation. By supporting one of the crucial documents for international trade, the ePhytosanitary system enhances transparency, expediting the clearance of trade commodities and enhancing exports via its features of data sharing and transfer.

In 2018, the GDP of the CAREC region[19] constituted 14.4 percent and employed 31.6 percent of workers. The UNESCAP 2021 report highlighted that almost one fifth to one quarter of GDP is produced by the agriculture sector for four countries and employed a third to half of the workers in five countries.[20] The global share of CAREC's GDP is less than 1 percent, while CAREC produces a significant proportion of the world's GDP—such as wheat, fruit (26.7 percent of global production), vegetables (54.9 percent), citrus fruit

[16] http://www.standardsfacility.org/sites/default/files/SPS_Ecert_Backgroundpaper.pdf

[17] Digital and Sustainable Trade Facilitation in Central Asia Regional Economic Cooperation (CAREC) 2021. Available at: https://www.unescap.org/kp/2021/untf-survey-2021-carec?ref=untfsurvey.org

[18] More information on the Framework Agreement can be found at: https://www.unescap.org/kp/cpta

[19] The Inner Mongolia Autonomous Region and Xinjiang Uygur Autonomous Region of the People's Republic of China, which are CAREC members, are excluded from the estimates owing to the unavailability of data

[20] https://www.carecprogram.org/uploads/2019-Modernizing-Sanitary-Phytosanitary-CAREC.pdf

(27.9 percent), nuts (25.1 percent), sheep and goats (25.6 percent). The total exported agriculture commodities in 2018 were 22 percent of ten CAREC countries.[21] The several agriculture sectors in the CAREC region have an export value of high potential—such as wheat flour, several types of fruit and nuts, cotton fiber, silk-worm cocoons, asses, horsemeat, and animal hides and skin. WTO's[22] Agreement agenda emphasizes the application of the SPS Agreement[23] and the Trade Facilitation Agreement (TFA)[24] to accelerate the agriculture trade.

8.4.2 CAREC readiness for ePhyto

The International Plant Protection Convention (IPPC) has, among other systems, developed a generic system called ePhyto Solution with two elements—HUB and Generic ePhyto National System (GeNS)—that allow parties to exchange ePhytos through a single point. It facilitates data entry, standard codes, and a list of translated export certifications. The agriculture trade plays a major role, especially in the CAREC countries; the digital landscape in the region is uneven for ePhyto certificates. The implementation of electronic certification (ePhyto system) requires legal environment, mode of transmission, import requirements, certification procedures, and the use of IT in the CAREC countries.

Table 8.2 shows the mode of transmission and validity of SPS certificates in the CAREC countries. The table indicates that, except for the PRC and Uzbekistan, countries still exchange hard copies. The PRC and Uzbekistan have implemented digital reforms and have successfully transitioned towards the adoption of digital technologies. Therefore, the PRC and Uzbekistan have issued a substantial number of e-certificates. The PRC

[21] This consists of SITC Sections 0, 1, 2 (except 27 and 28), and 4. (Chapter 8 of WTO, World Trade Statistical Review, 2018)

[22] Eight CAREC countries are WTO members: Afghanistan, People's Republic of China, Georgia, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, and Tajikistan

[23] Article 8: inspection and approval procedures for traded goods

[24] Article 5: inspection, detention, and test procedures for food, beverages, and foodstuffs. Article 7.9: perishable goods. Article 10: formalities and documentation requirements

[25] https://www.adb.org/sites/default/files/publication/720191/adb-brief-184-agri-trade-central-asia.pdf

has issued an annual figure of 0.69 million e-certificates to facilitate traders. The PRC is followed by Uzbekistan at 0.25 million ePhyto certificates per year.

Table 8.2: Mode of transmission and validity of ePhyto certificate

Country	Mode of transmission of PS certificates to other users like Customs and other countries	Validity/ duration of PS certificates after issuance and prior to export	Fee for PS certificate	Number of PS certificates issued per year
Afghanistan	Hard Copy	-	100Af(1.28 US $)per sheet	-
Azerbaijan	Hard Copy	14 Days	10 AZN (5.88 USS)	40, 000
People's Republic of China	Hard as well as Electronic (where countries can transmit/ receive)	Fresh Goods-14 Days Other Plant Products-21 Days In North Region(during Winter)-35 Days	Free	0.69 Million (690, 000/)
Georgia	Hard Copy	15 Days	25-50 GEL (8.67- 17.33 US $)	3428(Border by Georgia Revenue Service) 10,333(National Food Agency)
Kazakhstan	Hard Copy	30 Days (from the date of issuance)	Free to Individuals and Legal Entities	Around 0.3 Million
Kyrgyz Republic	Hard Copy	Requirements of the importing country	200 SOM (2.86 US $)	40,000
Mongolia	Hard Copy; Via the media and the website;By e-mail	5 Days to 1 month depending upon commodities	10000 MNT(10 thousand tugrik) 3.69 US $	10,000
Pakistan	Hard Copy	90 Days	PKR 50-300 (0.32- 1.94 US $)	Around 0.15 Million
Tajikistan	Letter or application to legal entities and individuals	30 Days	Based on estimates and volume of products	Depending on the volume of the shipment of goods
Turkmenistan	Hard copy as well as through email(where required)	30 Days	Based on tariffs approved by Ministry of Finance and Economy of Turkmenistan	Depends on the number of contracts awarded
Uzbekistan	Electronically	Unlimited until the delivery to the importer's country	up to 10 kg-0.15 MRZP(MP3n); up to 100 kg-0.18 MRZP(MP3n); up to 500 kg - 0.20 MRZP(MP3); up to 1000 kg - 0.25 MRZP(MP3);	0.25 Million

Source: https://www.unescap.org/sites/default/d8files/knowledge-products/CAREC_report_2021_0.pdf

8.4.3 Conclusion

COVID-19 posed challenges for countries to safeguard the free flow of goods within and across all regions while ensuring prevention from the epidemic. The Food Agriculture Organization (FAO)[26] has identified agriculture products as the sixth main channel to transmit the COVID-19 virus. Several trade measures[27] have been taken to temporarily restrict exports such as wheat, rice, grains, beans, soybeans, sunflower seeds, sugar, onions, garlic, potatoes, carrots, vegetable oil, vegetables, and timber in the CAREC region.

Trade facilitation, especially via the simplification and digitalization of trade procedures, could play a crucial role in minimizing disruption from the COVID-19 pandemic. Many CAREC countries are implementing digital measures to varying degrees to handle trade disruptions owing to the pandemic, but these measures are mostly on an adhoc, not a permanent, basis. The CAREC countries need a policy priority to prepare themselves for ongoing and future crises.[28]

In the case of CAREC, there is a legal basis for the recognition of phytosanitary certificates and exchange e-certificates in most countries in the region. However, CAREC's digital landscape for the electronic application and exchange of SPS certificates, among other agricultural trade facilitation measures, is highly uneven.

The CAREC countries should continue implementing trade facilitation, including institutional arrangement, transparency, and formalities, as included in the WTO Trade

[26] Schmidhuber J, Pound J, and Qiao B (2020). 'COVID-19: Channels of Transmission to Food and Agriculture.' Rome, FAO, https://doi.org/10.4060/ca8430en

[27] ITC. COVID-19 Temporary Trade Measures, https://macmap.org/covid19

[28] Digital and Sustainable Trade Facilitation in Central Asia Regional Economic Cooperation (CAREC) 2021. Available at: https://www.unescap.org/kp/2021/untf-survey-2021-carec?ref=untfsurvey.org

Facilitation Agreement (TFA). Moving forward, digitalization offers immense potential for making international trade simpler and more resilient. SPS certificates are one type of essential documentation for international trade. In this regard, ePhyto could contribute to a more significant reduction in trade costs and to the increased effectiveness of the CAREC countries.

8.5 E-COMMERCE REGULATIONS

The world is experiencing a massive transformation of online trade and communication, which provides improved economic efficiency and employment opportunities. It also helps to narrow the development gap and the rural-urban divide, as well as increasing inclusiveness.[29] There are countless benefits derived from international trade using e-commerce; whereas, cross-border paperless trade reduces up to 25 percent of transaction costs across Asia and the Pacific and increases regulations (UNESCAP 2019). E-commerce removes the entry barrier and allows SMEs to compete on an international scale.

The commercial laws are applicable to e-commerce transactions, while countries are introducing new amendments to the commercial laws in the line with e-commerce. Some countries have taken different paths; these differences cause trade barriers and inefficient practices. The CAREC members observed the same issues. Analysts recognized that legal measures are a critical element of the proper implementation and expansion of e-commerce. The law must enable consumers to trust e-commerce engagement

[29] Inclusiveness includes: demographic, economic, geographic, cultural, or linguistic. It also helps narrow the rural-urban divide (ADB and ESCAP 2018)

and online truncations such as personal privacy, cybercrime, and consumer protection. 'Opening the door does not mean that anyone will pass through it' (Development Asia) .[30]

The countries in the CAREC region have endorsed e-commerce laws. Effective regulatory and dispute-resolution systems reflect a country's capacity to adopt the technology.

8.5.1 Policy option: e-transaction and regulatory matters

The guiding principle of the United Nations Commission on International Trade Law (UNCITRAL) regarding e-commerce is the Model Law on Electronic Commerce and the Model Law on Electronic Signatures—namely, technology neutrality. Globally, for many states this approach does not address the authentication of origin or the integrity of electronic documents. Many countries around the globe have two laws: one for e-documents and one for e-signatures, while the countries in the CAREC region have a single law on e-transactions and e-documents; having the relevant rules in one place provides internal consistency. This consistency is in favor of technology neutrality, technology specificity, and hybrid laws.

The policy consequences of a country should be in line with reputable international laws. Trade Facilitation Agreement (TFA) obligations also facilitate harmonization among countries such as electronic customs processing. This obligation also harmonizes the CAREC member countries if they join the TFA. The regulatory matter deals with privacy, cybercrime, and consumer protection. The computer via the internet collects a huge amount of personal information directly and indirectly via any online activity. Some CAREC member countries have privacy legislation, which reflects international standards; personal data should be collected with the consent of the data subject.

[30] https://development.asia/policy-brief/developing-e-commerce-policies-central-asia

[31] The remaining countries: Azerbaijan, Turkmenistan, and Uzbekistan

Table 8.3 shows data protection privacy laws in the CAREC region. Uzbekistan has updated data protection and privacy laws on personal data in 2019, followed by Tajikistan and Mongolia. Pakistan drafted the electronic data protection act in 2005. Pakistan is followed by Kyrgyzstan. No data is available for Afghanistan.

Table 8.3: Legislation/draft legislation

Country	Type	Title of legislation/draft legislation
Azerbaijan	Legislation	Law on Personal Data 2010 (in Azerbaijani)
China	Legislation	The Decision of the Standing Committee of the National People's Congress on Strengthening the Network Information Protection, 2012 (in Chinese)
Georgia	Legislation	Law of Georgia on Personal Data Protection (in English)
Kazakhstan	Legislation	On Personal Data and Its Protection No. 94-V/2013 (in Russian)
Kyrgyzstan	Legislation	Personal Data No. 58/2008
Mongolia	Legislation	Law on information transparency and right to information, 2011 (updated in 2015)
Pakistan	Draft legislation	Bill—Electronic Data Protection Act 2005 (in English)
Tajikistan	Legislation	Law of the Republic of Tajikistan No. 1537 about Personal Data Protection, 2018
Turkmenistan	Legislation	Law on Information on Private Life and its Protection No. 519-V (in Russian)
Uzbekistan	Legislation	Law No. ZRU-547, on Personal Data, dated 2 July 201

Source: https://www.carecinstitute.org/wp-content/uploads/2021/08/ADB-e-commerce-carec-laws-policies-Aug-2021.pdf

All CAREC member countries have cybercrime laws as per international standards. Cybercrime is an activity in which a computer allows criminal activity. This includes:
a) Unauthorized access to a computer or a network, which is sometimes prohibited in every case and sometimes only if there is damage to data or interference in operations
b) Infecting computers or networks with malware that harms or prevents their operation entirely, whether for malice, commercial advantage, or extortion ('ransomware')
c) Exceeding one's authority to access a network and causing harm

The Budapest Convention of Cybercrime in 2001 of the Council of Europe. It required member countries to legislate against a large number of cybercrime activities including online fraud, forgery, and so on. Azerbaijan and Georgia are the member countries shown in Table 8.4; it further discusses the international instrument for various e-commerce-related legislation.

Table 8.4: International instruments

Instrument	Type/Scope	CAREC Members as Parties
UNCITRAL Electronic Communications Convention (ECC)	Global	AZE (Recommend: ALL for domestic & international)
ESCAP Framework Agreement on Facilitation of Cross-border Paperless Trade (FAPT)	Regional	AZE, CHN (Recommend: ALL)
Convention on the International Sale of Goods (CISG)	Global	AZ, CHN, GEO, KGZ, MON, UZB (Recommend: ALL)
World Trade Organization Trade Facilitation Agreement (WTO TFA)	Global	AFN, CHN, GEO, KGZ, KAZ, MON, PAK, TAJ
Revised Kyoto Customs Convention	Global	AZE, CHN, KAZ, MON (w/ UZB upcoming)
Council of Europe (Budapest) Cybercrime Convention	Global	AZE, GEO
TIR Trucking Convention (has an electronic supplement)	Global	AFN, AZE, CHN, GEO, KGZ, KAZ, MON, PAK, TAJ, TKM, UZB

Source: https://www.carecinstitute.org/wp-content/uploads/2021/08/ADB-e-commerce-carec-laws-policies-Aug-2021.pdf

Table 8.5 shows that only Azerbaijan, China, and Kyrgyzstan have consumer protection laws; other countries have no provision against fraud and misrepresentation. There is a dire need to legislate consumer protection law in each CAREC member country; countries should participate in the international enforcement of consumer rights including assisting cross-border investigations.

Table 8.5: Consumer protection laws

Country	Type	Title of legislation/draft legislation
Azerbaijan	Draft legislation	Bill—on protection of consumer rights (1995, amended up to 2012) No date for confirmation (in Azerbaijani)
China	Legislation	Consumer Rights and Interests Protection Law of the People's Republic of China (in English, unofficial translation)
Kyrgyzstan	Draft legislation	Bill—electronic commerce

Source: UNCTAD E-commerce legislation

8.5.2 Conclusion

Two sets of regulatory issues were highlighted: 'laws that do not recognize e-commerce, and laws that recognize it inconsistently, and possibly inadequately.' For electronic transactions, three approaches were discussed — technology neutrality, technology specificity, and a hybrid approach, having elements of both technology neutrality and specificity. Based on the regulatory landscape of the CAREC countries, hybrid approach was recommended for electronic transactions. Similarly, privacy, cyber-crime, and consumer protection issues were highlighted and given high importance to privacy, cryber-crime, and consumer protection legislations consistent with international best practices.

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RESILIENCE AND ECONOMIC GROWTH IN TIMES OF HIGH UNCERTAINTY

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Resilience and Economic Growth in Times of High Uncertainty is a compendium of chapters by prominent researchers addressing some of the most important economic growth issues in the CAREC region. The book is targeted at an advanced group of researchers, policymakers, and senior practitioners for whom it aims to be a useful resource. It is intended to provide a well-informed and authoritative guide to the economic growth matters of CAREC economies and to the current debates taking place in the field of sustaining resilience in a post-COVID-19 period. The chapters address key questions on recovering SMEs, sustainable agriculture and food security, green growth and climate risks, and e-commerce.

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