


KAZAKHSTAN

ACCELERATING ECONOMIC DIVERSIFICATION

Edited by Kym Anderson, Giovanni Capannelli, Edimon Ginting, and Kiyoshi Taniguchi

AUGUST 2018


ASIAN DEVELOPMENT BANK

ADB

KAZAKHSTAN

ACCELERATING ECONOMIC DIVERSIFICATION

Edited by Kym Anderson, Giovanni Capannelli, Edimon Ginting, and Kiyoshi Taniguchi

AUGUST 2018

ASIAN DEVELOPMENT BANK

ADB

6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines
Tel +63 2 632 4444; Fax +63 2 636 2444
www.adb.org

ISBN 978-92-9261-262-7 (print), 978-92-9261-263-4 (electronic)
Publication Stock No. TCS189413-2
DOI: http://dx.doi.org/10.22617/TCS189413-2

Notes:
In this publication, "$" refers to United States dollars.
ADB recognizes "China" as the People's Republic of China; "Korea" as the Republic of Korea; and "Russia" as the Russian Federation.
Corrigenda to ADB publications may be found at http://www.adb.org/publications/corrigenda.

Cover photos: *Top (clockwise from left)*: Workers carefully select the quality of apples before being juiced in a plant just outside the city of Almaty (photo by Ariel Javellana); Adoption of digital technologies in Industries (photo by Andrey Terekhov); Aktau port is Kazakhstan's main seaport on the Caspian Sea (photo by Igor Burgandinov); Buildings being constructed in Astana, Kazakhstan (photo by Ariel Javellana); Bottom (from left to right): Grain terminal 'AkBidai' is one of the three dry terminals in the Aktau port (photo by Igor Burgandinov); and Almaty company install a culvert in south Kazakhstan oblast (photo by Igor Burgandinov)

Contents

Tables, Figures, and Boxes

Tables

Figures

Boxes

Preface

After achieving independence in 1991, Kazakhstan has successfully restructured its economy and propelled itself to become one of the economic leaders in Central Asia. In 2006, it entered the upper-middle-income group of countries, driven by its strong economic growth drawn from its extensive use of natural resources, particularly the exploitation of oil and natural gas. The oil-and-gas sector contributes about a third of the country's public revenues, which in turn support Kazakhstan's fast-paced development and growth, and enable it to invest in more infrastructure, and at the same time to uplift the social conditions of its people through reducing poverty, improving access to primary education, and promoting gender equality and women's empowerment. Kazakhstan significantly reduced poverty from 46.7% in 2001 to 2.6% in 2016.

However, the downturn of oil and other commodity prices in 2014 increased the country's vulnerability to external shocks and constrained government revenue, underlining the need for it to chart a transformation policy to foster more diversified growth in the economy and to reduce its dependence on oil and gas.

This book, *Kazakhstan: Accelerating Economic Diversification*, presents an in-depth analysis of the sectors that show the largest potential for supporting the country's quest for economic diversification. The study assesses the challenges and key constraints of the agriculture, manufacturing, oil-and-gas, and transport-logistic sectors, and analyzes key areas in which specific sector reforms can best contribute to economic diversification. The book also discusses evidence-based policy suggestions that will be useful for the government's future strategies and plans.

For instance, in agriculture, action is required to make public services such as water and infrastructure accessible to all producers. State support to agricultural finance and the capacity for innovation and knowledge management, including public investments in agricultural research and a more coherent and effective extension system, will be crucial. Well-functioning local institutions providing more effective services and local collective action can be instrumental to improve access to services, finance, and human capital for small producers; however, this will require a supportive environment and should not be based on incentives to absorb subsidies.

Manufacturing can further accelerate economic diversification and create more jobs. Kazakhstan has a strong potential in basic metal products and chemicals, food processing, textiles, and leather products. It has been a growing consensus among policy makers that the private sector plays a critical role for sustainable growth, and thus it is important to identify factors constraining investment. Human capital development, through improving the quality of primary and secondary education and encouraging on-the-job training and apprenticeships, can also help address existing skills shortages. Investments in research and development, from both the government and the private sector, are very much needed to drive innovation, while greater investment in infrastructure is essential to provide a link to unexploited markets, decrease transport costs, and support the production of tradable goods. A high-level committee for centralized coordination of industrial programs and policy making should be instituted.

Oilfield services constitute an important component of the petroleum value chain. Kazakhstan's local content regulations of 2010 have resulted in increased involvement of local producers in developing petroleum resources. The new approach is toward formation of joint ventures and consortia between local and foreign oilfield service companies as vehicles for the transfer of technologies and skills.

Transit trade, while currently small, has a large growth potential. A 10% increase in the efficiency of transport infrastructure could generate a 0.9% increase in productivity of firms operating in other sectors. For the manufacturing industry, this could translate to an overall productivity improvement of about 1.1%. Given this, the transport and logistics sector should not be seen just as an additional input in the production process, but rather given leverage for the rest of the economy.

This study confirms that a no-reform strategy of promoting continued reliance on oil and gas can neither produce as much growth as in the recent past nor come close to Kazakhstan's growth potential. Consistent reforms in these key sectors can improve the country's growth rate by 1.2% annually. The additional growth can be generated through widespread improvement in the productivity of both labor and capital, which in turn can lead to increased exports from non-oil sectors. More diversified sources of growth will reduce the country's current vulnerability to external shocks while reducing regional income disparities. Accelerating economic diversification in Kazakhstan will require strong political will to improve the country's business climate, enhance competitiveness, and increase private sector participation—as laid out, along with other reforms, in the Kazakhstan 2050 Strategy as well as Strategic Plan 2025.

We are grateful for the generous support and cooperation extended by the Government of Kazakhstan during this study. We are hopeful that it will continue to generate dialogue and provide meaningful inputs for the country's future plans and strategies. We at the Asian Development Bank look forward to continued partnership and collaboration.

Yasuyuki Sawada
Chief Economist and Director General
Economic Research and Regional Cooperation Department
Asian Development Bank

Acknowledgments

The Kazakhstan Country Diagnostic Study was prepared by the Asian Development Bank (ADB) under a regional technical assistance project (TA 8343-REG) on Country Diagnostic Studies in Selected Developing Member Countries. The study aims to contribute in the analysis of the various economic and structural reforms taken by the Kazakhstan government to diversify its economy. The more in-depth sectoral analysis from this study attempts to look deeper into sectors like agriculture, manufacturing and industry, oil and gas, and transport and logistics to determine how reforms can be made more effective in accelerating economic diversification, and to provide concrete and evidence-based policy suggestions that may provide insights to support government planning in the future years.

The study was undertaken by the Economic Research and Regional Cooperation Department (ERCD), under the overall guidance and supervision of Edimon Ginting, director, Economic Analysis and Operational Support Division (EREA). The study was initiated by Valerie Mercer-Blackman, senior economist, Macroeconomics Research Division, ERCD, and led to completion by Kiyoshi Taniguchi, senior economist, EREA, ERCD. In-depth sector studies were authored by the following teams: Chapter 1 (Macroeconomic overview) by Kym Anderson, Giovanni Capannelli, Edimon Ginting, Kristian Rosbach, and Kiyoshi Taniguchi; Chapter 2 (Agriculture) by Martin Petrick, David Raitzer, and Saule Burkitbayeva; Chapter 3 (Manufacturing) by Alexander Julian and Kiyoshi Taniguchi; Chapter 4 (Oil and Gas) by Zauresh Atakhanova; Chapter 5 (Transport and Logistics) by Jozef Konings; and Chapter 6 (Structural Reforms) by Edimon Ginting, Mark Horridge, Zhanna Kapsalyamova, and Deeptha Wijerathna. Overall technical review and economic editing was provided by Kym Anderson, to ensure coherence and quality of the chapter studies, with support from Steve Banta as copy editor and Tuesday Soriano as proofreader. Overall research and technical support was provided by Jindra Nuella Samson, and Amanda Isabel Mamon on project administration. Research assistance was provided by Amador Foronda, Daryll Naval, and Reneli Gloria. Manshuk Nurseitova edited the Russian translation of the report, while Mike Cortes did the graphic design and layout.

Background papers for the agriculture chapter were also contributed by Daniya Asanova, vice-rector on International Relations and Investments, Kazakh National Agrarian University; Dauren Oshakbayev, agriculture consultant; and Rauan Yerulankyzy, Agro-Competence Center consultant. The Kazakhstan ORANI Computable General Equilibrium (CGE) Model was developed by Mark Horridge, Edimon Ginting, Deeptha Wijerathna, and Zhanna Kapsalyamova, with data and information inputs from Chingiz Shuneyev, JSC Economic Research Institute. The KAZ-ORANI CGE capacity-building workshop in Astana, Kazakhstan, was implemented by Mark Horridge, Deeptha Wijerathna, and Zhanna Kapsalyamova with support from Edimon Ginting, Kiyoshi Taniguchi, and Jindra Nuella Samson.

The study is a product of extensive consultations with key government ministries in Kazakhstan, its think-tank agencies and research institutions supporting development and strategy planning. The study team would like to express special gratitude to the Ministry of National Economy of the Republic of Kazakhstan, the Ministry of Finance of the Republic of Kazakhstan, the Ministry of Agriculture of the Republic of Kazakhstan and the Ministry for Investments and Development of the Republic of Kazakhstan, which provided invaluable suggestions. Contributions from other stakeholders, included civil society, development partners, cooperatives, state enterprises, and the private sector have also been instrumental for the study.

We would like to thank our partners from the Nazarbayev University, led by Shigeo Katsu, for hosting the study's workshops and capacity-building training, and from the Kazakh National Agrarian University for the seminars and consultations.

Last, we would like to thank the ADB Kazakhstan Resident Mission for the generous support and cooperation, led by Giovanni Capannelli, country director. We acknowledge the support and cooperation provided by Olga Kim-Mukhambetova, Kenzhekhan Abuov, Elimira Dautova, Aliya Ibadildina, Zhanat Murzakulova, and Kalamkas Bekibayeva.

Author Profiles

Kym Anderson

Kym Anderson is a professor of economics at the University of Adelaide in South Australia and at the Crawford School of Public Policy of the Australian National University in Canberra, where he has been affiliated since doctoral studies at the University of Chicago and Stanford University. In periods of study leave, he worked at the General Agreement on Tariffs and Trade (now the World Trade Organization) Secretariat during 1990–1992 and at the World Bank during 2004–2007. He has published around 400 articles and 40 books. He chairs the Board of Trustees of the International Food Policy Research Institute. He is a recipient of an honorary doctor of economics degree from the University of Adelaide and a distinguished alumni award from the University of New England. In 2015, he became a Companion of the Order of Australia.

Zauresh Atakhanova

Zauresh Atakhanova's research projects include risk measurement in international energy markets; energy demand in Kazakhstan (electricity, coal, and energy efficiency); impact of natural resource revenues on regional development; and income inequality in Kazakhstan. Her current projects are on structural transformation and the service sector in Kazakhstan. Zauresh worked at the Kazakhstan Institute of Management, Economics, and Strategic Research; Mount Royal University (Canada); and Nazarbayev University.

Saule Burkitbayeva

Saule Burkitbayeva is a PhD student of development economics at the LICOS Centre for Institutions and Economic Performance of the University of Leuven, Belgium. She is currently a member of the "AGRICHANGE" project on institutional change in the land and labor relations of Central Asia's irrigated agriculture with the Leibniz Institute of Agricultural Development in Transition Economies (IAMO) in Halle (Saale), Germany. Her areas of expertise and interest include agriculture, rural development, and value chains in transition countries.

Giovanni Capannelli

Giovanni Capannelli has been serving as the country director of the Asian Development Bank's (ADB) Kazakhstan Resident Mission since September 2016. Prior to this appointment, he was principal economist in ADB's Central and West Asia Department (CWRD), special adviser to the dean of the ADB Institute in Tokyo, and held various other positions since he joined ADB in 2002. Previously, he worked for the Bank of Italy in Tokyo. He served as professor of regional economic integration at the University of Malaya in Kuala Lumpur and taught economics in three universities in Japan. He holds a PhD and a master's in economics, both from Hitotsubashi University, Tokyo, and a bachelor's degree in economics from Bocconi University, Milan, Italy.

Edimon Ginting

Edimon Ginting is the director of Economic Analysis and Operational Support Division (EREA), Economic Research and Regional Cooperation Department (ERCD), ADB. In his current capacity, he leads the preparation of country diagnostic studies for ADB developing member countries (DMCs). The studies inform ADB operations and facilitate dialogue with DMC officials on key structural reforms. In his first 6 years in ADB, he led nine large ADB operations to support economic reforms and countries' response to the global financial crisis. As deputy country director of ADB in Indonesia, he supervised the delivery of ADB programs for the country, including a number of loans to support structural reforms in the capital market, transport, and energy sectors. Prior to joining ADB, he had extensive international experience, including as an economist at the International Monetary Fund; advisor to the Indonesian Parliament; research economist at the Productivity Commission, Australia; researcher and lecturer at the University of Indonesia; postdoctoral fellow at Monash University; and research economist at Gadjah Mada University. He received his PhD in economics from Monash University.

Mark Horridge

Mark Horridge is a research professor and the director of GEMPACK Software at Victoria University's Centre of Policy Studies (CoPS). He specializes in multi-regional and environmental computable general equilibrium (CGE) modeling, and development of CGE software for South Africa; Brazil; the People's Republic of China; Finland; Indonesia; Japan; the Philippines; Poland; Taipei,China; Thailand; and Viet Nam. From 2007 to 2013, he held a similar position at CoPS in Monash University, where he pioneered the development of the Monash Multi-Regional Forecasting Model and The Enormous Regional Model that were used to support policy analysis in Australia. He has been associated with the Global Trade Analysis

Project (GTAP) since its inception in 1991, and has been a member of the GTAP Advisory Board since 2009. Pursuant to his various international projects, he has organized and taught in more than 80 CGE training courses, and published 26 refereed journal articles and 12 book chapters. He obtained his graduate diploma in economics from the Australian National University and a doctor of philosophy in economics from Melbourne University in 1988.

Alexander Julian

Alexander Julian is an economist at ADB in the CWRD. Prior to joining ADB in 2015, he was a consultant with the World Bank in the Lao People's Democratic Republic. He was an Overseas Development Institute fellow, assigned as economist at the Internal Revenue Commission of Papua New Guinea, where he focused on revenue analysis, national budgeting, and tax policy. Alexander has worked for the International Fund for Agricultural Development as a financial analyst, covering rural development projects in Indonesia, Timor-Leste, and Viet Nam. As an economist at a consultancy firm based in Viet Nam, he worked on a range of research projects, including aid effectiveness and monitoring and evaluation studies. He holds a master's degree in economics and development economics and a bachelor's degree in economics from the University of Nottingham.

Zhanna Kapsalyamova

Zhanna Kapsalyamova is an assistant professor of economics at Nazarbayev University. During her past career, she worked as a deputy director of the Center for Macroeconomic Research and Quantitative Economic Modeling at the Economic Research Institute under the Ministry of National Economy of Kazakhstan. She was a Fulbright visiting scholar at Massachusetts Institute of Technology and postdoctoral research associate at the Masdar Institute of Science and Technology in the United Arab Emirates. In the past, she worked as a part-time consultant for the DIW ECON, Organisation for Economic Co-operation and Development, and the World Bank. She holds her doctoral degree in economics from the Christian Albrechts University of Kiel. Her research interests lie in energy economics, environmental economics, health economics, and CGE modeling.

Jozef Konings

Jozef Konings is currently a full professor in economics at Nazarbayev University, Astana and at the Katholieke Universiteit Leuven, Belgium. He is a research fellow of the Centre for Economic Policy Research in London and director of the Research

Centre for Regional Economics (VIVES) at the University of Leuven. He held visiting positions at the International Monetary Fund, Dartmouth College, the University of Michigan, Ljubljana University, and the Federal Reserve Bank of New York. Between November 2008 and March 2010, he was an economic adviser to President Barroso at the European Commission. Jozef also served as dean of the School of Business and Economics at the University of Leuven. His research focuses on emerging markets, firm dynamics and globalization, and using "big data" analysis. He has publications in leading academic journals such as the American Economic Review, Review of Economics and Statistics, Journal of International Economics, and the Economic Journal.

Martin Petrick

Martin Petrick is deputy head of the Department of External Environment for Agriculture and Policy Analysis at the Leibniz Institute of Agricultural Development in Transition Economies (IAMO) and a professor at Martin Luther University in Halle (Saale), Germany. He holds a PhD in agricultural economics from Martin Luther University (2003). Major fields of expertise include structural change in agriculture, agricultural transition in former Soviet republics, the evaluation of agricultural policy measures, and public action in rural development. He has worked in senior positions for activities funded by organizations including Deutsche Forschungsgemeinschaft (DFG), ADB, European Commission, the World Bank, and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

David Raitzer

David Raitzer is an economist at ERCD, ADB, where he does research on agricultural development constraints, environmental policy challenges, and impact evaluation of development interventions. His primary research interest is on how to make natural resource policies and expenditures more effective in contributing to sustainable, inclusive growth. He has previously worked with the International Rice Research Institute, Center for International Forestry Research, the CGIAR System, and national donor agencies on planning, economic assessment, and impact evaluation of agricultural and natural resources innovations. His undergraduate studies were at Cornell University and his graduate studies were at the Royal Veterinary and Agricultural University (now part of the University of Copenhagen), Denmark.

Kristian Rosbach

Kristian Rosbach, economist (Regional Cooperation), joined ADB's CWRD in 2013. He leads the development of a pilot economic corridor around Almaty and Bishkek. Kristian led and contributed to the ADB country partnership strategies for Kazakhstan, 2017–2021, and Pakistan, 2015–2019. He also supported the design of various ADB loans related to state-owned enterprises, small and medium-sized enterprises, and countercyclical support. Before joining ADB, he served as a public finance management advisor for GIZ Support to the Public Finance Reforms Program in Nairobi, Kenya. He obtained his economics degree at the Albert Ludwigs University of Freiburg, Germany.

Kiyoshi Taniguchi

Kiyoshi Taniguchi is a senior economist at ERCD, ADB. Within ADB, he held several economist positions including at the Private Sector Operations Department, Uzbekistan Resident Mission, and Pacific Department. Prior to his current position, he was an economist for Poverty Reduction and Economic Management Network of the World Bank. He started his career as an economist at the Food and Agriculture Organization of the United Nations in Rome, Italy. He held several research and teaching positions at International University of Japan, Westminster International University in Tashkent, and University of the Philippines. He holds a PhD and master's degree in economics from the Ohio State University, bachelor of science in economics with honor from the University of Oregon, and bachelor of law from Chiba University in Japan.

Deeptha Wijerathna

Deeptha Wijerathna is a development economist, working as consultant with ERCD, ADB. He is an economic modeler and researcher with over 15 years of proven work experience in national and international settings. He completed his PhD research on areas related to bottom-up multiregional CGE modeling, development of input-output models and social accounting matrices, and conduct of regional and policy analysis. He also conducts project evaluations and household level analysis. Prior to his current assignment, he completed a number of assignments for several organizations such as International Water Management Institute, Japan Bank for International Cooperation, Japan International Cooperation Agency, the World Bank, Yaso Udana Development Consultants, Government of Sri Lanka, and Griffith University Australia as an employee as well as a consultant.

Abbreviations

ADB	Asian Development Bank
BRI	Belt and Road Initiative
CGE	computable general equilibrium
EAEU	Eurasian Economic Union
EBRD	European Bank for Reconstruction and Development
ECI	economic complexity index
EU	European Union
FDI	foreign direct investment
FGP/WPMP	Future Growth Project and the Wellhead Pressure Management Project
GDP	gross domestic product
GVC	global value chain
GWS	goods, works, and services
HHI	Herfindahl-Hirschman Index
IMF	International Monetary Fund
KMG	KazMunaiGas
KPO	Karachaganak Petroleum Operating Company
LC	local content
M&E	monitoring and evaluation
NACE	Nomenclature of Economic Activities
NBK	National Bank of Kazakhstan
NCOC	North Caspian Operating Company
NFRK	National Fund of the Republic of Kazakhstan
OECD	Organisation for Economic Co-operation and Development
OFS	oilfield services
PCI	product complexity index
PRC	People's Republic of China
R&D	research and development
RCA	revealed comparative advantage
SIID	Strategy for Industrial and Innovative Development
SMEs	small and medium-sized enterprises
SOE	state-owned enterprise
SPIID	State Program of Industrial and Innovative Development
TCO	Tengizchevroil
TFP	total factor productivity
US	United States
VS	vertical specialization
WTO	World Trade Organization
WUA	water users' association

KAZAKHSTAN

FAST FACTS

as of 2015 or latest available year

PEOPLE AND RESOURCES

Total population: 18.2 million
Total fertility rate: 2.6 births per woman
Agricultural area: ~~222 million ha~~ (29 million ha or 13% is arable)
Forest area: 1.2% of land area

SOCIAL INDICATORS

Unemployment rate: 5%
Proportion of population living below the national poverty line: 2.6%
Gini index: 26.3%
Life expectancy at birth: 72 years
Infant mortality rate: 13 per 1,000 live births

ECONOMY

Value added by sector:
- Agriculture: 5%
- Industry: 33%
- Services: 62%

GDP (current $): 134 billion
Per capita GNI (current $): 8,710
Oil rent as % of GDP: 5.6%

FOREIGN TRADE

Exports: $36.8 billion
Imports: $25.2 billion
Top 3 imports: Refined petroleum, medicaments, motor cars
Top 3 exports: Crude petroleum, radioactive chemicals, copper
Top 3 export trading partners: People's Republic of China, Russian Federation, France

18-1166 17-KGZ AV

Chapter 1
The Kazakhstan Economy: Achievements, Prospects, and Policy Challenges

Kym Anderson, Giovanni Capannelli, Edimon Ginting, Kristian Rosbach, and Kiyoshi Taniguchi

Kazakhstan is at a crossroads of geographic and economic importance. The country is located along the great silk road—an ancient transit network and the center of trade and civilization connecting Europe and Asia. Kazakhstan is the largest economy in Central Asia, endowed with extensive natural resources and reliant largely on revenues from the export of primary commodities, particularly petroleum and natural gas. The Kazakhstan government has been keen to diversify its economy, as most of its economic growth from 2000 to 2010 was based on the exploitation of its natural resources. Its oil-and-gas sector generated 21% of the country's gross domestic product (GDP) at its peak in 2005 (World Bank 2017), contributing a major part of public revenues. The sustained revenue created from it enabled the country to achieve fast-paced growth, build more infrastructure, improve education and healthcare, and position itself well within the global arena. However, the recent rapid decline in global prices of fossil fuels, and the expectation that they will remain low in real terms for the foreseeable future as the world transitions to less-pollutive fuels, poses significant challenges for Kazakhstan's economy and society.

The two dominant influences on the Kazakhstan economy over the past decade have been the commodity price boom and subsequent slump, and the economic conditions of major trading partners, especially the Russian Federation. The oil price is the major determinant, since more than 70% of export earnings have come from oil and gas in recent years. The links between Kazakhstan and the Russian Federation include (i) the historical and political relationship, (ii) Kazakhstan's imports of Russian consumer goods, and (iii) their similar reliance on oil and gas price movements due to similar export structures. The recent fall in international oil prices, coupled

with the devaluation of the Russian currency, ensured that Kazakhstan's economy experienced a massive slowdown in its rate of growth. Under the current situation of low oil prices, the government is examining its policy options for stimulating and diversifying the economy to ensure sustainable and equitable growth (Government of Kazakhstan 2017).

In 2014, Kazakhstan signed on as a member of the Eurasian Economic Union, which came into effect in 2015. Kazakhstan also joined the World Trade Organization (WTO) in 2015. These moves signaled that the country has an ongoing interest in promoting trade, including through regional integration. They coincided with the launching of the People's Republic of China's (PRC) Belt and Road Initiative (BRI), which offers great potential for both transit trade through Kazakhstan and more investment within the country in export-oriented production of products that could become more competitive with the lowering of trade costs associated with that transit traffic. Both prospects could contribute to economic diversification of the country and broaden its range of foreign exchange earnings.

Moving forward, Kazakhstan's economic transformation will be more challenging than in the recent past. Commodity prices, particularly of fossil fuels, are projected to remain subdued. To weather the detrimental impacts of prolonged weak external conditions, it is imperative that the non-oil deficit be reduced, and that non-oil revenues rise to support the desired level of fiscal spending. This will require sound macro-prudential policies and other policy reforms.

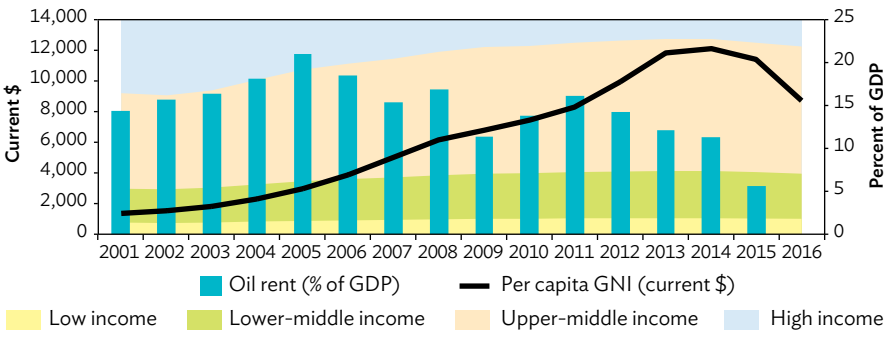
With the rapid and ongoing development of global value chains (GVCs), there is less and less need for production and consumption to have to be in the same place. Kazakhstan can potentially engage its well-educated skilled labor via participation in GVCs even though the country is landlocked. For Kazakhstan to become one of the world's high-income countries, total factor productivity (TFP) growth is the key (ADB 2017). Sustainable economic growth cannot be underpinned without enhanced productivity growth. In the case of Kazakhstan, it requires a transformation of its economy away from heavy dependence on extractive resources to earn export revenue. The government needs to improve the business environment to attract more investment from the private sector, particularly foreign direct investment (FDI) in non-extractive sectors. At the same time, it needs to avoid distorting incentives via its intervening in markets.

In this chapter we provide an overview assessment of recent growth dynamics and their impact on income inequality.

1.1. Growth, Inequality, and Environmental Dynamics

After becoming an independent country in 1991 following the dismantling of the Soviet Union, Kazakhstan faced tremendous economic challenges throughout the 1990s. The country overcame many of these, reorganized its economy, and achieved strong economic growth between 2000 and 2014, when oil rents exceeded 10% of GDP, averaged 15% during 2005–2014, and peaked at 21% in 2005 (see blue bars in Figure 1.1). In 2006, Kazakhstan entered the upper-middle income group of countries and it almost broke into the high-income group in 2014 (Figure 1.1), making it an economic and political power in Central Asia. But the downturn of oil and other commodity prices from 2014 resulted in a decline in per capita income and in the share of oil and gas revenue in the country's GDP and exports. The same occurred in many resource-rich, primary product-exporting countries, including high-income ones such as Australia (Lowe 2015).

Figure 1.1: Per Capita Gross National Income and Oil Rent



GDP = gross domestic product, GNI= gross national income.
Source: World Bank. World Development Indicators. http://databank.worldbank.org (accessed 2 August 2017).

Social development in Kazakhstan has accompanied this strong economic growth. The country has achieved most of the original and additional targets of its Millennium Development Goals, such as poverty reduction, access to primary education, promotion of gender equality and women empowerment, and improvement in children's and maternal welfare (United Nations 2010). As of 2016, the share of the poor on the basis of the national poverty line (% of the population) decreased to 2.6% from 46.7% in 2001. The gap in income inequality also decreased, as evidenced by the decline in the Gini index from 34.8 in 2001 to 27.3 in 2017. However, the country's Millennium Development Goal 7 target of ensuring environmental sustainability has been only partly achieved.

Kazakhstan records consistently low figures for unemployment, with levels around 5% since 2011 (5.4% in 2011 and 5% in 2016) according to the International Labour Organization (ILO). This excludes 29% of the working age population classified as economically inactive. Officially, unemployment of youth aged 15-24 is low (3.8% in 2016), but in the third quarter of 2016 the share of youth who were not in education, employment, or training (and not actively looking for a job or registered as unemployed) was much higher at 9.5%.

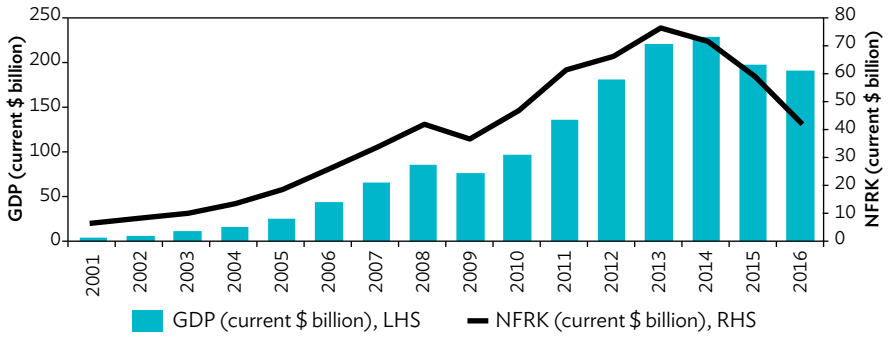
The labor code of Kazakhstan ensures equal work opportunity and treatment across gender. The code articulates explicitly on the protection of women from any form of discrimination. According to statistics, the female labor force participation rate in Kazakhstan is among the highest in Central Asia.

1.2. The National Wealth Fund

To manage its revenues from oil earnings effectively and prudently, the Government of Kazakhstan created the National Fund of the Republic of Kazakhstan (NFRK) by Decree of the President of the Republic of Kazakhstan No. 402 on 23 August 2000 (Kemme 2012). The NFRK operates as both for stabilization and savings fund, overseen by a Management Council appointed by the President, and managed by the Treasury Department of the National Bank of Kazakhstan (NBK). Volume and uses of the Fund are determined by the President based on suggestions from the Management Council.

The NFRK was originally designed to distribute oil rents across generations. In fact, most oil-related public revenues, which represented approximately 10% of GDP in 2012–2014, are channeled to the NFRK and sterilized (OECD 2016). A series of economic shocks—the global financial crisis in 2008, the oil price drop in 2014, and the economic slowdown in major trading partners—revealed structural vulnerabilities of the economy that pose risks for the sustainability of the achieved levels of economic development and inclusion. The NFRK has been increasingly used to provide a cushion against economic shocks. The share of revenue being transferred from the NFRK to the government budget reached 40% of total government revenue in 2015, when there was a net drawdown of the NFRK (Figure 1.2). The NFRK is also used (with mixed success) to help transition to a more diversified economy, with high domestic value addition in manufacturing and services as well as less reliance on revenues from commodity exports.

Figure 1.2: Nominal GDP and Assets of the NFRK ($ billion)



GDP =gross domestic product, LHS = left-hand scale, NFRK = National Fund of the Republic of Kazakhstan, RHS = right-hand scale.
Sources: National Bank of Kazakhstan. http://www.nationalbank.kz (accessed 12 July 2017); World Bank. World Development Indicators. http://databank.worldbank.org (accessed 14 July 2017).

1.3. Real Exchange Rate Movements and the Inflation Target

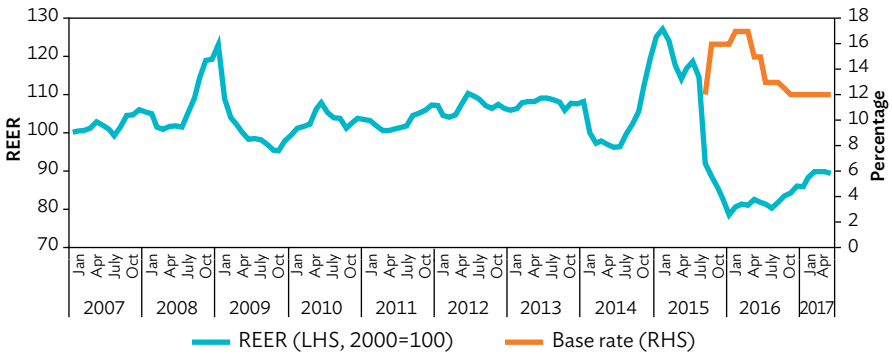
Kazakhstan's deteriorating external conditions from 2014 posed a threat to its pegged exchange rate (OECD 2017). The country responded to the challenges from the recent fall in oil prices and the slowdown in economic growth in the PRC, Europe, and the Russian Federation in several ways: not just exchange rate adjustment but also targeted fiscal support and enhanced monetary policy management (IMF 2017).

Moving toward a flexible exchange rate is desirable. Well-received theory indicates that, while fixed exchange rates can be effective in dealing with internal demand shocks, flexible exchange rates work best for external trade shocks (Frankel 2013). This is because flexible exchange rates can adjust to real shocks automatically in real time. Kazakhstan, like all natural resource-rich economies, has been very vulnerable to external trade shocks, especially a fall in the world oil price. This vulnerability has now been reduced by the move to a more flexible exchange rate regime.

After the global financial crisis in 2008 and its own banking crisis, Kazakhstan devalued the tenge in February 2009 by 18%, to 150 per dollar plus or minus 5 tenge (Figure 1.3). The pegged exchange rate regime (i.e., within a narrow corridor against a basket of currencies) had been supported by the positive external environment including rising export prices and solid growth in the diversity of trading partners. It led to strong inflows of foreign investment. However, the NBK devalued the tenge by 19% in February 2014 because of the effect of United States tapering on emerging markets (Horton et al.

2016). In August 2015, the NBK decided to let the tenge float as part of a shift to an inflation-targeting regime. At the same time, the NBK introduced the one-day repo rate (aka the base rate) set at 12%. The current exchange rate policy regime allows the tenge's value to be determined by fundamentals, which are influenced mainly by the oil price and developments in major trading partners, especially the Russian Federation. This new floating exchange rate regime is expected to accommodate much better to any future external shocks than was the case under a fixed rate regime.

Figure 1.3: Real Effective Exchange Rate and the Base Rate

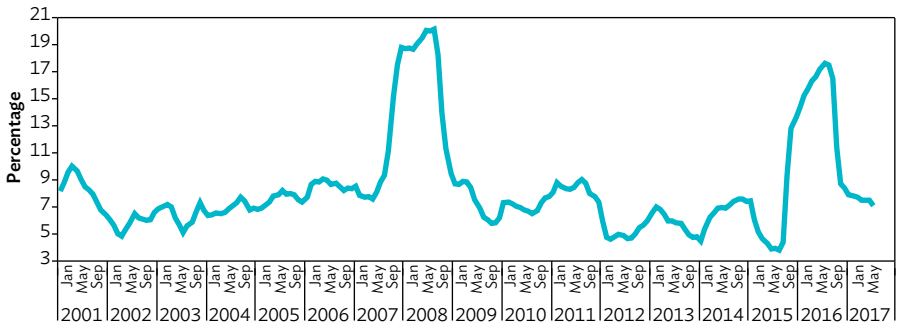


LHS= left-hand scale, REER = real effective exchange rate, RHS = right-hand scale.
Source: Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan.. http://stat.gov.kz (accessed 3 August 2017).

After the introduction of the one-day repo rate in August 2015, the real effective exchange rate decreased substantially (a real depreciation of the currency), which meant that exports became more competitive internationally and imports became more expensive in local currency terms.

Figure 1.4 shows that inflation has declined as exchange rate pressures subsided in 2017 (IMF 2017). In August 2015, the NBK adopted an inflation-targeting regime as part of monetary policy (NBK 2016). Its operational framework as monetary policy is well understood by money market participants. The introduction of this inflation-targeting regime, together with the base rate, provides a sense of predictability to market participants, who have supported the policy reform. The NBK should continue with the new monetary regime, in tandem with the flexible exchange rate.

Figure 1.4: Year-on-Year Consumer Price Index Inflation Rate



Note: Base year is 2010.
Sources: International Financial Statistics. http://data.imf.org/regular.aspx?key=60998113 (accessed 23 August 2017); National Bank of Kazakhstan. http://www.nationalbank.kz (accessed 23 August 2017).

1.4. The Dutch Disease

The term "Dutch disease" refers to the domestic economic impact of a boom in one tradable sector on other tradable sectors and on the markets for nontradable products. The term was coined following the discovery of natural gas in the Netherlands, and has been applied to many other situations since, including mining booms in Australia and North Sea oil exploitation by the United Kingdom and Norway (Corden and Neary 1982). Typically, the inflow of foreign capital to invest in mining exploration and infrastructure, and then the increase in exports of mined products, causes an appreciation in the real exchange rate, which weakens the international competitiveness of other tradable products. Domestic capital and labor also tend to shift from manufacturing and agriculture to the booming sector. At the same time, the boost to real incomes raises the nation's demand for all goods, including nontradables, which, by definition, need to be produced domestically (Freebairn 2015). Since the production of many nontradables is relatively labor intensive, and mining production is typically very capital intensive, capital investment expands in the booming sector but employment tends to grow in the sectors producing nontradables.

Since the early 2000s the Kazakhstan economy has shown clear symptoms of the Dutch disease (Akhmetov 2017, IMF 2013, OECD 2016). The Dutch disease can be assessed by analyzing the following symptoms: (i) faster growth in prices of nontradables compared with tradables; (ii) the lagging tradable sectors losing their share of GDP, employment, and exports; and (iii) rapid wage growth outpacing productivity growth.

This indeed is what has been happening in Kazakhstan, according to analysis by the Organisation for Economic Co-operation and Development (OECD 2016) and the International Monetary Fund (IMF 2013, 2017). Given that situation, the government has come under pressure to assist noncompetitive sectors such as agriculture by imposing import restrictions and subsidizing farmers. When government resource revenues are so spent, particularly through fiscal expenditures, aggregate demand increases. This in turn expands the nontradable sectors further, which attracts more labor and capital from the lagging tradable sectors.

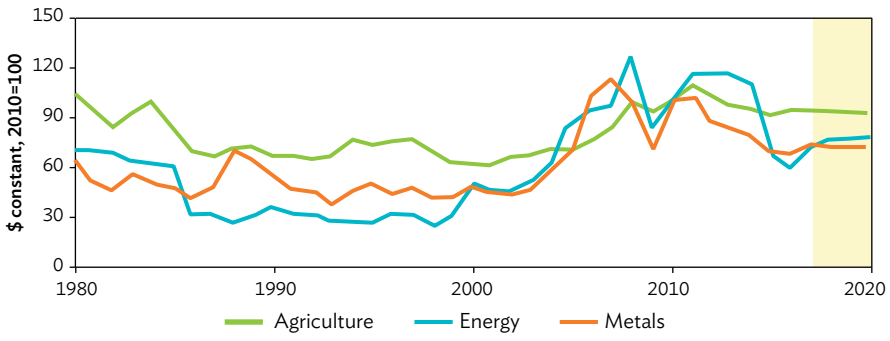
Applying vector autoregression to Kazakhstan's macroeconomic data, Akhmetov (2017) found the following: (i) the presence of unidirectional causality running from the world oil price and tradable industries production to currency appreciation, and (ii) unidirectional causality running from currency appreciation to nontradables and the agriculture sector. Furthermore, the world oil price shock has immediate effect on the output of the booming sector (i.e., within 1 year), and currency appreciation has a delayed effect (e.g., more than 5 years) on nontradable industries, manufacturing, and agriculture. In 2017, we observed the immediate effect of the low oil price on depreciating the real exchange rate. If oil and gas prices remain relatively low, we will see the reversal of the Dutch disease on the fortunes of the various sectors over the remainder of the present decade.

1.5. Diversification of the Economy

Resource-rich economies such as Kazakhstan have a strong comparative advantage in primary products. The more open such economies are, the more extreme their natural resource endowments per worker, and the lower their costs of trading internationally, the more specialized will be their production of tradables and the more concentrated will be their exports on just a few primary products. Since primary product prices are more volatile in international markets than those of manufactured goods, resource-rich economies face more volatile terms of trade; and historically such countries have grown less rapidly than industrialized economies (Williamson 2008). However, in more recent decades, two new developments have affected emerging economies. One is the opening up of several relatively natural resource-poor developing economies, most notably the PRC, which has raised the demand for primary product exports from resource-rich economies. The other is the policy-driven growth in demands from high-income countries for crop products as inputs into biofuel production (Williamson 2012). Both caused a reversal in the long-run downward trend in real international prices of primary products, and resource-rich economies including Kazakhstan have enjoyed the consequent benefits.

The recent downturn in energy and other primary product prices has caused many in resource-rich economies to again doubt whether dependence on exports of a few primary products can be relied on for sustainable long-run growth. So far, though, real prices of primary products in international markets have not fallen to the levels at the start of this century, nor are they expected to over the medium-term, according to the World Bank (Figure 1.5). Nonetheless, it is worth reviewing policies, institutions, and investments in public goods to ensure that they are providing the most appropriate incentives for the business community to deliver strong economic growth, including in nontraditional sectors. In doing so, other resource-rich economies have found that it is crucial to have the right fundamentals in place, and to ensure that markets remain flexible (Lowe 2015).

Figure 1.5: Real Prices in International Markets for Primary Products, 1980–2020 (constant $)



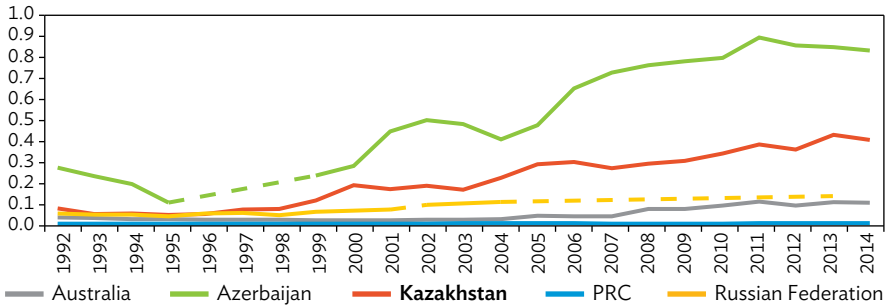
Note: Shaded area (2017–2020) denotes forecast.
Source: World Bank (2017).

Being a relatively high-wage economy because of its abundance of natural resources per worker, Kazakhstan's competitive non-oil products will be those that can benefit from (i) oil and mineral abundance (hence metals, chemical products), (ii) a vast land mass (hence broadacre farming and grazing), (iii) existing productive capabilities, and (iv) cheap electricity.

The Herfindahl–Hirschman Index (HHI) can be used to gauge the dispersion of trade value across an exporter's products (WITS 2013). A country with a preponderance of trade value concentrated in a very few products will have an HHI value close to one, whereas a country with a very diversified export portfolio will have an HHI value close to zero. If all products have equally variable prices over time, this indicator shows the exporter's vulnerability to terms of trade shocks.

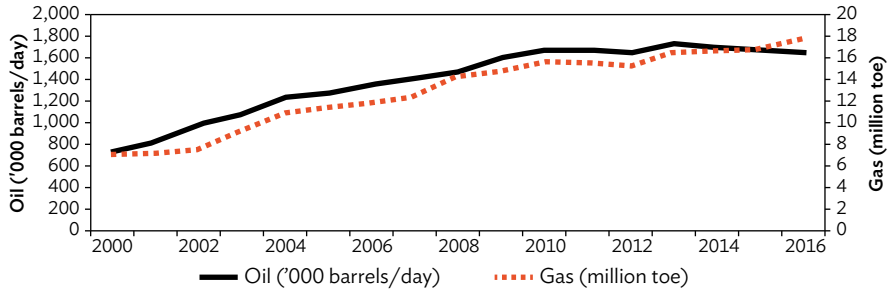
Figure 1.6 shows the HHI indices of Kazakhstan and four other countries. Azerbaijan and Kazakhstan show the greatest increase in export concentration in fewer product groups, in both cases driven mainly by the increase in oil-and-gas prices and in quantities produced (Figure 1.7). While the extent of Kazakhstan's export concentration is less than Azerbaijan's it is much greater than that of the Russian Federation or Australia.

Figure 1.6: The Herfindahl–Hirschman Index of Export Diversification



HHI = Herfindahl–Hirschman Index, PRC = People's Republic of China.
Notes:
1. The HHI is calculated over Standard International Trade Classification 4-digit product groups.
2. Dotted lines indicate that data coverage is below 80% of total exports.
Source: OECD (2017), recalculated by authors.

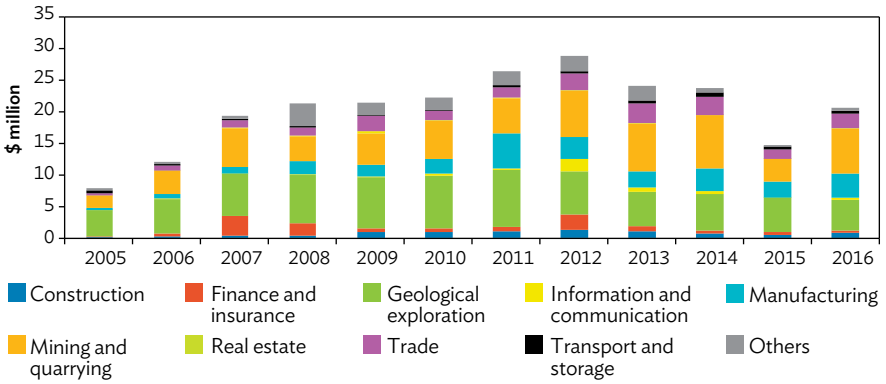
Figure 1.7: Oil-and-Gas Production, Kazakhstan, 2000–2016



toe = ton of oil equivalent.
Source: British Petroleum (2017).

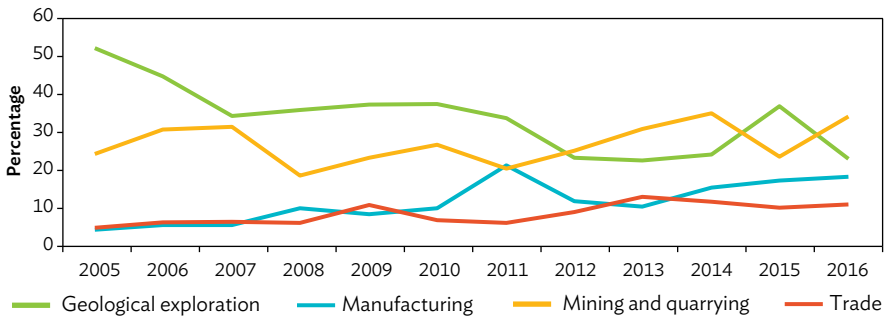
The data on FDI also imply heavy concentration on extractive industries (Figure 1.8). In 2016, Kazakhstan received approximately $20 billion in FDI, of which one-third was directed to the mining and quarrying sector and almost one quarter to the geological exploration sector, while the manufacturing sector received one-sixth of FDI. Even though the mining and geological exploration sectors have been receiving major shares of FDI, it is encouraging to see in Figure 1.9 that the FDI shares for the manufacturing and trade sectors have upward trends.

Figure 1.8: Foreign Direct Investment by Sectors



Sources: National Bank of Kazakhstan. http://www.nationalbank.kz (accessed 13 July 2017); calculations by the authors.

Figure 1.9: Foreign Direct Investment Share by Selected Sectors

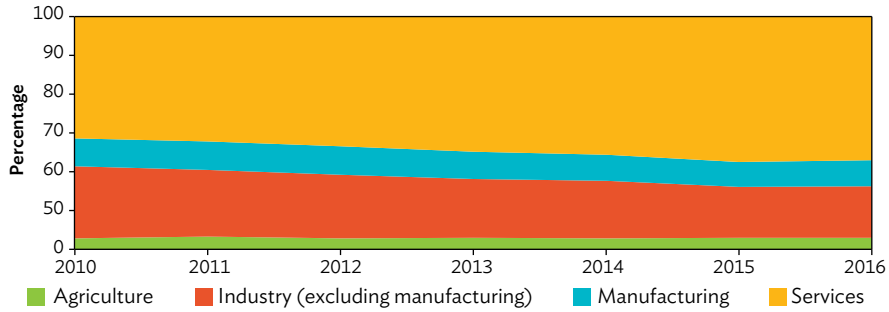


Source: National Bank of Kazakhstan. http://www.nationalbank.kz (accessed 13 July 2017); calculations by the authors.

Structural transformation in Kazakhstan since 2010 has seen a continuation of the shift from agriculture to the services sector (Figures 1.10 and 1.11). In 2010, agriculture's share was 4.8% of value added and 28.3% of employment. The agricultural value-added share was around 5% in 2016, but the employment share had declined to 16.2%. The services sector absorbed the decline of other sectors. Its share of value added rose from 54.6% of value added and 53.0% of employment in 2010 to 61.7% and 63.2%, respectively in 2016.

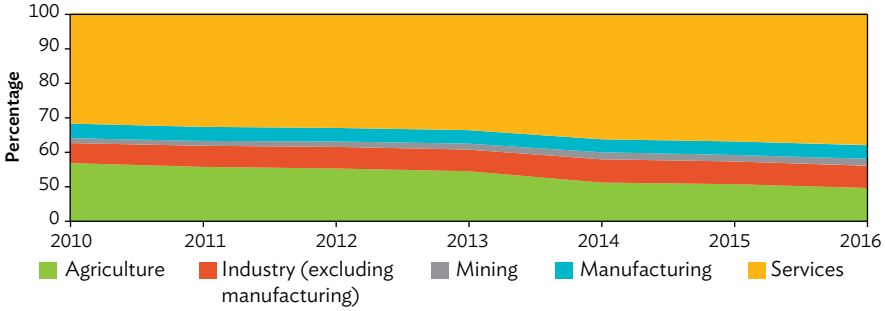
The services sectors have considerable potential to contribute more to Kazakhstan's future productivity growth and export earnings. The services sectors have already been capturing increased shares of trade in value-added and have been helping the country to integrate into GVCs.

Figure 1.10: The Sectoral Value Shares



Source: World Bank. World Development Indicators. http://databank.worldbank.org (accessed 2 August 2017).

Figure 1.11: The Employment Share



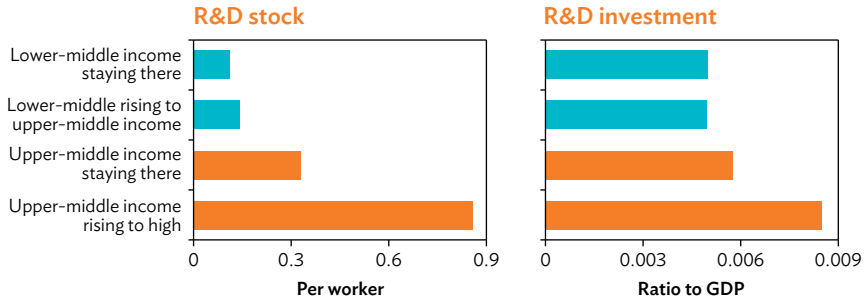
Source: Committee on Statistics of the Ministry of National Economy of the Republic of KazakhstaN. http://stat.gov.kz (accessed 6 August 2017).

1.6. Transcending the Middle-Income Challenge

An important factor that enabled the newly industrialized economies of Hong Kong, China; the Republic of Korea; and Singapore to achieve high and steady growth is innovation, which led their rapid technological progress. According to ADB (2017), research and development (R&D) played a critical role in that innovation, just as they were important for TFP growth in advanced industrial economies (UNIDO 2007). R&D is important not only for pushing the production possibility frontier outward but also for keeping up with the latest technologies (World Bank 2010).

Examining R&D behavior in middle-income economies, ADB (2017) maintains that economies that cross to a higher income group typically exhibit better performance indicators on innovation intensity including R&D stock per worker and ratio of R&D investment to GDP (Figure 1.12).

Figure 1.12: Innovation Intensity in Middle-Income Economies



GDP = gross domestic product, R&D = research and development.
Source: ADB (2017).

The government's "Strategy 2050" (Government of Kazakhstan 2012) clearly stipulated the strategic long-term goal to transform Kazakhstan into a knowledge-based diversified economy driven by the private sector, and this has been reiterated in its latest medium-term Strategic Plan (Government of Kazakhstan 2017). An increase in R&D spending alone is insufficient, though; efforts also need to be exerted to bring the innovation and research system closer to business (OECD 2017). Since risk-taking entrepreneurs are central to foster innovation, these individuals and enterprises should be incentivized to invest in R&D, training, and human capital development in general (ADB 2017). From a broader macroeconomic view, government policies need to encourage innovative enterprises to start up and grow. Since competition plays a key role in innovation (Arrow 1962), the government should encourage market competition and minimize distortive interventions in product and factor markets.

1.7. Country Diagnostic Study for Kazakhstan

This country diagnostic study of Kazakhstan focuses on potential areas of diversification of the economy. Each sectoral analysis comes with policy suggestions for the government to consider implementing in coming years. A summary of each of those chapters follows.

Agriculture

The government has earmarked the agro-food sector as a key to further economic development and diversification in its "Kazakhstan 2050" strategy document. This is appropriate, given that agricultural prices are projected to fall less than oil-and-gas prices in international markets over the foreseeable future (Figure 1.5), even if they are expected to be lower than at their previous peak as demand growth in a number of

emerging economies slows and biofuel policies have a diminished impact on markets (OECD-FAO 2017).

Despite Kazakhstan's agricultural potential, vast land mass, and generous government support for agriculture, the country continues to be a net food importer. Wheat is the most important crop (the country is one of the world's top 10 wheat exporters), but yields are low by international standards. Other crops are produced with higher productivity (e.g., potatoes, tomatoes, and watermelons), but they are planted mostly in a relatively small area in the warm southern regions of the country.

Large tracts of land fell out of production in the 1990s, and the value of agricultural output only recently reached pre-independence levels. For livestock, it is still below its pretransition level, despite one-third of all agricultural policy expenditure being devoted to that subsector. Among the many challenges for agriculture that remain are (i) farm restructuring from massive Soviet state farms to more efficient farm sizes, (ii) enabling crop intensification because of highly variable growing conditions, (iii) pricing water appropriately to better manage its scarcity, (iv) improving public infrastructure, and (v) reducing value-chain fragmentation.

An analysis of the technical efficiency of beef and spring bread wheat production shows that family farms are more efficient than large corporate enterprises. Yet government support in the agriculture sector in the form of subsidies for inputs and outputs is captured by a small number of large enterprises and agro-holdings. If subsidies are to be used as the main agricultural support mechanism, they need to be reformed by improving the transparency of subsidy allocation, restricting eligibility to farms below a certain income threshold, and means testing those farms over time. Poverty and income inequality would be reduced if more of these subsidies were directed toward assisting disadvantaged groups in rural areas.

The government could redirect some of the agricultural support budget to boosting public services, especially in integrated water management, rural road connectivity, and agricultural research and extension. These are investments that would improve long-term productivity and competitiveness in agriculture. Provision of these public services also needs to be more equitable, as access in the past was biased toward larger, better connected entities (e.g., large agro-holdings, which were granted preferential access to land).

To encourage private sector investments in agriculture, the business environment can be improved by (i) introducing more flexibility to land markets to ensure that land is allocated to its most efficient uses, (ii) having more stable and transparent agricultural

policies to reduce investment risks, and (iii) streamlining governance in agriculture by decreasing the considerable fragmentation and eliminating overlapping mandates.

The formation of agricultural cooperatives could be a cornerstone of agricultural policy. The history of forced collectivization under socialism and the Kazakhstan farmers' lack of experience in democratic models of cooperation have impeded cooperative development, so it is necessary to first improve the enabling environment (e.g., the legal framework; and training in management, planning, and finance) so that cooperatives can thrive. Cooperatives also need sufficient autonomy and ability to sell and administer shares, provide dividends, and solicit member contributions so that they can become financially independent and able to provide a sustainable form of local credit.

Manufacturing

Another avenue for Kazakhstan to further its economic diversification goal and create more jobs is through developing the manufacturing sector. It is widely acknowledged that manufacturing has been undertapped and has stagnated, employing only 6%–7% of the total labor force and contributing very little to economic growth over the past decade. To reach high-income status, Kazakhstan needs to grow the sector to perhaps 18% of total employment and output, as no country has achieved prosperity without reaching that share, according to ADB (2017).

Export diversity is low owing to the country's dependence on crude petroleum, which contributes more than 50% of export earnings. Diversifying exports could lower volatility and instability in export earnings, avoid potential real exchange rate cycles, and improve the overall investment climate. However, past initiatives targeting manufacturing have been largely unsuccessful owing to underfunding, inefficient coordination, poor methodology for monitoring and evaluation, and little involvement by the private sector.

For diversification to work, the government should recognize the important role the private sector plays in knowledge generation, and identify factors constraining investment. Kazakhstan has a strong potential in basic metal products and chemicals, food processing products, textiles, and leather products.

There is a need to increase human capital development by improving the quality of primary and secondary education and encouraging on-the-job training and apprenticeships to address the existing skills shortage, which could hamper the

growth impetus. Collaboration between industries and universities should also be strengthened to ensure the continuous supply of skills needed by emerging industries. And investments in R&D, from both the government and the private sector, are very much needed to drive innovation, with less involvement of state-owned enterprises to allow a more vibrant and innovative private sector to flourish.

In addition to upskilling the labor force, greater investment in infrastructure is essential to address current bottlenecks as well as to provide a link to unexploited markets, decrease transport costs, and support the production of tradable goods.

Policy priorities should be tackled within the context of a diversification plan that is development-stage dependent. This involves reviewing existing industrial programs and streamlining them to ensure effective program implementation, setting clear benchmarks and goals, and creating a high-level committee that monitors progress against such goals and resolves problems if and when they arise.

Oil-and-gas services

Kazakhstan is the 16th largest oil producer in the world and the largest in Central Asia. Its oil-and-gas sector is behind the country's remarkable growth, with oil accounting for close to half of total government revenues in recent years. While jobs in the sector itself have been few (accounting for less than 1% of employment because of the high capital intensity of its production processes), the spending of the resource rents from oil and gas have supported the growth of jobs in services, which use labor relatively intensively.

One such area involves oilfield service (OFS) companies. They provide services to the petroleum exploration and production industry but do not typically produce petroleum themselves. Maintaining the efficiency of OFS companies is vital to ensure the competitiveness of the country's oil-and-gas industry, particularly when oil prices are decreasing globally.

The local OFS market is composed mostly of small, specialized firms that may have limited access to new technologies, credit, and large contracts from petroleum products. Providing incentives for firms to form cooperatives and enter joint ventures, as well as setting up a legal framework for the formation and dissolution of such cooperatives, is one way to address firm fragmentation in the current market.

There is a need to upgrade the skills and level of innovation of OFS firms, and thereby the oil-and-gas sector, so as to raise sector competitiveness. This entails strengthening

local R&D through additional funding or tax incentives, assisting commercialization, and reducing bureaucratic hurdles that hamper innovation. Improving the quality of the physical sciences, engineering, and other relevant disciples within the higher education sector is also necessary to grow indigenous knowledge.

While local R&D is being strengthened, Kazakhstan could benefit from the formation of joint ventures and consortia between local and foreign OFS firms to promote the transfer of technologies and skills. This calls for steps to make the local OFS firms more transparent through improvements in existing electronic vendor databases (e.g., Alash) to help foreign OFS companies identify local partners that would meet their requirements as joint venturers.

Transport and logistics services

Infrastructure is an important determinant of trade costs, particularly for landlocked countries, where transportation costs could make up to 60% of total trade costs (Limao and Venables 2001). While various globalization trends such as the emergence of GVCs, falling import tariffs, and the upsurge in FDI present various opportunities for improving the country's foothold in the global market, they are hampered by poor transport infrastructure.

From 2014 to 2016, Kazakhstan ranked from 88th to 77th over 160 countries in terms of logistic performance (World Bank 2014 and 2016b). Although great improvements have been achieved, Kazakhstan has not yet taken full advantage of its large potential in the global production networks, partly due to nontariff barriers (e.g., long processing time for clearing imports and exports at the border), which continue to hinder trade. As well, the state of transport infrastructure needs much improvement, as reflected in its low logistics performance index vis-à-vis, for example, the PRC and India (World Bank 2016b).

There is a need to address gaps in transportation and logistics to take full advantage of recent economic developments such as the advent of the BRI (a PRC-led initiative that aims to increase connectivity and trade between Asia and Europe); the recent accession of Kazakhstan to the WTO; and the completion of the Almaty–Astana Highway, which will link the northern and southern parts of the country.

An analysis of firm-level data shows that an efficient transport and logistics sector can generate significant productivity gains owing to improved overall efficiency in production. This improvement is likely to transcend and lead to gains for the entire economy, starting with the manufacturing sector, which will benefit the

most from such enhancements. This is in line with the government's goal of stimulating competitiveness in the manufacturing industry (Chapter 3). A high-performing transport and logistics sector could help "high-potential" sectors producing tradables to enter and exploit GVCs and contribute more to national economic growth and export diversification.

Economywide analysis

A business-as-usual strategy of continuing to rely on the oil-and-gas sector would not produce as much economic growth for Kazakhstan as in the recent past, or come close to Kazakhstan's growth potential, assuming the price of oil increases by only 1.6% annually from its current relatively low level (the World Bank's latest price projection) and labor productivity improves at the same rate as in the past. In that case, GDP growth is projected to average only 2.3% annually from now until 2030.

By contrast, reforms in key sectors to improve the business climate, enhance competitiveness, and increase private sector participation—as laid out, along with other reforms, in the new medium-term Strategic Plan (Government of Kazakhstan 2017)—would improve the country's growth rate by about 1.2 percentage points annually. The additional growth would be generated through widespread improvement in the productivity of both labor and capital, which would lead to increased exports from non-oil sectors such as priority manufacturing and agriculture. With these more diversified sources of growth, the country's current vulnerability to external shocks would be reduced, as would regional income disparities.

The average 3.5% growth projected to 2030 under that reform scenario is lower than the 4% potential growth of Kazakhstan recently suggested by the IMF and Kazakhstan Strategy 2025 target of 5% GDP growth, but this is because the policy simulation conducted in Chapter 6 uses policy shocks that are more conservative than the government's target and includes only a selection of the government's policy reform initiatives. With less conservative assumptions about the extent and number of policy reforms, that potential growth rate of 4% suggested by the IMF may well be attainable, and would lead to a more diversified economy over time.

References

Akhmetov, A. 2017. Testing the Presence of the Dutch Disease in Kazakhstan. *Munich Personal RePEc Archive Paper. No. 77936*. Munich. https://mpra.ub.uni-muenchen.de/77936/.

Arrow, K. 1962. Economic Welfare and the Allocation of Resources for Invention. In R. Nelson, ed. *The Rate and Direction of Inventive Activity: Economic and Social Factors.* pp. 609–626. Princeton, NJ: Princeton University Press for the NBER.

Asian Development Bank (ADB). 2017. *Asian Development Outlook 2017: Transcending the Middle-Income Challenge.* Manila.

British Petroleum. 2017. BP Statistical Review of World Energy. June. http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-worldenergy.html .

Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan. 2017. http://stat.gov.kz/

_____. 2018. Socio-economic Development of the Republic of Kazakhstan. http://stat.gov.kz/.

Corden, W. M. and J. P. Neary. 1982. Booming Sector and De-Industrialisation in a Small Open Economy. *The Economic Journal.* 92 (368). pp. 825–848.

Frankel, J. 2013. *Exchange Rate and Monetary Policy for Kazakhstan in Light of Resource Exports*. Written as part of a project directed by Ricardo Hausmann, undertaken for the Government of Kazakhstan. Cambridge, MA.

Freebairn, J. 2015. Mining Booms and the Exchange Rate. *Australian Journal of Agricultural and Resource Economics.* 59 (4). pp. 533–548.

Government of Kazakhstan. 2012. *Kazakhstan 2050 Strategy*. Astana.

_____. 2017. *Technological Modernisation for Accelerated Growth and Better Quality of Life: Strategic Plan for Development of Kazakhstan until 2025.* Astana.

Horton, M., H. Samiei, N. Epstein, and K. Ross. 2016. *Exchange Rate Developments and Policies in the Caucasus and Central Asia*. Washington, DC: International Monetary Fund.

International Labour Organization (ILO). www.ilo.org (accessed August 2017).

International Monetary Fund (IMF). 2013. Leveraging Oil Wealth for Development in Kazakhstan: Opportunities and Challenges. Country Report No. 13/291. Washington, DC.

_____. 2017. *Kazakhstan 2017 Article IV Consultation Staff Report*. Washington, DC.

Kemme, D. 2012. Sovereign Wealth Fund Issues and the National Fund(s) of Kazakhstan. *William Davidson Institute Working Paper. No. 1036*. Memphis: University of Memphis.

Limao, N. and A. J. Venables. 2001. Infrastructure, Geographical Disadvantage, Transport Costs and Trade. *World Bank Economic Review.* 15 (3). pp. 451–79.

Lowe, P. 2015. Fundamentals and Flexibility. Speech delivered at the CFA Institute Australia Investment Conference. Sydney. 13 October. http://www.rba.gov.au/speeches/2015/sp-dg-2015-10-13.html.

National Bank of Kazakhstan (NBK). 2016. *Monetary Policy Guidelines of the Republic of Kazakhstan for 2016*. http://www.nationalbank.kz/?docid=3309&switch=English.

Organisation for Economic Co-operation and Development (OECD). 2016. Multi-dimensional Review of Kazakhstan: Volume 1. Initial Assessment. *OECD Development Pathways.* Paris: OECD Publishing.

_____. 2017. Multi-dimensional Review of Kazakhstan: Volume 2. In-depth Analysis and Recommendations. *OECD Development Pathways.* Paris: OECD Publishing.

OECD–Food and Agriculture Organization of the United Nations (FAO). 2017. *OECD-FAO Agricultural Outlook 2017–2026.* Paris: OECD.

United Nations. 2010. *Millennium Development Goals in Kazakhstan*. Astana.

United Nations Industrial Development Organization (UNIDO). 2007. *Determinants of Total Factor Productivity: A Literature Review*. Research and Statistics Branch Staff Working Paper 02/2007. https://open.unido.org/api/documents/4812034/download/Determinants%20of%20total%20factor%20productivity%20-%20a%20literature%20review .

Williamson, J. G. 2008. Globalization and the Great Divergence: Terms of Trade Booms and Volatility in the Poor Periphery 1782–1913. *European Review of Economic History.* 12 (3). pp. 355–391.

_____. 2012. Commodity Prices over Two Centuries: Trends, Volatility, and Impact. *Annual Review of Resource Economics.* 4 (6). pp. 1–22.

World Bank. 2010. *Innovation Policy: A Guide for Developing Countries*. Washington, DC.

_____. 2014. Logistics Performance Index Global Ranking. https://lpi.worldbank.org/international/global/2014.

_____. 2016a. *Women, Business and the Law: Getting Equal*. Washington, DC.

_____. 2016b. Logistics Performance Index Global Ranking. https://lpi.worldbank.org/international/global/2016.

_____. 2017. World Development Indicators. Washington, DC. https://data.worldbank.org/indicator/LP.LPI.INFR.XQ.

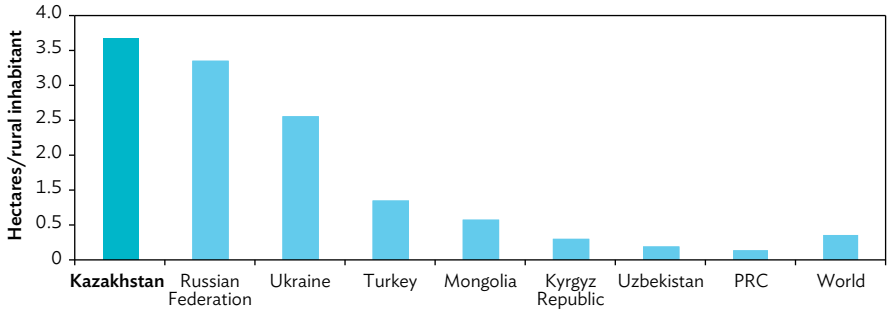
World Integrated Trade Solution (WITS). 2013. *Online Trade Outcomes Indicators—User's Manual*. Washington, DC: World Bank. http://wits.worldbank.org/WITS/docs/TradeOutcomes-UserManual.pdf.

Chapter 2
Policies to Unlock Kazakhstan's Agricultural Potential

Martin Petrick, David Raitzer,[1] and Saule Burkitbayeva

Kazakhstan has enormous underutilized agricultural potential that can help to make economic growth more diverse and inclusive. Although agriculture accounted for around 5% of gross domestic product (GDP) in 2015, Kazakhstan is a sparsely populated country with vast amounts of agricultural land—the most important input for agricultural production. Overall, the country's total agricultural area amounts to 222 million hectares (ha), of which about 13% (29 million ha) is classified as arable. Kazakhstan has arable land availability per rural inhabitant that is greater than in many other countries in the region (Figure 2.1).

Figure 2.1: Available Arable Land per Rural Inhabitant, Selected Countries, 2014



PRC = People's Republic of China.
Source: Food and Agriculture Organization of the United Nations. FAOSTAT. http://www.fao.org/faostat/en/#data/QV (accessed 1 April 2017).

[1] Lead authorship of this chapter is shared between Martin Petrick and David Raitzer.

Kazakhstan's favorable agricultural development potential extends far beyond simple land endowments. The country has well-recognized comparative advantages in agricultural production for the following reasons (OECD 2011, Petrick and Pomfret 2017):

- As a former "breadbasket" of the Soviet Union, the country has a legacy of using extensive arable land resources as well as vast amounts of natural pastures for competitive, surplus agricultural production.
- Demand prospects in neighboring countries (People's Republic of China [PRC], the Russian Federation) are projected to be positive in the medium to long term.
- Kazakhstan features a relatively open trade regime compared with much of Central Asia, as witnessed by its recent accession to the World Trade Organization and its membership in the Eurasian Customs Union.
- As agriculture accounted for one quarter of the nation's workforce but produced just 5% of GDP, labor availability for agriculture is relatively high.
- Kazakhstan has the fiscal resources to support rapid agricultural development, as well as political commitment to the agro-food sector.

Utilizing this substantial potential depends on whether an enabling policy environment is in place. This chapter suggests possible reforms to this end, recognizing that the long term demand prospects for agricultural products may be more favorable than for oil and gas (OECD–FAO 2017). It begins by laying out the country's agricultural policy framework. The chapter then reviews the sector's recent performance and examines its challenges before considering options for unlocking the sector's potential. The analysis concludes that a new policy approach is needed that focuses on addressing market failures through improved public goods and services and on setting enabling conditions for market-driven restructuring of the sector.

2.1. Kazakhstan's Policy Framework for Agriculture

In December 2012, President Nazarbayev announced "Kazakhstan 2050—New Strategy of the Established State." That strategy statement envisages "a great opportunity" for Kazakhstan to play a leading role in satisfying the growing global demand for agricultural products. It also calls for the share of agriculture in the country's GDP to grow by a factor of five by 2050 and for the level of state support for agricultural production to increase by 4.5 times by 2020.[2]

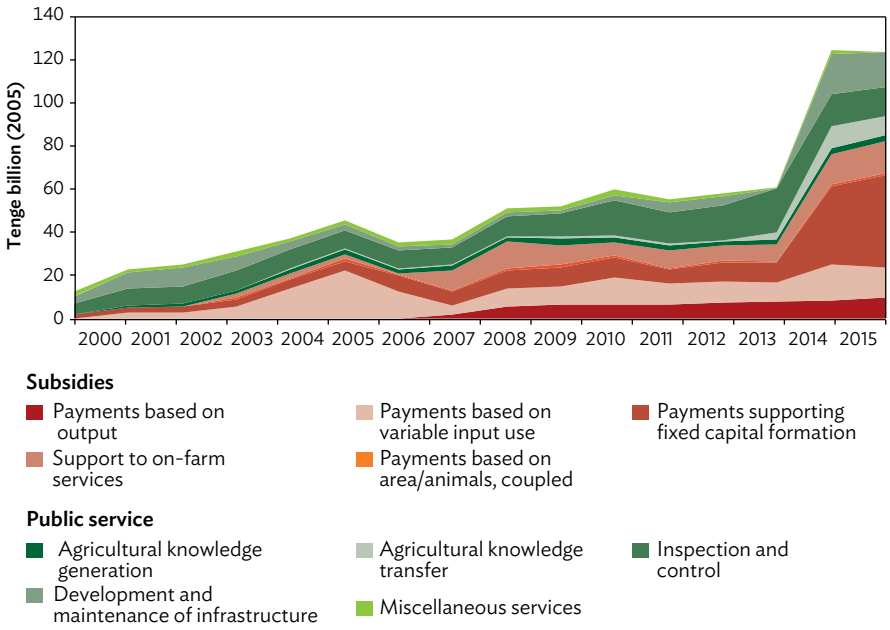
[2] As the share of agriculture in GDP in 2012 was 4.7%, this implies 23.5% of GDP from agriculture by 2050.

Budget support to agriculture has been increasing

"Kazakhstan 2050" was followed in 2013 by the "Program for the Development of the Agro-industrial Complex in the Republic of Kazakhstan for the years 2013–2020 (Agribusiness 2020)." Goals of the program included to increase agricultural production by 50%, labor productivity by 300%, and exports by 20% and to ensure 80% self-sufficiency of basic food items by 2020 (MoA 2012).

Figure 2.2 displays how public agricultural spending increased substantially following the implementation of Agribusiness 2020 in 2013. Based on the classification of the Organisation for Economic Co-operation and Development's (OECD) Producer Support Estimate, two groups of policy measures are distinguished and highlighted: (i) subsidy payments based on output and inputs used and/or production factors employed in red, and (ii) funding of public agricultural services in green.

Figure 2.2: Kazakhstan's Producer Support Estimate, 2000–2015
(excluding market price support)



GDP = gross domestic product, OECD = Organisation for Economic Co-operation and Development.
Note: Real values expressed in 2005 tenge, using the GDP deflator. Codes of spending categories refer to OECD classification.
Source: Authors, based on OECD (2017a).

While almost all agricultural spending categories have seen growth, payments supporting fixed capital formation and infrastructure stand out for their strong increases after 2013. The biggest items in the former category have been outlays for the purchase of pedigree livestock, especially cattle, and debt write-offs to support the financial rehabilitation of agro-enterprises. These are actually transfer payments, not physical capital formation. Most spending in the latter category has been on irrigation and drainage facilities.[3]

In 2015, the percentage of total producer support (including market price support) in gross farm receipts was 11.4%, above that of the United States, and roughly the same as the Russian Federation. The vast majority of this support has been in the form of subsidies for inputs and outputs. Subsidies for input use relative to production value were well above comparator countries or the OECD average (OECD 2016).

Local governments handle the distribution of production-oriented subsidies. KazAgro, a fully state-owned holding company, serves as an umbrella organization for a system of government agencies that channel services to agriculture. Most credit is extended by the daughter holdings KazAgroFinance and the Agrarian Credit Corporation. Only a few years after their formation, many of these agencies have been subject to repeated restructuring efforts, and several have been planned for privatization.

Agricultural policy has increasingly recognized the potential of small farms

In 2017, Agribusiness 2020 was replaced with a new "State Program for the Development of the Agroindustrial Complex 2017–21," which elevated attention to agriculture by expanding execution from the Ministry of Agriculture to all relevant national and regional agencies. By 2021, agricultural production is targeted to increase by 30%, productivity by 38%, and the annual agri-food trade balance by $1.42 billion, relative to 2015. Goals also include stimulating domestic trade and improving water use efficiency.

The new program includes eight objectives (Table 2.1), with the bulk of funding intended to support increased production through subsidies and credit, which are focused much more explicitly than under the previous program on small farms. More subsidies are now allocated to livestock (produced mainly by small farms) than to grain production (produced mainly by large farms), and are based on output rather

[3] Market price support was excluded from the producer support estimate analysis, as there are complications in appropriately reflecting transport and marketing margins in world price comparisons, given the long distances to international ports prevalent in Kazakhstan (Petrick and Pomfret 2017).

Table 2.1: Objectives and Expenditures of the State Program for the Development of the Agro-Industrial Complex, 2017–2021 (T billion)

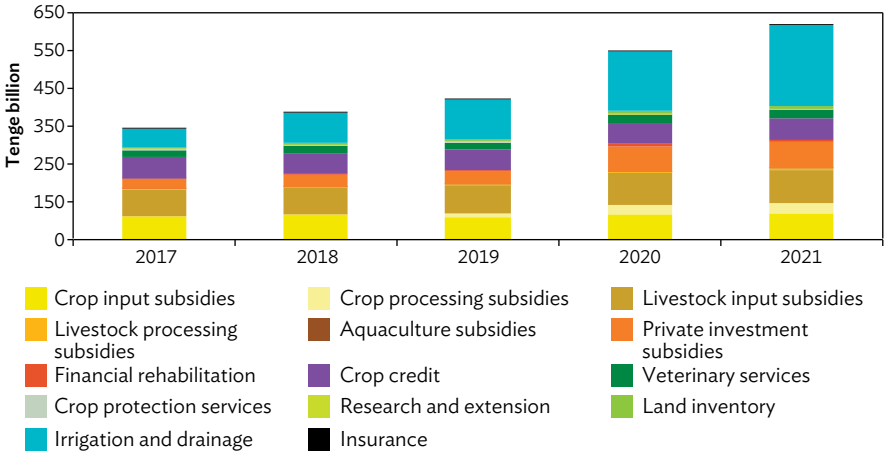
Objective	Subsidies	Credit	Infrastructure Investments	General Services	Total
1) Involvement of small and medium-sized farms in agricultural cooperation	0.0	0.0	0.0	2.0	2.0
2) Saturation of the domestic market and development of the export potential of domestic products	876.4	300.0	0.0	120.3	1,296.7
3) Effective use of financial measures of state support	383.7	0.0	0.0	0.0	383.7
4) Effective use of water resources	0.0	0.0	355.9	3.7	359.6
5) Creation of conditions for efficient use of land resources	0.0	0.0	295.3	32.8	328.1
6) Increase of agricultural producers' sufficiency with machinery and chemicals					
7) Development of trade and logistics infrastructure					
8) Scientific and technological, personnel, and information-marketing support of the agro-industrial complex				4.1	4.1
Total	**1,260.1**	**300.0**	**651.2**	**162.8**	**2,374.2**
Share of total	*53.1%*	*12.6%*	*27.4%*	*6.9%*	*100%*

Sources: Authors' interpretation of MoA (2017); Oshakbayev (2017).

than area cultivated. Support is intended to flow to more small farmers and household producers via agricultural cooperatives, which are to be a centerpiece of the program and to expand in membership from 41,000 as of early 2017 to 500,000 by 2021, organized into 1,204 cooperative units.

Similar to Agribusiness 2020, program expenditures are to remain concentrated on input subsidies, although complemented by increased investment in water infrastructure (Figure 2.3). Credit for the agriculture sector is to be increasingly intermediated by private banks, rather than the State. The program specifies detailed targets for specific agricultural products in terms of production levels and values of trade, and many subsidy measures are for particular inputs, facilities, and outputs to achieve envisaged targets.

Figure 2.3: Annual Planned Expenditures of the State Program for the Development of the Agro-Industrial Complex, 2017–2021



Source: Authors' interpretation of MoA (2017).

Land market liberalization has been incomplete

Kazakhstan has faced a massive task in to facilitate the restructuring of a system of giant state farms under a planned economy to a system of private profitable farm units. Since national independence, land legislation has been subject to ongoing reform. In the 1990s, the paradigm was that all land remained in state ownership. Nevertheless, major private property rights were introduced, including the right to temporary or permanent use of land leased from the government, to extract benefit from it, and to transfer it via sublease. So-called "conditional land shares," in the form of paper certificates of entitlement, were distributed among rural citizens. However, no specific physical land plot was assigned to the share, so that the holders of the certificates were not aware of the location of the land to which they were issued rights. For most beneficiaries of land share distribution, renting their land to the enterprises was the only way to make productive use of their shares. Even so, the creation of individual farms also accelerated, so that among the registered farms a significant number of both corporate and individual farms began to coexist.

At the turn of the millennium, the paradigm shifted to the recognition of full private ownership of farmland. A new land code was adopted in 2003 and came into force in 2005, allowing private ownership of agricultural land with all property rights, including the free sale and purchase of land plots (Petrick et al. 2011). At the same time, subleasing of land shares or demarcated land plots received under previous privatization steps was outlawed. Subleased land shares as well as land plots could

be contributed as a share to the capital stock of an agricultural enterprise. They could be used to form an individual farm, or they could be purchased from the government.

Most land is rented from the government at a low, administratively set price that is similar to the taxation level for owned land. In essence, this means that the land is free. As secondary rentals of land leased from the State are prohibited, short- and medium-term adjustments in land ownership and farm configuration are difficult for the vast majority of agricultural land. Such adjustments occur mostly when existing farms change ownership, due to liquidations or mergers, and the land shares are transferred to the new owner (Petrick et al. 2011). Land transactions are largely controlled by local land commissions, in which directors of existing farms and local officials are represented, and the commissions have tended to favor agricultural enterprises. If cultivation of land leased from the government ceases for more than 2 years, the State may terminate the lease.

In order to attract foreign investment in the agriculture sector, the land-lease terms for foreign entities were prolonged from 10 to 25 years in 2015. However, after public protest, a moratorium was imposed on this amendment from 2016 until 2021. At the same time, all state land sales were suspended for the same period, so that progress toward competitive land markets stalled.

2.2. Kazakhstan's Agricultural Performance

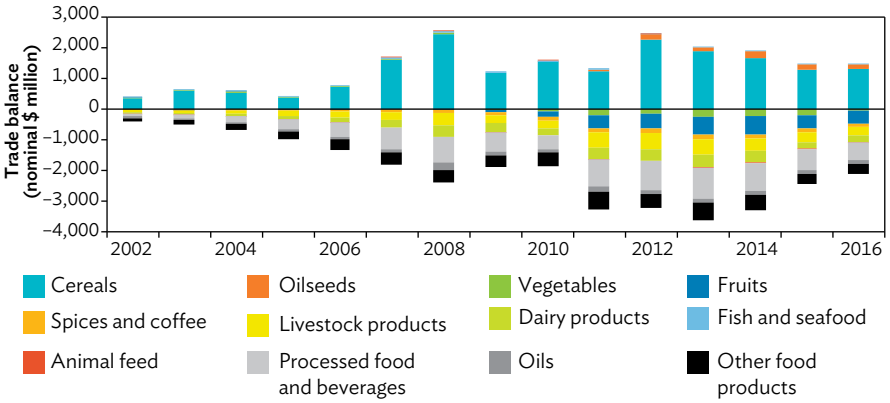
Kazakhstan has ample agricultural potential and provides large levels of support to the agriculture sector. Even so, its actual agricultural performance is far below what is possible were appropriate policy reforms undertaken. As a result, agriculture has not played its full role in supporting a diversified economy and in fostering inclusive growth.

Kazakhstan remains import-dependent

Despite Kazakhstan's historical role as an agricultural exporter, resource endowments that give it comparative advantage in agriculture, and generous state support to the sector, trade performance remains poor for the sector. In 2016, agro-food trade accounted for only about 5% of total exports. Although Kazakhstan is one of the top 10 exporters of wheat in the world, and cereals have remained consistent export items since independence, they also remain the only major agricultural export, and Kazakhstan remains a net importer of agro-food products. In 2015, agricultural imports exceeded 8% of agricultural GDP.

Although Kazakhstan had surplus livestock production prior to independence, since independence it has been heavily import-dependent in livestock and dairy products, as well as fruits, spices, and other products (Figure 2.4). Customs Union partners and neighboring countries, traditional importers of Kazakhstan wheat and flour, remain Kazakhstan's major export destinations.

Figure 2.4: Balance of Trade in Food Products, Kazakhstan, 2002–2016



Source: Authors' calculations from United Nations Comtrade database. https://comtrade.un.org/ (accessed 1 April 2017).

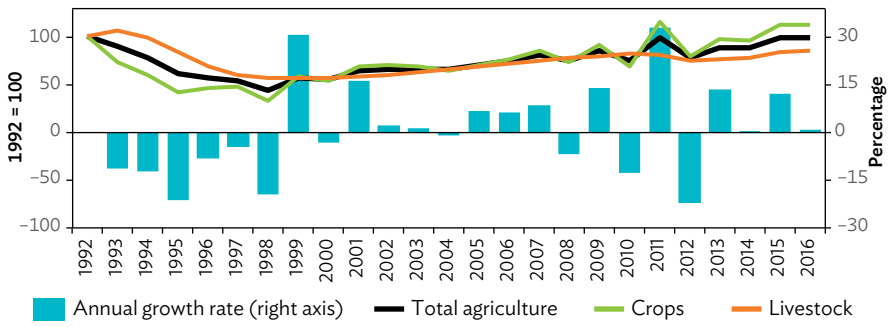
During the period of high and generally rising world oil prices from the early 2000s until 2014, Kazakhstan experienced exchange rate appreciation from oil exports, as well as a diversion of labor and other resources to the booming oil sector. This phenomenon, known popularly as "Dutch disease," adversely affected the agriculture sector, as exchange rate and labor cost appreciation made agricultural production uncompetitive with trade partners (Akhmetov 2017, Oskenbayev and Karimov 2013). In addition, oil revenue inflows have adversely affected local institutional quality, which in turn has limited agricultural growth (Oskenbayev 2015).

Since 2014, global oil prices have fallen sharply. Just as the Dutch disease has been detrimental to agriculture, the period of low oil prices after 2014 offers an opportunity for agricultural growth, as the Kazakhstan tenge depreciated considerably after oil prices fell. Consequently, agricultural production is increasingly competitive on global markets, and agriculture offers an important potential path for economic diversification—if the right policy steps are now taken.

Agriculture has only recently regained pre-independence production levels

After independence, the large state and collective farms earmarked for privatization and restructuring fell into a decade of crisis in Kazakhstan, as in other formerly Soviet republics. In the northern grain region, large tracts of land fell out of production because it was no longer profitable to cultivate them under the new market conditions (Kraemer et al. 2015). Agricultural output more than halved during the early years of transition and only picked up a positive trend in the beginning of the 2000s (Figure 2.5). Despite the highly volatile annual growth rate driven by fluctuating grain yields and export prices, agricultural output continues to recover.

Figure 2.5: Evolution of Agricultural Output in Real Monetary Terms, 1992–2016

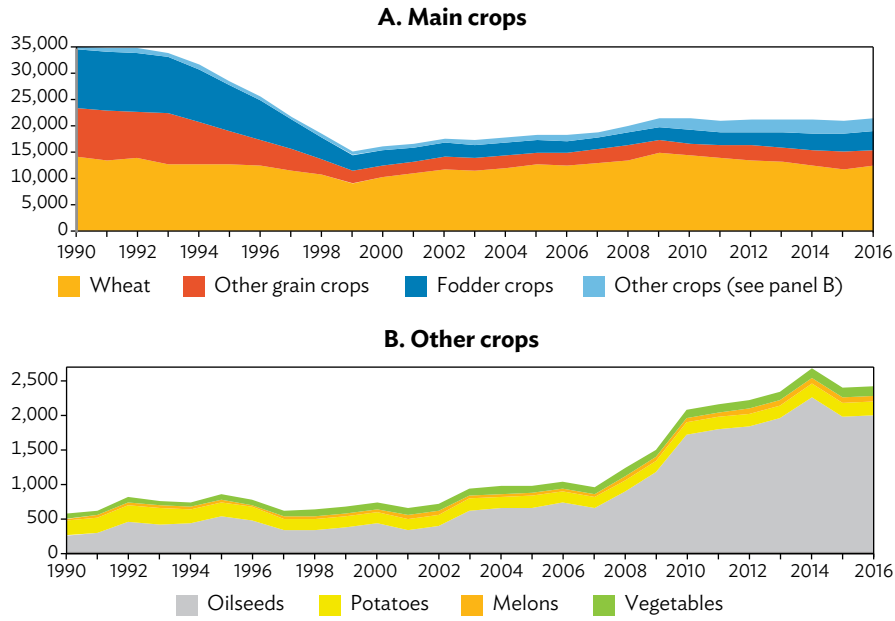


Sources: Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan; Food and Agriculture Organization of the United Nations. FAOSTAT. Value of Agricultural Production. http://www.fao.org/faostat/en/#data/QV (accessed 14 August 2017).

According to official statistics, 20.6 million ha of cropland were abandoned between 1991 and 1999, and in 2015 total agricultural area was still 40% lower than in 1990 (Figure 2.6). In response to the collapse of the livestock sector, there were dramatic production declines in cereals used for feed and other fodder crops. Part of the cropland was shifted to other crops, such as oilseeds. However, land productivity increases have offset the land abandonment, as total production value has recovered to pre-independence levels.

It is unlikely that agricultural area will return to historical levels, since land abandonment occurred in areas less favorable for agriculture, while the best soils have remained under cultivation (Kraemer et al. 2015). Even the most optimistic estimates suggest that only a fraction of the abandoned cropland could return to crop production without significant costs or major environmental tradeoffs (Swinnen et al. 2017).

Figure 2.6: Area Planted with Agricultural Crops, 1990–2016
(thousand hectares)



Sources: OECD (2013); Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

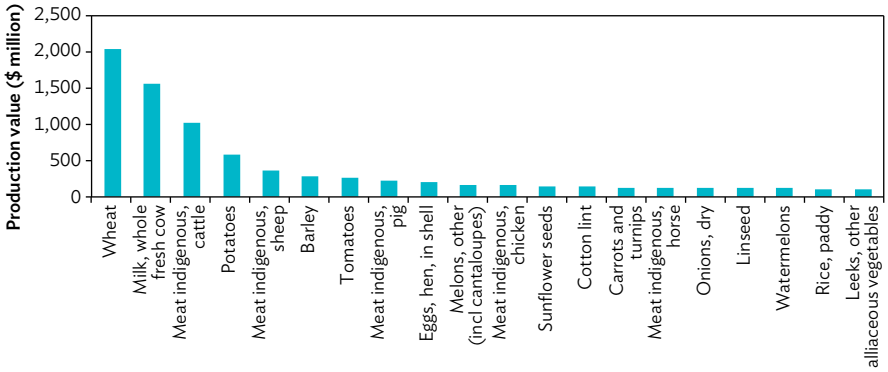
Wheat dominates the agriculture sector, but productivity lags behind peers

Wheat remains the most important commodity in the gross value of agricultural production, and it continues to dominate crop values (Figure 2.7). Milk and beef are the next most important agricultural products, which, when taken together, are similar to the value of cereals.

Since independence, total grain production has remained volatile. Yield fluctuations continue to be an important factor in Kazakhstan's potential to remain a reliable exporter and a regional breadbasket, as production variability remains higher than for other countries in the region (Figure 2.8).

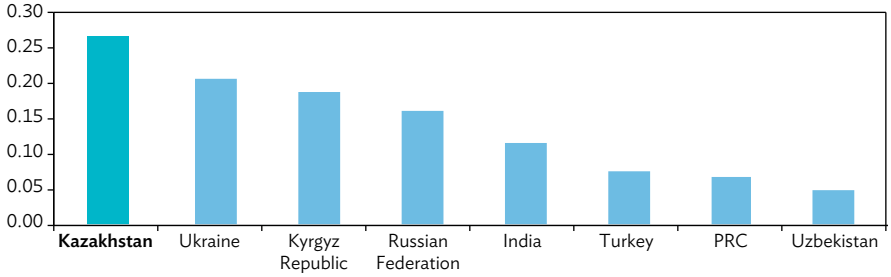
Yields for wheat, Kazakhstan's major cereal output, are very low by international standards. Moreover, the attainable yields possible, given Kazakhstan's climate, varieties, and soil, are among the lowest in the region. However, there is also substantial unused agronomic potential for Kazakhstan, due to a yield gap for wheat of about 60% of attainable yield (Figure 2.9).

Figure 2.7: Composition of Agricultural Production Value, 2014



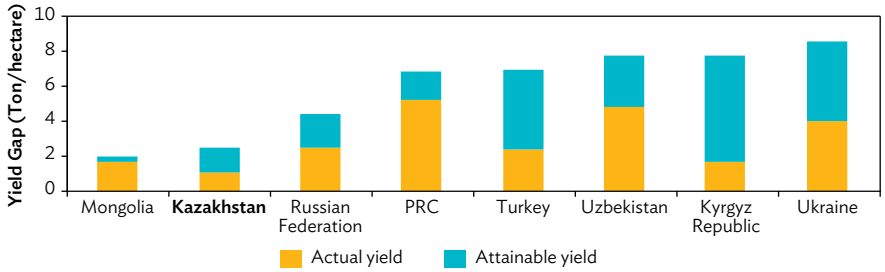
Source: Food and Agriculture Organization of the United Nations. FAOSTAT. http://www.fao.org/faostat/en/#data/QV (accessed July 2017).

Figure 2.8: Coefficient of Variation in Annual Wheat Production, 2005–2014



PRC = People's Republic of China.
Source: Authors, based on Food and Agriculture Organization of the United Nations. FAOSTAT. Crops. http://www.fao.org/faostat/en/#data/QC (accessed 12 March 2017).

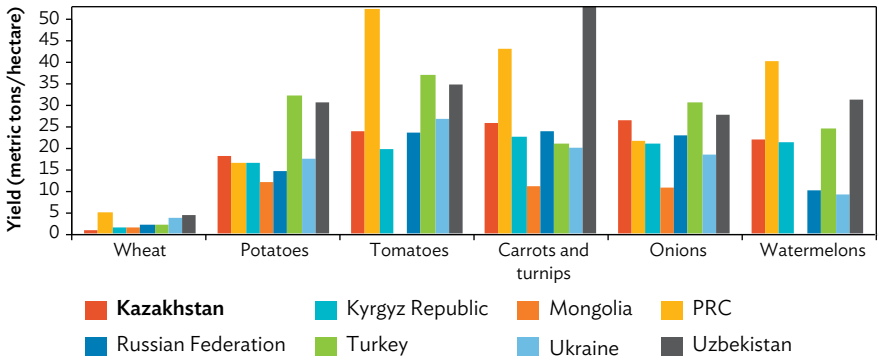
Figure 2.9: Actual and Agro-Ecologically Attainable Yields for Wheat in Selected Countries



PRC = People Republic of China.
Source: Authors, based on Food and Agriculture Organization of the United Nations (FAO)/International Institute for Applied Systems Analysis (IIASA). 2011. Global Agro-Ecological Zones (GAEZ v3.0). Rome, Italy: FAO and Laxenburg, Austria: IIASA.

Although wheat dominates the agriculture sector, other crops are produced with higher productivity. For high-value crops such as potatoes, tomatoes, and watermelons, yields in Kazakhstan are similar to comparator countries, as these crops are produced mostly under irrigation and/or in the more favorable southern regions of the country (Figure 2.10).

Figure 2.10: Yields of Various Crops in 2014, Selected Countries

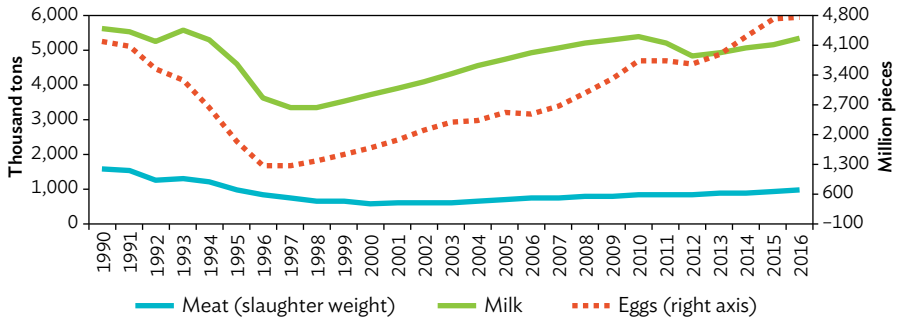


PRC = People's Republic of China.
Source: Food and Agriculture Organization of the United Nations. FAOSTAT. Crops. http://www.fao.org/faostat/en/#data/QC (accessed 5 March 2017).

Livestock production has struggled to regain historical levels despite generous government assistance

Livestock production, which plummeted during the early years of postsocialist transition, began to recover again around 1997 (Figure 2.11). Both meat and milk production are still below their pretransition levels, although fluctuations in those output levels are much smaller than in crop production. Incomplete recovery is despite the government's generous support for livestock production (Figure 2.3). Spending on livestock subsidies and veterinary services makes up about one-third of all agricultural policy expenses, and will be further expanded in the new state program.

Figure 2.11: Production of Principal Livestock Products, 1990–2016



Sources: OECD (2013); Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

2.3. Kazakhstan's Agricultural Development Challenges

The agriculture sector's performance in Kazakhstan has remained limited because of a series of specific challenges. These challenges fall into five categories: (i) farm restructuring, (ii) addressing water constraints, (iii) enabling crop intensification, (iv) improving rangeland management, and (v) resolving value-chain fragmentation. Each challenge is substantial but can be addressed through specific policy actions.

Farm restructuring: Attaining appropriate scales of production

Kazakhstan has experienced a slow process of restructuring from the Soviet system of massive state farms to a system of viable and efficient farming units. During the 1990s, property rights for land and assets were distributed to rural inhabitants in the form of long-term leases. A class of individual family farms emerged to complement household plots held since Soviet times and agro-enterprises that derived from state farms. Thus, three dominant groups of agricultural producers emerged from the restructuring processes of the transition period (Dudwick et al. 2007):

- agricultural enterprises, typically in the form of limited liability partnerships, that cultivate about 10,000 ha per farm on average and control almost three quarters of agricultural land in the northern grain region;
- individual farms, which emerged as a new type of producer in the process of land privatization and cultivate one quarter of land in the grain region and much more in other parts of the country; and

- household producers, which engage mostly in labor-intensive vegetable and livestock production and produce about two-fifths of agricultural output value, despite holding a tiny fraction of land area.

Agro-holdings have also emerged as agglomerations of enterprises. They attracted substantial investment in the early 2000s, as they offered collateral (land access, machinery) and foreign exchange earnings and received favorable treatment by state agencies. Agro-holdings are typified by enormous size of up to 100,000 ha of land plus several stages of production and processing, and by the dominance of nonagricultural investors from the trade, processing, or energy sectors (Petrick et al. 2013).

Despite receiving considerable state support, Kazakhstan's largest agro-holdings suffered from the global financial crisis of 2008/09 and have been plagued by debt problems, partly reinforced by volatile grain yields and prices. The holdings were treated as too big to fail by policy makers and, rather than being restructured after insolvency, they have received substantial state subsidies to rehabilitate their financial situation (Box 2.1).

Box 2.1: Kazakhstan's Top Three Agro-Holdings under Financial Stress

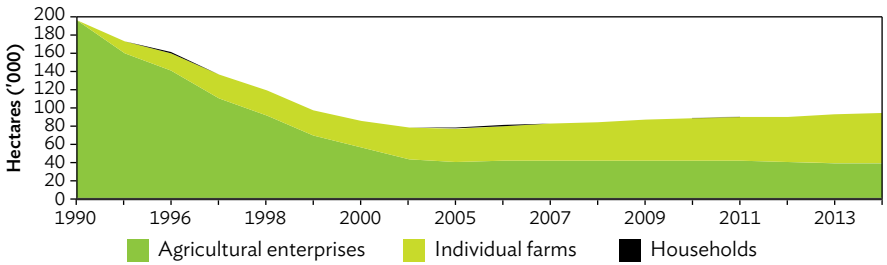
Kazakhstan's three biggest agro-holdings operate a land endowment of approximately 2.8 million ha in the northern grain region, especially Akmola, Kostanai, and North Kazakhstan provinces. Their main areas of activity are grain, oilseed, and pulse production and export. The companies also run processing companies and port terminals for grain. In mid-2016, investors from the PRC announced plans to take over the majority share of one of these companies to direct exports to the PRC market, but the plan was withdrawn after street protests emerged against foreign land ownership. All three companies have been unable to service their debt payments, and were participating in the state's financial rehabilitation program as of 2016.

PRC = People's Republic of China.
Sources: Forbes.kz (2016); Latifundist.com (2014); Radiotochka.kz (2016); company reports.

Over time, the share of area cultivated by individual farms has gradually increased and has replaced areas cultivated by enterprises (Figure 2.12). Cultivation by households has grown in importance to include many production units, but the area remains negligible (Table 2.2).

Household production is generally focused on higher-value vegetables, roots, tubers, and other crops, as well as on livestock (Figure 2.13). Enterprises dominate wheat production, while individual farmers dominate cotton and oilseeds.

Figure 2.12: Agricultural Land Use by Farm Type, 1990–2014



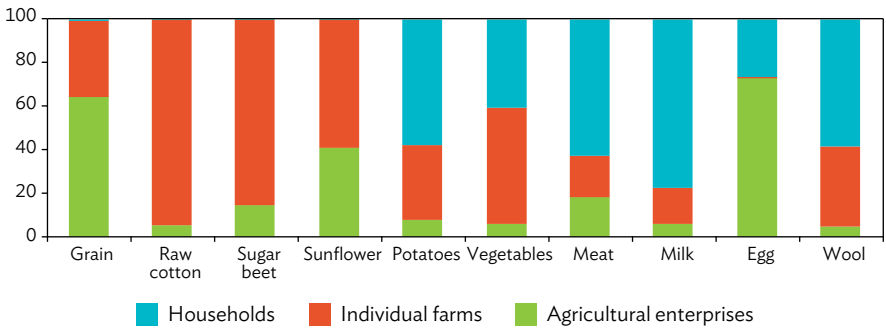
Note: Figure includes arable land, pastures, and other land. A barely visible area represents households.
Sources: OECD (2013); Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

Table 2.2: Number of Operating Farms by Type, 1990–2013

		Agricultural Enterprises			
	Total	State	Nonstate	Individual Farms	Household Plots
1990	4,918	2,223	2,371	324	2,094,000
1995	36,285	1,405	4,095	30,785	2,175,000
2000	81,078	74	4,631	76,373	2,181,000
2005	161,962	65	4,919	156,978	2,133,000
2010	175,772	n.a.	5,443	170,329	n.a.
2013	172,821	n.a.	7,965	164,856	n.a.

n.a. = not available.
Note: Total excludes household plots. Enterprises in 2010 and 2013 include both state and nonstate entities.
Source: OECD (2013); Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

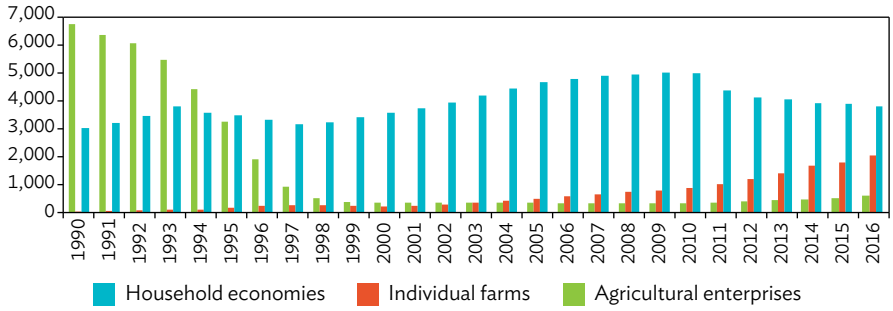
Figure 2.13: Shares of Different Farm Types in Total Production, 2016 *(%)*



Sources: OECD (2013); Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

Large-scale livestock production on former collective and state farms collapsed after independence due to disruption of the mechanized supply channels of field forage as well as downstream processing and marketing in other parts of the former Soviet Union (Pomfret 2008). Since 2010, livestock herd growth has been most prominent among individual farms (Figure 2.14). The number of agricultural enterprises engaged in livestock production has remained small. Livestock numbers in households increased until 2010 but have been decreasing in the years that followed.

Figure 2.14: Number of Cattle by Farm Type in Kazakhstan
(thousand head)

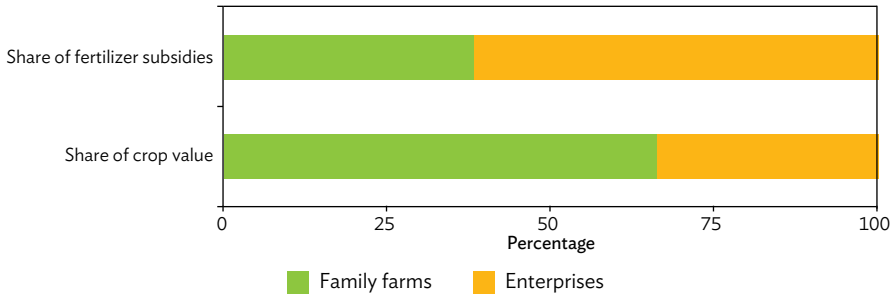


Source: Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

Enterprises have received disproportionate shares of agricultural subsidies as a result of both bailout funds for financial rehabilitation of agro-holdings and better access to input and capital subsidies. There were 181,000 individual farms in Kazakhstan in 2015, plus millions of household producers, but there were only 67,000 total subsidy recipients (MoA 2016). While 67% of 2014 crop production value was by family farms (individual farms and households), they received less than 40% of fertilizer subsidies in that year (Figure 2.15).[4] As enterprises have lower production value per hectare than family farms, area payments (another important subsidy) also disproportionately favor enterprise cultivation relative to production value. Farmers regularly complain of complicated procedures to access subsidies, which also favor enterprises that can spread transaction costs among larger production volumes (Petrick and Pomfret 2017).

[4] This analysis assumes that all fertilizer applied actually receives the 50% subsidy that is intended under current policy, which may overestimate the share of subsidies to family farms.

Figure 2.15: Shares of Fertilizer Subsidies and Crop Value by Farm Type, 2014



Source: Authors' estimates based on data from the Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

To enrich this analysis, it includes new empirical research to identify whether individual farms or enterprises are more productive and, by association, whether the sector would benefit from further restructuring. Technical efficiency analysis provides a useful measure of how well farms make use of inputs to produce outputs. It identifies the production frontier via a stochastic regression, and then identifies how far observed farms are from the frontier, given the level of inputs used. The technical efficiency estimate captures how much of the frontier production is actually achieved with observed input use.

The analysis was applied to district-level statistics on input costs/levels, other key resource endowments, and outputs for individual and enterprise farms via panel regression techniques (for districts for which data are available; see Appendixes 1 and 2 for methodological details). The focus was on wheat and beef production, as these are commodities for which Kazakhstan has comparative advantage with its extensive land area. The two commodities were chosen also for their contrasting production patterns, with wheat more dominated by enterprises, and beef more dominated by household and individual farms. Regressions were performed on a pool of individual and enterprise observations to identify the production frontier, and technical efficiencies of enterprise and individual observations were compared to draw conclusions about relative performance. Panel techniques were used to eliminate the effects of time-invariant variables.

The identified Cobb-Douglas production frontier for spring wheat based on 2012–2015 observations is presented in Table 2.3. Coefficients suggest that production is highly responsive to rainfall, seed costs, and other material input costs, in addition to the obvious land input. Notably, there is no significant response to fertilizer, which receives many input subsidies. The sum of coefficients (excluding rainfall, which

producers cannot change) is not significantly different from one, which indicates that wheat production is scale neutral, and that there is no clear advantage for large farms.

Table 2.3: Estimated Stochastic Frontier Production Function for Spring Bread Wheat

Equation	Variables	Coefficient	Standard Error
Frontier	Area, ha (log)	0.904***	(0.027)
Dependent variable	Labor cost (log)	-0.011	(0.042)
Tons of wheat (log)	Other cost (log)	0.046*	(0.026)
	Fuel cost (log)	-0.055	(0.058)
	Seed cost (log)	0.077**	(0.035)
	Fertilizer cost (log)	0.024	(0.017)
	Rainfall, mm (log)	0.141***	(0.054)
	Constant	2.091***	(0.336)
Sigma	Constant	0.453	(1.573)
Gamma	Constant	2.974*	(1.642)
Mu	Constant	-2.565	(5.765)
Eta	Constant	0.106***	(0.029)
	Observations	337	
	Number of clusters	111	

ha = hectare, mm = millimeter, * = significant at 10% level, ** = significant at 5% level, *** = significant at 1% level.
Sources: Authors' analysis of district data for 2012–2015 from Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan, and Precipitation Estimation from Remotely Sensed Information using Artificial Neural Networks data, from the Center for Hydrometeorology and Remote Sensing at the University of California, Irvine.

The technical efficiency of spring wheat production is high, which implies that new technologies are needed to improve productivity substantially. As in the case of wheat, individual farmers have significantly higher technical efficiency than do enterprises, which suggests that they make better use of inputs and are more productive (Table 2.4).[5]

Table 2.4: Technical Efficiency of Enterprise and Individual Farm Production of Spring Wheat

	Enterprises	n	Individual Farms	n	Differences	P-score
Technical efficiency	0.615	170	0.769	32	-0.154	<0.001

n = number.
Source: Authors' analysis of district data for 2012–2015 from Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

The identified production possibilities frontier for beef, based on 2013–2015 observations, is presented in Table 2.5. Coefficients suggest that production is highly

[5] Due to the smaller number of districts with complete input statistics for individual farms, the comparison is limited to regions for which individual farm observations are complete, so that a region effect is not conflated with a farm-type effect.

responsive to hay area, raw materials (including feed), other material input, and water input costs, in addition to cattle stocks. The sum of coefficients is not significantly different from one, which indicates that beef production is scale neutral, with no inherent advantage for large farms.

Table 2.5: Estimated Stochastic Frontier Production Function for Beef Cattle

Equation	Variables	Coefficient	Standard Error
Frontier	Head of cattle kept (log)	0.410***	(0.105)
Dependent variable	Area of hay, ha (log)	0.248***	(0.084)
Tons of beef (log)	Labor cost (log)	-0.113	(0.111)
	Other costs (log)	0.095*	(0.051)
	Water cost (log)	0.074*	(0.045)
	Raw material cost (log)	0.241***	(0.078)
	Fuel cost (log)	0.101	(0.072)
	year = 2013	-0.381	(0.273)
	year = 2014	-0.018	(0.177)
	Constant	-1.683	(1.230)
Sigma	Constant	0.290*	(0.162)
Gamma	Constant	0.485	(0.320)
Mu	Constant	2.190**	(1.114)
Eta	Constant	-0.015	(0.054)
	Observations	238	
	Number of clusters	109	

ha = hectare, * = significant at 10% level, ** = significant at 5% level, *** = significant at 1% level.
Source: Authors' analysis of district data for 2013–2015 from Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

The technical efficiency of beef cattle production is found to be rather low (Table 2.6). As in the case of wheat, individual farmers have significantly higher technical efficiency than do enterprises, which suggests that they make better use of inputs and are more productive.

Table 2.6: Technical Efficiency of Enterprise and Individual Farm Production of Beef Cattle

	Enterprises	n	Individual Farms	n	Differences	P-score
Technical efficiency	0.142	114	0.216	59	-0.074	<0.001

n= number.
Source: Authors' analysis of district data for 2013–2015 from Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

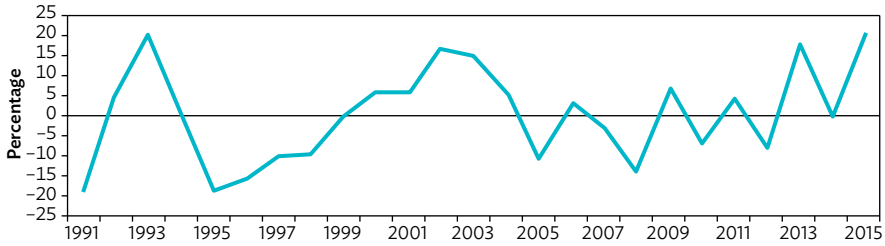
Overall, this analysis suggests that individual and family farms offer more prospects for productivity and value addition than do enterprises. Family farms are not only focused on higher value outputs, but, even for the same commodities, they make more effective use of inputs than do enterprises. Economies of scale are absent for

the analyzed commodities. Such observations are in line with a wealth of observations from a range of developing countries where productivity of family farms below certain threshold sizes exceeds that of larger farms and enterprises (Savastano and Scandizzo 2017, Carletto et al. 2013, Barrett et al. 2010). These results and prior literature imply that agricultural policy in Kazakhstan should seek to promote the transition to family farming, rather than keep less efficient enterprises in production through subsidies and financial bailouts.

Water availability: Improving access to Kazakhstan's limiting factor for agriculture

Although it is well endowed with land, Kazakhstan is poorly endowed with water, and is one of the most water-scarce countries in the Eurasian continent, with most of the country located in the arid zone, where water is difficult to access. At 250 millimeters annually, rainfall is comparable on a national basis to countries that are pastoral and/or where agriculture is entirely irrigation-dependent. Moreover, rainfall is highly variable, creating enormous risks for rainfed agricultural production (Figure 2.16). Drought occurs in 40% of years, with extensive damage to crops and livestock (World Bank 2016).

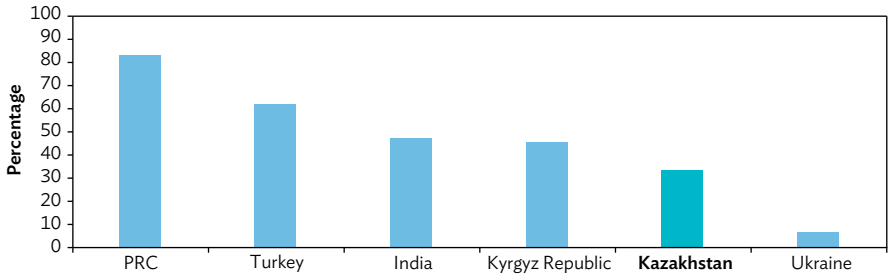
Figure 2.16: Annual Variation in Total Rainfall, 1991–2015



Source: World Bank. Climate Change Knowledge Portal. http://sdwebx.worldbank.org/climateportal/index.cfm (accessed 15 April 2017).

Irrigation offers the potential to utilize surface water and groundwater resources to alleviate this constraint and dramatically improve crop productivity. However, irrigation development remains limited due to inadequate infrastructure. The share of irrigation potential actually exploited is also among the lowest in the region (Figure 2.17).

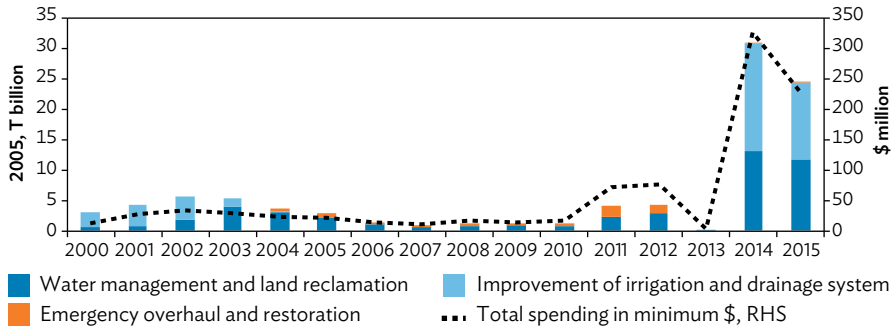
Figure 2.17: Share of Irrigation Potential Utilized in Kazakhstan and Selected Peer Countries



PRC = People's Republic of China.
Note: Data for actual irrigation, 2013 for PRC and India, 2012 for Ukraine, 2011 for the Kyrgyz Republic, 2010 for Kazakhstan, 2008 for Turkey. Data for irrigation potential, 2013 for all countries except Ukraine.
Source: Food and Agriculture Organization of the United Nations. AQUASTAT. http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en (accessed 14 April 2017).

Much irrigation fell into disrepair because of limited investment. Between 2006 and 2010, investment in irrigation was less than $20 million annually, which was inadequate to maintain millions of hectares of irrigation facilities (Figure 2.18). As a result, agricultural potential was forfeited. In 2014 and 2015, substantial investment in irrigation resumed.

Figure 2.18: Public Investments in Irrigation, 2000–2015



RHS = right-hand scale.
Source: OECD (2016).

Water demand is rising in Kazakhstan, with projections that by 2030, demand will outstrip all possible water supplies (Zhakenov 2014). Climate change may exacerbate this challenge over the long term. The country's glaciers, which feed rivers providing surface water supplies during the summer months, are already dramatically shrinking in size (Ibatullin et al. 2009). Modelers project that in lowland areas, water availability will fall by up to 10% between 2009 and 2040 (see Box 2.2).

Box 2.2: Impacts of Climate Change on Agriculture in Kazakhstan

Kazakhstan is a country where most agriculture is rainfed and is practiced at the lower limit of water availability for crop production. Thus, agriculture is very sensitive to shifts in climate and rainfall. To date, changes in climate reflect very slight increases in average annual rainfall, and an average air temperature increase of 0.28°C per decade, with the greatest increases during winter months (Ministry of Environment and Water Protection of the Republic of Kazakhstan 2013). Most rainfall increases have been experienced in mountain zones rather than arid areas, and rainfall has fallen in summer months and risen in winter. Glacial retreat has already been substantial.

Kazakhstan is projected under leading global climate models to have more rapid warming than the global average. The "balanced growth" A1B scenario of the Intergovernmental Panel on Climate Change shows a mean projected increase of 1.7°C by 2030, 2.9°C by 2050, and 4.1°C by 2085 (Ministry of Environment and Water Protection of the Republic of Kazakhstan 2013). Precipitation under the same scenario is projected to increase consistently, to 7.0% by 2030, 8.1% by 2050, and 9.9% by 2085. However, precipitation increases are projected to occur mostly during the winter months, rather than the summer growing period. By 2085, virtually all glaciers will have disappeared from the country. River flows in mountainous areas are projected to have modest increases, due to greater snowfall, even as lowland areas will have reduced water flow by up to 10% by 2030 (Ibatullin et al. 2009).

Modelers of climate change effects on agriculture in Kazakhstan consistently find adverse impacts, but the impacts differ in magnitude and timing. Modeling for the Government of Kazakhstan finds that spring bread wheat yields in the main wheat regions may decline under the A1B scenario by 23%–33% by 2050, relative to 1970–2010 conditions (Ministry of Environment and Water Protection of the Republic of Kazakhstan 2013). Under the same scenario, modeling of pasture productivity also suggests losses of 10%–54% by 2050 under the A1B scenario, with losses concentrated in mountain pastures.

°C = degree Celsius.
Source: Authors.

Most irrigation is used for relatively low-valued outputs, including wheat (19% of area), pastures and meadows for livestock (18%), and other cereals (23%, see Table 2.7). The irrigated pasture and fodder area has dramatically declined, from more than 1,000,000 ha in 1993 to 207,000 ha in 2010, as thousands of wells for livestock watering were abandoned. For irrigation to support horticultural crops with greater value added and water productivity, future irrigation development needs to be oriented toward piped, pressurized systems, rather than the gravity canals that are currently prevalent.

Table 2.7: Extent of Crop Irrigation in Kazakhstan

Thousand Hectares Irrigated	1993	2010
Pasture, fodder, and grass	1,007	207
Wheat	97	208
Other cereals	525	282
Cotton	111	134
Vegetables	30	183
Others	312	105
Total	**2,082**	**1,118**

Source: Food and Agriculture Organization of the United Nations. AQUASTAT. http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en. (accessed 14 April 2017).

On-farm volumetric water pricing was introduced in 1997, but is, in practice, often estimated based on area due to an inability to monitor water volumes (Wegerich 2008). Water volumes could not be monitored because dominant irrigation systems lack measurement and modern scheduling systems, and because tertiary infrastructure was transferred to local water users' associations, which had limited ability to collect funds from members. Pricing that is effectively based on area means that users face limited incentives for efficiency. As a result, farm-level losses are an additional 45%. Total agricultural losses, including those at main canals, are estimated at 66%, whereas minimal technical losses could be reduced to 27% (Zhakenov 2014). Modern pressurized irrigation systems would be more amenable to volumetric pricing than is existing infrastructure, and could incentivize better efficiency.

At the same time, maximum irrigation potential is under 4,000,000 ha, or 20% of cropped area. This means that, although irrigation development is very important, rainfed farming will continue to be the dominant form of agricultural production.

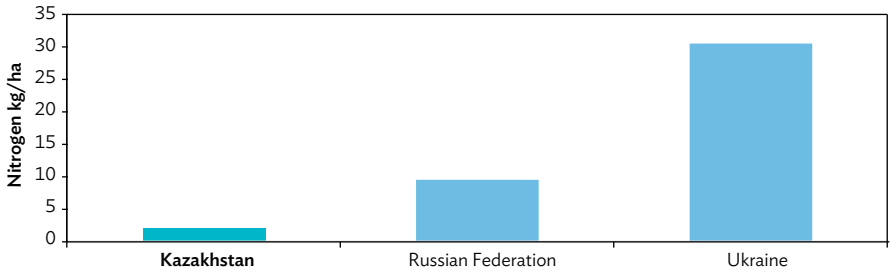
Intensification: Enhancing crop productivity under adverse environmental conditions

The main grain belt of Kazakhstan suffers from highly variable plant growing conditions due to the risk of drought and both late and early frost. Soils have also been depleted by wind erosion after the area was initially developed for cultivation in the 1950s, when soil conservation techniques were not practiced.

Due to variable rainfall, wheat yields have been highly erratic (Figure 2.8). Agriculture in Kazakhstan remains extensive rather than intensive, and uses much more land as input relative to labor and chemicals. This is despite considerable subsidies for chemical inputs. The level of fertilizer application in Kazakhstan is significantly lower

than in the other two major cereal producers in the region, the Russian Federation and Ukraine (Figure 2.19).

Figure 2.19: Fertilizer Use on Cropland in Kazakhstan, the Russian Federation, and Ukraine, 2014



kg= kilogram, ha= hectare.
Source: Food and Agriculture Organization of the United Nations. FAOSTAT. Fertilizers. http://www.fao.org/faostat/en/#data/EF (accessed 5 March 2017).

Kazakhstan's arid climate and low levels of water availability mean that water, rather than nutrition, is often the primary limiting factor for crop yields (Meinel et al. 2014, World Bank 2016). This is compounded by the fact that variable weather conditions lead to frequent crop failures, which reduce the expected value of investments in chemical inputs (Longmire and Moldashev 1999).

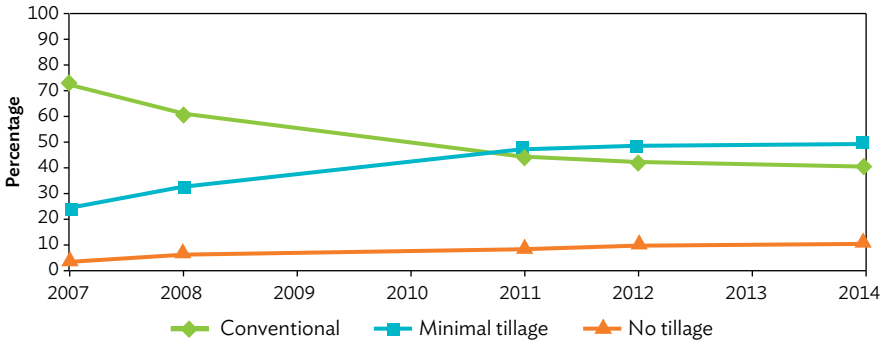
Adequate insurance schemes to deal with the risky production environment are lacking. Despite compulsory crop insurance in Kazakhstan, as of 2011, more than a quarter of cropped area remained uninsured. This is due to the reluctance of insurance companies to operate in particularly risky areas and deal with smallholders, as well as a lack of interest from farmers, who do not perceive benefits (World Bank 2011).

Three main approaches to tackle yield risk include: (i) the adoption of moisture-conserving cultivation practices, (ii) a diversification of crop rotations to diversify risks, and (iii) the use of drought-tolerant varieties. Conservation agriculture is often advocated as a means of conserving moisture. Minimal and no-tillage practices have been on the rise and now cover up to 60% of arable land in the northern rainfed areas (Karabayev et al. 2014).

However, Figure 2.20 also shows that adoption has slowed down recently. As Suleimenov et al. (2014) argue, conventional tillage has advantages for the infiltration of snowmelt water into the soil in early spring and for allowing higher nitrate

mineralization. Moreover, herbicide costs and machinery investments may make conservation agriculture prohibitively costly, and conservation agriculture's heavy reliance on herbicides can increase problems of herbicide-tolerant weeds and adverse health effects.

Figure 2.20: Adoption of Conservation Agriculture in the Northern Grain Region (% of total cropland)



Note: Data cover the three provinces of Akmola, Kostanai, and North Kazakhstan. Conventional: Multiple tillage with blades and sweeps.
Source: Authors based on Karabayev et al. (2014).

Kazakhstan's erratic patterns of precipitation and heat stress mean that cropping calendars are difficult to optimize to make use of available moisture, and that small shifts in planting dates can make large differences in crop performance. To rectify this issue, better location-specific seasonal weather forecasts are needed, along with advisory services to help translate forecasts into agronomic practice (Anderson and Kim 2014). With a very limited extension system and limited predictive modeling capacity for precise long-term weather or yield forecasts, there is much scope to improve weather information for farmers.

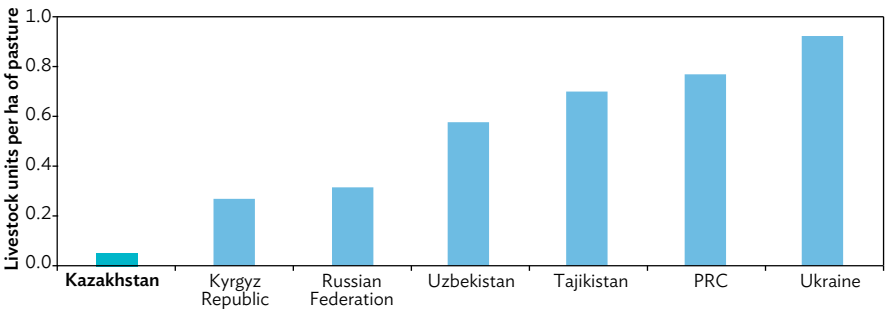
Released spring wheat varieties are based mostly on local crosses of materials from West Siberia or North Kazakhstan. Popular spring wheat varieties are medium to tall. Semidwarf varieties containing the *Rht* gene fundamental to the Green Revolution globally are not used in the region, reducing fertilizer responsiveness (Morgounov et al. 2010). According to international experts, public breeding institutes are widely underfunded, lack up-to-date facilities such as quality and double haploid laboratories, and engage very little in international exchange of knowledge and germplasm. There has been limited progress in identifying varieties specifically embedding genetic loci for drought tolerance. This suggests that there is still much unexploited potential for genetic improvement to enable productivity growth.

Rangelands: Providing conditions for effective use of a massive resource

While two-thirds of Kazakhstan is pasture area, only 32 million ha (17%) can be grazed, because 80% of the Soviet era wells were destroyed (World Bank 2016). Moreover, 76% of currently active pastures are within 5 kilometers (km) of settlements, whereas distant pastures are widely underused. The main reasons for a mismatch of livestock and pasture are a lack of infrastructure such as roads, bridges, and wells, as well as increasing populations of predators and a lack of shepherds (Kerven et al. 2016b).

Livestock density is 0.05 animals per ha of pasture land, which is substantially lower than in neighboring countries (Figure 2.21). This suggests that there is ample scope to increase livestock populations if pasture land is managed well. By one estimate, with improved infrastructure, adjusted herd migration patterns, and better market access, pastures could provide enough fodder for an additional 1.6 million tons of beef (four times current production) or 36 million tons of milk per year (seven times current production) (Hankerson et al. 2017). This could potentially turn a trade deficit in these products of $140 million, as in 2015, into $15 billion of annual net exports. That compares favorably with 2015's fossil fuel exports of $20 billion.

Figure 2.21: Livestock Density in Selected Countries, 2014

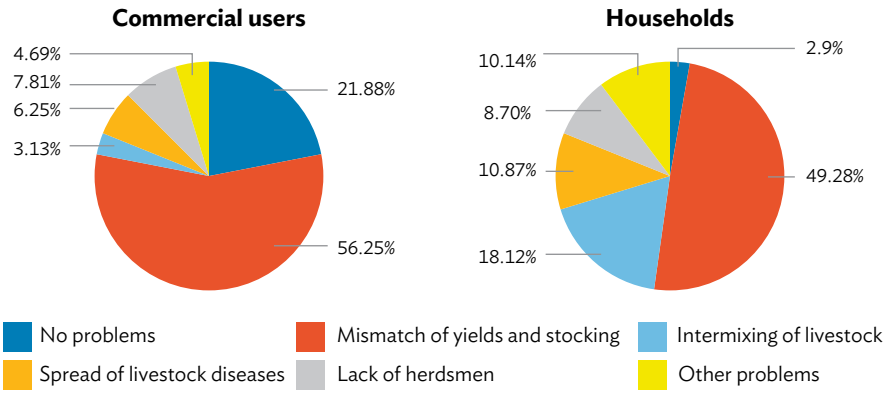


ha = hectare, PRC = People's Republic of China.
Note: Livestock units include cattle, pigs, sheep, goats, horses, and camels.
Source: Authors based on Food and Agriculture Organization of the United Nations.. FAOSTAT. http://www.fao.org/faostat/en/#data (accessed 5 March 2017).

Instead, Kazakhstan has suffered "the tragedy of the commons." Although all farm types make use of communal grazing land, household producers are most dependent upon common lands for animal nutrition. Their productivity is hampered by rangeland degradation and a lack of drinking water for animals. Case studies confirm that overgrazing and pasture deterioration are serious problems where livestock are kept near settlements (Alimaev et al. 2008, Kerven et al. 2016b).

Informal appropriation of herding rights and vague tenure arrangements on pastures tend to reduce the access of small livestock holders to public rangelands (Kerven et al. 2016a). Similarly, Petrick et al. (2014) find widespread complaints about the management of public grazing land, with overstocking most commonly reported (Figure 2.22). Intermixing of livestock is also frequently reported as a problem, which also arises from poor pasture coordination.

Figure 2.22: Problems with Communal Grazing Land by Type of User



Note: Statements by 202 communal range users surveyed in Akmola and Almaty provinces; multiple answers possible.
Source: IAMO Kazakhstan Farm & Household Surveys 2012.

While the government has put much emphasis in recent policies on the expansion of the livestock sector, the focus has been on subsidizing purchases of pedigree livestock and fodder inputs, as well as subsidizing livestock and dairy outputs. Measures to improve the local governance of pastures, such as the formation of local pasture user organizations and effective monitoring agencies, and rehabilitation of distant wells, could enhance Kazakhstan's vast pasture resources for the broader rural population.

Value chains: Resolving fragmentation

Kazakhstan's agricultural value chains often fail to connect producers to urban consumers or international trading hubs. Value chains are typically dominated by a small number of processors sourcing from large agricultural enterprises, and are concentrated in commodities with little processing and value addition. Value-chain integration is hampered because production and quality standards are not established or enforced, and because quantities and qualities offered by farmers do not match the demands of processors and marketers. Consequently, price premiums for quality

produce cannot be reaped, a lack of competition among buyers depresses producer prices, farmgate price volatility remains high, domestic value addition is forfeited, and small producers are locked into local markets with little expansion potential.

Grain processing is dominated by vertically integrated companies covering primary production, processing, and marketing. Fourteen companies form the "grain industry." They maintain a storage capacity of more than 1,000,000 tons and own mills and grain terminals at the Caspian Sea (Syzdykov et al. 2015). Processing is focused on bread and bakery products, whereas complex processing and value addition are limited.

Kazakhstan inherited the Soviet storage system where grain is stored mainly in large "elevators," which are centralized storage and trading facilities. After privatization, the ownership and management of elevators ended up mostly with the agro-holdings (Box 2.1). Storing and handling of their own grain is their top priority, while delivering storage services to other producers and traders is just an additional source of income. In a bumper crop year such as 2011, elevators exert considerable market power, and producers struggle to access storage. As loan interest rates are high and the payoff period for storage facilities is relatively long, many farmers cannot afford to establish their own on-farm storage.

Elevator market power is exacerbated by a grain warehouse receipt system introduced in 2001, for which about 200 elevators are licensed (OECD 2013). This is now a standard element of grain export finance. Farmers who wish to export their crop and participate in the advantages of warehouse receipt funding eventually have to deliver wheat to an elevator. Participation in commodity exchanges is also generally open only to wheat farmers who sell to elevators, as it depends on warehouse receipts. Futures contracts and other derivatives are intended as an element of commodity exchanges, but the largest commodity exchange (the Eurasian Trading System) lists no members that trade in futures contracts.

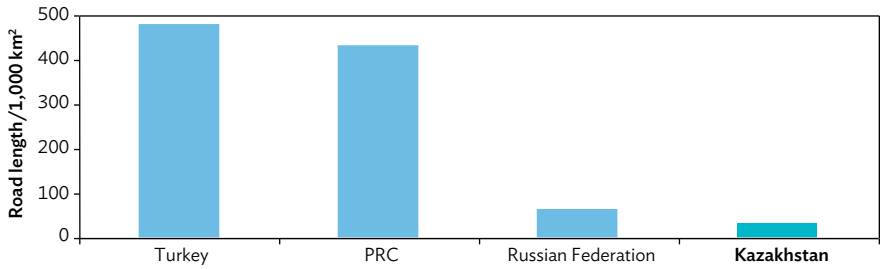
Farmers often complain that elevator laboratories try to underrate the gluten content in wheat and overrate humidity, impurities, and admixtures (Petrick and Oshakbaev 2015). Underrating gluten allows the elevators to offer depressed prices, and overrating the content of impurities and admixtures allows charging more for cleaning services. Smaller individual farmers typically do not sell directly to the elevator but rather use local traders or intermediaries to market their grain.

Transport of grain has become increasingly problematic for Kazakhstan as a landlocked country with the closest access to international ocean freight via Black Sea ports. Transport to those ports via the Russian Federation railway system is expensive. The Aktau seaport grain terminal is the most attractive point for exporting to Caspian Sea

countries. Railways to Afghanistan, Turkmenistan, and Iran pass through Uzbekistan, where political tensions have provoked a series of rail service interruptions. Although Kazakhstan's railways own a sufficient number of cars for operations in years of average harvest, in peak periods shortages need to be compensated by expensive rentals from Russian Federation companies. Exports to the PRC are impeded by high transportation costs and nontariff barriers for grain delivery (Petrick and Oshakbaev 2015).

Road transport is hampered by low road density compared with neighboring countries (Figure 2.23). Moreover, much of the road network is in poor condition, as about 60% of subnational roads require rehabilitation (Linn 2014).

Figure 2.23: Road Density per 1,000 Square Kilometers of Land Area, Selected Asian Countries, 2011



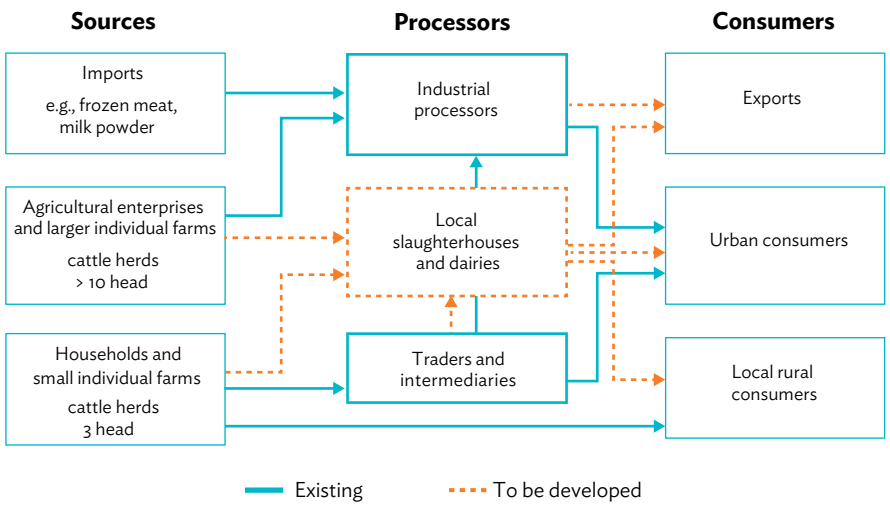
km² = square kilometer, PRC = People's Republic of China.
Source: United Nations Economic and Social Commission for Asia and the Pacific. ESCAP Online Statistical Database. http://data.unescap.org/escap_stat/ (accessed 1 May 2017).

Improved cattle and dairy value chains are required to access high-value markets for processed livestock products. Marketing channels differ considerably between agricultural enterprises with large herds and the individual household producers and private/smallholder farmers with small herds. Household producers and private/smallholder farmers sell their cattle mostly to traders (intermediaries), who are responsible for acquiring slaughter venues and necessary veterinary certificates (OECD 2013). Neither of these channels is subject to the strict quality and sanitary standards typical of high-value meat chains. In contrast, Petrick and Oshakbaev (2015) report that agricultural enterprises sell cattle directly to processors (50%), export markets (30%), and traders/intermediaries (20%).

Both beef and dairy value chains are subject to a bifurcation that prevents the integration of small-scale producers with high-value processing and outlets (Figure 2.24). Existing industrial processors supply to urban consumers with higher incomes, but they are dependent on imports of raw material. Export channels for

domestically produced livestock are not developed. Small producers mostly produce for local consumers and have limited connection to high-value markets through semiprofessional intermediaries. Local slaughterhouses and dairies are insufficient to link the two branches of the value chain (OECD 2013; Petrick and Oshakbaev 2015).

Figure 2.24: Value Chains of Beef and Dairy Production in Kazakhstan



Source: Petrick and Oshakbaev (2015).

Similar problems prevent value addition in other potentially promising chains, such as fresh fruits or vegetables. While produced widely on small farms, critical assets for ensuring consistent quality, such as storage facilities or cooling and sorting equipment, are lacking. Many small agricultural producers are locked into saturated local markets or depend on monopsonistic trading arrangements. Consequently, they refrain from integrating into value chains and are restricted to subsistence production.

Small and medium-sized enterprises active in crop and livestock marketing, processing, and intermediation are emerging (OECD 2013). However, these enterprises are constrained by high transport and transaction costs. A crucial bottleneck has been access to credit to pre-finance purchases from farmers. Crediting terms have considerably worsened after the recent exchange rate turbulence and the prolonged crisis of the banking sector in Kazakhstan (World Bank 2017). Moreover, Russian Federation banks active in Kazakhstan downsized operations due to post-2015 financial sanctions imposed on the Russian Federation.

The government has made the development of value chains and export channels a priority, but low coordination among producers and processors has impeded progress. One way of promoting coordination is via farmer cooperation. However, there are also important roles for the government in establishing and enforcing standards, following transparent business practices, and disseminating knowledge. Such measures can contribute to an improved business climate that encourages entry into the food sector by investors and expanded value-added processing such as pasta making, bakeries, or cold chains in dairy and meat.

2.4. Policy Options to Unlock Agricultural Potential

Kazakhstan's state program aspires to improve productivity, and recognizes the need to support small farmers. Most resources of the program consist of subsidies for inputs, facilities, and outputs. However, payments from public budgets for private goods such as agricultural inputs, machinery, or livestock induce the overconsumption of inputs when their marginal returns are less than their full economic costs to society. This not only creates economic welfare losses but also reduces competitiveness through input use inefficiency. Much international evidence shows that such subsidies often impede economic diversification and benefit only small and privileged groups of recipients (World Bank 2007). Moreover, they often come at the cost of investments in public goods such as agricultural research, irrigation, and roads.

To unlock faster agricultural growth, public transfers should be redirected toward proven productivity-enhancing investments. Yet this is not enough. How agricultural development is approached and how enabling conditions for agricultural growth are established also need substantial attention.

Recommendations here are premised on the economic principle that the public and private sectors have distinct roles, with the private sector able to most efficiently allocate resources when markets function effectively. The public sector's role should be limited to intervening only where market failures occur, such as in the provision of public goods. This implies a shift from attempting to direct agribusiness through detailed targets and active intervention in the sector to provision of reliable and high-quality public goods and services that allow market forces to direct agricultural modernization. Such public services should be endowed with sufficient human, financial, and political resources to support entrepreneurs in a flexible manner without interfering in natural processes including booms, busts, and restructuring among agribusinesses.

Redirect subsidies toward provision of public goods

Reducing subsidies can improve productivity. A large share of Kazakhstan's input subsidies has been for fertilizer and other chemical inputs for spring wheat production by agro-enterprises, as well as area payments (see section 2.1). However, as demonstrated earlier in this chapter, spring wheat yield response to fertilizer is not consistent under the low water availability prevalent in the country (section 2.3). Moreover, the efficiency of enterprises in using inputs is significantly lower than for individual farmers, who have received far fewer subsidies. This implies that subsidies have actually reduced productivity by mostly supporting inefficient practices and producers. Meanwhile, water is the variable input with greatest factor response, but water access through public goods (irrigation) has received relatively little support until recently.

For cattle production, enterprises have lower technical efficiency than individual farms. Large cattle feedlot operations of several thousand head have been a key target of government investment subsidies and recipients of output subsidies. The FAO Investment Centre (2010) finds that such operations hardly break even unless they are subsidized. Basic economics suggests that reductions in subsidies help to improve productivity in competitive markets.

Subsidy reform can begin with better targeting. Agricultural subsidies often have been implemented in countries across the globe to bridge disparities between rural and urban incomes when labor productivity growth and wages in agriculture do not keep pace with other sectors during structural transformation. In such cases, subsidy reform presents distributional challenges because it removes transfers to lower-income populations that may not have immediate employment options outside of agriculture. To avoid regressive distributional implications, subsidy reform can be undertaken by recognizing that the primary goal of subsidies may be to assist disadvantaged populations. In that case, subsidies should be restricted to just those populations. Subsidy reform could begin by improving transparency of subsidy allocation, restricting subsidy eligibility to farms below a certain income threshold, and increasingly means testing support to those farms over time.

Expenditures on subsidies can be redirected to investments that raise productivity. Revenues saved if subsidies are reduced can be redirected toward productivity-enhancing public goods that will improve Kazakhstan's long-term competitiveness in agriculture. Unlike subsidies, there is ample evidence of high economic returns to investments in innovation, water management, and infrastructure for connectivity such as roads (Fan et al. 2002, Fan et al. 1999).

Make public services broadly accessible

Public services can better serve more efficient family farms. In the past, the government tended to favor large agro-holdings by granting them preferential access to land and by generally pursuing a policy of industrial cluster formation and "picking winners" in agriculture (Wandel 2010). Skewed resource allocation was exacerbated when agro-holdings experienced financial difficulties, which were addressed with public bailouts that consumed substantial resources.

However, as shown in section 2.3, enterprises are significantly less efficient and productive than family farms, despite receiving most state support. As recognized in recent policy, support can better build on the strengths of households and individual farms as efficient units.

More equitable access to services promotes productivity. With the new state program, the government has acknowledged the importance of smallholders for agricultural development in Kazakhstan and committed to expand the range of support and services to them. However, beyond political commitment, such a strategy requires investment in infrastructure and institutional reforms that make services better accessible for small producers (Poulton et al. 2010).

To ensure that the most productive segments of Kazakhstan's agriculture sector flourish, they need to be facing a "level playing field." This means that access to public resources should not be skewed to favor enterprises or agro-holdings that should be allowed to fail and be restructured into smaller, more viable operations when market forces so dictate.

Public service expansion is needed to reach a larger share of family farmers. Under Kazakhstan's low intensity of public service provision for agriculture, those services cannot reach large numbers of individual farmers, and access is skewed toward larger, better connected entities. Reaching substantial shares of family farms requires vastly expanded public services (extension, roads, etc.) and more competitive rural markets. It also requires simplifying access procedures and eligibility requirements for financing, land access, and other services. Diverting resources from subsidies to public goods will also make resource allocation among farms more balanced.

Investment in improved integrated water management is critical. Under the state program, a target has been set to rapidly rehabilitate 600,000 ha of former irrigation systems by 2021. To meet this target, the Water Resources Committee has initiated a large series of irrigation investment projects for support, which largely

consist of rehabilitation of former surface schemes that were plagued by problems and abandoned. However, transboundary water sources still need to be secured to ensure adequate irrigation water supplies in the face of increasing use of those waters by Kazakhstan's neighbors (FAO 2013). A more comprehensive water resources development plan that takes a basin approach to water resources planning, establishes clear incentives for efficiency (including effective volumetric pricing), and resolves operation and maintenance issues is needed to maximize value addition from irrigation investments.

Connectivity can be improved from low levels. Rural transport infrastructure is in need of additional investment to keep transport costs competitive (see section 2.3). This is especially important given Kazakhstan's vast size. To make better use of the country's huge pasture resources, they must be made more accessible through better road networks. Similarly, the road, railway, and port network could be expanded to reduce the costs of bulk transport of agricultural commodities. Although landlocked, improved transport infrastructure would allow Kazakhstan to better exploit its role as a transit corridor between East and West, given its advantage of proximity to large markets such as the Russian Federation and the PRC. To complement road connectivity, market connectivity can also be enhanced through better physical infrastructure such as wholesale markets and storage facilities, as well as soft infrastructure such as real-time market information systems.

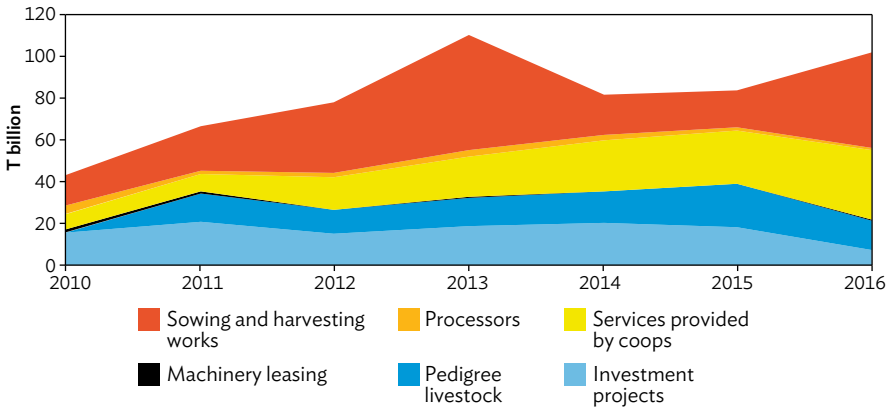
Reform agricultural finance

Agriculture remains unattractive to private finance without reforms. With vast scales of operation, many Kazakhstan farms have large needs for investment in complementary inputs to land, on both a seasonal and a long-term basis. At the same time, Kazakhstani agriculture faces substantial climate fluctuations and associated production risks. The recent experience with large agricultural conglomerates' bankruptcy and nonrepayment of loans (Box 2.1) has contributed to a perception in the finance sector that agriculture is risky, and private credit provision (excluding KazAgro lending to banks) has declined since 2011 from what were already only modest levels (Oshakbayev 2017).

Farmers pose a risk to creditors because their largest asset for production—land—is largely illiquid, as subleasing or lease transfers are restricted (section 2.1). Liberalization of the land market (allowing subleases) would allow collateralization of land to reduce the risk for agricultural lenders and increase agricultural lending attractiveness.

Public sector agricultural finance has left gaps to fill for productive investments. The public sector has stepped in to fill credit gaps, although there are important limitations to what it has offered. A striking pattern in the credit available is that it principally has a short-term orientation toward variable input costs or "working capital" for crops within a season of production (Figure 2.25). Many of these costs are already reduced substantially by input subsidies, which also induce input usage, so the effect of credit on farm behavior may be limited. Moreover, evidence offered above suggests that many of these inputs may have limited returns, making them unattractive to borrowers. Long-term investment projects would benefit from increased credit allocation, as they are least attractive to private finance and may offer greater effects on productivity.

Figure 2.25: Portfolio of Subsidized Credit Provided by ACC and KAF, 2010–2016



ACC = Agrarian Credit Corporation, KAF = KazAgroFinance.
Sources: OECD (2013); ACC data tables provided to authors in 2017; KAF data tables provided to authors in 2017.

Credit risk appraisal for agriculture can be improved as a public service. Enterprises have received most public finance, even though they are the clients most preferred by private banks, which provided 98% of 2016 agricultural lending to them (Oshakbayev 2017). Yet enterprises have also had a disproportionate share of nonperforming loans, compared with family farms. Plans under the state program to increase intermediate public agricultural finance via private banks may exacerbate credit misallocation to less efficient and less financially viable enterprises. The public sector could help private sector creditors to better appraise credit risks in agriculture through the development of improved credit scoring procedures, analytical services, and capacity building, which may extend the reach of private credit.

Credit cooperatives can be liberalized to allow financial independence. ACC is linked to a network of some 183 "rural credit partnerships." Unlike traditional credit cooperatives in other countries, the credit partnerships have no autonomy in decision making (Gaisina 2007). They are not allowed to take regular savings, and have no control over the deposits made by farmers. Only registered enterprises (including individual farms), not private individuals, can become members, and there are only 13,700 members.

Rules for credit cooperatives/partnerships could be liberalized to allow them to raise funds from members, achieve financial independence, and increase the number of financial products offered. This could allow a more sustainable form of local credit to emerge.

Risks can be better addressed via agricultural insurance reforms. Compulsory weather insurance for widely cultivated crops has been costly, even as insurers have faced heavy losses, and insurable losses are capped at low levels per hectare (World Bank 2011). Moreover, actual claims are often litigious, with payouts well below requested amounts (OECD 2013). However, there is scope to change this situation. Current insurance is via individual claims-based approaches, which require transaction-cost intensive individual verification of indemnities. Index-based insurance does not depend on verification of individual claims, and could be a much less costly alternative to reach small family farms, provided that statistical systems are sufficiently reliable.

Furthermore, only small farmers need public intervention to induce appropriate decisions regarding insurance, as larger farmers can manage assets and savings to retain risk. This means that insurance need not be compulsory, and that market interventions may be targeted to risk-avoiding smaller producers to support better productivity. Making insurance coverage optional and more flexible could allow insurance underwriters to better appraise client risks and offer a wider range of products to meet client needs. By better ensuring farm ability to meet contractual obligations in the context of weather uncertainty, improvement of the insurance market can also enable broader participation in derivative commodity markets, so that price risks can also be better managed. Index insurance may also be interlinked with input credit, where the interest rate embeds the premium, and borrowed funds do not need to be repaid when the index is triggered. If sufficient capacity were established, input and service cooperatives could also serve as important insurance conduits for smallholders.

Agriculture can benefit from broader finance sector reform. Plans to increase public agricultural lending through private bank intermediaries will increasingly

link the fate of farms to that of the banking system. A high share of nonperforming loans in the wake of the global financial crisis in 2008, currency volatility, and the recent economic slowdown have severely weakened the general banking system in Kazakhstan (World Bank 2017). Further coordinated and transparent efforts by the government and the supervisory bodies of monetary policy are required to reestablish the health of the national banking sector. Long repayment periods and climate risks make the agriculture sector particularly vulnerable to banking crises.

Build capacity for innovation and knowledge management

Investment in agricultural research, extension, and innovation can be expanded. Agricultural growth depends to a large extent on the adoption of technical and institutional innovations. This is recognized by the guiding principles of the "Kazakhstan 2050" strategy around economic modernization and the upgrading of education and professional skills in science, technology, and engineering. Even so, public spending on research and development (R&D) in agriculture relative to the value of production, termed "agricultural research intensity," has fallen to very low levels (Figure 2.26). As one comparison, the United States has an intensity that is more than 25 times that of Kazakhstan.

Figure 2.26: Share of Agricultural Production Value Spent on Agricultural Research, 2005–2015

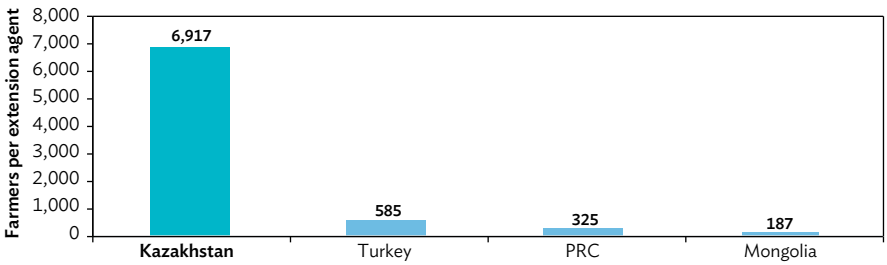
R&D = research and development.
Source: Authors based on data from the National Agrarian Scientific Educational Center (2017).

The innovation system for agriculture in Kazakhstan needs revitalization to underpin more rapid productivity growth. With Kazakhstan's climate constraints, agricultural productivity growth is especially dependent on developing drought-tolerant varieties and climate-optimized cultivation practices. Most obviously, research and extension need expanded investment, especially as Kazakhstan has a unique growing

environment that limits spillovers from other countries and regions. However, the research and extension systems also need reorientation and reform.

Fragmentation of extension can be reduced. Kazakhstan has far fewer extension agents per farmer than other countries in the region (Figure 2.27). Moreover, recent restructuring of extension services has assigned a greater role to the National Chamber of Entrepreneurs (Atameken) at the expense of the National Agrarian Scientific Educational Center (NANOTS), the public agricultural research system. As extension is a new function for Atameken, this creates a new set of learning curves and transaction costs for implementing agricultural knowledge support services. To reduce these costs, extension could be consolidated closer to technology providers.

Figure 2.27: Farmers per Extension Agent, Selected Countries



PRC = People's Republic of China.
Note: Number of extension agents for 2015; number of farms from latest available census data.
Source: Authors based on Absattar (2015); Food and Agriculture Organization of the United Nations. FAOSTAT.

At the same time, the extension system has remained focused on unidirectional, top-down techniques comprising seminars and formal training. Interactive, field-based, and participatory techniques, such as the "visit" component of the "training and visit" extension technique, or farmer field schools, could be further applied, as they have proven to be far more effective in other contexts (Waddington and White 2014).

Social science research capacity for agriculture can be expanded. Research itself has had limited on-farm engagement or use of social science techniques for evaluating agronomic technologies or agricultural policies, and social science research remains very limited in Kazakhstan (OECD 2017b). As a result, there are few mechanisms to ensure that agricultural technologies are relevant to user needs or adoption contexts or that broader agricultural expenditures are effective. Social science and economic capacity of the research system should be strongly enhanced, and should serve to orient evidence-based agricultural policies.

Private sector investment in research can be attracted. It has been increasingly recognized that agricultural innovation systems involve much more than public agricultural research and extension systems (World Bank 2012). Private funding of R&D occupies an increasing share of agricultural research investment in leading developed countries, and private fee-for-service has also emerged in such contexts. Robust intellectual property protection, upstream technology development by the public sector, and contract enforcement are necessary for such broadening of investment sources.

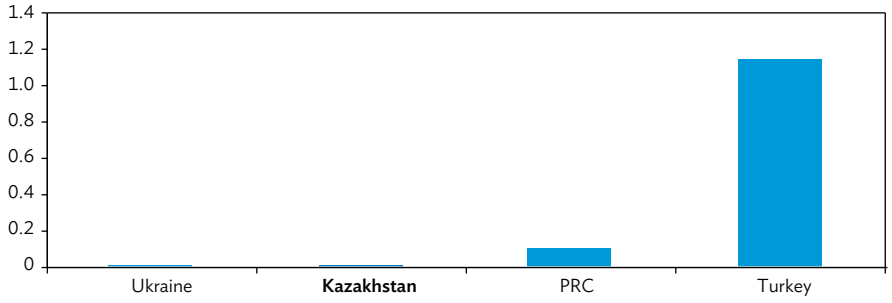
Research network linkages and technology transfer can be accelerated. Given the small size of Kazakhstan's scientific population, robust innovation systems depend upon building networks and linkages among research institutes, both domestically and internationally. Many of the research agencies in Kazakhstan operate in a fragmented fashion and have limited engagement with international research partners, such as in varietal improvement (section 2.3). These partnerships can be expanded to better build economies of scale in research.

Develop and empower appropriate local governance institutions

More effective public services depend on better local institutions. Previous sections have shown that to unlock the potential of agriculture, more effective provision of public services related to knowledge, finance, land administration, and water management is essential. Weak administrative capacity of local governments and overlapping responsibilities across levels of government are obstacles to further progress in this direction (Linn 2014, OECD 2014). Strengthened local government is a stepping stone for broader empowerment of local governance institutions that connect service provision to the needs and preferences of beneficiaries.

Effective collective action depends on developing an appropriate enabling environment. The formation of cooperatives and their expansion to large numbers of members is a cornerstone of the state program (section 2.1). Although the vast majority of Kazakhstan's producers are small in scale and should benefit from service, input, processing, or marketing cooperatives, the observed degrees of cooperation have remained far lower in Kazakhstan than in most comparator countries (Figure 2.28). Unfamiliarity with democratic models of cooperation, limited startup capital, low management capacity, and inconsistent cooperative legislation have impeded prior development (Sedik and Lerman 2015, OECD 2015). Constant returns to scale found in this chapter for key products also mean that production cooperatives may not offer inherent benefits from increasing scale.

Figure 2.28: Number of Cooperative Memberships per Farmer in Selected Countries



PRC = People's Republic of China.
Note: Number of cooperative memberships in Ukraine and Kazakhstan are nil compared to PRC and Turkey.
Source: Authors based on OECD (2015); Zheng et al. (2012); Lowder et al. (2016).

Rapid cooperative promotion also poses risks. "False cooperatives" may be established with the sole purpose of absorbing subsidies (Sedik and Lerman 2015). Many of Kazakhstan's farmers still reject the idea of state-led cooperation, given the history of forced collectivization under socialism (Asanova 2017). The provision of state support has had mixed results elsewhere, while improving broader aspects of the enabling environment, such as legal frameworks, have often proven to be more important (Box 2.3).

Kazakhstan's 2015 Agricultural Cooperative Law has taken important steps to address deficiencies in the previous five cooperative laws issued since independence, but the focus remains strictly on a subset of possible cooperative types (Asanova 2017). It may also be important to help foster a range of collective action mechanisms, such as other types of farmer groups or associations, which can often be important precursors to cooperatives, rather than focusing only on formal cooperative support.

Building local capacity is important for successful collective action. The two principal forms of agricultural cooperatives in Kazakhstan are production cooperatives, in which farmers pool their assets for joint production, and "rural consumers' cooperatives," which are akin to the service cooperatives common in many countries. Although recognized by recent legislation, there are few storage, sales, or processing cooperatives (Asanova 2017). Producer coops are often the successors of Soviet collective farms, and service coops have emerged very slowly. Many registered consumer cooperatives are inactive (OECD 2015) or focus on specific activities that were initiated and financially supported by the government, essentially credit and water governance.

Box 2.3: Challenges in Creating and Maintaining Agricultural Service Cooperatives

Agricultural service cooperatives are membership-based producer organizations with elected leaders accountable to their constituents. In many industrialized countries, they have contributed to the economic success of family farms. At the same time, creating and maintaining cooperatives also involves challenges (Bijman et al. 2016, World Bank 2007, Garnevska et al. 2011):

- Managerial capacity and human capital are required to effectively link cooperatives to high-value chains.
- Norms and values of solidarity and equity may clash with requirements for professional, business-oriented management based on efficiency and innovation.
- Heterogeneity in membership may pose challenges in reconciling the different interests represented by large and small farmers or younger and older members.
- A stable and conducive legal environment is critical to enable cooperatives to become legally registered and undertake effective contracts.

Many of the classical cooperative movements (such as the "Rochdale pioneers" or the cooperatives founded by Friedrich Wilhelm Raiffeisen in Germany) stressed the selection of members based on their economic capability, discipline, and talent under the guidance of exogenous promoters who possessed a social and political overview as well as moral authority (Muller 1994).

International experience with state promotion of cooperatives has been mixed, as organizations became dependent on subsidies and governmental support that undermined their self-management capacity rather than empowered it. To avoid this pitfall, funds could be disbursed using a demand-driven approach, under which cooperatives select capacity-enhancing services and even service providers from a menu, and providers then get directly funded from the government. Services may prioritize specific investments into the managerial capacity and knowledge base of cooperative leaders (World Bank 2007).

Source: Authors.

In 2003, a legal framework was established for water users' associations (WUAs) as "rural consumers' cooperatives." WUAs were to be formed via bottom-up processes, wherein farmers needed to come together to register the entities as nongovernment organizations, with defined leadership and members. Recognized WUAs could access finance from the government for undertaking repair and maintenance work on irrigation facilities. In parallel to WUAs, district water authorities retained mandates for administering irrigation systems, and sometimes competed with them. Many WUAs became financially insolvent as a result of financial mismanagement and inability to attract member contributions (Wegerich 2008, Zinzani 2015). In recent years, the government has reduced its support to WUAs, and the Water Resources Committee intends to centralize control and ownership of irrigation assets again.

To avoid these types of outcomes, it is essential that cooperatives be supported by measures to build management, planning, and financial capacity sufficient to sustain operations. Current cooperatives have an average size of 26 members, which would imply that 20,000 cooperatives of this scale would need to be established by 2021 to meet state program targets (Asanova 2017). Building capacity for such numbers of cooperatives, or making fewer but much larger coops, is a task that requires massive capacity building, which may be difficult with the current small numbers of extension personnel. A focus on quality of cooperation mechanisms may ultimately be more important than quantities of cooperative bodies or memberships.

Improve the business climate for private sector agricultural investment

More flexible land markets can support better land productivity. As noted earlier, agricultural restructuring has the potential to contribute to increased productivity. Achieving such restructuring depends on the ability of land markets to efficiently allocate land to users. The partial nature of Kazakhstan's land reform, with most agricultural land held by the State and administered under nontransferable long-term leases, has left land markets insufficiently fluid for this to happen. More efficient household producers and individual farms are crowded out of the rental market, because artificially low rental rates create excess demand among more established enterprise farms (Petrick and Oshakbayev 2015). Nontransferable leases also impede restructuring of insolvent enterprises. The limited duration of leases, and the potential loss of leases should cultivation cease, mean that risk for long-term investment is also exacerbated.

Across the globe, large-scale farming by investor-held agro-enterprises has rarely been efficient or socially optimal, and has often been driven by political economy factors, rather than economies of scale (Binswanger et al. 1995). However, large enterprises have often played an important role as pioneers to develop infrastructure and farmlands that have been transferred to more efficient family farmers, either as a business model or as part of agricultural restructuring (Byerlee et al. 2015). Unlike agricultural production, land development has economies of scale and benefits from specialized expertise that enterprises can better mobilize. For agro-enterprises to play an effective land improvement role, land markets must allow enterprises to recover investments by selling or leasing land after improvements have been made. To this end, land leases may be made domestically transferable and more flexible.

Investment risks can be reduced by stable, transparent policy. Investment among individual farms and households is limited by high transaction costs and low

perceived returns in light of many risks (Petrick et al. 2017). Inherent climate risks are exacerbated by commodity price volatility, high transport costs, and other policy risks. It remains as a core challenge to reduce risks where possible.

Policy instability is a source of investment risk due to recurrent restructuring of KazAgro and its affiliates, as well as frequent changes in subsidy programs. KazAgro has been repeatedly earmarked for privatization and restructuring, and agricultural products prioritized by government programs have often changed. Subsidy requirements shift frequently, and rules on subsidy eligibility are inconsistently applied by local government officials (Petrick and Pomfret 2017).

If a long-term approach is adopted toward supporting the sector through enhanced public goods and services, coupled with a predictable phase-out of subsidies and market interventions, policy risks may be substantially reduced. This can lead to greater investment in intensification and value addition.

A "whole of government" approach can streamline governance. Interdepartmental coordination within the government can be improved through a "whole of government" approach (Christensen and Laegreid 2007). Currently, there is considerable fragmentation. For example, rural land administration involves not only the MoA, but also the Ministry of Energy, and various local agencies at different levels. Policies are implemented by regional administrations that can augment schemes with their own funds, leading to regional inequities and cross-regional inefficiencies. To ensure that many overlapping mandates contribute to high level goals of advancing the sector, there could be a cross-government coordinating authority. This authority could translate goals into individual mandates and objectives for individual agencies that fit into a larger coherent, integrated strategy for value-chain development.

2.5. Conclusions

During the past decade, the Government of Kazakhstan has earmarked an unprecedented and rising budget allocation to the agriculture sector. Yet the sector continues to perform below its potential, even following the devaluation from 2014. Kazakhstan has remained a food importer, and yields for its principal crops are far below world averages. After nearly a quarter century of independence, aggregate production has still barely reached levels achieved during Soviet times. More than a quarter of the population remains employed in an agriculture sector that generates just 5% of GDP.

Although the government provides substantial funding for the agriculture sector, it spends most of it on input and output subsidies, of which a lion's share has been captured by a small number of enterprises and agro-holdings. The evidence presented in this chapter suggests that these few beneficiaries of subsidies are less efficient and less productive than the family farms that constitute the bulk of Kazakhstan's agricultural value added. It is investment in public services and institutional reforms that can provide a long-term basis for productivity growth in the sector, rather than budgetary transfers that favor inefficient production modalities.

If agriculture is to contribute more to export revenue and economic diversification, action is required to make public services accessible for all types of producers. Crucial public services to be improved include water and road infrastructure. State support to agricultural finance can move away from direct input finance to public services in risk appraisal. More capacity should be built for innovation and knowledge management, including public investments in agricultural research and a more coherent and effective extension system. Finally, more effective services require well-functioning local institutions. Local collective action can be a tool to improve access to services, finance, and human capital for small producers, but it requires a supportive environment and should not be based on incentives to absorb subsidies.

More so than some of its peers, the Government of Kazakhstan has recognized the opportunities for agriculture to promote economic diversification, and it has the fiscal basis to substantially improve the conditions for sector development. Combining political will with the right public investments will bring Kazakhstan closer to its goals of becoming an agricultural powerhouse and having a more diversified economy.

References

Absattar, T. 2015. The Status of Rural Advisory Services in the Republic of Kazakhstan: A Collaborative Country Assessment. Modernizing Extension and Advisory Services. Washington, DC: USAID.

Agrarian Credit Corporation (ACC). Data tables provided to authors in 2017. Unpublished.

Akhmetov, A. 2017. Testing the Presence of Dutch Disease in Kazakhstan. *Munich Personal RePEC Archive Paper*. No. 77936. https://mpra.ub.uni- muenchen.de/77936/1/MPRA_paper_77936.pdf.

Alimaev I., C. Kerven, A. Torekhanov, R. Benhnke, K. Smailov, V. Yurchenko, Z. Sisatov, and K. Shanbaev. 2008. The Impact of Livestock Grazing on Soils and Vegetation around Settlements in Southeast Kazakhstan. In R. Benhke, ed. *The Socio-Economic Causes and Consequences of Desertification in Central Asia.* Dordrecht: Springer. https://doi.org/10.1007/978-1-4020-8544-4_5.

Anderson, G. and Y. Kim. 2014. Mid-Level Assessment: Climate Forecasting in Kazakhstan. Report prepared for USAID. Washington, DC: Engility/International Resources Group.

Asanova, D. 2017. Analysis of the State Program for Agriculture Development 2017–2021 in part of cooperatives' development. Draft consultant's report submitted to ADB.

Barrett, C. B., M. F. Bellemare, and J. Y. Hou. 2010. Reconsidering Conventional Explanations of the Inverse Productivity-Size Relationship. *World Development.* 38 (1). pp. 88–97. DOI: 10.1016/j.worlddev.2009.06.002.

Battese, G. E. and T. J. Coelli. 1992. Frontier Production Functions, Technical Efficiency and Panel Data: with Application to Paddy Farmers in India. *The Journal of Productivity Analysis.* 3. pp. 153–159.

Bijman, J., R. Muradian, and J. Schuurman, eds. 2016. *Cooperatives, Economic Democratization and Rural Development.* Cheltenham: Edward Elgar Publishing.

Binswanger, H. P., K. Deininger, and G. Feder. 1995. Power, Distortions, Revolt and Reform in Agricultural Land Relations. *Handbook of Development Economics.* 3. pp. 2659–2772.

Byerlee, D., W. A. Masters, and D. Robinson. 2015. Investment in Land Development: An Overlooked Dimension of the Land Grab Discourse on Frontier Agriculture. Paper presented at the pre-conference workshop on agro-holdings and other types of mega-farming operations at the 29th International Conference of Agricultural Economists. Milan, Italy. 8–14 August.

Carletto, C., S. Savastano, and A. Zezza. 2013. Fact or Artefact: The Impact of Measurement Errors on the Farm Size-Productivity Relationship. *Journal of Development Economics.* 103. pp. 254–261. Dx.doi.org/10.1016/j.jdeveco.2013.03.04.

Christensen, T. and P. Lægreid. 2007. The Whole-of-Government Approach to Public Sector Reform. *Public Administration Review*. 67 (6). pp. 1059–1066. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.611.6124&rep=rep1&type=pdf .

Dudwick, N., K. Fock, and D. J. Sedik. 2007. *Land Reform and Farm Restructuring in Transition Countries: The Experience of Bulgaria, Moldova, Azerbaijan, and Kazakhstan*. Washington, DC: World Bank.

Fan, S., P. B. R. Hazell, and S. Thorat. 1999. *Linkages between Government Spending, Growth, and Poverty in Rural India*. Research Report. 110. Washington, DC: International Food Policy Research Institute.

Fan, S., L. Zhang, and X. Zhang. 2002. *Growth, Inequality, and Poverty in Rural China: The Role of Public Investments*. Research Report. 125. Washington, DC: International Food Policy Research Institute.

FAO Investment Centre. 2010. The Meat Sub-Sector. *Highlights on Four Livestock Subsectors in Kazakhstan*. Rome: FAO.

Food and Agriculture Organization of the United Nations (FAO). 2013. *Irrigation in Central Asia in Figures: AQUASTAT Survey 2012*. FAO Water Reports. 39. Rome: FAO.

FAO/International Institute for Applied Systems Analysis (FAO/IIASA). 2011. Global Agroecological Zones (GAEZ v3.0). Rome, Italy: FAO and Laxenburg, Austria: IIASA. http://gaez.fao.org/Main.html# (accessed July 2017).

Forbes, Kz. 2016. How the grain companies of Kazakhstan lost their financial independence, 16 June 2016, https://forbes.kz/process/kreditnyie_istorii_1/

Gaisina, S. 2007. Rural Credit Partnerships and Their Role in the Development of Agriculture in Kazakhstan. In M. Petrick and G. Buchenrieder, eds. *Sustainable Rural Development: What Is the Role of the Agri-Food Sector?* pp. 148–63. Halle (Saale): IAMO.

Garnevska, E., G. Liu, and N. Shadbolt. 2011. Factors for Successful Development of Farmer Cooperatives in Northwest China. *International Food and Agribusiness Management Review*. 14 (4). International Food and Agribusiness Management Association.

Hankerson, B. R., F. Schierhorn, A. V. Prishchepov, C. Dong, C. Eisfelder, and D. Muller. 2017. A Model for the Spatial Distribution of Livestock and Pasture in Kazakhstan. Halle (Saale): IAMO.

Ibatullin, S., V. Yasinsky, and A. Mironenkov. 2009. The Impact of Climate Change on Water Resources in Central Asia. Sector Report. Almaty: Eurasian Development Bank. http://www.vinokurov.info/assets/files/EDB%20Report%206%20climate%20eng.pdf.

Karabayev, M., A. Morgounov, H. J. Braun, P. Wall, K. Sayre, Y. Zelenskiy, R. Zhapayev, A. Akhmetova, V. Dvurechenskii, K. Iskandarova, T. Friedrich, T. Fileccia, and M. Guadagni. 2014. Effective Approaches to Wheat Improvement in Kazakhstan: Breeding and Conservation Agriculture. *Journal of Agricultural Science and Technology*. 4. pp. 761–65.

KazAgroFinance (KAF). Data tables provided to authors in 2017. Unpublished .

Kerven, C., S. Robinson, R. Benhke, K. Kashenov, and E.J. Milner-Gulland. 2016a. A Pastoral Frontier: From Chaos to Capitalism and the Recolonisation of the Kazakh Range-lands. *Journal of Arid Environments*. 127. pp. 106–119.

_____. 2016b. Horseflies, Wolves and Wells: Biophysical and Socio-Economic Factors Influencing Livestock Distribution in Kazakhstan's Rangelands. *Land Use Policy*. 52. pp. 392–509.

Kraemer, R., A. V. Prishschepov, D. Muller, T. Kuemmerle, V. C. Radeloff, A. Dara, A. Terekhov, and M. Fruhauf. 2015. Long-Term Agricultural Land-Cover Change and Potential for Cropland Expansion in the Former Virgin Lands Area of Kazakhstan. *Environmental Research Letters.* 10 (054012). http://iopscience.iop.org/article/10.1088/1748-9326/10/5/054012/pdf.

Latifundist.com. 2014. The top 10 latifundists of the world, 20 August 2014, http://latifundist.com/rating/top-10-latifundistov-mira

Leibniz Institute of Agricultural Development in Transition Economies (IAMO). 2012. Kazakhstan Farm & Household Surveys.

Linn, J. F. 2014. Urbanization, Regional Development, and Decentralization. In A. Aitzhanova, S. Katsu, J. F. Linn, and V. Yezhov, eds. *Kazakhstan 2050: Toward a Modern Society for All.* pp. 187–223. New Delhi: Oxford University Press.

Longmire, J. and A. Moldashev. 1999. Changing Competitiveness of the Wheat Sector of Kazakhstan and Sources of Future Productivity Growth. *CIMMYT Economics Paper*. 99–06. Mexico DF: CIMMYT.

Lowder, S. K., J. Skoet, and T. Raney. 2016. The Number, Size, and Distribution of Farms, Smallholder Farms, and Family Farms Worldwide. *World Development.* 87. pp. 16–29.

Meinel, T., L. C. Grunwald, and K. Akshalov. 2014. Modern Technologies for Soil Management and Conservation in Northern Kazakhstan. In L. Mueller, A. Saparov, and G. Lischeid, eds. *Novel Measurement and Assessment Tools for Monitoring and Management of Land and Water Resources in Agricultural Landscapes of Central Asia.* pp. 455–64. Cham: Springer.

Ministry of Agriculture of the Republic of Kazakhstan (MoA). 2012. Programme for the Development of the Agroindustrial Complex in the Republic of Kazakhstan for the Years 2013–2020 (Agrobusiness-2020) (in Russian). Astana.

_____. 2016. About New Directions of State Support of the Agro-Industrial Complex and Prospects of Increasing the Competitiveness of Domestic Agribusiness (slide set in Russian). Astana.

_____. 2017. Action Plan to Implement the State Programme for the Development of the Agro-Industrial Complex of the Republic of Kazakhstan during Years 2017–2021. Astana.

Ministry of Environment and Water Protection of the Republic of Kazakhstan. 2013. The III–VI National Communication of the Republic of Kazakhstan to the UN Framework Convention on Climate Change. Astana, Kazakhstan.

Morgounov, A., V. Zykin, I. Belan, L. Roseeva, Y. Zelenskiy, H. F. Gomez-Becerra, H. Budak, and F. Bekes. 2010. Genetic Gains for Grain Yield in High Latitude Spring Wheat Grown in Western Siberia in 1900–2008. *Field Crops Research.* 117 (1). pp. 101–12. doi:10.1016/j.fcr.2010.02.001.

Muller, J. O. 1994. Strategies Employed When Establishing Co-operatives. In E. Dulfer, ed. *International Handbook of Cooperative Organizations.* pp. 841–46. Gottingen: Vandenhoeck & Ruprecht.

National Agrarian Research and Education Center (NANOTS). Data tables provided to author in 2017. Unpublished.

Organisation for Economic Co-operation and Development (OECD). 2011. *Competitiveness and Private Sector Development: Kazakhstan 2010: Sector Competitiveness Strategy.* Paris: OECD Publishing.

_____. 2013. *OECD Review of Agricultural Policies: Kazakhstan 2013.* Paris: OECD Publishing.

_____. 2014. *Kazakhstan: Review of the Central Administration.* Paris: OECD Publishing.

_____. 2015. *Strengthening Agricultural Co-operatives in Kazakhstan: Private Sector Development Policy Handbook.* Paris: OECD Publishing.

_____. 2016. *Agricultural Policy Monitoring and Evaluation 2016.* Paris: OECD Publishing.

_____. 2017a. Producer and Consumer Support Estimates Database for Kazakhstan. http://www.oecd.org/tad/agriculturalpolicies/producerandconsumersupportestimatesdatabase.htm.

_____. 2017b. *OECD Reviews of Innovation Policy: Kazakhstan 2017*. Paris: OECD Publishing.

OECD–FAO. 2017. *OECD-FAO Agricultural Outlook 2017–2026.* Paris: OECD Publishing.

Oshakbayev, D. 2017. Analysis of Kazakh State Program for Agriculture Development 2017–2021. Draft consultant's report submitted to ADB.

Oskenbayev, Y. 2015. International Analyses of Natural Resource Curse and Kazakhstan's Related Economic Performance with Special Attention to Its Wheat and Energy Sectors. Inaugural Doctoral Dissertation. Rheinischen Friedrich-Wilhelms-Universitat, Bonn.

Oskenbayev, Y. and A. Karimov. 2013. Is Kazakhstan Vulnerable to Natural Resource Curse? *WIDER Working Paper*. No. 2013/130. Helsinki, Finland: UNU-WIDER. https://www.econstor.eu/bitstream/10419/93714/1/772093768.pdf.

Petrick, M., A. Gramzow, D. Oshakbayev, and J. Wandel. 2014. A Policy Agenda for Agricultural Development in Kazakhstan. IAMO Policy Brief. No. 15. http://www.iamo.de/fileadmin/documents/IAMOPolicyBrief15_en.pdf.

Petrick, M. and D. Oshakbayev. 2015. Kazakhstan's Agricultural Development Constraints: Evidence from the Wheat, Beef and Dairy Sectors. In A. Schmitz and W. H. Meyers, eds. *Transition to Agricultural Market Economies: The Future of Kazakhstan, Russia, and Ukraine.* pp. 15–26. Wallingford, UK: CABI.

Petrick, M. and R. Pomfret. 2017. Agricultural Policy in Kazakhstan. In T. Johnson and W. H. Meyers, eds. *Handbook on International Food and Agricultural Policy: Volume I: Policies for Agricultural Markets and Rural Economic Activity*. Singapore: World Scientific. https://www.iamo.de/fileadmin/documents/dp155.pdf.

Petrick, M., D. Oshakbayev, and J. Wandel. 2017. More than Pouring Money into an Ailing Sector? Farm-Level Financial Constraints and Kazakhstan's "Agribusiness 2020" Strategy. In S. Gomez y Paloma, M. Sebastien, S. Langrell, and P. Ciaian, eds. *The Eurasian Wheat Belt and Food Security: Global and Regional Aspects.* pp. 103–18. New York: Springer.

Petrick, M., J. Wandel, and K. Karsten. 2011. *Farm Restructuring and Agricultural Recovery in Kazakhstan's Grain Region: An Update.* IAMO Discussion Paper. 137. Halle (Saale): IAMO.

_____. 2013. Rediscovering the Virgin Lands: Agricultural Investment and Rural Livelihoods in a Eurasian Frontier Area. *World Development.* 43. pp. 164–79.

Pomfret, R. 2008. Kazakhstan. In K. Anderson and J. F. M. Swinnen, eds. *Distortions to Agricultural Incentives in Europe's Transition Economies.* pp. 219–63. Washington, DC: World Bank.

Poulton, C., A. Dorward, and J. Kydd. 2010. The Future of Small Farms: New Directions for Services, Institutions, and Intermediation. *World Development.* 38 (10). pp. 1413–28. doi:10.1016/j.worlddev.2009.06.009.

Radiotochka.kz.2016. What in Kazakhstan belongs to the world's largest landowner, 26 February 2016, https://radiotochka.kz/21722-chto-v-kazakhstane-prinadlezhit-krupneyshemu-zemlevladelcu-mira.html

Savastano, S. and P. L. Scandizzo. 2017. Farm Size and Productivity: A "Direct-Inverse-Direct" Relationship. Policy Research Working Paper. No. 8127. Washington, DC: World Bank.

Sedik, D. and Z. Lerman. 2015. Agricultural Cooperative Development in Kazakhstan and Ukraine. In A. Schmitz and W. H. Meyers, eds. *Transition to Agricultural Market Economies: The Future of Kazakhstan, Russia, and Ukraine.* Wallingford (UK): CABI.

Suleimenov, M., Z. Kaskarbayev, K. Akshalov, and N. Yushchenko. 2014. Conservation Agriculture for Long-Term Soil Productivity. In L. Mueller, A. Saparov, and G. Lischeid, eds. *Novel Measurement and Assessment Tools for Monitoring and Management of Land and Water Resources in Agricultural Landscapes of Central Asia.* pp. 441–454. Cham: Springer.

Swinnen, J., S. Burkitbayeva, F. Schierhorn, A. V. Prishchepov, and D. Muller. 2017. Production Potential in the "Bread Baskets" of Eastern Europe and Central Asia. *Global Food Security.* doi:10.1016/j.gfs.2017.03.005.

Syzdykov, R., K. Aitmambet, and A. Dautov. 2015. *Country Report: Kazakhstan.* Astana: Analytical Centre of Economic Policy in Agricultural Sector.

Waddington, H. and H. White. 2014. Farmer Field Schools: From Agricultural Extension to Adult Education. 3IE Systematic Review. Delhi.

Wandel, J. 2010. The Cluster-Based Development Strategy in Kazakhstan's Agro-Food Sector: A Critical Assessment from an "Austrian" Perspective. IAMO Discussion Paper. 128. Halle (Saale): IAMO.

Wegerich, K. 2008. Blueprints for Water User Associations' Accountability Versus Local Reality: Evidence from South Kazakhstan. *Water International.* 33 (1). pp. 43–54.

World Bank. 2007. *Agriculture for Development: World Development Report 2008.* Washington, DC.
_____. 2011. *Kazakhstan Agricultural Insurance Feasibility Study.* Washington, DC.
_____. 2012. Agricultural Innovation Systems: An Investment Sourcebook. Washington, DC.
_____. 2016. *Kazakhstan Agricultural Sector Risk Assessment.* World Bank Group Report Number 103076-KZ. Washington, DC.
_____. 2017. *The Economy Has Bottomed Out: What is Next? Kazakhstan Country Economic Update Spring 2017.* Washington, DC.
Zhakenov, M. 2014. State Programme for Water Resources Management and Kazakhstan's Transition to Green Economy. Presentation to the Annual Meeting of EUWI EECCA Working Group. Geneva. 24 June 2014.
Zheng, S., Z. Wang, and T. O. Awokuse. 2012. Determinants of Producers' Participation in Agricultural Cooperatives: Evidence from Northern China. *Applied Economic Perspectives and Policy*. 34 (1). pp. 167–186.
Zinzani, A. 2015. Irrigation Management Transfer and WUAs' Dynamics: Evidence from the South-Kazakhstan Province. *Environmental Earth Sciences.* 73. pp. 765–77.

Appendix 1: Methods for Measuring Technical Efficiency of Agricultural Producers in Kazakhstan Using Stochastic Frontier Production Functions for Panel Data

Technical efficiency analysis measures the extent to which outputs of a producer could be increased without increasing inputs. The measure of a producer's technical efficiency is its distance from a "frontier production function" measured via a stochastic production frontier approach for panel data (Battese and Coelli 1992).

Absent inefficiency, a production function can be denoted as a function of inputs such that at time t, the *i*th producer will produce $Y_{it} = f(x_{it},\beta)$. This can be reduced by inefficiency, where u_{it} is the level of inefficiency of producer I at time t, and inefficiency varies between 0 and 1. The stochastic frontier approach also incorporates random error, denoted as v_{it}, so that the full production function is $Y_{it}=f(x_{it}, \beta)\ \exp(v_{it}-u_{it})$. Assuming that there are k inputs and the production function is linear in logs, the stochastic frontier model becomes:

$$\ln(Y_{it})=\beta_0+\sum\beta_j\ \ln(x_{jit})+v_{it}-u_{it}$$

Thus, the model estimates the parameters of a linear model with the "disturbance" term having two components: the technical inefficiency term (a nonnegative distribution), and the component with the symmetric distribution as the idiosyncratic or external disturbance. The technical efficiency of a producer at any time is defined by $e_i = \exp[E(-u_i|\varepsilon_i)]$ where $\varepsilon = v - u$.

This study employs a time variant model of the technical inefficiency term u_{it} (Battese and Coelli 1992), so that $u_{it}=\exp\{-\eta(t-T_i)\}\ u_i$, where T_i is the last period in the *i*th panel, η is the decay parameter, $ui\ \sim iid\ N^+(\mu,\sigma^2)$, $v_{it} \sim iid\ N^+(0,\sigma_v^2)$, with u_i and v_i distributed independently of each other and the covariates in the model.

Appendix 2: Summary Statistics of Variables Used in Technical Efficiency Analysis

Variable	Observations	Mean	Standard Deviation
Spring wheat yield, dt/ha	337	11.26	4.704
Precipitation, mm	337	278.6	88.16
Spring wheat seed cost/ha	337	4.867	5.196
Spring wheat fuel cost/ha	337	3.615	2.608
Spring wheat labor cost/ha	337	3.229	6.446
Spring wheat fertilizer cost/ha	337	1.373	2.139
Spring wheat other cost/ha	337	4.074	8.554
Individual farm proportion	337	0.095	
2012 proportion	337	0.255	
2013 proportion	337	0.252	
2014 proportion	337	0.249	
2015 proportion	337	0.243	
Number of clusters	111		

dt/ha = deci ton per hectare , ha = hectare, mm = millimeter.
Note: Variables normalized to per hectare for presentation purposes only. Costs are in thousands of 2012 tenge. Observations are district level data separated by individual and enterprise farm types where all variables are available.
Sources: Authors' analysis of district data for 2012–2015 from Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan and precipitation estimation from Remotely Sensed Information using Artificial Neural Networks data from the Center for Hydrometeorology and Remote Sensing at the University of California, Irvine.

Variable	Observations	Mean	Standard Deviation
Raw material cost per ton	238	263.1	373.3
Water cost per ton	238	5.492	11.76
Labor cost per ton	238	159.9	203.8
Fuel cost per ton	238	57.99	104.2
Area of hay (ha) per ton	238	635.3	5,090
Head of cattle kept per ton	238	78.22	254.2
Other costs per ton	238	72.23	136.3
Individual farm proportion	238	0.248	
2013 proportion	238	0.315	
2014 proportion	238	0.345	
2015 proportion	238	0.340	
Number of clusters	109		

ha = hectare.
Note: Independent variables normalized to per ton of output (the dependent variable) for presentation purposes only. Costs are in thousands of 2012 tenge. Observations are district level data separated by individual and enterprise farm types where all variables are available.
Source: Authors' analysis of district data for 2013–2015 from Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

Chapter 3
Kazakhstan's Manufacturing Potential

Alexander Julian and Kiyoshi Taniguchi

Kazakhstan's economy is currently highly dependent on natural resource extraction. Oil production represents about one-fifth of the country's total gross domestic product (GDP) and approximately 56% of total exports.[1] With a production level of 1.7 million barrels per day in 2016, Kazakhstan is the 16th largest oil producer in the world and the largest in Central Asia.[2] Kazakhstan's per capita income has increased significantly since 1991; however, the government acknowledges that the country faces challenges from its high dependence on oil and gas exports. With the recent economic shock and oil price drop, these reinforced the need for the government to consider structural reforms. Thus, economic diversification has become a key objective of its current economic policy. Diversification away from extractive industries, and a reduction of the state's footprint in the economy, are deemed necessary to sustain development of the private sector and help boost job creation in the country.

This chapter first reviews Kazakhstan's historical and current industrial development programs that the country has embraced to diversify the economy. It then presents an overview of the current status and role of the manufacturing sector in the economy. We analyze trends in and the composition of Kazakhstan's exports over the past 2 decades, and discuss how diversification and transitioning to high-potential manufacturing export products can help the country's industrial development. The potential advantages of pursuing such economic diversification are laid out, and useful lessons for Kazakhstan are drawn from the experiences of other countries that have achieved success in developing their manufacturing sector. Policy implications and

[1] United Nations Commodity Trade Statistics Database.
[2] United States Energy Information Administration.

suggestions on ways forward for the government to meet its diversification objectives conclude the chapter.

The key policy priorities for boosting manufacturing sector development, discussed in detail in the conclusion of the chapter, include:

(i) **Improved formulation, coordination, implementation, and monitoring of industrial programs and strategies.** A review of the implementation of Kazakhstan's industrial programs suggests they can be streamlined to be more effective. A high-level committee for centralized coordination of industrial programs and policy making needs to be institutionalized, and clear benchmarks for industrial program successes and failures need to be established.

(ii) **Improved dialogue with the private sector for product selection and addressing constraints for investment**. The government should work in close collaboration with the private sector to help identify and address constraints to private sector investment and initiatives in growing sectors and products.

(iii) **Increased human capital development and innovation**. To address the shortage of skilled professionals hindering manufacturing sector development, the quality of primary and secondary education needs to be improved and on-the-job training and apprenticeships encouraged. Increasing research and development (R&D) expenditure, both public and private, and building networks among small and medium-sized enterprises (SMEs) can also facilitate greater innovation.

(iv) **Greater investment in infrastructure.** Kazakhstan must upgrade its transportation, logistics, and energy systems to remove infrastructure bottlenecks and allow increasing competitiveness, trade, and diversification.

3.1. Kazakhstan's Industrial Programs: An Overview

In 1997, the Kazakhstan government articulated its first long-term "Strategy 2030" (Government of Kazakhstan 1997), stating its strategic objectives of reducing the country's dependence on natural resources, and building an economy that is more resilient by forming a more dynamic and entrepreneurial private sector and developing stronger links between the resource-based and other sectors. In 2012, the government announced its "Strategy 2050" (Government of Kazakhstan 2012), the key target of which is to be among the top 30 most developed countries in the world by 2050. Strategy 2050 specifically commits the government to develop a plan for the next phase of industrialization, with the objective of doubling the share of non-energy exports in total exports by 2025, and tripling it by 2040.

Over the past 2 decades, Kazakhstan has implemented a series of industrial policies aimed at increased diversification. This section provides an overview of how the

government's industrial objectives have evolved over time to support the country's development.

Strategy for Industrial and Innovative Development of the Republic of Kazakhstan, 2003–2015

Following the announcement of Strategy 2030, plans were drafted and supporting legislation was passed (more than 30 laws), and the Strategy for Industrial and Innovative Development (SIID) of the Republic of Kazakhstan for 2003–2015 was adopted. The new institutional framework encouraged the development of institutions, socio-entrepreneurial corporations, and holding companies, and piloted infrastructure investments such as technology parks, economic zones, and industrial zones. The SIID aimed to achieve sustainable development for the country by moving away from being resource-dependent, supporting industrial modernization and diversification to enhance competitiveness, and providing conditions to promote transition toward a service-rich and technology-oriented economy.

The SIID intended to reverse the decline experienced by the manufacturing sector during the recent oil boom, and gear it toward the production of high value-added goods and associated services. With this strategy, the annual rate of GDP growth was expected to average 9% per year, with manufacturing growing at 8% and contributing 13% of GDP. Using 2000 as the base year, SIID targeted tripling labor productivity in the manufacturing sector by 2015, halving the energy intensity of GDP, bringing the share of science and high-tech-driven enterprises up to 1.3% of GDP, and increasing the contribution of small and medium-sized enterprises (SMEs) to 43% of GDP. Production of competitive and export-oriented processed goods and services was identified as the major focus of the SIID.

However, over this period, extractive industries grew further in terms of their contribution to GDP, while the manufacturing sector's contributions continued to fall. Export revenue multiplied during this period; however, the composition of exports narrowed and became more simplified. Table 3.1 shows that manufacturing output recovered in the 2000s but remained below 1991 output levels, while the extractive industries' output grew steadily above 1991 levels.

Table 3.1: Kazakhstan's Sector Production Trends, 1990-2007 (index 1980=100)

	1990	1991	1992	2001	2002	2003	2004	2005	2006	2007
Extractive industries	121.5	118.1	103.5	108.8	126.1	139.0	157.6	161.9	173.2	177.7
Manufacturing	140.7	145.0	114.7	71.0	76.7	82.8	90.4	97.3	105.1	112.2

Source: Hwang et al. (2008).

The State Program for Industrial and Innovative Development, 2010–2014

The first phase of the revised industrialization strategy, known as the State Program for Industrial and Innovative Development (2010–2014) (SPIID) included state support through the provision of physical infrastructure (for information and communications, energy, and transport) and social infrastructure (skilled human resources), the lowering of administrative barriers, detailed guidelines on technical regulations, and the creation of a more business-friendly environment for entrepreneurship and foreign direct investment (FDI). The main objective of the SPIID was to provide sustainable and balanced economic growth though diversification and enhanced competitiveness. Targets set for the end of 2014 compared with 2008 included

- 38% growth of real GDP,
- 40% increase in real gross value added in manufacturing,
- 44% real growth of manufacturing production,
- 30% increase in the share of nonresource exports,
- labor productivity in manufacturing to grow at least 1.5 times, and
- 10% decrease in energy intensity of GDP.

This 5-year plan highlighted seven sectors: (i) agriculture, (ii) construction and construction materials, (iii) oil and gas products and infrastructure, (iv) metallurgy and metal products, (v) chemicals and pharmaceuticals, (vi) energy, and (vii) transport and telecommunications infrastructure.

SPIID 2010–2014 envisaged industrial evolution to ascend from the basic, traditional sectors of the economy to the "economy of the future" through

- diversification of production in traditional industries (oil and gas, petroleum chemistry, ore mining and smelting, chemical industry, atomic industry);
- development on the basis of domestic demand in machinery, pharmaceuticals, construction engineering, and construction materials;
- promotion of sectors with export potential (agro-industry, light industry, tourism); and
- promotion of the economy of the future: information and communication technology, bio-technologies, space industry, alternative energy, atomic energetics.

In 2015, the Kazakhstan Industry Development Institute reported on the result of SPIID 2010–2014. The outcomes were as follows:

- Four of the six targets of SPIID 2010–2014 had a high risk of nonfulfillment, including the manufacturing gross value added and manufacturing output growth targets.

- Of the T866 billion budget allocated for SPIID 2010–2014, only 14.7% directly related to the program. Most of the funds were supplemented to finance long-term infrastructure projects and institutional development, indirectly influencing the program's implementation.

In 2015, the Ministry of National Economy evaluated the program and found that, of the 191 evaluation indicators, 147 indicators (77%) were achieved and 44 were not achieved. There had been some positive impacts of the program on the economy; on the social, business, and investment environments; and on infrastructure development, enabling further economic diversification; however, the Ministry of National Economy identified three major reasons for the shortfall of the SPIID 2010–2014 evaluation:

- the large coverage of economic sectors, projects, and indicators considered by the program;
- deterioration of external economic factors; and
- underfunding of SPIID 2010–2014.

There was also inefficient coordination between state bodies, and a poor methodology for monitoring and evaluation. In addition, there was little direct involvement of the private sector and of the regions in implementation.

The State Program for Industrial and Innovative Development, 2015–2019

The second phase of the SPIID (2015–2019) focuses on development of the manufacturing sector, based on regional specialization, a cluster approach, and effective industry regulation (Government of Kazakhstan 2014). On 6 September 2016, a revised version of SPIID 2015–2019 was adopted, given the global crisis experienced in 2015 that was related to falling oil prices, external risk factors, and effects of the Russian ruble devaluation. The list of priorities was reduced from 14 to 8 areas: ferrous and nonferrous metallurgy, oil processing, petrochemistry and agrochemistry, food production, car manufacturing, and electro-technical machine building (OECD 2017).

The goal of SPIID 2015–2019 is to stimulate competitiveness in the manufacturing sector, oriented on labor productivity growth and an expansion of exports of manufactured products. The main objectives include

- complete creation of effective basic industries through modernization of enterprises in the traditional sectors;
- new growth through implementation of large sector-systemic projects;

- conditions conducive for efficient, export-oriented industrial entrepreneurship and/or continuous improvement of labor productivity; and
- preconditions for emergence of a critical mass of innovative businesses.

Targets for 2019 from a 2015 base include
- 19% real growth of manufacturing exports,
- 22% real growth of labor productivity in manufacturing,
- investment in fixed capital for the manufacturing sector of T4.5 trillion, and
- reduced energy consumption in manufacturing by at least 7% compared with 2014.

Total funding was increased to T878.3 billion (or 36.5% above the first version).

The program supports a shift from protection of enterprises in the internal market to promotion of export-oriented enterprises, using methods eligible under international obligations, especially relating to World Trade Organization (WTO) and Eurasian Economic Union (EAEU) membership. Given global trends, the document emphasizes growth potential for export of quality products of ferrous and nonferrous metallurgy, electrical equipment, food, agrochemicals, and petrochemicals. Entrepreneurship and SMEs are included as drivers of change. Macroeconomic stability and access to finance are key for their development and realization of their potential.

The government is aiming to improve the investment climate in line with Organisation for Economic Co-operation and Development (OECD) standards, moving toward softening the administration of businesses and decreasing state presence in the manufacturing sector (from privatization of the state-owned enterprises [SOEs] currently operating in the sector to banning the emergence of new SOEs). It is also focused on offering fiscal and nonfiscal stimuli and preferences to attract multinational corporations, particularly in priority sectors that present new innovative enterprises, export support by methods not prohibited by WTO and EAEU, and stimulation of entrepreneurship and local SMEs.

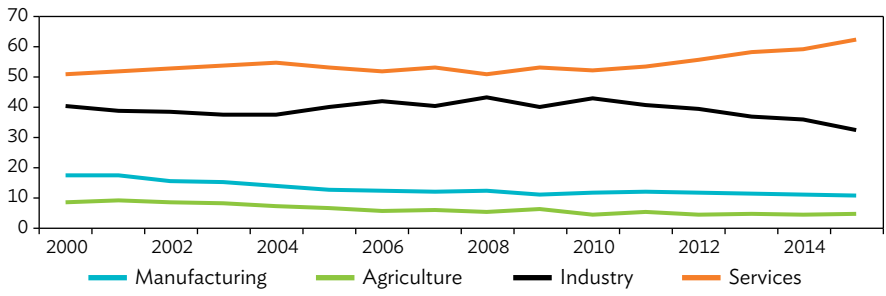
The long-term goal of industrial policy is to achieve the level of labor productivity of OECD countries. However, the program aims to preserve jobs in the manufacturing sector (around 515,000 were employed in 2015, excluding self-employed) and create new jobs. Overall, 400 new projects are planned, which will create more than 70,000 new quality work places in the sector.

SPIID 2015–2019 also outlines new policies for promoting cluster development in Kazakhstan.[3] It is planned that the government will focus on the development of five national clusters for metallurgy, processing of oil and gas, and petrochemicals. The Kazakhstan Industry Development Institute has been appointed as an operator for the development of regional clusters, and will develop and implement the policies jointly with the World Bank.

3.2. Kazakhstan's Manufacturing Sector

The manufacturing sector has a large potential to develop and enable greater economic diversification, based on the sector's current share of GDP and employment. Manufacturing output as a share of GDP fell from 18% of GDP in 2000 to 11% in 2015 (Figure 3.1). Total industrial output as a share of GDP also fell over 2012–2015, caused partly by falling oil prices. This has been compensated by an increasing share of services in GDP. However, around 67% of the service sector comprises low-sophistication services such as trade, transport, storage, real estate, and accommodation.[4] Employment in the manufacturing sector has remained flat but relatively low at only 6%–7% of national employment (Figure 3.2).

Figure 3.1: Value Added by Sector, 2000–2015 (% of GDP)

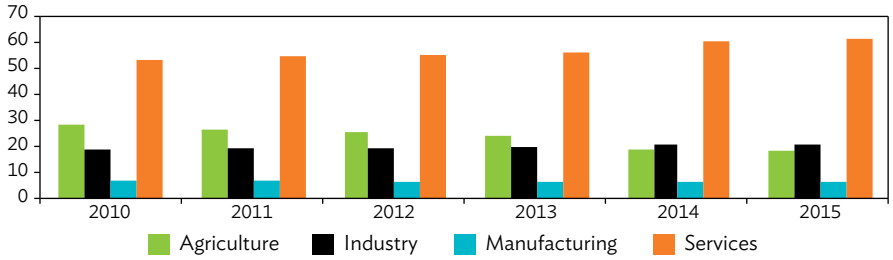


GDP = gross domestic product.
Note: Values for industry include manufacturing.
Source: World Bank (2017).

[3] Cluster is defined as a geographically concentrated group of interrelated and complementary specialized companies and organizations.

[4] Based on service sector data from the Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

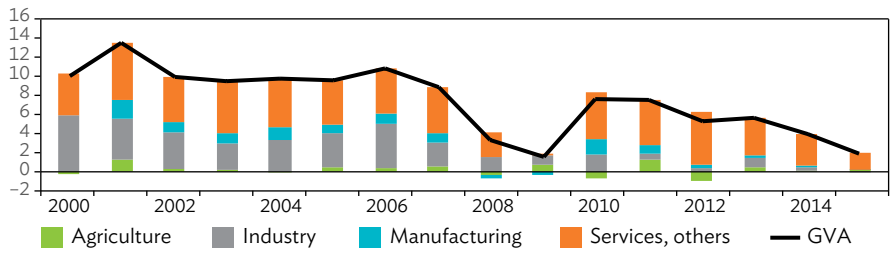
Figure 3.2: Employment by Sector, 2010–2015 (% of total employment)



Note: Values for industry include manufacturing.
Source: ADB statistical database system.

GDP growth has come largely from growth in the service sector over 2010–2015 (Figure 3.3), with a relatively minor and declining contribution coming from the manufacturing sector. The stagnation in the manufacturing sector reflects difficulty in transferring resources from low to high value-added activities, plus increasing macroeconomic instability. This suggests that there is potential for interventions to enable the manufacturing sector to engage in new and higher value-adding activities that can potentially lead to greater contributions of the sector to the economy and to employment, hence promoting economic diversification. A study by the Asian Development Bank (ADB) found that no country has achieved high-income status without its manufacturing sector reaching at least an 18% share of total employment and output over a sustained period of time (ADB 2013).

Figure 3.3: Real Gross Value-Added Growth by Sector, 2000–2015

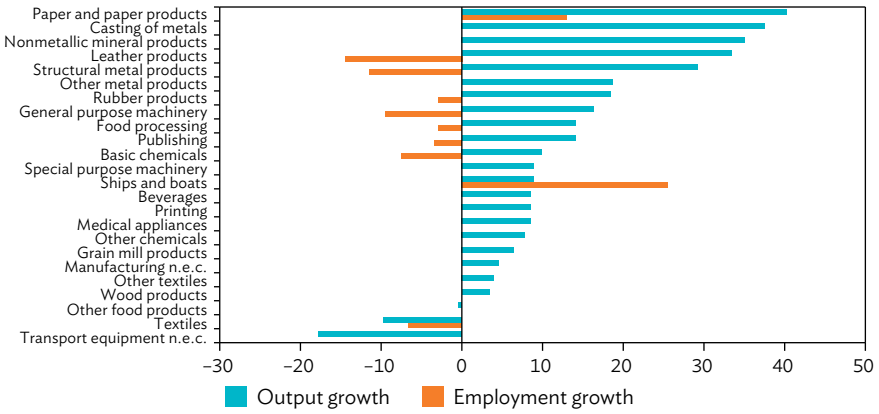


GVA = gross value added (GDP excluding financial intermediation services indirectly measured).
Note: Figures for industry growth exclude manufacturing.
Source: World Bank (2017).

The manufacturing sector has not yet exploited its role as a key driver of growth and employment in the economy, with scope remaining to diversify domestic value addition and exports away from other industrial commodities. However, some manufacturing industries showed 25%–35% average annual output growth over 1998–2007, as

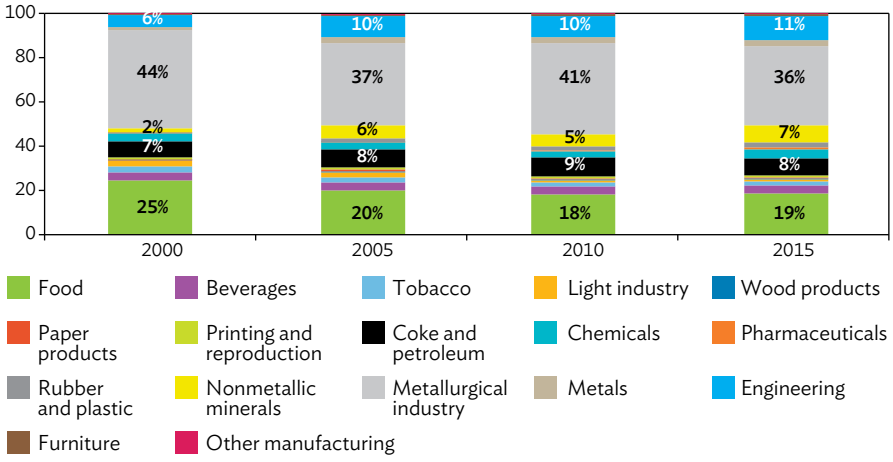
shown in Figure 3.4. These include paper production, casting of metals, processing of leather, and structured metal products. Meanwhile metal products remained the largest component of total manufacturing output in 2015 (36%), followed by food items (19%), as shown in Figure 3.5. The mismatch between growth of output and employment in Figure 3.4 can be explained by the labor capital substitution.

Figure 3.4: Breakdown of Manufacturing Output Growth, 1998–2007
(average annual %)



n.e.c. = not elsewhere classified.
Note: Compound annual growth rates over 1998–2007 based on real output. Manufacturing products listed where only output data available.
Source of basic data: UNIDO (2015).

Figure 3.5: Composition of Manufacturing Output (%)



Source: Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

3.3. Why Does Kazakhstan Need to Diversify Its Economy?

Kazakhstan's development policy challenge is to transform its growth model away from reliance on natural resource extraction. To do so, the country needs to diversify and upgrade its agriculture, manufacturing, and service sectors. Today, the economy is less diversified and competitive in international markets than it was 10 or 20 years ago. Many countries in a similar income bracket, and other significant natural resource-rich economies, are substantially more diversified than Kazakhstan. The natural resource sector also tends to be capital intensive; hence, development of more labor-intensive manufacturing and service industries can have a positive impact on the supply of jobs. Although a boom in commodity export prices (e.g., oil and minerals) can have a positive short-run economic impact on resource-based countries like Kazakhstan, these gains are often short-lived, and aggregate output can quickly return to levels prior to the boom. This is what the country experienced in 2014 when the global commodity price of oil fell, shocking the Kazakhstan economy.

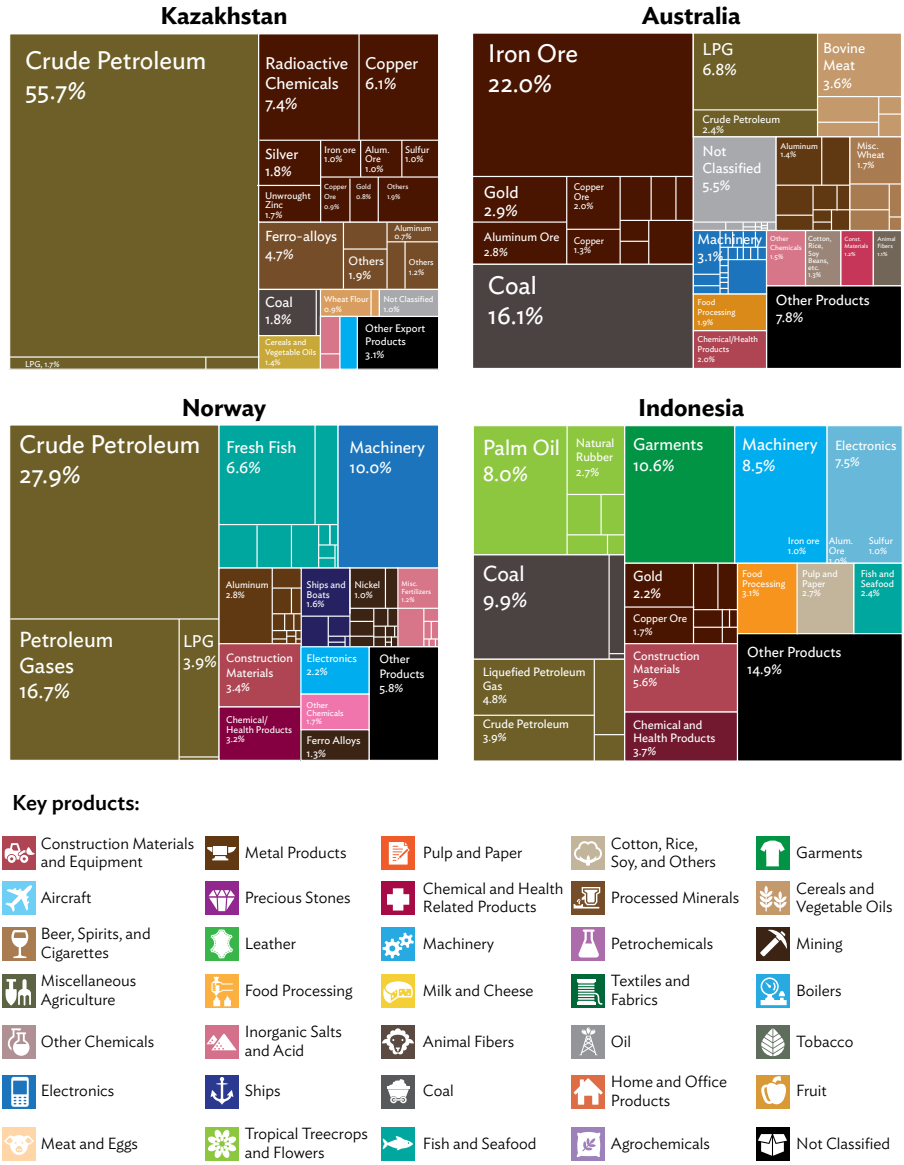
A static tree map diagram (Figure 3.6) shows a comparison of the current level of diversification and composition of exports (as a percentage of total exports) in four countries that are well endowed with natural resources: Kazakhstan, Australia, Norway, and Indonesia. The tree maps provide a hierarchical view of each country's export data, in which each product is represented by a rectangular segment and grouped by sector (represented by different colors). The size of each product segment is proportional to its export share.

Figure 3.6 shows that Kazakhstan has less export diversity than the other three countries, given that 56% of its total exports in 2015 comprised crude petroleum, and many of its secondary products were resource intensive. Kazakhstan's manufactured export products remain least in its export basket. The three other countries have much more diverse export baskets, with resource-based manufactured goods comprising a significant proportion of their exports.

Indonesia, for example, maintains exports of natural resources including coal (10% of total exports), liquefied natural gas (5%), and crude petroleum (4%), but at the same time exports significant shares of manufactured products such as garments (11% of total exports), machinery (9%), and electronics (8%). Indonesia succeeded in launching labor-intensive, export-oriented manufacturing industries in the early 1980s. A large influx of FDI into the footwear and garment industries contributed to developing its sizeable manufacturing sector. The country shifted from a heavily oil-dependent economy during the 1960s and 1970s toward an economy that is much more diversified. However, during the 1990s, Indonesia started to lose its

competitiveness as manufacturing exports from the People's Republic of China (PRC) dominated world markets, eroding Indonesia's wage advantage.

Figure 3.6: Export of Goods—Tree Maps, 2015



Key products:

- Construction Materials and Equipment
- Metal Products
- Pulp and Paper
- Cotton, Rice, Soy, and Others
- Garments
- Aircraft
- Precious Stones
- Chemical and Health Related Products
- Processed Minerals
- Cereals and Vegetable Oils
- Beer, Spirits, and Cigarettes
- Leather
- Machinery
- Petrochemicals
- Mining
- Miscellaneous Agriculture
- Food Processing
- Milk and Cheese
- Textiles and Fabrics
- Boilers
- Other Chemicals
- Inorganic Salts and Acid
- Animal Fibers
- Oil
- Tobacco
- Electronics
- Ships
- Coal
- Home and Office Products
- Fruit
- Meat and Eggs
- Tropical Treecrops and Flowers
- Fish and Seafood
- Agrochemicals
- Not Classified

Source: ADB estimates based on United Nations Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed March 2017).

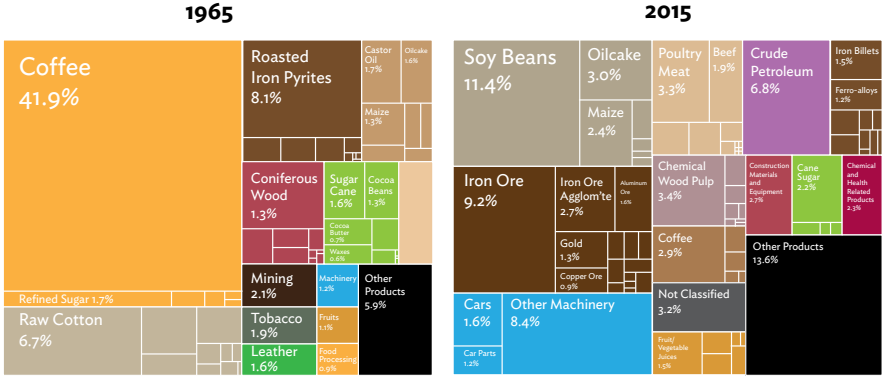
Australia and Norway also display similar degrees of diversification. Based on current data, these countries are also exporting significant shares of other products alongside their traditional natural resource-based exports.

3.4. Potential Benefits of Diversification

Empirical evidence suggests that the production structure of an economy affects export diversification and economic growth (Hausmann and Klinger 2006). Export diversification can lower volatility and instability in export earnings, and economic downturns are shorter-lived in countries that have a more diversified export structure. Diversification can lead to an increase in total exports, and does not necessarily mean that traditionally strong export sectors will become weaker in terms of global market share, as shown in the case of Brazil.

In 1965, coffee was Brazil's main export, accounting for 42% of exports, and Brazil was the world's main coffee exporter with 31% of the world's coffee exports. In 2015, Brazil remained the world's leading coffee exporter, with a market share of 18%.[5] Yet, coffee represented only 2.9% of Brazil's 2015 exports, since the economy had diversified considerably since 1965 (Figure 3.7). If Brazil had remained specialized in coffee production (i.e., without diversification), it would not have been able to increase its total exports by the same amount. This raises the possibility that Kazakhstan could diversify and export more manufactured goods without having a negative impact on earnings from oil exports.

Figure 3.7: Diversification of Brazil's Exports, 1965 and 2015



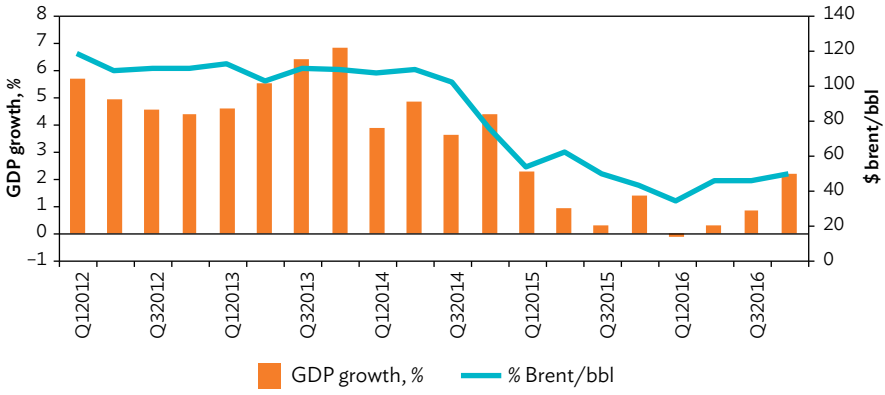
Source: ADB estimates based on United Nations Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed March 2017).

[5] Source from International Coffee Organization.

Another benefit of diversification is avoiding sharp real exchange rate appreciation driven by foreign exchange inflows generated by natural resource-based exports when prices spike. Such appreciation reduces the trade competitiveness of other exports and is commonly referred to as the "Dutch disease." Without developing a variety of other tradable goods (e.g., manufacturing), it is difficult to reduce reliance on natural resources, stabilize the exchange rate, generate gainful employment, and induce structural change. Macroeconomic stability, including exchange rate stability (where the exchange rate is not driven mainly by resource price fluctuations), is important for increasing investor confidence in the manufacturing sector and thereby production and exports of manufactured products.

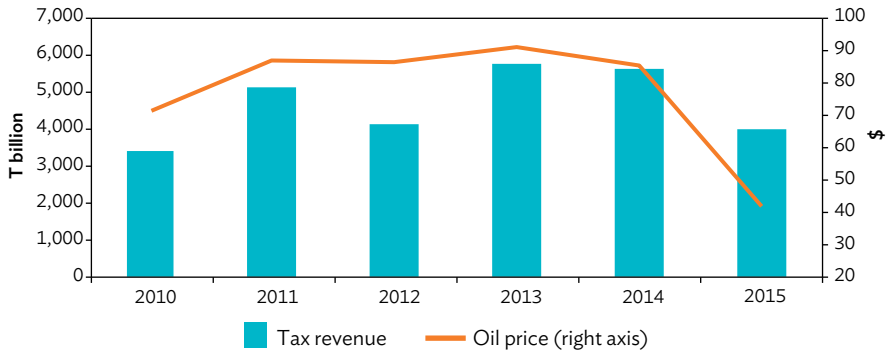
Dependence on natural resource outputs can lead to a volatile growth cycle, correlated closely with the resource price. Figure 3.8 shows how Kazakhstan's GDP growth fell sharply in 2015 in line with the decline in the oil price, with growth falling into negative figures by the first quarter (Q1) of 2016. Figure 3.9 illustrates how Kazakhstan's total tax revenues are closely correlated with the oil price, too, with tax revenues falling by T1,160 billion (30%) in 2015 largely as a result of the oil price decrease. This revenue volatility in turn creates problems for stable fiscal management.

Figure 3.8: Kazakhstan GDP Growth versus Oil Price, 2012–2016



bbl = barrel of oil, GDP = gross domestic product.
Source: Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

Figure 3.9: Kazakhstan Tax Revenues versus Oil Price, 2010–2015



Source: World Bank (2017).

The natural resource sector can also exert a negative impact on growth through potential adverse effects on institutional quality and governance. Resource-rich countries face the risk of lower integrity of government institutions. Large windfall revenues can lead government institutions into corruption, macroeconomic mismanagement, poor fiscal and budgetary discipline, less transparency, and an increase in income and wealth inequality.

The prevalence of corruption is confirmed by the ranking of Kazakhstan in Transparency International's Corruption Perception Index (126th of 176 countries in 2016) (Transparency International 2016). This is also supported by the Worldwide Governance Indicators Control of Corruption, where Kazakhstan is ranked in the 20th percentile (World Bank 2015), and the 2016–17 World Economic Forum Global Competitiveness Report, where corruption appears as the third most problematic factor for doing business. Diversification of the economy and revenue sources is important for a country to be able to maintain good governance and institutions (World Economic Forum 2016).

Furthermore, countries rich in natural resources and dependent on the revenues generated from those resources are less likely to be motivated to implement growth-enhancing reforms or to improve their investment climate. This is often because political pressure to do so is lacking amid commodity price booms that increase revenues, even as other areas of the economy stagnate or remain underdeveloped. For Kazakhstan, the investment climate can be improved with reforms to encourage greater investment in the manufacturing sector. For example, in the World Bank Doing Business Survey, Kazakhstan ranks 35th overall, although it performs relatively poorly in the "trading across borders" category, being ranked 119th of 190 in 2017.

Time lengths and costs related to border compliance, including customs clearance, inspection procedures, and documentation requirements, are high for Kazakhstan's exporters, which is also reducing the competitiveness of their manufactured products.

SOEs, as recipients of public investment, have initiated the industrial development of Kazakhstan's manufacturing sector. SOEs are prevalent in several key sectors, and contribute as much as 50% of GDP, well above the OECD average of 15% of GDP (EBRD 2017). The role of SOEs needs to be reduced to avoid continued government support to industry and potential loss of competitiveness when a fall in resource prices causes a negative shock to fiscal support, as was found in the case of Algeria (Box 3.1). Reducing the role of SOEs will allow a more vibrant and innovative private sector to emerge.

Box 3.1: Role of State-Owned Enterprises in Algeria's Diversification

Algeria launched its manufacturing sector in the 1970s by using an import substitution strategy. The country enjoyed an oil revenue windfall during this period and decided to invest significant resources in manufacturing, especially heavy industries. The level of investment increased in absolute terms 1.5 times between 1970 and 1973, and 2.2 times between 1973 and 1977. The average investment-to-gross domestic product (GDP) ratio reached 28.3% and 40.4%, respectively, during those two periods. Algeria's newly developed manufacturing industries expanded at an average of 13.5% per year between 1970 and 1977, which was a far higher growth rate than that of GDP. At the same time, almost all investment in manufacturing industries was allocated to public enterprises. When Algeria suffered a rapid decline in oil and gas revenue in the mid-1980s, these manufacturing industries lost their competitive edge. In fact, with the rapid decline in financial investment, machines and equipment rapidly became obsolete. Due to their public status, these companies could not lay off surplus employees, despite excessively high wages relative to productivity. The only public enterprise in electronics (Entreprise Nationale des Industries Electroniques) still exists, despite years of business losses, due to direct financial aid from the government and regulation that bars private firms from selling to or having business dealings with the market. Since the mid-1980s, Algerian manufacturing industries have continuously declined. The share of manufacturing in GDP, which reached 12.6% on average between 1963 and 1986, declined to 10.8% from 1987 to 1999 and to 6.6% from 2000 to 2005.

GDP = gross domestic product.
Source: Felipe and Rhee (2013).

While a country's export diversification and economic growth are strongly linked, entrepreneurs face significant cost uncertainties initially when they decide to invest or produce new goods. They can also be constrained by the investment climate and deterred by macroeconomic instability. Where they succeed, the information spillovers and gains are shared by others. Entrepreneurs who fail, however, shoulder the cost (Hausmann and Rodrik 2003). Therefore, a government that provides the

right kind of incentives, business climate, macro stability, and missing public inputs to investors can encourage them to engage in new activities and help accelerate structural transformation. Having the necessary institutions and improvements in capabilities is a prerequisite for transforming the production structure toward diverse and higher value-added goods. It should be emphasized that structural transformation may need to be policy induced; relying on market forces may be insufficient.

3.5. Kazakhstan's Performance in Diversifying Its Manufacturing Sector, 1995–2015

This section examines how Kazakhstan has performed in terms of diversification of its export basket over time, and discusses options for greater diversification. Diversification can be measured by the number of products exported and with the "revealed" comparative advantage (RCA) index (Balassa 1965). RCA is the ratio of a country's export share of a product to the world export share of the same product. Where X_{cp} represents the exports of product p by country c, we can express the RCA that country c has in product p as:

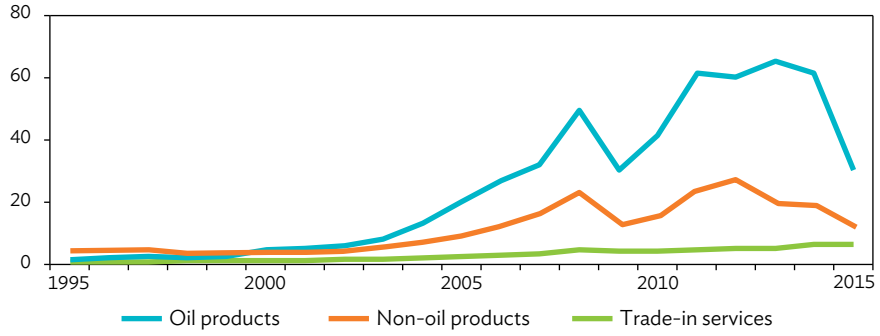
$$RCA_{cp} = \frac{X_{cp} / \sum_c X_{cp}}{\sum_p X_{cp} / \sum_c \sum_p X_{cp}}$$

This measure allows us to simultaneously discuss the country's diversification and its level of competitiveness. A value of RCA for a given product equal to 2, for example, indicates that a country's export share of that product is twice the world's total export share for the same product. Empirically, we set the threshold of RCA>1 to determine if a country has an RCA in a product.

Kazakhstan's export receipts have increased substantially in value terms over the past 2 decades (Figure 3.10). Oil export values increased rapidly over this period as a result of the commodity price boom, during which Kazakhstan benefited mainly as a result of higher international oil prices from the late 2000s and also from higher oil production. Oil exports declined rapidly in 2014–2015 following the decline in the oil price. Non-oil exports also increased gradually since 2005, reaching a peak in 2012, following which there has been a decline in exports.

Most of Kazakhstan's exports of goods are to a small number of trade partners, and the concentration has changed little over time. Table 3.2 lists Kazakhstan's top 10 recipients of exported goods, which account for 75% of total exports, while the PRC and the Russian Federation receive 30% of Kazakhstan's goods exports. Other main destinations include the European Union and other Central Asian countries.

Figure 3.10: Kazakhstan's Exports of Goods and Services, 1995–2015
($ billion)



Sources: Estimates based on World Trade Organization. https://www.wto.org/ (accessed May 2017).

Table 3.2: Kazakhstan's Top 10 Goods Export Partners
(percentage of total exports)

	Export Destination Country	2000	2005	2010	2015
1	China, People's Republic of	11.0	12.9	24.1	17.3
2	Russian Federation	25.0	13.9	9.9	12.8
3	France	5.4	10.3	9.4	11.1
4	Germany	10.7	14.1	10.7	9.0
5	Italy	5.8	10.4	6.8	7.6
6	Greece	1.3	1.8	3.1	4.7
7	Spain	0.7	2.9	1.0	3.7
8	Romania	3.4	6.0	4.0	3.3
9	Turkey	4.0	2.5	3.1	3.3
10	Austria	4.1	2.9	2.6	2.9

Source: United Nations Commodity Trade Statistics Database. https://comtrade.un.org/db/default.aspx (accessed March 2017).

Table 3.3 lists Kazakhstan's top 15 exports according to the increase in the nominal value of exports between 2000 and 2015, using the standard international trade classification for export products. Kazakhstan's top increasing exports are concentrated in mineral fuels such as crude petroleum, liquefied petroleum gas, and coal. There have also been increases in exports of chemicals and manufactured goods (copper, ferro-alloys, and silver). The table also shows the change in RCA for these products: While their export values have increased, six products have a decreasing RCA ratio, including manufactured goods. This indicates that Kazakhstan's competitiveness in producing and exporting these products decreased relative to other countries. Table 3.4 lists the top exports for which nominal values decreased

over this period. This includes mostly manufactured goods (iron sheets and iron coils), food (wheat and unmilled barley), and some crude materials (iron waste). Most of these products also show corresponding decreases in their RCA.

Table 3.5 shows the level of diversification of Kazakhstan's economy, measured by the number of products exported with RCA>1 out of a total of 773 products, by category of products. A product with RCA>1 indicates both diversification and competitiveness. The data in Table 3.5 suggest that between 1995 and 2015, overall diversification deteriorated, as the total number of products with comparative advantage fell from 82 in 1995 to 45 to 2010, and picked up only slightly to 60 in 2015. The detailed list of 60 products exported with revealed comparative advantage in 2015 is provided in Appendix 1. This number is low relative to other resource-rich countries such as Australia and Norway, which export around 100 products each with RCA>1, and Indonesia, which exports around 200 products (UN 2017).

Table 3.3: Kazakhstan's Top 15 Exports by Nominal Increase, 2000–2015

No.	SITC	Commodity	PCI	PCI Rank (out of 773 products)	RCA		Export Value ($ million)	
					2000	Change 2000–2015	2000	Change 2000–2015
1	3330	Crude petroleum	-2.840	765	0.87	10.22	3,732	14,873
2	5241	Radioactive chemicals	-1.176	662	15.98	70.08	175	2,290
3	6821	Copper	-1.207	667	49.37	(33.55)	491	1,560
4	6716	Ferro-alloys	-0.854	601	43.82	(16.64)	386	939
5	3413	Liquefied petroleum gases	-2.076	746	0.09	1.69	14	566
6	3222	Coal	-1.271	680	4.46	(1.06)	105	498
7	6811	Silver	-0.340	504	121.89	(106.89)	116	486
8	2741	Sulfur	-0.937	614	0.39	33.12	0	333
9	6861	Unwrought zinc	-0.291	488	46.83	(22.26)	230	323
10	2871	Copper ore	-1.952	740	0	3.29	30	284
11	0460	Wheat flour	-0.955	620	0.78	33.67	23	276
12	2815	Iron ore	-2.114	751	0.07	2.04	89	254
13	9710	Gold	-2.072	745	0	0.49	23	240
14	5221	Chemical elements	-0.479	537	13.44	(8.68)	15	164
15	6841	Aluminum	-1.071	642	1.13	1.14	91	141

PCI = product complexity index, RCA = revealed comparative advantage, SITC = standard international trade classification.
Source: ADB estimates based on United Nations Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed March 2017).

Table 3.4: Kazakhstan's Top 15 Exports by Nominal Decrease, 2000–2015

No.	SITC	Commodity	PCI	PCI Rank (out of 773 products)	RCA		Export Value ($ million)	
					2000	Change 2000–2015	2000	Change 2000–2015
1	6746	Thin iron sheets	0.495	285	6.38	(5.27)	348	-274
2	0412	Misc. wheat	-0.014	426	0.98	1.38	360	-230
3	6727	Iron coils	0.448	299	16.88	(16.12)	234	-175
4	2882	Misc. non-iron waste	-0.844	599	20.59	(19.75)	195	-134
5	2820	Iron waste	-0.963	625	3.09	(2.21)	163	-112
6	0430	Unmilled barley	0.247	354	11.58	(11.49)	57	-55
7	2631	Raw cotton	-2.631	764	23.61	(21.82)	87	-48
8	6747	Tinned sheets	0.588	254	33.93	(29.13)	95	-40
9	2816	Iron ore agglomerates	-1.152	658	6.88	(2.20)	154	-40
10	2877	Manganese	-2.162	753	8.24	(6.31)	40	-26
11	0579	Misc. fruit	-1.503	707	0.02	0.03	27	-24
12	2111	Raw hides of bovine/ equine	-0.743	585	19.11	(19.01)	23	-22
13	6822	Processed copper	0.061	402	0.32	(0.28)	17	-14
14	0545	Misc. vegetables	-1.477	704	0.02	0.09	20	-14
15	6744	Thick iron sheets	1.029	126	2.30	(1.94)	25	-12

Misc. = miscellaneous, PCI = product complexity index, RCA = revealed comparative advantage, SITC = standard international trade classification.
Source: ADB estimates based on United Nations Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed March 2017).

Table 3.5: Composition of Exports with Comparative Advantage, 1995–2015
(number of products with comparative advantage and % of total exports)

SITC	Commodity	1995		2000		2005		2010		2015	
		No.	Share (%)	No.	Share (%)	No.	Share (%)	No.	Share (%)	No.	Share (%)
0	Food	11	2.4	15	7.1	11	2.0	6	2.3	4	1.8
1	Beverages and tobacco	0	-	1	0.1	1	0.1	1	0.0	1	0.2
2	Crude materials	26	19.8	25	13.4	22	9.7	17	4.4	26	6.9
3	Mineral fuels	3	2.0	6	44.8	7	61.5	2	63.2	6	59.7
4	Animal and vegetable oils	0	-	0	-	1	0.0	1	0.0	2	0.0
5	Chemicals	14	9.3	7	3.6	8	1.7	5	3.9	7	8.5
6	Manufactured goods	25	57.3	18	27.1	20	21.2	12	12.7	14	16.7
7	Machinery and transport	3	0.2	2	0.1	1	0.3	0	-	0	-
8	Miscellaneous manufactures	0	-	0	-	0	-	0	-	0	-
9	Other manufactured articles	0	-	0	-	0	-	1	10.3	0	-
	Total	**82.0**	**91.0**	**74.0**	**96.2**	**71.0**	**96.6**	**45.0**	**96.9**	**60.0**	**93.9**

SITC = standard international trade classification.
Note: Number of products refers to those exported with RCA > 1.
Source: ADB estimates based on United Nations Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed March 2017).

The largest increase for Kazakhstan over the 1995–2015 period was in the mineral fuels category, which increased export share from 2% to 60%. For manufactured goods, the number of products exported with comparative advantage fell from 25 to 14, and the share in total exports fell from 57% to 17%. Other technologically advanced sectors such as chemicals and machinery and transport also had declines in the number of export products with RCA>1. This suggests that industrial policy has not been having a significant impact in terms of diversity of total exports and exports of manufactured goods.

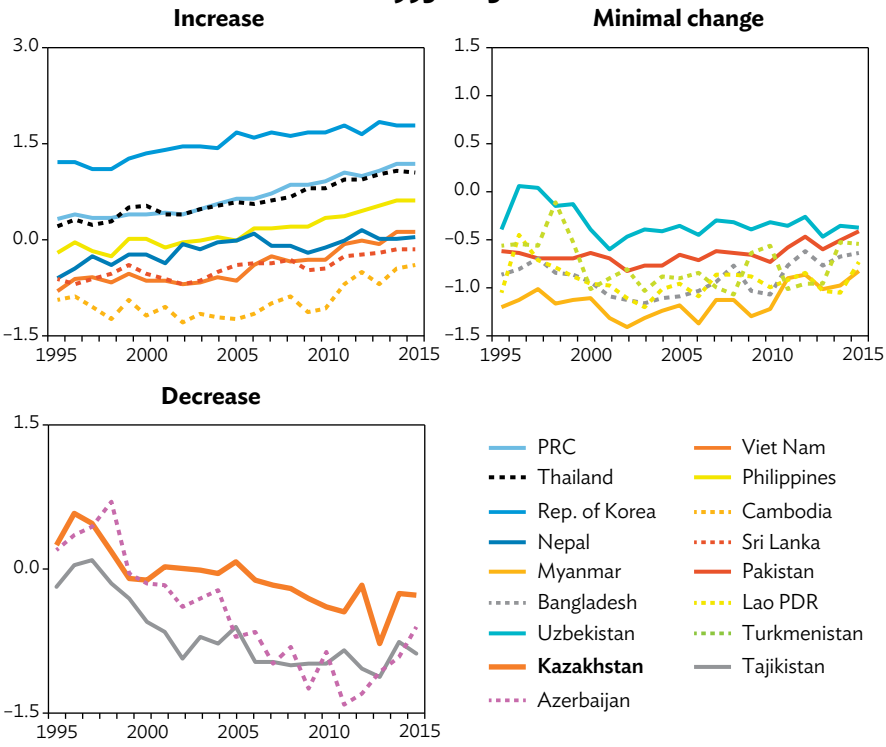
As the above evidence reveals, there has been a change over time in the composition of exported goods, with an increasing concentration of exports of mineral fuels in terms of number of goods and share of total exports, and a decreasing concentration of manufactured goods. Hence, there has been an increasing dependence on oil and petroleum products in Kazakhstan's exports.

The trend of economic complexity of national export baskets for Kazakhstan and 18 other Asian countries from 1995 to 2015 is shown in Figure 3.11, using the economic complexity index (ECI). The ECI is a measure incorporating information about the diversity of a country's export basket and the uniqueness or sophistication of its products. The complexity of each export product contained within an export basket is measured using a product complexity index (PCI).

The trends show that 10 Asian countries in the sample displayed increasing economic complexity, 6 showed little change, and only Kazakhstan, Tajikistan, and Azerbaijan had a declining trend of economic complexity. This is a result of a change in the composition of export products and their respective complexity levels. That is, Kazakhstan's exports are becoming more similar to other countries' exports, and the diversification of its products is decreasing, which has an overall negative impact on the ECI. The trends for the comparator countries suggest that they are exporting products with increasing or similar levels of diversification and uniqueness. The top increasing export products for Kazakhstan shown in Tables 3.3 and 3.4 had relatively low PCIs (i.e., crude petroleum, radioactive chemicals, copper) and the top decreasing products had relatively high PCIs (i.e., thin iron sheets, misc. wheat, iron coils).

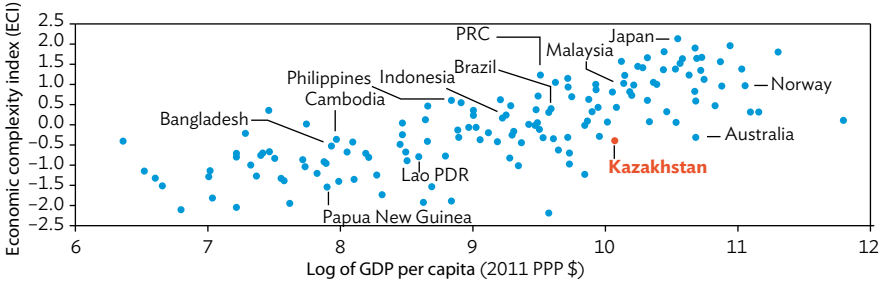
Empirical research demonstrates that countries seldom become rich by simply producing more of the same products, but rather they grow by moving into new and more complex products. If a country has a more sophisticated export basket, it is likely that production has shifted to activities that pay workers higher wages (Hausmann and Klinger 2010). More-developed economies have greater diversity of available inputs, and diversity and uniqueness of the outputs they produce. This is reflected in Figure 3.12, which shows a positive trend between ECI and GDP per capita when

Figure 3.11: Economic Complexity Index—Selected Asian Economies, 1995–2015



ECI = economic complexity index, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.
Note: ECIs are standardized with mean = 0 and standard deviation = 1. Changes based on the slope of the country's ECI trend.
Source: ADB estimates based on United Nations Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed March 2017).

Figure 3.12: Economic Complexity Index and GDP per Capita, 2015



GDP = gross domestic product, Lao PDR = Lao People's Democratic Republic, PPP = purchasing power parity, PRC = People's Republic of China.
Sources: Estimates based on World Bank (2017) and United Nations Commodity Trade Statistics Database (all accessed March 2017).

the two indicators are plotted for a range of countries using 2015 data. Countries with higher GDP per capita have a more complex export basket, and participate in more sectors and markets. Kazakhstan has a below-average ECI, given its level of GDP per capita. This underscores the importance of diversifying and upgrading the structure of the economy toward high-value-added export products. The sustainability of growth and the creation of decent jobs also require moving to new and high-value-added exports.

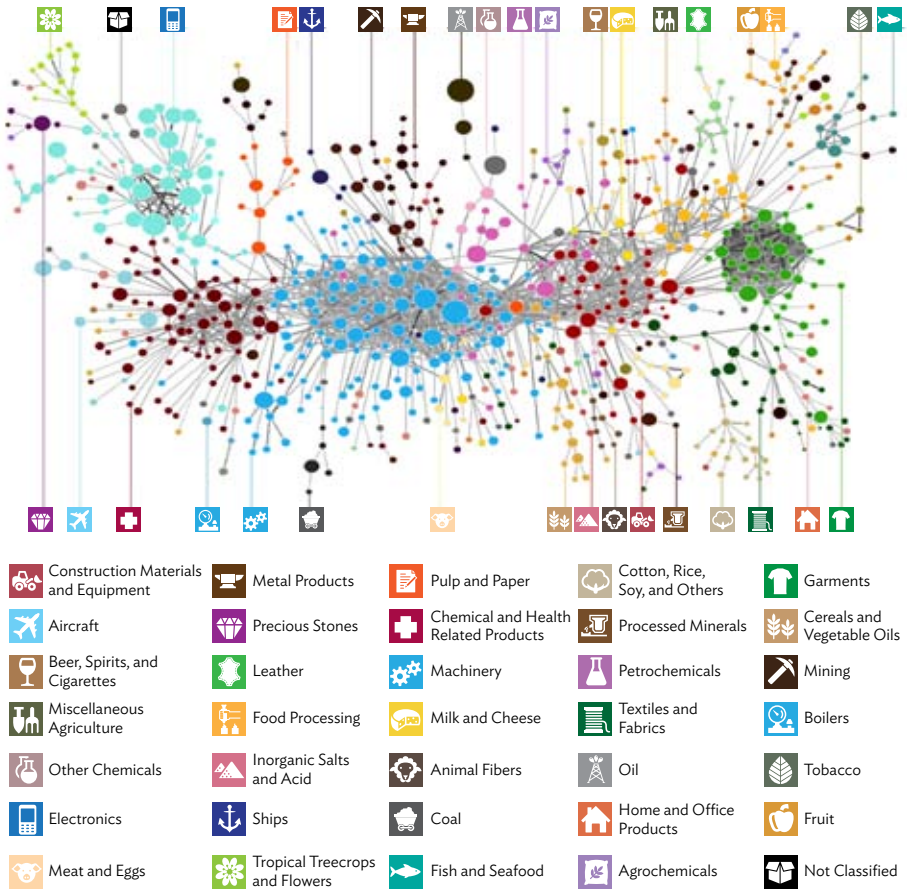
Countries well-endowed with natural resources generally have weak incentives to diversify. As demonstrated by the data presented above, Kazakhstan has a low level of economic complexity of its export basket relative to other countries, including in developing Asia. Kazakhstan has also reduced its diversification and complexity of products over the past 20 years, and reduced the number and share of manufactured goods exported with RCA>1. Kazakhstan can address this long-term trend by aiming to expand the export basket and increase its sophistication in terms of complexity of goods and services, in order to accelerate growth and create decent jobs.

3.6. Product Space Analysis

A product space analysis is used in this section to identify how Kazakhstan may be able to transition into production of more complex and higher valued manufactured goods, based on the composition of its current export basket and the connectedness it has to other types of manufactured products. Product space analysis can illustrate how the production of an existing set of exports in the economy can be diversified by transitioning to the production of different and more sophisticated goods. By examining the position of a country's export basket in the product space, and the relation of one product to another, we can assess the country's potential to expand production toward higher value goods.

Hidalgo et al. (2007) mapped product exports across all countries (Figure 3.13). This accounts for the proximity between goods by computing the probability of a country having a comparative advantage in one product, given its comparative advantage in another. Proximity measures capabilities that are used by firms to produce a given product that can be used to produce another, i.e., how connected are pairs of products. Capabilities include knowledge about the product, physical assets, intermediate inputs, labor relations, labor training requirements, technology, marketing, infrastructure, property rights, regulatory requirements, and other public goods.

Figure 3.13: The Product Space



The product space map uses the United Nations Commodity Trade Statistics Database (a world trade data set) for 773 products. The different nodes represent products, their colors correspond to product groups based on the Leamer classification, and the node size is in proportion to world trade values.[6] The length of the lines that connect the nodes represents the proximity of a pair of products. The dense areas represent many products that are closely connected—particularly machinery, chemicals, electronics, transformed metals, and capital-intensive products. This indicates the ease with which companies can move from producing one commodity to another.

[6] The product classification introduced by Leamer (1984) is based on relative factor intensities, that is, the relative amount of capital, labor, land, or skills required to produce each product.

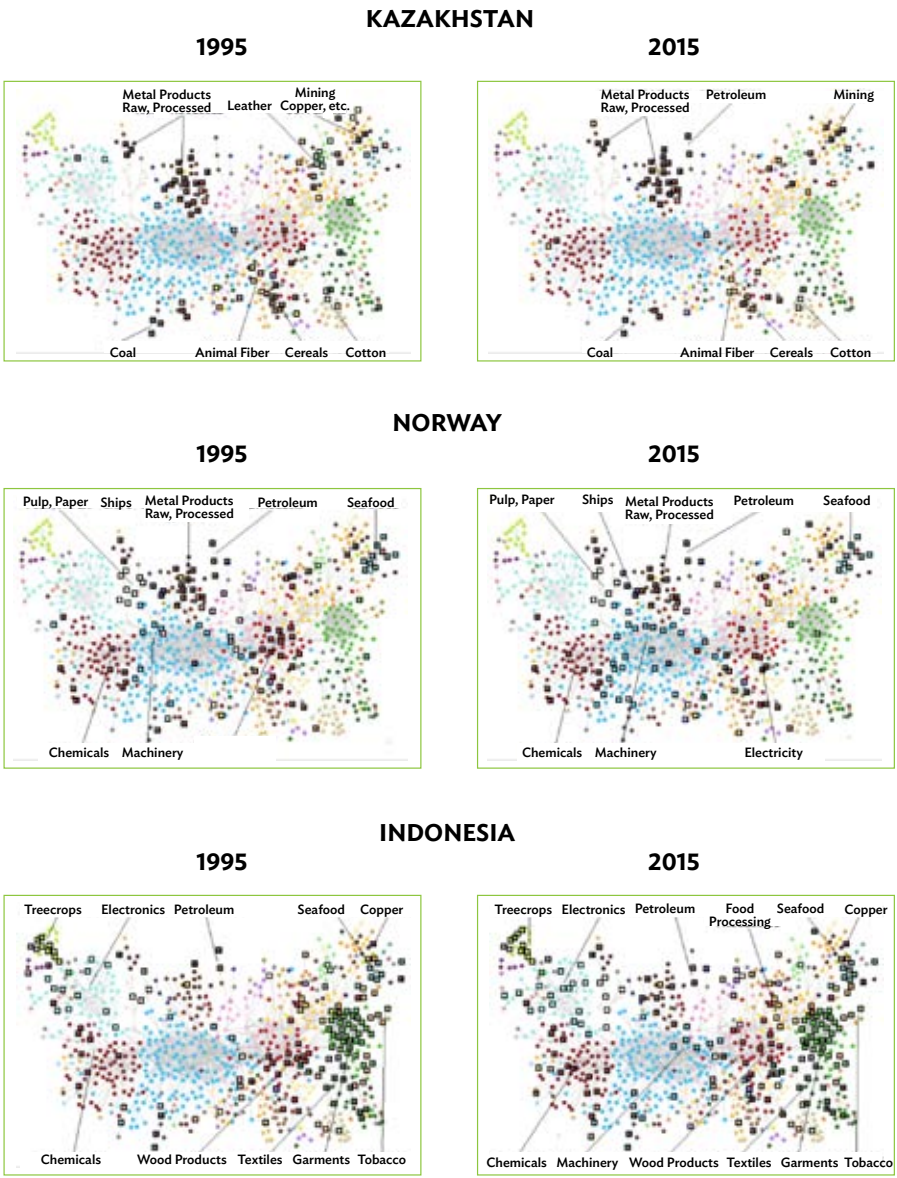
If a country is producing goods in the core of the product space (as often observed in developed economies), the set of existing capabilities can be easily redeployed to other nearby products—and therefore the process of product diversification is simpler. Core products also tend to be more sophisticated than isolated periphery products. On the periphery, products such as natural resources, primary products, and agricultural products are weakly connected to others. An economy whose exports are found mainly on the periphery (as often found in developing economies) will have greater difficulty moving towards nearby products, as fewer of its capabilities can be redeployed elsewhere in the economy. The position of a country in the product space determines its opportunities to expand its productive capability and increase its economic complexity.

The product space for Kazakhstan for 1995 and 2015 is illustrated in Figure 3.14, where squares on the map represent products Kazakhstan is exporting with an RCA>1. First, it is observed that the number of products has decreased, suggesting that greater specialization is occurring (which is consistent with the findings above). Second, Kazakhstan produces and exports products that are mainly peripheral in nature. This implies that certain capabilities have been acquired that cannot easily be redeployed to make unexploited products. This impedes diversification and increasing sophistication.

Kazakhstan's product space map is compared in Figure 3.14 with two other natural resource-abundant countries, Norway and Indonesia, over the same time period. For these two countries, a greater degree of diversification is observed, indicated by a greater number of products appearing in the product space. There has also been a shift of products toward the core in both cases, indicating increasing sophistication, and more closely connected products. That is, both countries have acquired capabilities that can be replicated with relative ease to produce similar or more sophisticated products.

There are currently not many high-tech sectors in Kazakhstan's economy due to the lack of a competitive environment, insignificant business incentives to introduce and absorb technologies, insufficient legal mechanisms and protection of intellectual property rights, and a poor culture of innovation management (Kosherbayeva 2013a, b). Innovation is also constrained to a great degree by an underdeveloped finance sector. Overall, there is space for enhancing the knowledge-generating capacity of the economy through targeted policy interventions.

Figure 3.14: Evolution of Structural Transformation—Product Space Maps, 1995 and 2015



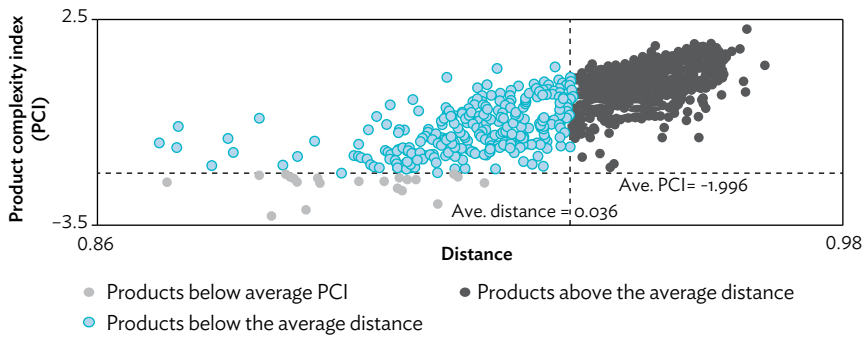
Source: ADB estimates based on United Nations Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed February 2017).

3.7. Identifying High-Potential Export Products in Kazakhstan

Product space analysis can be used as a tool to identify existing capabilities and potential opportunities to increase diversification and economic complexity. For Kazakhstan, we can use product space analysis to explore which products offer the best combination based on proximity to the current export basket, sophistication, and strategic value, while representing large market opportunities. This is not an exercise to make specific recommendations to the government on which industries to support explicitly through policy interventions. Rather, it is an analysis of close-proximity products for potential upgrading and diversification, using data derived from the product space.

In this context, we analyze unexploited exports based on their distance from current capabilities. Figure 3.15 represents Kazakhstan's knowledge frontier, i.e., the unexploited products (which do not currently have a revealed comparative advantage) including products currently exported and not exported, based on distance from current capabilities and each product's complexity (PCI). Products located further from the current capability set (i.e., toward the right-hand side of the horizontal axis) are generally more sophisticated (have a higher PCI) and can increase sophistication of the export basket.

Figure 3.15: Identifying Products at Kazakhstan's Knowledge Frontier, 2015



Source: Based on United Nations Commodity Trade Statistics data set as of December 2016.

We will analyze unexploited products, defined as having an RCA index of less than one, based on three distance categories (near, medium, and far), using average distance from current capabilities as a cutoff. We also look only at products that have a current

export value greater than zero, and products with a PCI above the current average for Kazakhstan (leaving the set of products represented by the blue circles in Figure 3.15).

There is a trade-off between distance and complexity of unexploited products. That is, close-by products are easier to transition to, but they will generally be less complex than further away products, and have a smaller impact on raising economic complexity of the export basket. First, we will look at "nearby products." However, not all the nearest products may be the best areas of focus, since some are found in isolated parts of the product space and have spillover impacts that are insufficient for speedy diversification. While the following tables of unexploited products include products from all sectors, only manufacturing products will be listed as the top potential products.

Table 3.6 lists the first set of 32 nearby products (for distance 1.5 standard deviations below the mean distance) grouped into 12 product groupings using the 3-digit International Standard Industrial Classification Revision 3. The unexploited product groups are listed by their current total export value, as an indicator of the current level of development of these products. The full list of detailed products included in these groups is given in Appendix 2. The value of world exports for products in the table is an indicator of the size of the world market for these products. The average

Table 3.6: Option 1—List of Unexploited Products, 2015
(1.5 standard deviations below mean distance)

No.	ISIC	ISIC Description	Average PCI Rank	Average Opportunity Gain Rank	Kazakhstan Exports ($ '000)	World Exports ($ billion)
1	151	Food processing	676	622	29,530.7	88.2
2	241	Basic chemicals	565	490	16,732.3	107.9
3	011	Crop farming	700	589	15,234.3	153.3
4	272	Basic precious and nonferrous metals	476	349	12,335.9	21.3
5	132	Mining: nonferrous metal ores	677	535	11,651.1	6.0
6	154	Other food products	737	657	7,599.3	6.1
7	012	Animal farming	703	580	1,671.5	5.3
8	141	Quarrying: stone, sand, and clay	689	622	1,520.4	4.4
9	172	Other textiles	697	525	353.0	1.0
10	171	Textiles	744	665	42.8	0.4
11	242	Other chemical products	585	573	6.3	1.2
12	271	Basic iron and steel	530	481	2.3	8.7

ISIC = International Standard Industrial Classification, PCI = product complexity index.
Note: Table shows all unexploited products (RCA>1) for Kazakhstan in 2015, excluding those (i) for which PCI is less than average PCI; (ii) of mineral fuels, works of art, and special transactions; (iii) that have no export value; and (iv) products with a distance greater than 1.5 standard deviations below the mean for all unexploited products. The remaining products meeting the above criteria were combined into ISIC Revision 3 sectors, weighted by 2015 world exports. PCI and opportunity gain ranks are based on 773 products with 1 being the highest rank.
Sources: Estimates based on United Nations Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed March 2017); and United Nations Statistics Division. Correspondence between ISIC Rev. 2 and ISIC Rev. 3. http://unstats.un.org/unsd/cr/registry/regso.asp?Ci=1&Lg=1.

opportunity gain rank is also included in the table, for which a higher ranking implies being closer to more products or products that are more complex. The opportunity gain is a measure of the potential benefit to a country if it were to move to a new product, and investment in higher ranked products will more likely facilitate structural transformation.

For close-by products (option 1), based on current export value, and opportunity gain rank, the top potential manufacturing products for development include

- food processing and other food products (oil cakes, sunflower seed oil, tea);
- basic chemicals (nitrogen fertilizers); and
- basic precious and nonferrous metals (base metal manufactures).

Table 3.7 includes the 32 nearest products and an additional 37 "medium distance" products[7] (1.0 standard deviation below mean distance), hence the export values are cumulative. Targeting these products (option 2), also ranked by current export value, will require slightly further jumps from the current set of capabilities but will provide greater opportunity for diversification and structural transformation than option 1. The additional top manufacturing product categories that emerge at this distance range include

- additional food processing products (pasta, frozen fish);
- additional basic chemicals (metallic salts, fertilizers);
- leather products (bovine and equine leather);
- basic iron and steel (iron billets);
- textiles (cotton yarn); and
- grain mill products (milled rice).

Table 3.8 includes the first 69 near and medium-distance products and an additional 68 "far-away" products (0.5 standard deviation below mean distance). This distance from current capabilities allows the addition of more sophisticated products into Kazakhstan's frontier products. However, this also implies that the transition of firms to increase total production of these products will also be more challenging and will require targeted support. The additional top manufacturing products that emerge from this distance range include

- additional basic iron and steel products (iron coils, iron bars and rods, iron tubes and pipes);
- refined petroleum products (bituminous mixture);
- additional basic chemical products (polypropylene);
- additional food processing (margarine, vegetable oil, bovine meat);
- additional basic precious and nonferrous metals (processed copper);

[7] The detailed list of products is provided in Appendix 2.

Table 3.7: Option 2—List of Unexploited Products, 2015
(1.0 standard deviation below mean distance)

No.	ISIC	ISIC Description	Average PCI Rank	Average Opportunity Gain Rank	Kazakhstan Exports ($ '000)	World Exports ($ billion)
1	131	Mining: iron ores	628	562	50,937.2	27.8
2	151	Food processing	667	625	50,123.9	136.0
3	241	Basic chemicals	546	495	48,599.8	164.0
4	191	Leather products	669	690	27,034.8	18.8
5	011	Crop farming	687	591	17,293.9	214.6
6	272	Basic precious and nonferrous metals	323	310	14,813.3	45.3
7	271	Basic iron and steel	483	432	12,399.1	32.9
8	132	Mining: nonferrous metal ores	677	535	11,651.1	6.0
9	154	Other food products	701	603	11,068.7	20.0
10	141	Quarrying: stone, sand, and clay	569	567	9,891.7	14.4
11	171	Textiles	720	649	8,260.8	13.7
12	153	Grain mill products	733	645	7,305.3	15.5
13	101	Mining: hard coal	652	490	3,883.3	4.7
14	012	Animal farming	689	580	1,888.6	8.2
15	050	Fishery	678	643	1,814.8	27.1
16	269	Nonmetallic mineral products n.e.c.	611	668	1,778.0	10.0
17	202	Wood products	623	580	973.2	10.6
18	172	Other textiles	671	579	363.8	4.3
19	182	Fur products	546	491	124.2	1.6
20	160	Tobacco products	560	564	32.9	4.8
21	155	Beverages	555	514	9.9	32.9
22	242	Other chemical products	585	573	6.3	1.2

ISIC = International Standard Industrial Classification, n.e.c. = not elsewhere classified, PCI = product complexity index.
Note: Table shows all unexploited products (RCA>1) for Kazakhstan in 2015, excluding those (i) for which PCI is less than average; (ii) of mineral fuels, works of art, and special transactions; (iii) that have no export value; and (iv) products with a distance greater than 1.0 standard deviation below the mean for all unexploited products. The remaining products meeting the above criteria were combined into ISIC Revision 3 sectors, weighted by 2015 world exports. PCI and opportunity gain ranks are based on 773 products with 1 being the highest rank.
Sources: Estimates based on United Nations Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed March 2017); and United Nations Statistics Division. Correspondence between ISIC Rev. 2 and ISIC Rev. 3. http://unstats.un.org/unsd/cr/registry/regso.asp?Ci=1&Lg=1.

- additional textiles (finished cotton fabrics);
- dairy products (preserved milk, cheese); and
- garments (outerwear).

By employing this data-driven approach, we have highlighted the top unexploited products by representing optimal trade-offs between proximity and sophistication. It is important to note that identification of these high-potential and strategically valuable sectors is not meant to be seen as "picking winners" or championing certain products. Rather, this analysis should be treated as a first step toward identifying potential areas for investment and initiating a meaningful dialogue with the private sector to examine the product-specific constraints that have inhibited investors from backing these activities.

Table 3.8: Option 3—List of Unexploited Products, 2015
(0.5 standard deviation below mean distance)

No.	ISIC	ISIC Description	Average PCI rank	Average Opportunity Gain Rank	Kazakhstan Exports ($ '000)	World Exports ($ billion)
1	271	Basic iron and steel	432	441	92,924.8	148.9
2	241	Basic chemicals	523	489	77,988.1	212.3
3	151	Food processing	621	609	74,486.9	285.4
4	132	Mining: nonferrous metal ores	603	582	73,748.0	45.5
5	131	Mining: iron ores	628	562	50,937.2	27.8
6	232	Refined petroleum products	505	463	38,209.8	20.8
7	154	Other food products	618	607	28,977.6	38.2
8	191	Leather products	669	690	27,034.8	18.8
9	011	Crop farming	666	577	19,383.1	239.7
10	272	Basic precious and nonferrous metals	363	334	18,295.1	89.7
11	141	Quarrying: stone, sand, and clay	566	562	11,824.9	16.2
12	171	Textiles	670	635	11,061.8	28.5
13	153	Grain mill products	652	617	9,555.3	22.7
14	269	Nonmetallic mineral products n.e.c.	584	642	5,889.1	22.8
15	152	Dairy products	445	461	5,106.5	45.8
16	181	Garments	675	708	5,104.8	253.9
17	142	Mining and quarrying n.e.c.	671	608	5,055.3	12.1
18	210	Paper products	357	359	3,200.0	33.5
19	012	Animal farming	644	606	3,111.3	16.1
20	261	Glass products	529	589	2,878.7	8.5
21	172	Other textiles	656	654	2,498.2	30.5
22	242	Other chemical products	440	418	2,103.3	22.6
23	020	Forestry	596	597	2,008.9	5.1
24	050	Fishery	678	643	1,814.8	27.1
25	202	Wood products	607	569	974.3	13.7
26	201	Sawmilling and planing of wood	514	502	769.4	40.2
27	155	Beverages	541	499	485.2	36.3
28	331	Medical and specialized instruments	377	392	351.7	4.1
29	182	Fur products	546	491	124.2	1.6
30	160	Tobacco products	560	564	32.9	4.8
31	369	Other manufacturing	420	350	0.8	1.3

ISIC = International Standard Industrial Classification, n.e.c. = not elsewhere classified, PCI = product complexity index.
Note: Table shows all unexploited products (RCA<1) for Kazakhstan in 2015, excluding those (i) for which PCI is less than average PCI, (ii) that have no export value, and (iii) products with a distance greater than 0.5 standard deviation below the mean for all unexploited products. The remaining products meeting the above criteria were combined into ISIC Revision 3 sectors, weighted by 2015 world exports. PCI and opportunity gain ranks are based on 773 products with 1 being the highest rank.
Sources: Estimates based on United Nations Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed March 2017); and United Nations Statistics Division. Correspondence between ISIC Rev. 2 and ISIC Rev. 3. http://unstats.un.org/unsd/cr/registry/regso.asp?Ci=1&Lg=1.

The above analysis shows that unexploited opportunities exist in several areas. For example, Kazakhstan has very strong potential to further develop manufactured basic metal products, basic chemicals, food processing products, textiles, and leather products (option 1 and option 2 areas in the above analysis). Similarly, refined petroleum products, dairy products, more sophisticated metals, chemicals, food processing products, and textiles (option 3) are other candidates for government–

private sector collaboration to tap potential for increasing competitiveness. Food products, metallurgy, and petrochemicals are also included as potential sectors for export growth in Kazakhstan's ongoing State Program for Industrial and Innovative Development 2015–2019. These product sectors have the capacity to contribute significantly to employment and income growth. A recent study by OECD (2017) also found that priority sectors in the SPIID 2015–2019 strategy appear aligned with findings from the product space methodology. By following the steps that other successful economies have taken, Kazakhstan can reap the benefits of such a transformation.

Potential products with closer proximity can be interpreted as having lower risk, as the necessary capabilities for producing and successfully exporting the new products are largely already present. The products that are farther away from Kazakhstan's current capabilities, and with low export volumes, suggest that only a handful of companies are currently producing these high-potential products. However, those products with higher sophistication can have higher spillovers. Once an activity starts in a new and well-connected part of the product space, other nearby products also become feasible and attract investors (Hausmann and Klinger 2009). The government and policy makers will need to help the private sector accumulate new capabilities and improve the sophistication of export products through a realistic industrial vision and an effective set of policies, and identify potential domestic and foreign investors.

In cases where a country has more ambitious plans and decides to leapfrog from the periphery to the core, the real challenge is how to build capacities of existing and new institutions and address coordination and innovation externalities amid a transition. This might require larger investments to secure economies of scale and complementary infrastructure compared with the case of moving to "close-by" industries. After investments are made, if a country fails to achieve international competitiveness, the resulting capacity underutilization and financial distress may lead to large fiscal losses. In addition, even if technological challenges could be overcome at the individual country level, there would be global overcapacity if too many countries targeted the same industries. This "fallacy of composition" effect further increases the risks of industrial policy. Accordingly, a country must carefully weigh the challenges of skill accumulation, economies of scale, and complementary investments against the possibility of capacity underutilization and financial distress before embarking on an ambitious industrial policy (Felipe and Rhee 2013).

3.8. Elements of Successful Manufacturing Development: Lessons and Insights from Other Countries

This section discusses some examples of modern industrial policies that can help improve the production structure of an economy. We first present the successful case of the industrialization of the Republic of Korea and then compare it with the experience of Malaysia. These experiences provide valuable insights into the key elements of successful policy and a clearer picture of what challenges may be faced.

The Republic of Korea experience

The Republic of Korea transformed from one of the poorest countries in the world in 1960 to a developed economy epitomized by it becoming a member of the OECD in 1996. It provides a classic case for understanding the use of industrial policy at different phases of development.

Sector selection. The Republic of Korea's pursuit of export-oriented industrialization during the 1960s initially revolved around the development of labor-intensive manufacturing industries. The government and the private sector then collaborated to fill in the missing links in the domestic value chain, to move up the quality ladder, and to improve the country's comparative advantage in more sophisticated products. Moreover, to maximize spillover effects, the government consistently sought to increase the links between sectors of high productivity and the rest of the economy (Felipe and Rhee 2013).

During early industrialization in the 1960s, the Government of the Republic of Korea was very active in the selection of industry sectors for development, led by the President and industry-related ministries. The private sector was also involved in decision making and in setting up export-oriented industries, while the government provided subsidies and incentives if they managed to achieve certain targets. The country's industrial policy phases are a good example of the changing role of government in promoting new industries as an economy goes through different development stages, as shown in Table 3.9.

The involvement of the private sector in decision making grew and remained crucial to the Republic of Korea's plan to develop heavy and chemical industries. In the 1970s, the government worked closely with the private sector on this goal. The economy progressed such that by the 1990s and 2000s, it was increasingly difficult for the government to select and directly support specific industrial units because of

Table 3.9: Industrial Policy Phases in the Republic of Korea

	1960s	1970s	1980s	1990s	2000s
Development stage	Factor driven	Investment driven		Innovation driven	
Industry policy	Support export development	Promote heavy and chemical industries	Shift from industry targeting to research and development (R&D) support	Provide information infrastructure and R&D support	Promote new engines of growth and upgrade R&D
Science and technology policy	• Ministry of Science and Technology/ Korea Institute of Science and Technology • Science and Technology (S&T) Policy Promotion Act • 5-Year Economic Plan including S&T	• Government research institutes • Technical and vocational schools • R&D Promotion Act • Daedeok Science Town	• National R&D plan • Private sector initiatives in R&D	• Information • E-Government • Restructuring of government research institutes • University-industry-government linkages	• Universities leading role • Efficient national innovation system • Regional innovation system and innovation clusters

R&D = research and development, S&T = science and technology.
Source: Lim (2011).

insufficient technological knowledge and concerns about the potential for international trade conflicts. In this era, the private sector led the move into information and communication technology industries. Government assistance was confined to R&D efforts that were usually related to selected high-technology industries, and to financial guarantees to support private loans from financial institutions. A special committee, consisting of government officials, academic experts, business representatives, and engineers, was formed to identify indicative high-tech industries.

Tools for manufacturing development. One important aspect of the Republic of Korea's industrial policies was that the government not only provided various incentives such as tax preferences and interest-rate subsidies to exporters, but also assisted via the provision of basic infrastructure and the development of key industries supplying raw and intermediate materials. Similarly, targeted import restrictions were applied to protect infant industries until they became competitive enough to export or supply inputs to domestic manufactures competitively (Felipe and Rhee 2013).

The Republic of Korea's experience reveals the importance of industrial policy that changes with the level of development. Developed and developing economies can

apply a range of industrial policy instruments while enforcing a particular policy for industrial upgrading. These can broadly be classified into eight categories: (i) fiscal incentives, (ii) investment attraction programs, (iii) training policies, (iv) infrastructure support, (v) trade measures, (vi) public procurement, (vii) financial mechanisms, and (viii) industrial restructuring schemes. We now analyze how the Republic of Korea applied these instruments in industrial upgrading.

During the 1960s, the Republic of Korea provided fiscal incentives including preferential tax credits and concessions, and allowed exporting firms to retain foreign exchange earnings for import purchases. Similarly, export credits were given to promote the export of heavy and chemical industries in the 1970s. To attract investment, in the 1960s the government established a special export-orientated industrial zone in Seoul, offering qualified labor and improved infrastructure. To meet these goals and promote exports for heavy and chemical industries, the government drafted a comprehensive human resources development plan, and technical and vocational training facilities were greatly expanded. The government set up several research institutes to promote science and technology, as well as industry-specific institutes and science parks. This helped increase the number of high-quality technicians needed for heavy and chemical industries.

To provide quality infrastructure and to develop industry, the government established several industrial complexes in the 1970s, including quality transportation and energy infrastructure. This helped develop domestic supply chains for specific industries. The Republic of Korea also used international trade measures as an essential component of its development policy, including setting export targets that influenced firm behavior. Low import tariffs were set for capital goods used by export industries. The development of a competitive export sector helped the country discover its emerging comparative advantage in high-value-added products, overcoming the limits of its small domestic market and exploiting economies of scale. Export promotion propelled growth by helping infrastructure development, industrial upgrading, and human resources development (Felipe and Rhee 2013).

Public procurement also played an important role, where industrial complexes established under the heavy and chemical industry program were expected to provide 30% of manufactured products to the military, serving as a measure of revenue stability for firms in the industry. Similarly, financial support was provided for developing SMEs.

Financial restructuring schemes were used by the government when the impact of oil price shocks during the 1970s and the 1980s undermined the heavy and chemical industries. Industry was also suffering at that time from structural difficulties, mainly due to overinvestment and competition, which led to excessive supply capacity

because export demand was not increasing at the same pace. The government helped restructure industry by closing or merging uncompetitive units, saving the country from debt default. The government also provided various fiscal incentives such as low-interest loans to surviving firms, and depreciated the exchange rate to assist exports.

As the economy advanced further, development of the knowledge economy became a key objective of industrial policy, and the government allocated special funds for R&D and education in the 1990s. By the 2000s, a more indirect industrial policy was pursued, which involved financial tools that supported risk sharing, R&D, education, and SME development (Lim 2011).

Monitoring and evaluation mechanisms. To help implement industrial policy in the early phase of industrialization, the country adopted a top-down monitoring and evaluation (M&E) mechanism. The President and industry-focused ministers monitored the progress of exports against targets through monthly meetings and an Industry Promotion Committee. The private sector also took part in the decisions. As the industrial structure became more complex, oversight was shifted and decentralized to ministries and agents. The emphasis of M&E moved from the short term to the medium term, and more weight was given to risk management. Sophisticated performance-based evaluation systems were designed to measure actual outcomes generated by policy initiatives (Felipe and Rhee 2013).

Summary. The Republic of Korea's experience is a good example of how industrial policy tools change as development proceeds, and highlights the role of the private sector. In the 1960s, when processing trade was a major target of industrial policy, preferential export credits and special export zones were primary policy tools. In the 1970s, when the domestic industrial base started to emerge, the government backed policy loans and special industrial complexes that brought together domestic firms seeking access to modern transportation and energy infrastructure. After the two oil shocks, the 1980s saw industrial restructuring, facilitated by fiscal incentives for corporate restructuring and a low interest rate policy, and the depreciation of the exchange rate as a tool for export promotion. As the economy advanced beyond middle-income status, developing the knowledge economy became a key objective of industrial policy, and the government allocated special funds for R&D and education in the 1990s (Felipe and Rhee 2013).

The Republic of Korea's case shows that industrial policy consists not only of providing targeted incentives, but also the restructuring of industrial units as and when needed. To promote development, the government and the private sector jointly addressed the problems of innovation and coordination externalities. Conventional industrial policy tools, such as enhancing human capital, improving infrastructure, and providing key

inputs such as electricity, are important. However, to diversify and upgrade industrial structure and raise export sophistication, it is necessary to establish more targeted incentive schemes. The Republic of Korea's experience shows the importance of the appropriate incentives and commitments, public–private dialogue, and M&E mechanisms that ensure incentives are time-bound and properly linked to the actual performance of companies.

The Malaysian experience

In the 1980s, Malaysia began to promote heavy industries such as automotive, motorcycle assembly, steel, cement, and fertilizers in its attempt to emulate the success of Japan and the Republic of Korea. This required the importation of intermediate and capital goods for outputs that were oriented toward the domestic economy. However, this resulted in large fiscal and external deficits and, with the advent of global recession and a drop in commodity prices in the early 1980s, led to reconsideration of the strategy and forced the government to focus on a private-sector-led approach. The government then initiated programs to attract FDI and liberalize trade. The country also became a beneficiary of the relocation of Japanese and other East Asian investments to Southeast Asia.

Malaysia made use of industrial policy instruments, including fiscal incentives, to attract FDI to promoted sectors and to meet specific objectives. For example, tax holidays were given to firms awarded pioneer status, and special zones with duty-free imports were developed to promote exports that were dependent on imported components. For investment attraction, Malaysia created technology parks as part of its Multimedia Super Corridor, which opened in 1999 as a specialized zone to attract high-tech FDI. To develop the country's human capital, the Malaysian government instituted requirements for sectors receiving government support that included skills training. As part of its infrastructure policies, the government opened Iskandar Malaysia in 2006, a special economic zone in southern Malaysia, to spur growth in manufacturing and services. For trade measures, Malaysia practiced import substitution before shifting to export-oriented manufacturing due to a limited domestic market and the need to generate employment. It also provided tariff protection, although this was used moderately relative to other developing countries.

Malaysia attracted FDI to acquire advanced technology, which led to a degree of technology transfer as some Malaysian companies linked up as suppliers in global supply chains. However, Malaysia's approach has not produced as many domestically owned and designed sophisticated products exported with global reach as has the Republic of Korea. Although Malaysia has undergone substantial

industrial transformation and reached middle-income country status, its economy continues to depend on imported technology and capital, and the manufacturing sector is facing premature deindustrialization (Heng and Yean 2011). The government provided incentives and exemptions to multinational corporations, which increased capital flows and the profitability of multinational corporations operating in Malaysia, but this did not automatically result in the transfer of technology to domestic firms. Multinational corporations maintained strict control over technology, which carried negative implications for diversifying and upgrading of exports (Felipe and Rhee 2013).

For M&E mechanisms of industrial policy, Malaysia's Economic Transformation Plan for 2010–2020 provides for periodic updates on new projects and investments in 12 targeted areas, as well as a publicly available annual report. Overall, greater transparency exists in the review process for sector performance under the Economic Transformation Plan than under the previous 5-year industrial plans. The Ministry of International Trade and Industry has institutionalized an annual policy dialogue with the private sector that focuses on operational issues, although strategic issues are discussed occasionally as well.

Overall, Malaysia's experience of manufacturing development has been positive but relatively modest. This was due mainly to its excessive reliance on foreign investments and an industrial policy in which incentives were not linked clearly with the actual performance of firms, as was done in the Republic of Korea. The Malaysian experience shows the limited potential of relying on FDI to improve the domestic economy through technology transfer, without corresponding promotion of domestic private sector R&D.

3.9. Policy Priorities for Manufacturing Development in Kazakhstan

Based on the above analysis, including recent performance of the manufacturing sector, Kazakhstan's export profile and potential products for diversification, previous industrial development strategies, and international experiences, the following appear to be the highest policy priorities for boosting manufacturing sector development.

Policy priority 1: Improved formulation, coordination, implementation, and monitoring of industrial programs and strategies

As discussed in section 3.1 reviewing Kazakhstan's industrial programs, the targets set out for manufacturing development have not been achieved during the program

implementation period. This suggests that **industrial programs need to be reviewed and streamlined** to ensure that necessary actions are taken by the government and strengthened institutions are in place for effective implementation of the programs and strategy. Any tools or incentives provided by the government to support the manufacturing sector under industrial programs must be provided in a transparent way.

A high-level committee for centralized coordination of industrial programs and policy making needs to be institutionalized. This independent body must demonstrate leadership in guiding the policy implementation process. A good example is the Republic of Korea's monthly meetings of export-promoting ministers initiated in the 1960s, chaired by the President. An industrial policy committee in Kazakhstan would check progress against targets, and coordinate between government, business, and academic institutions to resolve implementation problems quickly.

Clear benchmarks for industrial program successes and failures need to be established. This principle of clear benchmarking for companies and industries engaged in producing new products requires an effective M&E system. This should be set up for monitoring projects with public support, including measurement of annual performance indicators. For transparency and accountability, an external monitoring mechanism involving Parliament, academics, and private sector representatives should also be established. International experience suggests that industrial policy may sometimes face setbacks that entail excessive fiscal costs. In these cases, activities receiving public funding need to be scaled back to reduce further costs after a specified time period, as a stop-loss mechanism, to ensure that funds are used most effectively.

Policy priority 2: Improve dialogue with the private sector for product selection and addressing constraints for investment

The product space analysis has revealed that Kazakhstan's current set of export products are relatively isolated in the product space, and are facing declining comparative advantage. The country has relatively few sophisticated export products, and most of its existing products (e.g., mineral fuels) are weakly connected to others. The product space analysis discussed some high potential products for improving the diversification and sophistication of the export mix. The idea is not about "picking winners" but rather opening dialogue with the private sector to help identify new economic opportunities in structural transformation and address obstacles to exploiting these potential opportunities.

The analysis also highlights the importance of addressing investment and product-specific constraints. This requires the government to work in close collaboration with the private sector to identify factors that have been constraining private sector initiatives in new growth areas and high potential products, and to take meaningful steps to reduce these constraints. Examples include improving the business climate, reducing compliance costs for trading across borders, and creating a stable macroeconomic environment. The key aim for improving public–private dialogue is to have a better understanding of product-specific constraints and missing public inputs needed to attract investors into these new areas and products.

Policy priority 3: Increase human capital development and innovation

Innovation and human capital are an essential part of industrial policy, as highlighted in the cases of the Republic of Korea and Malaysia. They remain a weak link in Kazakhstan's industrial development. Given students' relatively low test scores, the **quality of primary and secondary education needs to be improved** (since enrollment levels are already relatively high).[8] Diversification into product sectors that are "close by" existing products will require mainly investment in strengthening basic education (primary and secondary) and training to increase the capabilities of companies. **On-the-job training and apprenticeships should be encouraged,** and links between industries and universities strengthened. This can address the shortage of highly skilled professionals, particularly professional managers, and thereby increase the stock of human capital. Sending public sector employees overseas for higher education and training (including public officials managing industrial policy) is also important for providing more effective public services as the private sector matures. Considering Kazakhstan's relatively small population, immigration policies that bring in highly skilled workers could be another important strategy.

Increase research and development expenditure, both public and private. The private sector currently plays a limited role in knowledge generation. Market-driven demand for technology is low, as evidenced by the low level of spending on R&D, which was only 0.18% of GDP in 2013 (World Bank 2017). Innovation, acquiring technology, and self-sustaining R&D capacities are key to industrial diversification by expanding firms' production capabilities and increasing product sophistication. The public sector alone is not capable of leading R&D expenditure, as it does not have active incentives to commercialize R&D outcomes. The government could lead a consortium of firms to develop new technologies for targeted products, which would

[8] In mathematics, Kazakh students are on average 2 years behind their peers in OECD countries, and about 45% of them are low performers, a proportion significantly above the OECD average of 23% (OECD 2015).

eventually be transferred to private firms, to kick-start increases in private R&D expenditures. To sustain dynamic R&D processes, incentives must be provided and competition encouraged. This can also be facilitated by reforming SOEs and reducing their role in commercial sectors. Currently SOEs spend very little on innovation, which makes it difficult to upgrade Kazakhstan's comparative advantage in traded products.

Build links among small and medium-sized enterprises and between SMEs and larger companies—both public and private. SMEs could be important innovation incubators, but the government must act as a catalyst to establish SME networks that serve as the foundation for innovative value chains.

Policy priority 4: Greater investment in infrastructure

To **remove the infrastructure bottlenecks** to increasing competitiveness and diversification, Kazakhstan must upgrade its transportation, logistics, and energy systems. Modern infrastructure will not only help integrate domestic markets, but also provide a link to unexploited external markets, reduce transport costs, and support the production of tradable goods. An ADB study estimated that investing between $55 billion to $71 billion over 30 years (equivalent to approximately 0.6% of the forecast cumulative GDP for the period) in improving Kazakhstan's transport infrastructure would reduce road travel time between provincial capitals by 35%, rail line-haul time by 71%, and intermodal rail and road container shipment costs by 24% (ADB 2012).

References

Asian Development Bank (ADB). 2012. Technical Assistance for the Preparation of Sector Road Maps for Central and West Asia. Project Data Sheet: Details (TA No. 7708). Manila.

_____. 2013. Asia's Economic Transformation: Where to, How, and How Fast? Key Indicators for Asia and the Pacific 2013: Special Chapter. Manila.

_____. Statistical Database System. https://sdbs.adb.org/sdbs/ (accessed March 2017).

Balassa, B. 1965. Trade Liberalization and Revealed Comparative Advantage. *Manchester School of Economics and Social Studies*. 33. pp. 99–123. Manchester: Blackwell Publications.

European Bank for Reconstruction and Development (EBRD). 2017. Kazakhstan Diagnostic Paper: Assessing Progress and Challenges in Developing a Sustainable Market Economy. London.

Felipe, J. and C. Rhee. 2013. Report to the Government of Kazakhstan: Policies for Industrial and Service Diversification in Asia in the 21st Century. Manila: ADB.

Government of Kazakhstan. 1997. *The Strategy "Kazakhstan 2030": Prosperity, Security and Ever Growing Welfare of All the Kazakhstanis*. Astana.

_____. 2012. *Kazakhstan 2050 Strategy*. Astana.

_____. 2014. *The State Program on Industrial Development of Kazakhstan 2015–2019*. Astana.

Hausmann, R. and B. Klinger. 2006. Structural Transformation and Patterns of Comparative Advantage in the Product Space. *CID Working Paper*. No. 128. Cambridge, MA: Center for International Development, Harvard University.

_____. 2009. Policies for Achieving Structural Transformation in the Caribbean. Private Sector Development Discussion Paper. No. 2. Washington, DC: Inter-American Development Bank. http://services.iadb.org/wmsfiles/products/Publications/2256193.pdf.

_____. 2010. Structural Transformation in Ecuador. Policy Brief: IDB-PB-112. Inter-American Development Bank, Country Department Andean Group. http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=35822676.

Hausmann, R. and D. Rodrik. 2003. Economic Development as Self-Discovery. *Journal of Development Economics*. 72 (2). pp. 603–33.

Heng, L. W. and T. S. Yean. 2011. Industrial Deepening in Malaysia: Policy Lessons for Developing Countries. *Asian Development Review*. 28 (2). pp. 88–109.

Hidalgo, C. A., B. Klinger, A. L. Barabasi, and R. Hausmann. 2007. The Product Space Conditions the Development of Nations. Notre Dame, IN: Center for Complex Network Research and Department of Physics, University of Notre Dame.

Hwang, J-Y., C-W. Lee, and J-H. Choi. 2008. Kazakhstan's Major Industries: Oil, IT, Construction Materials, and Pharmaceuticals. Table II-4, p. 24. Seoul: KIEP and KOTRA.

Kosherbayeva, A. 2013a. Perspectives of Advancing Kazakhstan's Industrial Policy Agenda. Submitted as output of the Asian Development Bank's RETA 8153: Policies for Industrial and Service Diversification in Asia in the 21st Century.

_____. 2013b. Review and Analysis of Kazakhstan's Industrial Policy Experiences. Submitted as output of the Asian Development Bank's RETA 8153: Policies for Industrial and Service Diversification in Asia in the 21st Century.

Leamer, E. E. 1984. *Sources of International Comparative Advantage: Theory and Evidence.* Cambridge MA: MIT Press.

Lim, W. 2011. Joint Discovery and Upgrading of Comparative Advantage: Lessons from Korea's Development Experience. A presentation for Korea Development Institute. http://cid.kdi.re.kr/upload/20110601_2.pdf .

Organisation for Economic Co-operation and Development (OECD). 2015. *OECD Reviews of School Resources: Kazakhstan.* Paris: OECD Publishing.

_____. 2017. Multi-Dimensional Review of Kazakhstan: Volume 2. In-Depth Analysis and Recommendations. *OECD Development Pathways*. Paris: OECD Publishing.

Transparency International. Corruption Perceptions Index 2016. https://www.transparency.org/country/AZE (accessed 10 April 2017).

United Nations (UN). UN Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed April 2017).

United Nations Industrial Development Organization (UNIDO). 2015. *International Yearbook of Industrial Statistics 2015*. Cheltenham: UNIDO and Edward Elgar Publishing.

World Bank. Worldwide Governance Indicators. http://info.worldbank.org/governance/wgi/index.aspx#home (accessed April 2017).

_____. World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators (accessed April 2017).

_____. Ease of Doing Business in Kazakhstan. http://www.doingbusiness.org/data/exploreeconomies/Kazakhstan (accessed April 2017).

World Economic Forum. 2016. *Global Competitiveness Report 2016–2017*. Geneva. http://www3.weforum.org/docs/GCR2016-2017/05FullReport/TheGlobalCompetitivenessReport2016-2017_FINAL.pdf.

Appendix 1: Kazakhstan's Exported Goods with Revealed Comparative Advantage > 1, in 2015 (60 products)

No.	SITC	SITC Description	PCI	ISIC	Export Value ($ '000)	World Value ($ million)
1	2713	Natural calcium phosphates, natural aluminum, etc.	(1.620)	142	11,546	3,342
2	2786	Slag, scalings, dross and similar waste, nes	(0.633)	142	2,890	1,149
3	2789	Minerals, crude, nes	(1.151)	142	36,259	5,129
4	2732	Gypsum, plasters, limestone flux, and calcareous stone	(1.123)	141	8,521	2,112
5	2783	Common salt; pure sodium chloride; salt liquors; sea water	(0.857)	142	8,081	3,554
6	6521	Cotton fabrics, woven, unbleached, not mercerized	(1.193)	171	10,636	3,256
7	2224	Sunflower seeds	(0.265)	011	29,089	3,011
8	1222	Cigarettes	(0.383)	160	64,854	20,271
9	4241	Linseed oil	(0.738)	151	1,930	291
10	5239	Inorganic chemical products, nes	0.579	241	10,556	3,824
11	5323	Synthetic tanning substances; tanning preparations	0.016	241	2,020	703
12	6746	Sheet, plates, rolled of thickness less 3 mm, of iron or steel	0.496	271	74,687	32,473
13	3353	Mineral tar pitch, pitch coke	0.112	241	2,297	796
14	3352	Mineral tars and products	0.226	231	136,252	17,484
15	6635	Wool; expanding or insulating mineral materials, nes	1.019	269	8,034	3,803
16	3330	Crude petroleum and oils obtained from bituminous materials	(2.833)	111	18,605,080	806,567
17	5241	Radioactive chemical elements, isotopes, etc.	(1.172)	233	2,465,465	13,782
18	6821	Copper and copper alloys, refined or not, unwrought	(1.137)	272	2,050,645	62,376
19	6716	Ferro-alloys	(0.851)	271	1,325,633	23,460
20	3413	Petroleum gases and other gaseous hydrocarbons, nes, liquefied	(2.072)	232	580,600	157,396
21	3222	Other coal, not agglomerated	(1.267)	101	602,321	85,185
22	6861	Zinc and zinc alloys, unwrought	(0.289)	272	553,008	10,827
23	2816	Iron ore agglomerates	(1.150)	131	114,798	11,784
24	2871	Copper ore and concentrates; copper matte; cement copper	(1.946)	132	314,552	45,971
25	2815	Iron ore and concentrates, not agglomerated	(2.108)	131	343,218	78,257
26	412	Other wheat and meslin, unmilled	(0.009)	011	129,533	26,429
27	6811	Silver, unwrought, unworked, or semi-manufactured	(0.336)	272	601,559	19,289
28	2741	Sulfur (other than sublimed, precipitated, or colloidal)	(0.932)	142	332,973	4,780
29	6841	Aluminum and aluminum alloys, unwrought	(1.068)	272	231,668	49,012

Appendix 1 continued

No.	SITC	SITC Description	PCI	ISIC	Export Value ($ '000)	World Value ($ million)
30	2873	Aluminum ores and concentrates (including alumina)	(1.232)	132	338,947	17,498
31	2879	Ores and concentrates of other nonferrous base metals	(2.092)	132	131,450	9,958
32	6749	Other sheet and plates, of iron or steel, worked	0.150	271	270,452	43,657
33	6899	Base metals, nes and cermets, unwrought (including waste and scrap)	(0.996)	272	103,892	6,672
34	6851	Lead, and lead alloys, unwrought	(1.357)	272	186,234	5,437
35	5221	Chemical elements	(0.475)	241	178,514	18,037
36	411	Durum wheat, unmilled	(0.696)	011	115,254	9,622
37	2234	Linseed	(0.444)	011	136,850	909
38	5224	Metallic oxides of zinc, iron, lead, chromium, etc.	(0.595)	241	132,981	4,685
39	460	Meal and flour of wheat and flour of meslin	(0.951)	153	299,435	4,181
40	2875	Zinc ores and concentrates	(1.258)	132	118,878	8,029
41	2860	Ores and concentrates of uranium and thorium	(2.946)	120	101,865	474
42	344	Fish fillets, frozen	(1.125)	151	71,998	13,776
43	2784	Asbestos	(1.874)	142	70,822	488
44	6747	Tinned sheets, plates of steel (not of high carbon or alloy steel)	0.588	271	54,469	5,461
45	2631	Raw cotton, excluding linters, not carded or combed	(2.622)	011	38,756	10,421
46	2890	Ores and concentrates of precious metals, waste, scrap	(0.728)	132	34,053	14,020
47	2877	Manganese ore and concentrates	(2.158)	132	14,707	3,669
48	5233	Salts of metallic acids; compounds of precious metals	0.457	241	46,297	5,725
49	6891	Tungsten, molybdenum, tantalum, magnesium, unwrought; waste, scrap	0.592	272	51,719	2,631
50	2785	Quartz, mica, felspar, fluorspar, cryolite, and chiolite	(1.175)	142	61,755	1,983
51	3223	Lignite, not agglomerated	(1.037)	102	22,968	2,276
52	6724	Puddled bars, pilings; ingots, blocks, lumps, etc., of iron or steel	(0.195)	271	55,785	1,801
53	2924	Plants and parts of trees used in perfumery; in pharmacy; etc.	(1.980)	011	20,057	3,041
54	5249	Other radioactive and associated materials	(0.245)	241	10,491	1,272
55	2238	Oil seeds and oleaginous fruits, nes	(1.427)	011	10,052	1,723
56	2682	Wool degreased, uncombed of sheep or lambs	(1.134)	171	6,516	1,054
57	4233	Cottonseed oil	(1.675)	151	5,015	99
58	2687	Sheep's or lambs' wool, or of other animal hair, carded or combed	(1.481)	171	1,460	344
59	2685	Horsehair and other coarse animal hair, not carded or combed	(1.237)	012	439	17
60	2814	Roasted iron pyrites	(0.705)	241	1,398	11

ISIC = International Standard Industrial Classification, mm = millimeter, nes = not elsewhere specified, PCI = product complexity index, SITC = standard international trade classification.
Sources: Estimates based on United Nations Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed March 2017); and United Nations Statistics Division. Correspondence between ISIC Rev. 2 and ISIC Rev. 3. http://unstats.un.org/unsd/cr/registry/regso.asp?Ci=1&Lg=1.

Appendix 2: Detailed List of Unexploited Products for Kazakhstan Using Product Space Analysis, Based on Distance from Current Capabilities (2015 data)

	ISIC	ISIC Description		SITC	SITC Description	Opportunity Gain Rank	Kazakhstan Exports ($ '000)	World Exports ($ billion)
A. 1.5 Standard Deviations Below Average Distance								
1	011	Crop farming	1	0459	Miscellaneous unmilled cereals	600	1,420.8	4.7
			2	0545	Misc. vegetables	685	6,349.5	29.2
			3	0571	Oranges	642	29.4	9.0
			4	0572	Misc. citrus	593	9.6	4.0
			5	0575	Grapes and raisins	592	170.4	9.9
			6	0579	Misc. fruit	686	3,543.6	36.4
			7	0752	Spices	709	22.0	4.6
			8	2222	Soybeans	455	3,689.1	55.5
2	012	Animal farming	9	2119	Misc. hides and skins	653	1.5	0.7
			10	2681	Greasy wool	560	1,079.1	2.9
			11	2683	Fine animal hair	466	511.9	0.5
			12	9410	Misc. live animals	633	79.0	1.2
3	132	Mining: nonferrous metal ores	13	2874	Lead ore	535	11,651.1	6.0
4	141	Quarrying: stone, sand, and clay	14	2731	Unworked building stone	622	1,520.4	4.4
5	151	Food processing	15	0112	Sheep and goat meat	574	0.0	6.2
			16	0360	Crustaceans and mollusks	701	16.3	32.1
			17	0813	Oilcake	586	16,898.4	33.1
			18	2911	Bones, ivory, and horns	666	688.9	0.6
			19	4232	Soybean oil	554	56.9	8.1
			20	4236	Sunflower seed oil	555	11,870.1	8.0
6	154	Other food products	21	0741	Tea	657	7,599.3	6.1
7	171	Textiles	22	2633	Cotton waste	665	42.8	0.4
8	172	Other textiles	23	6592	Knotted carpets	525	353.0	1.0
9	241	Basic chemicals	24	5111	Acyclic hydrocarbons	309	95.8	21.4
			25	5121	Acyclic alcohols	528	373.2	42.8
			26	5225	Inorganic bases	489	3,141.6	18.6
			27	5621	Nitrogenous fertilizers	582	13,121.7	25.1
10	242	Other chemical products	28	5721	Prepared explosives	573	6.3	1.2

Continued next page

Appendix 2 continued

	ISIC	ISIC Description		SITC	SITC Description	Opportunity Gain Rank	Kazakhstan Exports ($ '000)	World Exports ($ billion)
11	271	Basic iron and steel	29	6712	Pig and cast iron	507	0.1	4.3
			30	6713	Iron and steel powders	456	2.2	4.4
12	272	Basic precious and nonferrous metals	31	6831	Nickel	421	191.7	13.9
			32	6999	Misc. base metal manufactures	215	12,144.2	7.4
B. 1.0 Standard Deviation Below Average Distance (in addition to Table A)								
1	011	Crop farming	1	0440	Maize	541	399.5	30.2
			2	0544	Tomatoes	606	241.1	8.4
			3	0751	Pepper	698	1.8	4.6
			4	0812	Bran and other cereal residues	643	1,222.3	1.6
			5	1212	Stripped tobacco	700	5.2	9.7
			6	1213	Tobacco refuse	697	163.1	0.4
			7	2925	Planting seeds and spores	594	26.5	6.5
2	012	Animal farming	8	0012	Sheep and goat	558	51.4	1.9
			9	2112	Raw calf skins	650	160.7	0.4
			10	2116	Raw sheep skin with wool	605	5.0	0.6
3	050	Fishery	11	0341	Fresh fish	648	1,811.1	18.6
			12	0372	Misc. crustaceans and mollusks	631	3.8	8.4
4	131	Mining: iron ores	13	2820	Iron waste	562	50,937.2	27.8
5	141	Quarrying: stone, sand, and clay	14	2734	Stones	497	1,999.8	3.3
			15	2782	Misc. clay and refractory minerals	565	6,371.5	6.7
6	151	Food processing	16	0342	Frozen fish	682	7,798.9	20.6
			17	0546	Frozen vegetables	567	255.3	13.1
			18	0814	Inedible flours of meat and fish	627	195.0	6.4
			19	2919	Misc. animal origin materials	601	12,344.0	7.8
7	153	Grain mill products	20	0422	Milled rice	645	7,305.3	15.5
8	154	Other food products	21	0483	Pasta	635	3,469.4	4.3
			22	0615	Molasses	691	0.0	1.0
			23	0723	Cocoa butter	538	0.0	8.5
9	155	Beverages	24	1121	Wine	514	9.9	32.9

Continued next page

Appendix 2 continued

	ISIC	ISIC Description		SITC	SITC Description	Opportunity Gain Rank	Kazakhstan Exports ($ '000)	World Exports ($ billion)
10	160	Tobacco products	25	1223	Tobacco substitutes	564	32.9	4.8
11	171	Textiles	26	6513	Cotton yarn	649	8,218.0	13.3
12	172	Other textiles	27	6583	Blankets	595	10.8	3.3
13	182	Fur products	28	8483	Fur clothing	491	124.2	1.6
14	191	Leather products	29	6114	Bovine and equine leather	690	27,034.8	18.8
15	202	Wood products	30	6342	Plywood	580	973.2	10.6
16	241	Basic chemicals	31	5232	Metallic salts	508	18,629.3	14.9
			32	5622	Phosphatic fertilizers	587	759.9	1.8
			33	5623	Potassic fertilizers	328	0.0	16.9
			34	5629	Misc. fertilizers	625	12,478.3	22.4
17	269	Nonmetallic mineral products n.e.c.	35	6612	Cement	668	1,778.0	10.0
18	271	Basic iron and steel	36	6725	Iron billets	415	12,396.8	24.2
19	272	Basic precious and nonferrous metals	37	6812	Platinum	275	2,477.4	23.9
C. 0.5 Standard Deviation Below Average Distance (in addition to Tables A and B)								
1	011	Crop farming	1	0421	Rice	634	14.1	2.4
			2	0430	Unmilled barley	326	1,480.4	7.9
			3	0541	Potatoes	585	80.4	3.4
			4	0574	Apples	458	91.6	7.3
			5	0811	Hay	492	422.7	4.0
2	012	Animal farming	6	0616	Honey	671	91.6	2.3
			7	2111	Raw hides of bovine and equine	617	1,131.1	5.5
3	020	Forestry	8	2929	Misc. vegetable origin materials	597	2,008.9	5.1
4	132	Mining: nonferrous metal ores	9	2881	Ash and residues	469	898.7	4.0
			10	2882	Misc. non-iron waste	603	61,198.3	35.4
5	141	Quarrying: stone, sand, and clay	11	2733	Sands	521	1,933.2	1.8
6	142	Mining and quarrying n.e.c.	12	6673	Unmounted precious stones	608	5,055.3	12.1
7	151	Food processing	13	0111	Bovine meat	551	3,198.8	39.8
			14	0116	Bovine and equine entrails	390	33.1	6.7

Continued next page

Appendix 2 continued

	ISIC	ISIC Description		SITC	SITC Description	Opportunity Gain Rank	Kazakhstan Exports ($ '000)	World Exports ($ billion)
			15	0343	Fish fillets	656	4,527.1	5.2
			16	0350	Fish, preserved	688	1,048.9	5.1
			17	0561	Dried vegetables	604	1,081.5	2.6
			18	0565	Vegetables	674	254.4	14.6
			19	0583	Fruit jams	610	85.7	2.5
			20	0585	Fruit or vegetable juices	651	1,352.9	14.5
			21	0586	Temporarily preserved fruit	613	8.5	4.8
			22	0589	Prepared fruit	678	198.3	13.8
			23	0914	Margarine	570	8,164.5	4.3
			24	4239	Misc. vegetable oils	292	4,402.0	6.0
			25	4242	Palm oil	632	0.0	27.0
			26	4249	Fixed vegetable oils	615	7.4	2.3
8	152	Dairy products	27	0224	Preserved milk	429	1,207.8	19.5
			28	0240	Cheese	484	3,898.7	26.3
9	153	Grain mill products	29	0470	Non-wheat cereal flour	664	1,157.8	1.3
			30	0481	Misc. cereal grains	532	1,092.2	5.9
10	154	Other food products	31	0612	Refined sugars	626	87.3	8.8
			32	0620	Confectionary sugar	599	17,821.7	9.5
11	155	Beverages	33	0482	Malt	355	475.3	3.4
12	171	Textiles	34	6522	Finished cotton fabrics	621	2,801.0	14.8
13	172	Other textiles	35	6581	Textile bags	713	2,030.4	4.1
			36	6584	Linens	658	104.0	22.2
14	181	Garments	37	8423	Men's pants	706	4,257.4	31.5
			38	8429	Misc. men's outerwear	694	268.9	20.3
			39	8439	Misc. feminine outerwear	711	150.9	49.9
			40	8451	Knitted outerwear	707	216.1	51.0
			41	8452	Women's knitted outerwear	703	11.5	11.0
			42	8459	Misc. knitted outerwear	712	105.8	53.6
			43	8462	Cotton undergarments	710	94.3	36.7
15	201	Sawmilling and planing of wood	44	2482	Coniferous wood	427	723.5	25.8
			45	2483	Non-coniferous worked wood	636	45.9	14.5

Continued next page

Appendix 2 continued

	ISIC	ISIC Description		SITC	SITC Description	Opportunity Gain Rank	Kazakhstan Exports ($ '000)	World Exports ($ billion)
16	202	Wood products	46	6341	Sawn wood less than 5 mm thick	530	1.1	3.1
17	210	Paper products	47	2517	Chemical wood pulp of soda or sulfate	356	0.0	31.0
			48	2519	Misc. cellulosic pulps	398	3,200.0	2.5
18	232	Refined petroleum products	49	3354	Misc. bituminous mixtures	463	38,209.8	20.8
19	241	Basic chemicals	50	5222	Inorganic acids and oxygen compounds	416	7,839.3	11.3
			51	5322	Tanning extracts	596	0.0	1.7
			52	5832	Polypropylene	485	21,548.4	33.0
			53	5981	Woods and resin chemicals	436	0.7	2.3
			54	5331	Misc. coloring products	183	344.9	11.4
20	242	Other chemical products	55	5513	Essential oils	680	0.7	4.4
			56	5541	Soaps	659	1,751.4	5.6
21	261	Glass products	57	6651	Glass bottles	589	2,878.7	8.5
22	269	Nonmetallic mineral products n.e.c.	58	6611	Lime	602	455.7	0.9
			59	6613	Worked building stone	623	3,655.4	11.8
23	271	Basic iron and steel	60	6727	Iron coils	311	59,335.7	37.3
			61	6732	Iron bars and rods	542	10,499.8	34.9
			62	6733	Iron shapes	352	4,544.5	15.1
			63	6783	Misc. iron tubes and pipes	546	6,145.7	28.7
24	272	Basic precious and nonferrous metals	64	6822	Processed copper	358	3,481.8	44.4
25	331	Medical and specialized instruments	65	8731	Gas, liquid, and electric meters	392	351.7	4.1
26	351	Ships and boats	66	7931	Warships	478	0.0	3.5
27	369	Other manufacturing	67	2772	Misc. natural abrasives	422	0.0	0.7
			68	9610	Non-gold coin	253	0.8	0.5

ISIC = International Standard Industrial Classification, misc = miscellaneous, mm = millimeter, n.e.c. = not elsewhere classified, SITC = standard international trade classification.
Sources: Estimates based on United Nations Commodity Trade Statistics Database. http://comtrade.un.org/db/default.aspx (accessed March 2017); and United Nations Statistics Division. Correspondence between ISIC Rev. 2 and ISIC Rev. 3. http://unstats.un.org/unsd/cr/registry/regso.asp?Ci=1&Lg=1.

Chapter 4
Oil-and-Gas Services in Kazakhstan

Zauresh Atakhanova

The aim of this chapter is to evaluate the impact of the oil-and-gas sector in Kazakhstan on the development of its services sector, with particular emphasis on oilfield services (OFS), which are an important part of the petroleum value chain. The efficiency of the market for OFS is crucial for maintaining the competitiveness of Kazakhstan's oil-and-gas industry, especially in the current context of low prices in the international oil market following the recent boom. During 1994–2011, the production of oil-and-gas condensate quadrupled, and the share of oil and gas in national exports rose nearly eightfold, from just 8%. In addition, the share of oil-and-gas revenue to total government revenue grew from less than one-sixth to more than half. Oil rents as a share of gross domestic product (GDP) rose to a peak of 21% in 2005, but fell back to 6% in 2015 following the collapse of international oil prices from 2014.

Despite the increased concentration of economic activity in Kazakhstan over the past 2 decades and the greater vulnerability of the national economy to external shocks, the growth of the oil-and-gas sector has generated many positive spillovers. In particular, they have benefited firms specializing in producer services such as transportation and logistics, trade, construction, finance and insurance, research and development (R&D), professional services (legal, auditing and accounting, project management, etc.), and specialized auxiliary services.

As the economy adjusts to a low oil price environment, those service industries could contribute more effectively if some adjustments were made to current policies. Examples discussed in this chapter include replacing the current local

content regulations, encouraging small firms to reap economies of scale by forming cooperatives, and altering investments in research for the oil-and-gas sector.

Kazakhstan's local content regulations of 2010 have increased the involvement of local producers in developing petroleum resources. While the variety, quality, and complexity of local OFS have increased, World Trade Organization (WTO) rules require that the government change its stipulated minimum expenditure shares on local goods, works, and services (GWS) and minimum share of local employees. An attractive alternative is the formation of joint ventures and consortia between local and foreign OFS companies, since they can be vehicles for transferring technologies and skills. Making the local OFS market more transparent would support that process. In this respect, the Alash electronic database may play a key role, provided it has a sufficiently large number of participants on both sides of the market, and transactions are performed online.

The local OFS market still consists of many small firms, which impedes access to new technologies, credit, and large contracts from petroleum producers. However, smaller firms have an advantage over the larger ones in terms of greater specialization of the services they deliver. Providing incentives for such firms to form cooperatives and jointly bid for contracts may reduce excessive fragmentation of that services market. A legal framework that enables the formation and dissolution of such cooperatives in line with the duration of a particular project would increase the interest of small firms in participating in such cooperatives, some of which subsequently may become large companies.

Current legislation requires 1% of gross oil revenues to be invested in local R&D. Research in Kazakhstan is carried out predominantly by universities and public research organizations, but their outputs are often of low quality and have limited commercial application. Developing better incentives for commercialization, reducing bureaucratic hurdles, and promoting innovation in the private sector using both patent and nonpatent forms of intellectual property would all improve R&D productivity. This could be done by drawing lessons from the successful building of indigenous oil-and-gas R&D capacity in such countries as Malaysia and Norway. Raising the quality and prestige of education in the physical sciences and engineering, as well as in associated fields such as project management, would help, too.

The chapter is structured as follows: section 4.1 provides essential background information on oil and gas in the economy of Kazakhstan. Section 4.2 describes the oil-and-gas value chain and the role of OFS. Section 4.3 describes key features of the OFS sector in Kazakhstan. Section 4.4 presents an analysis of relevant data.

Section 4.5 describes key policies that influence the development of the OFS sector in Kazakhstan, while section 4.6 analyzes the challenges of innovation and R&D in the oil-and-gas sector. The final section draws out policy implications and conclusions.

4.1. Background

Oil-and-gas production is one of the oldest industries in Kazakhstan. Commercial oil production began in 1911 in the western regions along the Caspian Sea. During the Soviet period, the country's oil-producing western regions became an important industrial growth pole, along with the heavy industrial complex based on mining and metallurgy elsewhere in the country, in particular in its northeastern and eastern regions.

The oil sector's contribution to economic activity underwent a dramatic change starting in 1993 when a seminal agreement was signed between the Government of Kazakhstan and Chevron to develop the Tengiz field. This agreement was the first major contract of the newly independent country. It boosted international investor confidence and initiated a period of substantial FDI flows into Kazakhstan.

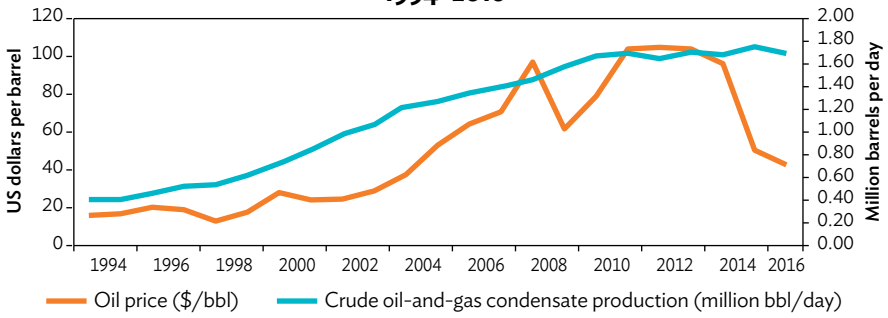
However, remoteness, technical challenges, and underdeveloped market mechanisms required enormous efforts and resources to develop the oil fields of western Kazakhstan.[1] Establishing the legislative base, designing a system of taxation and regulation, building the required infrastructure, producing and transporting complex equipment, and training the personnel were all necessary for the oil-and-gas sector to develop its potential.

Initially, a key constraint to the sector's growth was the limited capacity of delivering oil to international markets. However, pipeline construction of the Caspian pipeline consortium and improved interconnections with the Russian Federation pipeline system facilitated international market access for Kazakhstan's oil-and-gas producers by the mid-2000s. Between 1994 and 2011, the level of production of oi-and-gas condensate quadrupled (Figure 4.1), which significantly boosted the contribution of the oil-and-gas sector to overall economic activity. The share of oil-and-gas exports in the value of national exports rose from 8% to 63% during 1994–2014. In addition, the share of oil-and-gas revenue to total government revenue grew from 17% in 1999 to 54% in 2011 (Figure 4.2). Oil rents as a share of GDP increased from 3% in 1991

1 The State revenue committee within the Ministry of Finance works to identify additional reserves on proceeds from subsoil users engaged in the exploration and production of crude hydrocarbons (fossil fuels), and systematically combats illegal production of commonly occurring minerals and groundwater to identify unregistered paying agents.

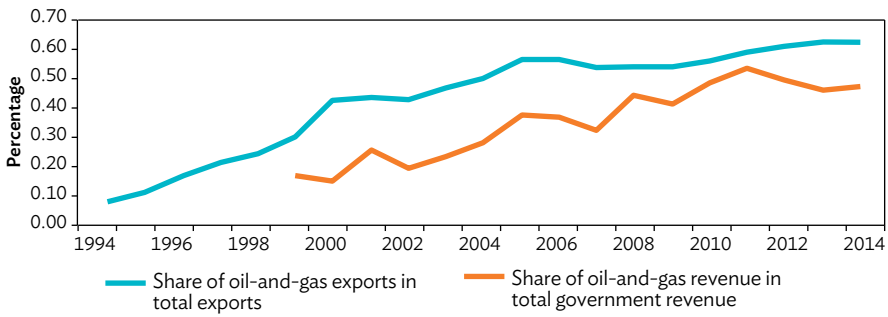
to the peak of 21% in 2005, but fell back to 5.6% in 2015 following the collapse of international oil prices from 2014 (World Bank Data).

Figure 4.1: Oil Production in Kazakhstan and the International Oil Price, 1994–2016



bbl = barrel.
Source: International Monetary Fund (2017).

Figure 4.2: Contribution of the Oil-and-Gas Sector to Economic Activity, 1994–2014



Source: International Monetary Fund (2017).

Within subnational administrative units, the oil-producing oblasts of Atyrau and Mangystau accounted for half of the transfers from the sector to the national budget during 2013–2016 (Table 4.1). At the same time, the other two oil-producing oblasts, Aktobe and West Kazakhstan, together received transfers from the national budget, but that represented only 6% of total transfers to all oblasts. Another indication of the importance of the oil-and-gas sector from a fiscal perspective is its role in the sovereign wealth fund, the National Fund of the Republic of Kazakhstan (NFRK). The fund's assets were valued at $75 billion in 2014 and $64 billion in 2016 (National Bank

of Kazakhstan 2018). All but 1% of NFRK annual receipts are from tax payments from the oil-and-gas sector.

Despite the strong impact of the resource sector on output and tax revenues, the *direct* employment impact of the oil-and-gas industry on national employment has been small. This is due to the high capital intensity of the sector's production process. On average, during 1994–2014, this sector accounted for only 0.5% of total employment in Kazakhstan. However, the *indirect* impact of the oil-and-gas sector on total employment is considerable, because spending of oil rents by the public and private sectors supports the growth of services in other sectors that are relatively labor-intensive. In Kazakhstan, the share of service jobs in total employment grew from 38% in 2001 to 48% in 2014, which may be attributed largely to the spending of resource rents. These developments are consistent with features of the Dutch disease (Corden 1984), whereby, during a resource boom, the services sector expands because of resource rent spending and is shielded from foreign competition because many services are nontradable.

Table 4.1: Subnational Government Budget Withdrawals and Payments, 2013–2016 (T million)

	2013	2014	2015	2016
Withdrawals from local budgets	**121,056**	**132,021**	**168,538**	**213,853**
Atyrau	44,225	51,211	60,683	73,203
Mangystau	24,607	10,080	16,726	25,713
Almaty City	52,224	70,730	83,656	97,684
Astana City	-	-	7,473	17,253
Payments from the republican budget	**865,844**	**978,094**	**904,371**	**836,882**
Akmola	53,074	64,076	59,210	52,707
Aktobe	32,806	29,376	19,926	8,621
Almaty	103,466	121,290	102,811	91,088
East Kazakhstan	89,282	93,509	86,527	80,124
Zhambyl	87,076	95,698	95,372	94,008
West Kazakhstan	13,485	36,321	36,204	37,001
Karagandy	58,562	50,464	33,833	16,133
Kyzylorda	71,143	83,979	83,181	80,719
Kostanai	51,166	63,071	58,910	55,912
Pavlodar	27,722	21,509	14,477	7,278
North Kazakhstan	50,820	59,913	58,719	57,471
South Kazakhstan	220,322	254,747	255,200	255,820
Astana City	6,920	4,141	-	-

- = no data.
Source: Ministry of Finance (2017).

4.2. The Oil-and-Gas Value Chain and the Role of Oilfield Services

The petroleum industry's value chain consists of a system of interrelated processes that transform raw natural resources into finished consumer products. It has three stages: upstream, including exploration, production, and auxiliary oilfield services; midstream, consisting of transportation and storage; and downstream, including refining and marketing. Some oil-and-gas companies are engaged in multiple stages of value creation, while others specialize in a specific stage of production. Tordo et al. (2013) identify drivers of value creation by oil companies: characteristics of the resource base, country-level factors (economic conditions, political considerations, and international obligations), sector-level factors (employment policies, taxation policies, and sector strategies), and company-level factors (corporate governance and international partnerships). A key sector-level determinant is competitive tendering of OFS, which is often at odds with the common development policy of encouraging backward linkages of the petroleum companies with domestic suppliers of goods and services (Tordo et al. 2013).

The growth of the international OFS market dates back to the 1980s, when low oil prices forced the oil majors to outsource some of their traditional activities such as drilling. In the 1990s, increasing technological demands on exploration and production provided an additional spur to the OFS companies that invested heavily in R&D. According to the United States (US) International Trade Commission (2003), in 1998 foreign affiliates of US firms registered $8.6 billion in sales of OFS, while the global market for OFS was estimated at $100 billion in the early 2000s. In 2001, integrated firms such as Schlumberger, Halliburton, and Baker Hughes together controlled 30% of the global OFS market, which also included hundreds of smaller specialized firms. By 2011, the global revenue of OFS was estimated at $750 billion (The Economist 2012). Market capitalization of the largest supplier, Schlumberger, stood at $91 billion and exceeded a number of major international oil companies such as ENI and Statoil. However, the OFS market is naturally dependent on developments in the international oil market. As a result of the oil price collapsing, Schlumberger cut its workforce by 25%, or by 34,000 workers (Lo 2016). In other words, the low oil price environment intensifies the pressure on OFS firms to cut costs and innovate. With this as background, the following section discusses how Kazakhstan's OFS market adjusted to the challenges of surviving in the current low-price environment.

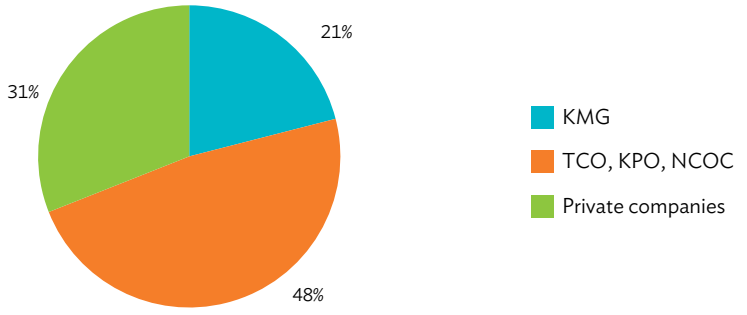
4.3. Oilfield Services in Kazakhstan

The OFS sector in Kazakhstan is represented by large-integrated and small-specialized firms. In 2005, Kazenergy, an association of producers of oil, gas, and electric power, was established and included some of the larger OFS companies. One of the activities of Kazenergy is the monitoring and promotion of competitiveness of the country's OFS industry. In 2011, another specialized association of OFS firms operating in Kazakhstan was established. This new association, Kazservice, was envisioned as a platform for discussing common problems faced by the OFS industry. The association represents the interests of its members through coordinated interaction with the government and oil-producing companies. In addition, one of the key goals of the association is promotion of competitiveness of local OFS producers and their involvement in large projects. The association publishes a journal and conducts a large annual business conference. According to the 2016 survey conducted by Kazservice, there are at least 1,000 firms in this industry together employing 160,000 people (Kazservice 2016). The average yearly sales of the OFS sector are $7 billion or around 50% of all inputs purchased by oil-and-gas producers.

Customers of OFS firms in Kazakhstan include the national oil company, KazMunaiGas, or KMG; three large international oil consortia (Tengizchevroil [TCO]; Karachaganak Petroleum Operating Company [KPO]; and North Caspian Operating Company [NCOC], which developed the offshore Kashagan field); and other private producers (Figures 4.3 and 4.4). The four largest customers account for 70%–84% of all OFS sold. Due to falling international oil prices and a reduction in demand for OFS (Table 4.2), the volume of sales adjusted for changes in the value of the national currency decreased by 36% between 2014 and 2015 (Kazservice 2016). In addition, if the cost of replacement of pipes at the Kashagan field is excluded, the value of the OFS market decreased by an additional 22% (Kazservice 2016).

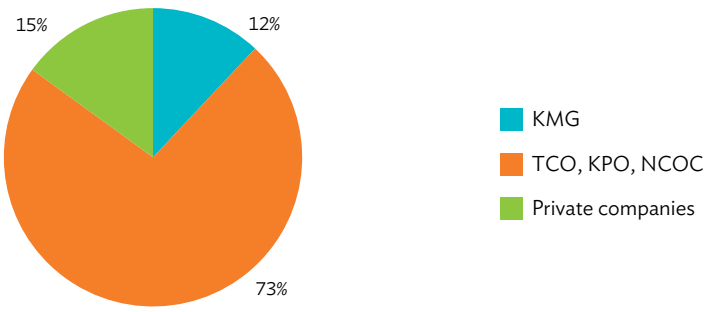
On the supply side, OFS may be divided into five types of services: drilling, construction, maintenance, engineering, and geophysical services. Until 2014, drilling services have been the largest segment of the OFS market. According to Kazenergy (2015b), between 2009 and 2011, the sum of production and exploratory drilling doubled from 1.2 million to 2.5 million meters, with the bulk of the growth being from production drilling. At the same time, the number of wells increased by 20% between 2010 and 2014 and amounted to 21,000 as of January 2015. Table 4.2 shows that the fall in oil prices affected drilling services to the greatest extent, resulting in almost 40% contraction of their sales. Figure 4.5 demonstrates market shares of specific OFS types in 2015.

Figure 4.3: Expenditures of Petroleum Producers on Oilfield Services in 2014, Shares in Total



KMG = KazMunaiGas, TCO = Tengizchevroil, KPO = Karachaganak Petroleum Operating, NCOC = North Caspian Operating Company.
Source: Kazservice (2016).

Figure 4.4: Expenditures of Petroleum Producers on Oilfield Services in 2015, Shares in Total



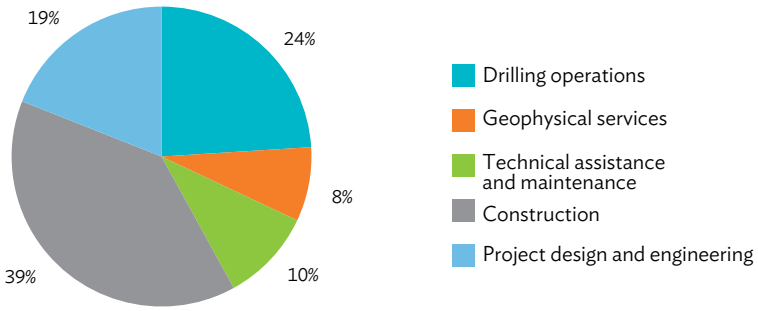
KMG = KazMunaiGas, TCO = Tengizchevroil, KPO = Karachaganak Petroleum Operating, NCOC = North Caspian Operating Company.
Source: Kazservice (2016).

Table 4.2: Oilfield Services Sales and Local Content Shares

Service Type	Sales (T billion) 2014	Sales (T billion) 2015	Change (%)	Local Content (%)
Drilling operations	538	329	(39)	57
Construction	302	523	73	80
Project design and engineering	169	253	50	28
Technical assistance and expertise	186	142	(23)	56
Geophysical services	150	108	(28)	28
Total	**1,346**	**1,355**	**1**	**58**

( ) = negative.
Source: Kazservice (2016).

Figure 4.5: Oilfield Services Types and Their Shares in Total Expenditures of Petroleum Producers in 2015



Source: Kazservice (2016).

The largest consumers of drilling services were KMG national oil company, China National Petroleum Corporation, and PetroKazakhstan, a joint venture of KMG and China National Petroleum Corporation (Kazenergy 2015b). Kazenergy (2015b) reported that the onshore market was dominated by KazPetroDrilling. KazPetroDrilling is a consortium of a KMG subsidiary and private firms; it accounts for 21% of the market and owns 42 rigs. The second largest onshore driller is Velikaya Stena, a Kazakhstan–People's Republic of China (PRC) joint venture, which owns 27 rigs. The offshore drilling fleet includes 11 rigs operating in the Caspian Sea by predominantly international firms. Kazenergy (2015b) noted a shortage of offshore rigs and limited local capacity of rig manufacturing as constraining factors, which were further aggravated by the scaling back of investments due to the slump in the international oil price.

Data from the Kazservice survey (2016) provides some information on other segments of the OFS market. It implies very high firm concentration in construction, project design, and geophysical services, with the top producers accounting for 45%–50% of relevant markets. However, the market for maintenance is less concentrated. In addition, Kazservice (2016) data suggest that the concentration in the drilling market was lower in 2015 than in the earlier period discussed in Kazenergy (2015b). In general, the number of OFS firms reported by Kazservice (2016) and the high market shares of leading companies in each of the five types of OFS together imply the presence of many smaller OFS firms. Issues of sustainability of these small and medium-sized enterprises (SMEs) are discussed in section 4.6.

4.4. Official Data on the Oilfield Services Market

The Committee on Statistics of the Republic of Kazakhstan, which is a part of the Ministry of National Economy, covers OFS in a number of categories of the National Output Classification by Economic Activity. Relevant categories are auxiliary mining services, construction, professional services, and equipment installation and repairs. Auxiliary mining services include production well drilling and maintenance, as well as on-site treatment and separation of hydrocarbons. Construction includes industrial construction and drilling of exploratory wells, as well as other types of construction. Professional services include design, engineering, geophysics, and R&D. In addition, Professional services also include legal, accounting, consulting, and marketing services. The value of OFS as captured by the four categories above was equal to T1,100 billion in 2014 and T853 billion in 2015 (Table 4.2). These numbers are smaller than the ones reported in the survey by Kazservice (2016), especially for 2015. In addition, one needs to take into account that professional services include several general business services. This suggests that the Ministry of Energy and Ministry of National Economy should cooperate to develop consistent approaches to measuring and reporting activity in the OFS sector. Specifically, publications from Kazenergy and Kazservice associations state that OFS account for 50% of all procurement of oil-and-gas companies. In contrast, according to Ministry of National Economy data, this indicator was at most 27% on average during 2004–2015, reaching up to 37% in 2014–2015. A potential source of discrepancy may be differential approaches to measuring intermediate input values.

Overall, the data illustrate the importance of the service sector for the oil-and-gas industry. Between 2004 and 2015, the oil-and-gas sector purchased on average 56% of all its intermediate inputs from the services sector (Table 4.3). Roughly half of the value of all service expenditures was on OFS. The remainder was attributed mainly to trade and transportation. Within OFS, the largest component was auxiliary mining services, which captured most of the drilling activities and accounted for 15% of intermediate input expenditures of the oil-and-gas sector. In turn, during 2004–2015, 96% of auxiliary mining services output value was purchased by the oil-and-gas sector. This type of OFS itself spends 53% of its intermediate input expenditures on services (Table 4.4), of which the most important are trade (13%), transport (9%), and professional services (9%). In addition, auxiliary mining services (Table 4.5) make large expenditures on metallurgy (13%), machinery (11%), crude and refined petroleum (8%), and chemicals (5%). In other words, similar to the oil-and-gas companies themselves, the OFS sector also uses services intensively.

Table 4.3: Value of Services Purchased by the Oil-and-Gas Sector, 2004–2015 (T million)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Repairs	6,531	12,276	14,974	17,504	13,608	14,439	12,952	53,694	107,515	172,315	93,374	76,035
Auxiliary mining services	148,638	195,592	220,113	188,496	291,878	276,536	374,256	411,958	451,817	519,045	632,729	478,955
Construction	11,459	18,344	15,981	27,793	20,215	39,636	12,717	56,858	153,772	63,319	107,582	38,926
Professional services	157,833	88,845	262,391	179,314	269,376	128,405	93,737	343,761	224,060	248,444	269,006	258,670
Total services	377,961	670,846	966,091	1,044,584	1,283,459	1,030,751	1,171,035	2,200,145	1,906,973	1,903,774	1,994,182	1,737,638
Intermediate inputs	793,450	1,138,821	1,462,171	1,930,580	2,522,116	2,115,302	2,674,450	3,464,447	3,485,265	3,573,276	3,174,091	2,317,306
Oilfield services*	175,823	315,056	513,459	413,107	595,077	459,016	493,661	866,271	937,163	1,003,124	1,102,692	852,585

*Sum of Repairs, Auxiliary Mining Services, Construction, and Professional Services.
Source: Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

Table 4.4: Share of services in intermediate Inputs Purchased by the Oil-and-Gas Sector, 2004–2015 (%)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Repairs	0.82	1.08	1.02	0.91	0.54	0.68	0.48	1.55	3.08	4.82	2.94	3.28	1.77
Auxiliary mining services	18.73	17.17	15.05	9.76	11.57	13.07	13.99	11.89	12.96	14.53	19.93	20.67	14.95
Construction	1.44	1.61	1.09	1.44	0.80	1.87	0.48	1.64	4.41	1.77	3.39	1.68	1.80
Professional services	19.89	7.80	17.95	9.29	10.68	6.07	3.50	9.92	6.43	6.95	8.48	11.16	9.84
Total services	65.55	57.83	65.05	53.20	50.35	48.05	43.30	61.96	51.63	48.46	59.89	71.70	56.41
Oilfield services*	22.2	27.7	35.1	21.4	23.6	21.7	18.5	25.0	26.9	28.1	34.7	36.8	26.80

*Sum of Repairs, Auxiliary Mining Services, Construction, and Professional Services.
Source: Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

Table 4.5: Major Expenditure Categories of Auxiliary Mining Services, 2014–2015 (% of intermediate input expenditures)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Crude and refined petroleum	9	10	7	8	10	9	10	3	14	12	6	1	8
Chemicals	4	4	3	6	5	6	6	6	5	4	5	3	5
Metallurgy	8	11	6	9	12	10	14	8	16	22	17	20	13
Machinery	11	11	12	13	11	18	14	16	7	9	10	6	11
Services of which	63	55	68	57	57	49	47	56	50	40	45	50	53
Trade	8	10	6	7	8	10	16	19	9	12	17	30	13
Transport services	11	9	17	10	9	10	8	7	6	9	7	5	9
Professional services	17	10	16	9	12	9	6	8	7	4	7	6	9
Other services	27	26	29	31	28	20	17	22	28	15	14	9	22

Source: Statistics Committee of Ministry of National Economy of the Republic of Kazakhstan.

4.5. Local Content Policies in the Post-World Trade Organization Context

National governments of resource-rich countries often formulate and use local content policies to ensure broad-based development beyond the extractive sector. According to World Bank (2013), the success of local content policies requires coordination with other policies in the fields of education, infrastructure, financial markets, macroeconomic management, and trade. The benefits of such policies in the form of increased employment outside the oil-and-gas sector have to be weighed against the cost of potential inefficiencies. The technological complexity of the petroleum production process and use of highly specialized inputs present a challenge to quickly creating the supply of such inputs from local sources. In addition, the relatively short payback period that is expected in the petroleum industry is at odds with the national government's long-term developmental aspirations. This section describes and assesses local content policy initiatives in Kazakhstan.

The first Petroleum Law of Kazakhstan, adopted in 1995, did not have local content (LC) provisions. Prior to adoption of the 2010 Law on Subsoil and Subsoil Use, the level of involvement of local firms as suppliers to petroleum producers was deemed low. Kazenergy (2013) reported that the average share of local GWS in overall expenditure was 10%–12%, while major producers purchased only 3% of GWS from local sources. The 2010 law required that bids for new mineral rights include commitments on minimum local GWS and training of local personnel that should constitute no less

than 95% of the firm's labor. In addition, operators were required to select contractors based on 20% reduction of bid prices of local producers (World Bank 2013). Furthermore, the policy required that subsoil users provide the government with their procurement plans that were made available to local suppliers. To ensure Kazakhstani origin of GWS, the government designed and implemented a system of certification that made a firm eligible to take advantage of the 20% discount on its bidding price.

The three big projects—TCO, KPO, and NCOC—were initially exempt from LC regulations. However, in each of the three cases, commitments on LC were made in subsequent expansion projects. For instance, currently the aspiration of many OFS companies is engagement in the TengizChevroil's Future Growth Project and the Wellhead Pressure Management Project (FGP/WPMP). FGP/WPMP will allow TCO to increase production levels by 260,000 barrels/day and extend the life of the field. In 2016, TCO announced plans to invest $36 billion and expects completion of the FGP/WPMP by 2022. TCO plans to source 32% of services from local companies and expects to create an additional 20,000 jobs. Some examples of successful employment of local service providers by TCO include local engineering firms KazGiproNefteTrans and Kazakhstan Institute of Oil and Gas, which were involved in designing the new modules for the FGP/WPMP. In addition, TCO worked closely with some construction companies such as MontazhSpetsStroy to upgrade its safety standards and become eligible to be involved in the previous and most recent expansion projects.

In general, according to Kazenergy (2015b), LC policies resulted in raising the share of domestically produced goods to 16%, while use of domestic OFS increased from 45% to 54% between 2010 and 2014. This is roughly consistent with the data collected independently by the Kazservice association (Table 4.1).[2] However, the launch of the Eurasian Economic Union and Kazakhstan's accession to WTO in 2015 led the country's authorities to reconsidering LC policies. In addition, there was a perception that excessive LC policies affected the attractiveness of Kazakhstan's petroleum sector to foreign investors.

Finally, there was a perception that the increased LC was achieved by means of supplying primarily low-value-added goods and services. More technologically advanced needs of petroleum producers remained to be met by international firms. As a result, and to meet the WTO requirements of nondiscriminatory treatment of service providers, LC-related terms of contracts of subsoil users will be terminated in 2022 unless they expire at an earlier date. Instead, the focus of policy makers is on encouraging the creation of joint ventures as vehicles of technology and skill transfer. In addition, the policy envisages funding by subsoil users of R&D activities in Kazakhstan.

[2] Kazservice (2016) estimates that the market share of local OFS firms is 50%–55%. However, when adjustments are made for subcontracting of works and purchases of equipment from foreign suppliers, the LC share of the OFS market is likely to be smaller. This number has not been reported.

4.6. Research and Development in the Oil-and-Gas Sector

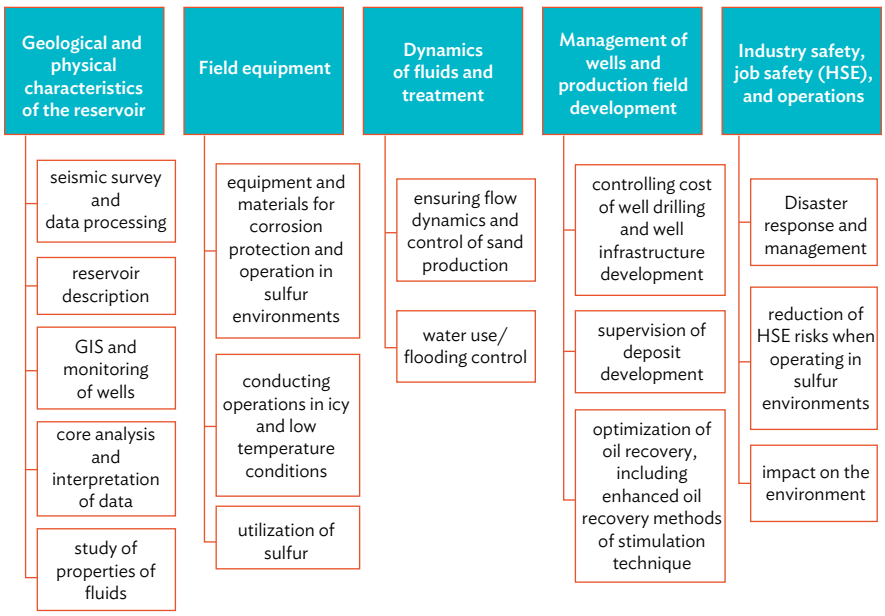
The oil-and-gas industry is highly capital intensive. Unique geologic, climatic, and environmental considerations of each field require innovative approaches in applying existing and developing new technologies. According to The Economist (2012), in 2011 oil majors spent 0.25%–0.4% of revenue on R&D, while this indicator for the leading OFS firms was 1.6%–3.7%. On average, R&D spending as a share of GDP in OECD countries is 2.4% and has been increasing since the early 2000s. Kazakhstan spends only 0.2% of its GDP on R&D and lags behind other former Soviet Union countries in terms of international patent applications (OECD 2016). As far as the petroleum sector is concerned, human capital, limited research infrastructure (especially laboratories), weak links between industry and research entities, and an inefficient research funding mechanism hinder R&D in this sector in Kazakhstan. In order to address the limitations to R&D in the petroleum sector, Kazenergy (2013) recommended establishing an advisory board that would include representatives from industry, research organizations, and academia. The purpose of the board would be to identify priority research areas, coordinate R&D activities, raise funds, facilitate international cooperation, assist with testing and implementation of technologies by the clients, and disseminate knowledge. In addition, the report highlighted the importance of simplifying research grant allocation mechanisms by the state bodies, addressing the difficulties in importing research-related and laboratory equipment, and improving the legislation on protection of intellectual property rights.

One example of cooperation between petroleum sector stakeholders was presented in the designing of the "road map for the scientific and technological development of the oil-and-gas sector in Kazakhstan." The road map was jointly developed by Shell, KazMunayGas national oil company, and Kazakhstan Institute of Oil and Gas. The road map identifies 15 priority tasks within five areas that represent persistent challenges for industry participants (Figure 4.6). Experts estimate that addressing each task will generate $2 billion–$7.5 billion of savings and expect a total of tens of billions of dollars in savings if the road map is implemented.

As the shortage of qualified personnel represents one of the constraints to R&D in Kazakhstan's petroleum sector, it is crucial to establish a closer dialogue between the industry and academia with respect to the development of appropriate human capital. Specifically, Kazenergy (2013) underscored the shortage of qualified personnel in the fields of basic sciences and engineering, especially in the subfields of geophysics, reservoir development technology, production, and analysis of the chemical composition of hydrocarbons. In addition, there is a shortage of skilled technicians in construction, operation, and maintenance. The report called for

consulting industry practitioners regarding the design of academic programs, greater utilization of fieldwork in the academic curricula, encouraging applied research to be carried out by graduate students, and holding regular meetings to discuss technical and technological constraints of petroleum producers and their potential solutions.

Figure 4.6: Priority Areas for Research and Development in the Oil-and-Gas Sector

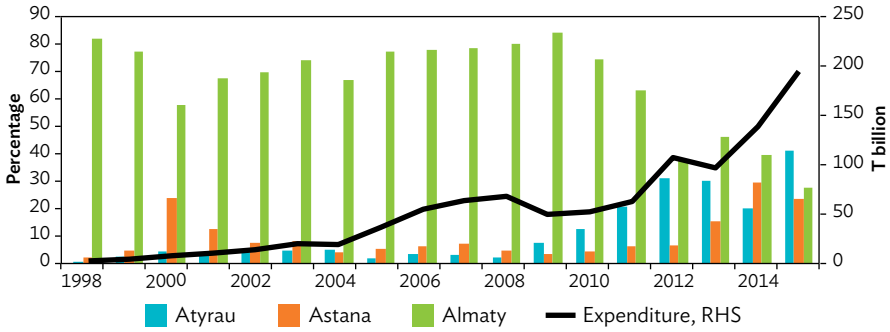


GIS = geographic information system, HSE = health, safety, and environment.
Source: Kazenergy (2013).

Despite the identified constraints, R&D activities in Kazakhstan's oil-and-gas sector surged during 1998–2015. According to Figure 4.7, Almaty City (the financial and commercial center of the country) dominated the market for R&D and professional services until 2012. At the same time, R&D and professional services expenditures gradually relocated to the Western Kazakhstan region. Specifically, the contribution to countrywide R&D and professional services expenditures of Atyrau (the largest city in Western Kazakhstan and the center of the petroleum industry) grew from 2% in 1998 to more than 40% in 2015. Overall, the pattern of countrywide R&D and professional services expenditures follows closely the rise of the importance of R&D and professional services in the oil-producing region of Kazakhstan and, to a lesser degree, in the capital city of Astana. An example of innovation, some of which may be linked to R&D expenditures in Kazakhstan, is provided in Box 4.1. This case discusses

innovations applied in developing the offshore Kashagan field and indicates the demand for R&D that may be present in other complex oil-and-gas projects.

Figure 4.7: Research and Development and Professional Services in Kazakhstan: Countrywide Expenditures and Shares of Major Cities



RHS = right-hand scale.
Source: Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2016 r.).

Box 4.1: Innovative Technology Solutions at Kashagan

Kashagan, a super-giant field in the Northern Caspian, was discovered in 2000 and is estimated to hold 35 billion barrels of reserves, of which 10 billion–13 billion barrels are recoverable. The field is being developed by North Caspian Operating Company (NCOC). During 2006–2016, NCOC paid more than $12 billion for local goods, works, and services. It is estimated that $50 billion was spent on this field since the time of its discovery. Development of the field presented multiple challenges due to shallow waters, ice coverage during 5 months of each year, high pressure of the reservoir and its depth, and high sulfur content of the hydrocarbons. The following is a sample of unique technological solutions applied at the field:

- simultaneous trenching, laying, and backfilling of the pipes to reduce disruption of the seabed and ecosystem;
- development of a new type of icebreaker ship with air supply for evacuation of personnel in case of hydrogen sulfide (H_2S) emergency;
- development (with Schlumberger) of a passive in-well monitoring system to minimize production downtime and exposure to H_2S;
- development of sophisticated removal, storage, and reinjection of H_2S;
- development (with Carnegie Mellon University, Shell, and Nazarbayev University) of the Sensaboat robot for performing inspection tasks on unmanned facilities;
- construction, equipment, and operation of artificial drilling and production islands while minimizing environmental impact; and
- use of unique reinforced corrosion-resistant pipes and welding technologies to address the high pressure and sulfur content of hydrocarbons.

Source: Authors, Hashem (2013), Tukayev (2016).

4.7. Policy Recommendations

OFS represent an important component of the petroleum value chain. While there are some discrepancies in valuation of this market from the industry versus official data sources in Kazakhstan, there is no doubt that efficiency of the OFS market is crucial for maintaining the competitiveness of Kazakhstan's oil-and-gas industry. Such competitiveness is especially important in the context of low prices in the international oil market. The present analysis proposes several potential areas where policy change may contribute to improving the operation of the OFS market in Kazakhstan.

Kazakhstan's LC regulations of 2010 have resulted in increased involvement of local producers in developing petroleum resources. The variety, quality, and complexity of works provided by local OFS have increased. However, the post-WTO accession environment requires that the government change its prior policies that stipulated minimum expenditure shares on local GWS and minimum share of local employees. The new approach requires emphasizing the formation of **joint ventures and consortia** between local and foreign OFS companies as vehicles for transferring technologies and skills.

There have been several cases where such forms of cooperation between a foreign and a local company were successful. The foreign partner usually contributes superior technology and management practices, while the local partner contributes its understanding of the local market, institutions, and resource base. In many cases, the local company used to be a subcontractor of the foreign company and managed to earn trust and adopt managerial and quality practices of the foreign company before a joint venture/consortium was set up. In other words, this mechanism is attractive to those foreign OFS companies that have been in the Kazakhstani market for some time. Lack of experience in working in Kazakhstan may represent a high barrier for new entrants that otherwise may be attractive partners for local companies. Addressing this market barrier is discussed below. In addition, those foreign service firms that employ the latest, highly complex technologies may have difficulty identifying local partners that would meet their expertise requirements. As a result, addressing human capital and innovation challenges of local service companies will be a prerequisite for forming joint ventures and consortia, especially in the most high-tech segments of the market.

One way to address lack of local experience of foreign market entrants is by making the local OFS market **more transparent**. In this respect, the Alash electronic database may play a key role. The system was created on the initiative of KMG, TCO, KPO, and NCOC with the specific objective of promoting procurement of local GWS by the operators of the three largest projects. The system provides operators with

access to OFS company profiles that contain details on the types of GWS, projects performed, quality, and labor safety. This is a welcome development, and it parallels similar initiatives abroad that provide online trading platforms. One such popular platform out of the US, RigUp, offers simplified procurement and cost saving for the operators and avoids subcontracting by OFS providers. The key feature of RigUp is a very large number of participants: 17,000 contractors and 150 oil-and-gas companies. RigUp has allowed the latter to receive a higher number of bids per award and 30% on cost saving.

As for Kazakhstan's Alash system, unless it has a sufficiently large number of participants on both sides of the market and transactions are performed online (awards are announced and assigned in a transparent manner), this initiative is likely to have a limited impact. In the long run, expanding the geography of the Alash system and allowing participants from the wider region will be beneficial for both buyers and suppliers. In addition, an important aspect of a successful operation of this system may encourage international certification (such as International Organization for Standardization [ISO]). Currently, Alash undertakes some form of quality assurance. Gradual transition to requiring ISO certification from system participants would allow Alash to focus its efforts on maintaining and improving the operation of the online market. Furthermore, international certification may increase the chances of Kazakhstani service companies accessing foreign markets as was done by KazStroyService working in the Middle East and India and LOGIC Services Kazakhstan working in the Russian Federation's Arctic. In general, the number of local OFS firms operating abroad is limited to a handful of cases. This is consistent with the official data, which report zero values for exports of auxiliary mining services, the largest segment of the OFS market. The upcoming phasing out of local content requirements will put more pressure on OFS firms to search for opportunities outside Kazakhstan, which, in turn, underscores the need to increase the technical sophistication of such firms.

The local OFS market consists of **many small firms**. Smallness of firms impedes access to new technologies, credit, and larger contracts from petroleum producers. One successful form of support for SMEs in the OFS market was a business incubator program implemented jointly by the United Nations Development Programme and Tengizchevroil (UNDP 2010). Starting in 2002, this program provided interest-free loans to those SMEs and start-ups in Atyrau Oblast that had an environmental or social component. In addition to financial support, the program provided technical and legal assistance as well as office space to its participants. In general, it is important to understand the potential market niche that SMEs may have in the OFS market. Smaller firms tend to have an advantage over larger ones in terms of greater specialization of the services they deliver. Providing incentives for such firms to form cooperatives

and jointly bid for contracts may address the issue of excessive fragmentation of the service market. According to Uzakbai Karabalin, former minister of energy, such companies may be very competitive in rejuvenating older fields, which are numerous in Kazakhstan and require enhanced oil recovery techniques (Karabalin 2017). Limited and complex existing tax incentives for upgrading such fields have prevented longer-term commitment of producers to apply enhanced oil-recovery technologies that have been developed and are widely used abroad. A legal framework that enables the formation and dissolution of such cooperatives in line with the duration of a particular project would increase the interest of small firms in participating in such cooperatives, some of which might lead to formation of larger companies.

According to the current legislation, 1% of gross revenues of oil producers should be invested in **local R&D**. However, lack of proper definition of types of activities that qualify as R&D slows down implementation of this regulation. Further work on detailing this regulation following best practices is required. In general, according to OECD (2016), Kazakhstan's system of innovation is at an early stage of development. Compared with other former Soviet republics (Russian Federation, Belarus, Ukraine, and the Baltic states), Kazakhstan significantly underperforms in terms of national and international patent applications. Gross expenditures on R&D in 2014 represented only 0.2% of Kazakhstan's GDP. Research in Kazakhstan is carried out predominantly by universities and public research organizations. The research output of these entities is often of low quality and has little relevance for commercial applications. Developing incentives for commercialization, reducing bureaucratic hurdles, and promoting innovation in the private sector using both patent and nonpatent forms of intellectual property such as trademarks and industrial designs, have been identified as general challenges of the intellectual property system in Kazakhstan. Limited funding and low demand characterizes the overall intellectual property market in Kazakhstan. In this context, the high demand for oil-and-gas related innovation represents valuable opportunities for local R&D firms.

Understanding the importance of innovation as the foundation of competitiveness in OFS, and a change of focus in LC policy, have started to take root among policy makers in Kazakhstan. Stronger commitment to innovation support and learning from the successful experience of building indigenous oil-and-gas R&D capacity in such countries as Malaysia and Norway have been recommended. Related to this is the importance of raising the quality and prestige of education in physical sciences and engineering, as well as associated fields such as project management. Until now, inadequate skills and innovation activity have been a drag on the development of the OFS sector in Kazakhstan. As a result, prioritizing policies aimed at upgrading skills and innovation represents a road map toward raising the competitiveness of Kazakhstan's OFS companies and the oil-and-gas sector.

References

Corden, W. M. 1984. Booming Sector and Dutch Disease Economics: Survey and Consolidation. Oxford Economic Papers. 36 (3). pp. 359–80.

Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan. 2016. Объем профессиональных, научных и технических и прочих услуг (in Russian). www.stat.gov.kz.

The Economist. 2012. The Unsung Masters of the Oil Industry. 21 July.

Hashem, M. 2013. Kashagan: Technological Breakthrough. Kazenergy Magazine. Special Edition "Kashagan: from Vision to Reality." pp. 77–78.

International Monetary Fund. 2017. Republic of Kazakhstan Article IV Consultation—Press Release; and Staff Report, Washington, DC.

Karabalin, U. 2017. Бесценный опыт работы. Kazservice Magazine. January–March. 1 (14). pp. 58–63. Astana: Kazservice.

Kazenergy. 2013. National Energy Outlook 2013. Astana. pp. 198–202.

_____. 2015a. The National Energy Report 2015. Astana: Kazenergy. p. 133.

_____. 2015b. The National Energy Report 2015. Astana: Kazenergy. pp. 336–341.

Kazservice. 2016. Нефтесервисная отрасль Казахстана в 2015 году. Kazservice Magazine. April–June. 2 (16). pp. 114–116. Astana: Kazservice.

Lo, C. 2016. The Schlumberger Slump: Can the Oilfield Services Industry Bounce Back?. Offshore Technology. 18 April. https://www.offshore-technology.com/features/featurethe-schlumberger-slump-can-the-oilfield-services-industry-bounce-back-4867222/.

Ministry of Finance. 2017. Статистический бюллетень Министерства Финансов Республики Казахстан (in Russian). www.minfin.gov.kz.

National Bank of the Republic of Kazakhstan.2018. International Reserves and Assets of the National Oil Fund of Republic of Kazakhstan. http://www.nationalbank.kz.

Organisation for Economic Co-operation and Development (OECD). 2016. *Boosting Kazakhstan's National Intellectual Property System for Innovation.* Paris: OECD Publishing.

Tordo, S., M. Warner, O. E. Manzano, and Y. Anouti. 2013. Local content policies in the oil and gas sector. A World Bank study, document 78994.

Tukayev, A. 2016. The Most Valuable Experience from Kashagan. Kazservice Magazine. October–December. 4 (18). pp. 96–101.

United Nations Development Programme (UNDP). 2010. Tengizchevroil: Boosting Small Business Development in Kazakhstan. New York.

United States International Trade Commission. 2003. Oil and Gas Field Services: Impediments to Trade and Prospects for Liberalization. Washington, DC. https://www.usitc.gov/publications/332/pub3582.pdf.

World Bank. Data. Oil Rents (% GDP). http://data.worldbank.org/indicator/NY.GDP.PETR.RT.ZS?locations=KZ.

Chapter 5
Transport and Logistics Infrastructure in Kazakhstan

Jozef Konings[1]

The economic performance of Kazakhstan, with its main income source being oil and gas revenues, has been under considerable stress in recent years. Falling oil prices have constrained government revenues, and the move from a fixed to a flexible exchange rate system in August 2015 resulted in a steep depreciation of the tenge and high inflation. In the subsequent 2 years, inflation has been under control, the currency has gradually gained strength, and there is again moderate output growth, partly due to a gradual increase of world oil prices. However, these events underline the pressing need for transforming the economy away from its oil and mineral dependence. An important challenge for emerging countries such as Kazakhstan is to set out a transformation policy to foster more-diversified growth.

To this end, a plan involving "100 concrete steps" was adopted involving institutional reforms to accelerate the development of industry and modernize Kazakhstan in order to boost its regional and global competitiveness (Nazarbayev 2015). An important priority is improving Eurasian logistics infrastructure, following trade liberalization associated with the creation of the Eurasian Economic Union (EAEU) and Kazakhstan's joining of the World Trade Organization (WTO) in 2015. With the advent of the Belt and Road Initiative of the People's Republic of China (PRC) and the completion of the Almaty–Astana highway, a large opportunity has opened up for transit trade and hence development of the related transport and logistics service sectors, which may become an important new source of revenue for Kazakhstan.

[1] Economics Department, Nazarbayev University and KU Leuven. Research assistance from Koen Breemersch and Aigerim Yergabulova is much appreciated. Comments from Jo Reynaerts, Kiyoshi Taniguchi, participants at the Asian Development Bank–World Bank workshop on country diagnostics at Nazarbayev University (5 June 2017), and Kym Anderson are also much appreciated.

More efficient transport infrastructure is also likely to boost industrial production and development. Donaldson (2017) has found that railroads in India decreased trade costs and interregional price gaps, increased interregional and international trade, and increased real incomes; and Hong et al. (2011) showed that improved water and land transport infrastructure contributed significantly to economic development in the PRC. Poor infrastructure makes up around 40% of trade costs in coastal African economies, and 60% in landlocked economies (Limao and Venables 2001). That estimate for landlocked economies indicates the necessity for neighboring countries to have good transport infrastructure, too. Policy and institutional constraints are also important, as well as indirect transport costs such as inventory holding costs (Hausman et al. 2013). Trade facilitation measures that make the transport and logistics sector more efficient can also raise the benefits from trade (Milner et al. 2008, Nordas et al. 2006).

In this chapter, we analyze the scope for new policies to enhance the role of transport infrastructure and logistics in growing and diversifying Kazakhstan's economy. We start by pointing out a number of important global trends (section 5.1). In particular, we discuss the emergence of global value chains (GVCs), the trade liberalization associated with WTO accession and the EAEU, and the reduction in transport costs. In section 5.2, we document these global trends with data for Kazakhstan, paying particular attention to the importance of high-quality transport and logistics infrastructure for economic growth and sector diversification. In section 5.3, we use a sample of medium-sized and large firms in Kazakhstan to estimate the impact of efficiency gains in the transport and logistics sector on firm-level productivity growth. In section 5.4, we provide a conceptual framework to guide economic policy affecting transport and logistics. Section 5.5 summarizes the findings and concludes that, to improve the efficiency of the transport and logistics sector, it is crucial that as the economy diversifies, the government reassesses the rates of return from various prospective public investments including in transport and logistics infrastructure, and prioritizes such investments accordingly.

5.1. Globalization Trends

Since the mid-1990s, increased intra-industry trade flows and a rapid expansion of multinational enterprises worldwide have changed the nature of production drastically. The classic example that illustrates well the international fragmentation of production is the iPod. It is assembled in the PRC using hundreds of components and parts that are sourced from around the world (Dedrick et al. 2010). International fragmentation of production has been triggered by a fall in transport costs (Hummels 2007) and a reduction in tariff and nontariff trade barriers as more countries join the WTO and open more of their markets.

Global value chains

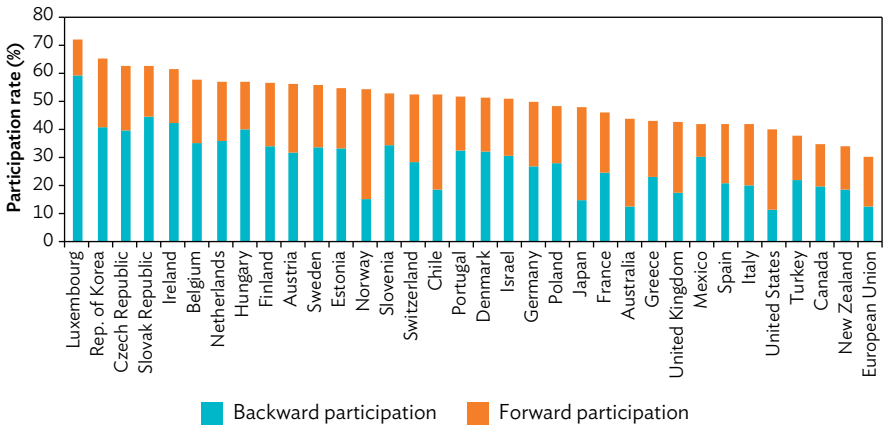
The emergence of GVCs has implications for interpreting and measuring export flows. In particular, traditionally export growth was considered to reflect the external competitiveness of countries. However, as inputs pass through production chains, crossing borders many times, gross exports overstate the amount of domestic value-added in exports (Johnson 2014). Clearly this changes the perspective on international integration and economic policy pursued by some countries. In particular, as Lamy (2011) pointed out, the fact that countries depend more on each other through global supply networks breaks down mercantilist views of trade. In other words, using trade barriers (e.g., an import substitution policy) is now far more costly than in earlier decades and will inhibit industrial development. Amiti and Konings (2007) showed that trade liberalization in Indonesia in the early 1990s boosted its firm-level productivity growth primarily due to having access to better and cheaper intermediate inputs. That is, the traditional "infant industry argument" for protection breaks down when GVCs are taken into account. Conversely, as regional and global value chains gain in importance, so, too, can transit trade with positive externalities for the transport and logistics sector.

Recognizing the importance of GVCs is important not only for resetting trade and industrial policy, but also for constructing new measures to capture the international competitiveness of countries. To this end, the Organisation for Economic Co-operation and Development (OECD), in collaboration with the WTO, has used the Inter-Country Input-Output tables to construct alternative measures of exports, capturing just the domestic value added in exports from each country. Arguably this is a better and more precise measure of competitiveness, as it is the value added that a particular country can put into a product, which it later exports, that translates into higher welfare and national income. The OECD's Inter-Country Input-Output model uses detailed transactions among countries for 37 industries to analyze GVCs from a global perspective (De Backer and Miroudot 2014).

To understand each country's participation in GVCs, one needs to measure to what extent its share of exports is involved in a vertically fragmented production chain. One of the measures to estimate the extent of involvement is the vertical specialization (VS) share, i.e., the value of imported inputs in the total exports of a country (Hummels et al. 2001). Another is the VS1 share, defined as the value of exports used as imported inputs for a production of other countries' exports (Hummels et al. 2001). Koopman et al. (2011) proposed consolidating the VS and VS1 shares so as to be able to assess participation of a country in both GVC aspects simultaneously: for users of foreign inputs in a country's exports (backward participation) and for providers of intermediate inputs used in other countries' exports (forward participation).

The GVC participation index for OECD countries is shown in Figure 5.1. Small economies such as Luxembourg, the Slovak Republic, and Hungary receive more inputs in GVCs from abroad than larger economies such as Japan, Norway, and the United States (US), where a large share of the value chain is domestic. However, the participation index is less dependent on the size of countries than the import content of their exports (De Backer and Miroudot 2014).

Figure 5.1: Global Value Chain Participation Index for Selected OECD Countries, 2013



OECD = Organisation for Economic Co-operation and Development.
Source: OECD. OECD.Stat. Global Value Chains Indicators – May 2013. https://stats.oecd.org/Index.aspx?DataSetCode=GVC_INDICATORS.

The emergence of GVCs and the internationalization of production, which started in the mid-1990s, are the result of reductions in trade barriers worldwide, reductions in transport costs, and the increased flow of foreign direct investment (FDI) triggered by the information and communication technology revolution. We discuss these trends in turn by documenting a number of stylized facts related to them.

A growing number of countries joining the WTO

On 1 January 1995, the WTO came into being and supplemented the General Agreement on Tariffs and Trade (which came into force in 1947) with numerous other agreements aimed at better regulating and facilitating international trade. Immediately, 128 General Agreement on Tariffs and Trade contracting parties signed the new agreements and became members of the WTO, and that number has since grown to 163 member economies plus the European Union (EU). The 36 post-1995

members are listed in Table 5.1. The most important one was the PRC, which joined the WTO in 2001. This caused some concern in the US and Europe, given their rapid increases in imports from the PRC and the decline of their manufacturing sectors (Autor et al. 2016). Kazakhstan joined the WTO in November 2015, having been a founding member of the EAEU, which expanded in 2015.

Table 5.1: World Trade Organization Members since 1996

Year of Accession	Members
1996	Bulgaria, Ecuador
1997	Mongolia, Panama
1998	Kyrgyz Republic
1999	Estonia, Latvia
2000	Albania, Croatia, Georgia, Jordan, Oman
2001	PRC, Lithuania, Moldova
2002	Taipei,China
2003	Armenia, Yugoslavia
2004	Cambodia, Nepal
2005	Saudi Arabia
2007	Tonga, Viet Nam
2008	Cabo Verde, Ukraine
2012	Montenegro, Russian Federation, Samoa, Vanuatu
2013	Tajikistan, Lao People's Democratic Republic
2014	Yemen
2015	Kazakhstan, Seychelles
2016	Afghanistan, Liberia

PRC = People's Republic of China.
Source: WTO (2017).

Global reductions in import tariffs

Significant expansion of international trade generally coincides with substantial reductions in trade barriers. Trade barriers include international transportation costs, policy measures (tariffs and nontariff barriers), and internal trade and transaction costs (WTO 2016).

Although tariffs remain the most commonly used policy instrument for restricting trade, their relative significance has been declining (WTO 2016). Trade openness—the result of agreements negotiated under the WTO or the aftermath of preferential trade agreements—has significantly reduced the average level of applied tariffs (WTO 2011). As an example, since the establishment of the WTO, tariff barriers have been reduced to the current average of 9%, which corresponds to a one-third decline since 1998 (Table 5.2). The average 2012–2014 applied most-favored-nation tariff amounts

to 8.1% on nonagricultural goods and 14.9% on agricultural goods. In addition to tariff cuts, WTO members, both developed and developing economies, have implemented duty-free and quota-free market access to goods from least-developed countries.

Table 5.2: Applied Most-Favored Nation Tariffs (%)

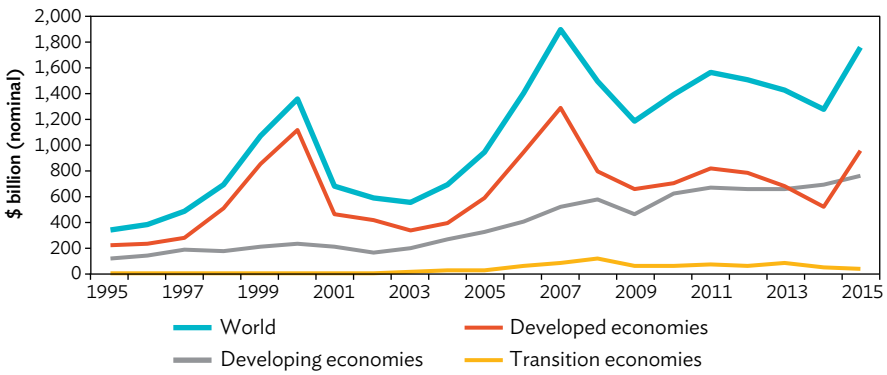
Products	Applied MFN	
	Average: 2012–2014	Decrease from 1998
Agricultural	14.9	2.9
Nonagricultural	8.1	4.1
All	**9.0**	**3.9**

MFN = most-favored nation.
Source: WTO (2016).

Global increases in foreign direct investment

Another important indicator of internationalization is the massive increase in FDI worldwide. Over the last 2 decades, FDI has quadrupled in nominal values globally. As shown in Figure 5.2, this happened least in transition economies.

Figure 5.2: Foreign Direct Investment Inflows, Global and by Group of Economies, 1995–2015



FDI = foreign direct investment.
Source: UNCTAD (2016).

In 2015, world FDI flows increased by 38%, reaching their highest level ($1.76 trillion) since the global economic and financial crisis of 2008–2009. Since 1995, world FDI inflows increased by 500%, wherein the major fraction is into developed economies (55% in 2015). Developing economies received $765 billion in FDI inflows in 2015,

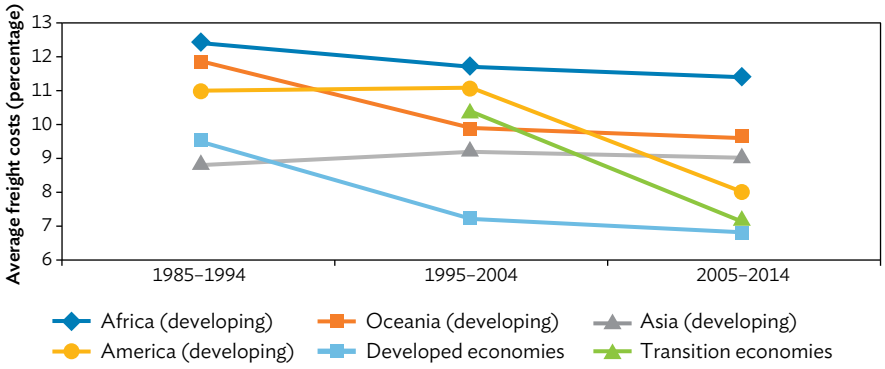
a 9% increase compared with 2014. Developing Asian countries continue to be the largest destination for FDI flows in the world. FDI flows to transition economies have increased steadily since 1995, except in 2015, when they declined to $35 billion.

Massive declines in transport costs

International transport costs are a major determinant of trade costs, so lowering trade logistics costs is a key to economic development (UNCTAD 2015). Transportation costs act as natural barriers to trade, and their scale can be far larger than tariffs (Hummels 2007). For example, UNCTAD (2015) notes that transport costs, maritime connectivity, and procedures have higher contribution to overall trade costs than customs duties.

On average, international transport costs (all modes of transport) are estimated at around 9% of the total value of imports between 2005 and 2014 (Figure 5.3). Transportation costs as a percentage of the value of imports declined for all economies except developing Asia, where the transport cost remained relatively stable at 9% between 1985 and 2014. On average, the fraction of transport costs was lowest in developed economies and highest in African countries, with the costs making up 7% and 12% of import values on average, respectively.

Figure 5.3: Freight Costs as a Percentage of Total Value of Imports
(10-year averages by group of economies)



Source: UNCTAD (2015).

Summary

In the last few decades a number of globalization trends have affected many economies throughout the world, in particular:

- the rise of global value chains, reflected in an increased fraction of imported intermediate inputs used to produce exported goods;
- a growing number of countries joining WTO, resulting in lower import tariffs and increased FDI; and
- a massive decline in transport costs.

5.2. Relevance of Globalization Trends for Kazakhstan

The previous section pointed to a number of trends that are highly relevant for the transformation context of Kazakhstan. In particular, the emergence of GVCs, the accession of Kazakhstan to the WTO in 2015, and current policy developments such as the Belt and Road Initiative (BRI). These have important implications for the transport and logistics sector of the Kazakhstan economy. Of particular relevance is the role of transport infrastructure and logistics, given that the BRI initiative is boosting goods trade between the PRC and Europe, which can potentially generate important revenues as transit trade in Kazakhstan. This section examines the extent to which those global trends discussed in section 5.1 are also emerging in Kazakhstan, and then examines the role that transport infrastructure and logistics can play in the country's economic development and growth.

Importance of global value chains for Kazakhstan

In the global economy, vertical production chains have been spreading across countries through the process of vertical specialization. By quantifying this vertical specialization and comparing Kazakhstan with other economies, we can evaluate the degree of integration of the Kazakhstan economy in global production networks. A common way to evaluate the aggregated integration is through the approach of Hummels et al. (2001), who make use of the input–output tables of a country and define VS through the following formula:

$$VS_i = \frac{uA^M [I - A^D]^{-1} X}{X_i} \qquad \text{(Equation 1)}$$

where subscript *i* refers to the country, $\boldsymbol{u}$ is a 1xn row vector of ones, $\boldsymbol{A^M}$ is an input–output matrix of imported intermediates, $[\boldsymbol{I - A^D}]^{-1}$ is the Leontief inverse of the input–output matrix of domestic intermediates, $\boldsymbol{X}$ is a nx1 column matrix of industry exports, and X_i is total exports of country *i*. The Leontief inverse of the domestic input–output matrix captures how imported intermediate goods are included both directly and indirectly in the exports of an economy. The indirect inclusion occurs as imported intermediates are partly used for the production of other domestic intermediates that are applied in the production of exports. This measure is seen as an indicator of backward participation in GVCs. To compute this measure for Kazakhstan, we use the 2015 input–output table of the Kazakhstan economy obtained from the Committee on Statistics of the Republic of Kazakhstan. In Table 5.3 we report the 2015 VS measure for Kazakhstan and compare it with that for selected other countries. Note that the numbers for the other countries refer to the years 2013 and 2011 (see also Figure 5.1), so that these numbers are likely lower than the true 2015 ones.

Table 5.3: Fraction of Imports of Intermediates in Total Gross Exports

Country	VS_i
Kazakhstan$_{2015}$	**0.078**
Japan$_{2013}$	0.14
PRC$_{2013}$	0.134
European Union$_{2013}$	0.13
US$_{2013}$	0.12
Netherlands$_{2013}$	0.35
Norway$_{2011}$	0.17
Russian Federation$_{2011}$	0.14
Saudi Arabia$_{2011}$	0.03

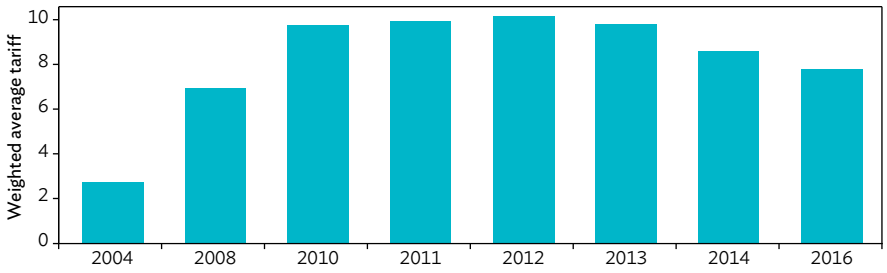
PRC = People's Republic of China, US = United States, VS = vertical specialization.
Sources: Authors' calculations and OECD (2013).

Table 5.3 reveals that around 7.8% of Kazakhstan's exports is made up of foreign inputs. The comparison with the other countries in the table reveals that this is a rather low level of integration in international production networks. The VS measure tends to be higher in small, open economies than in larger economies able to produce more inputs themselves. Yet, even compared with large countries such as the US or the PRC, the VS for Kazakhstan is still rather low. Also, when we benchmark this with other oil-and-gas exporters such as Norway and the Russian Federation, Kazakhstan scores relatively low (although not as low as oil-rich Saudi Arabia, whose VS is just 3%). This finding suggests there is significant scope for more integration of the Kazakhstan economy within GVCs.

Tariffs and nontariff measures

With the implementation of the common external customs tariff by EAEU founding members Kazakhstan, Belarus, and the Russian Federation in 2012, Kazakhstan had to increase tariffs on more than one-fifth of its tariff lines. Figure 5.4 shows that this led to an increase in its average ad valorem tariff rate. Imported intermediate products therefore became more expensive. However, Figure 5.4 shows that this has since been partly offset by a decrease in the average tariff rate, most likely induced by the Russian Federation, the Kyrgyz Republic, and Kazakhstan accessions to the WTO. Since the average bound tariff that the Russian Federation imposes on imported goods is expected to decline further in line with its commitments to the WTO, the restrictions imposed on imported intermediates into Kazakhstan will continue to ease. Estimates by Tarr (2016) show that the tariff changes led Kazakhstan importers to import lower quality and higher priced Russian Federation goods, which became more protected. Estimates by the World Bank (2012) also indicate that the implementation of the common external tariff of the Customs Union has been costly for the Kazakhstan economy.

Figure 5.4: Average Import Tariffs, Kazakhstan, 2004–2016 (%)

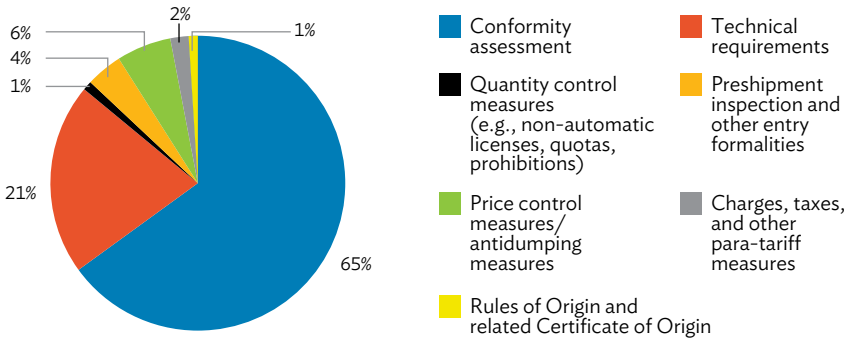


Source: Authors' calculations based on UNCTAD (2017).

Kazakhstan's involvement in regional (Customs Union and EAEU) and multilateral WTO trade agreements ensures that all changes to tariffs, while depending on the performance efficiency of exports, are in accordance with the stipulations of those agreements. In certain cases, e.g., to create favorable conditions for the development of trade and economic relations, a discounted (preferential) customs tariff is applied. This is relevant to goods originating from Commonwealth of Independent States countries and imported into Kazakhstan. These goods are exempt from customs duties based on the bilateral trade agreements with these countries. In order to stimulate exports, practically no export duties are applied. The list of exported goods that are not tariff-exempted is limited. It includes wool, nonferrous and ferrous metals, as well as certain types of petroleum products (Ministry of National Economy, 2016).

While tariffs are clear inhibitors of cross-border trade, nontariff measures can often also function as serious impediments to trade. For example, Kee et al. (2009) found that in 34 of 78 studied countries, the contribution of nontariff measures to the overall level of barriers was higher than that of tariffs. Numbers collected by the International Trade Commission and the World Bank (2015), presented in Figure 5.5, show that Kazakhstan entrepreneurs consider technical measures, measures of quantitative control, and rules of origin to be the most problematic nontariff barriers.

Figure 5.5: Perception of Nontariff Measures in Kazakhstan



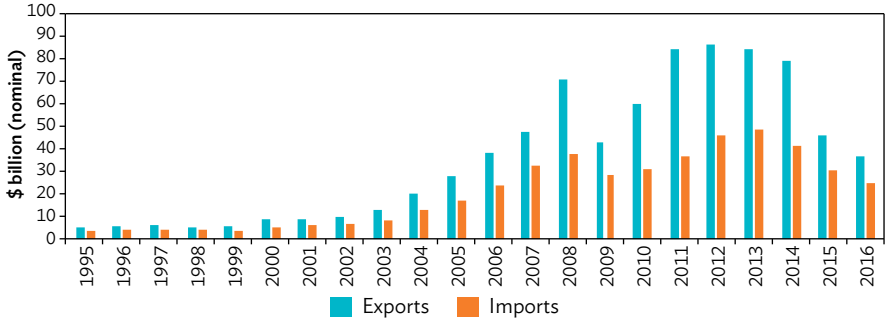
Source: World Bank (2015).

Kazakhstan has also identified several foreign trade policy priorities such as the conclusion of new free trade agreements within the Commonwealth of Independent States, with the European Free Trade Association, and with New Zealand (Antons and Hilty 2015).

Trade and transit in Kazakhstan

Figure 5.6 shows the total nominal amount of exports and imports over the past 20 years in Kazakhstan. Since the turn of the century, there has been a strong boost in trade with other countries, in terms of both imports and exports. A main driver behind this increase in trade has been the petroleum industry. Its share of total exports, which was 40%–50% of total exports in the early 2000s, jumped to 76% in 2013 and 2014. The fall in oil prices has since been a major driver behind the recent decline in export revenues of the Kazakhstan economy. This lack of diversification of exports leaves the Kazakhstan economy particularly sensitive to outside shocks.

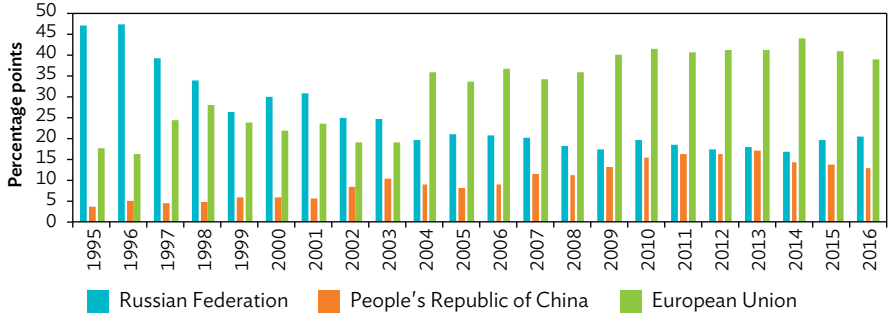
Figure 5.6: Total Exports and Imports, Kazakhstan, 1995–2016



Source: Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2017a).

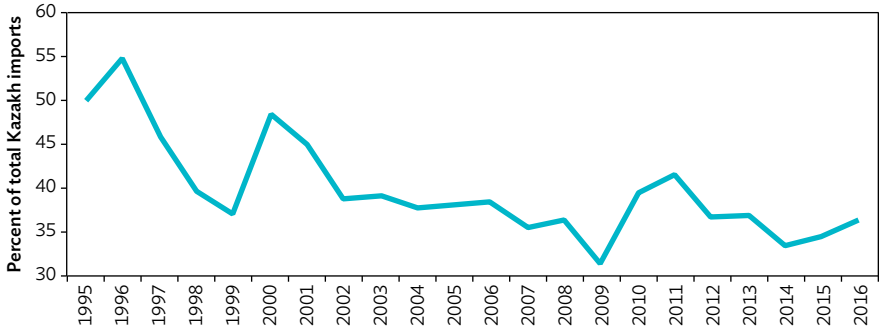
The destination markets served by the Kazakhstan economy have also increasingly diversified away from traditional trade partners such as the Russian Federation and other parts of the former Soviet Union, as is shown in Figure 5.7. Aside from EU countries, bilateral trade between Kazakhstan and its neighbor, the PRC, more than doubled its share of total trade turnover between the mid-1990s and 2016. These trends have occurred despite the creation of the EAEU in 2015, of which Kazakhstan is a member alongside the Russian Federation, Belarus, Armenia, and the Kyrgyz Republic. However, while Kazakhstan is reliant on the Russian Federation for a considerable (though declining) share of its overall imports (Figure 5.8), only 9% of its exports were destined there. The trade intensity with Belarus and Armenia, two other members of the EAEU, has been low.

Figure 5.7: Major Destinations as a Share of Total Trade Turnover, Kazakhstan, 1995–2016 *(%)*



Source: Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2017a).

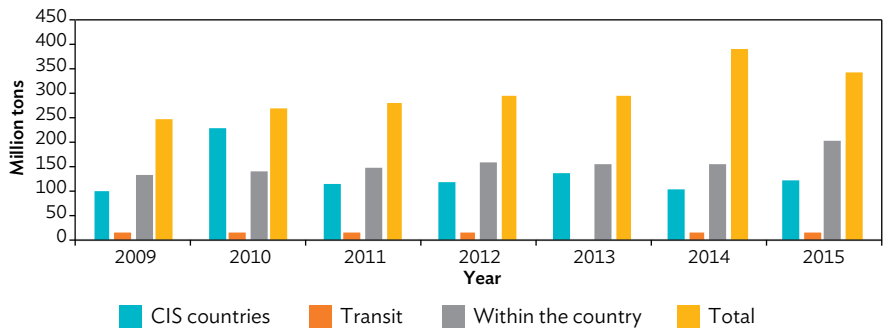
Figure 5.8: Russian Federation Share of Total Kazakhstan Imports, 1995–2016 (%)



Source: Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2017a).

These trends show the growing integration of the Kazakhstan economy in the world economy. This integration will be further boosted by the BRI, as this will bring about considerable transit trade. Currently, transit trade occurs only to a small degree in Kazakhstan, as shown in Figure 5.9. While comparable statistics are not directly available for road transport, the evidence in the figure is suggestive of the limited role that transit trade plays in the overall transport sector.

Figure 5.9: Transported Goods and Cargo through Railroads in Kazakhstan, 2009–2015

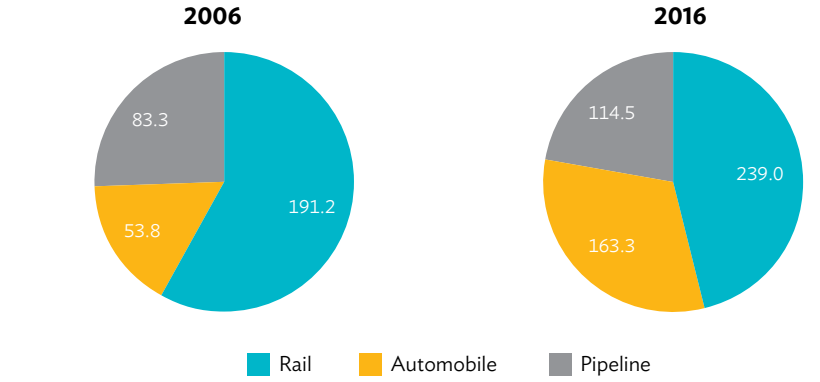


CIS = Commonwealth of Independent States.
Source: Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2017b).

Figure 5.10 reports freight turnover by major means of transportation for 2006 and 2016. The leading role of the transport system in Kazakhstan belongs to railroads, comprising around half of the total volume of freight. Freight turnover by automobiles

has tripled in 10 years, while pipelines have increased steadily by 37%. Hence, the graph depicts the importance of railroad and auto-transport infrastructure development, and thus some amelioration of the transit potential of the economy.

Figure 5.10: Freight Turnover by Major Means of Transport in Kazakhstan
(billion ton-kilometers)

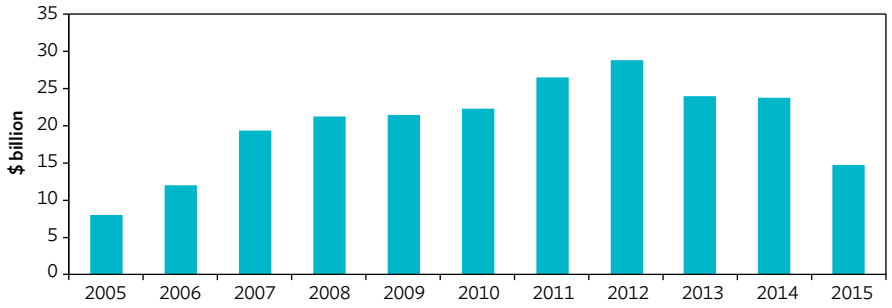


Source: Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2017).

The BRI was initiated by the PRC and came into force in 2015 with the main aim to create a Eurasian economic corridor through "transportation infrastructure diplomacy," trade liberalization, and investment (National Development and Reform Commission of the PRC 2015). It consists of a land-based road and a maritime route, with the former running through Kazakhstan. Villafuerte et al. (2016) estimated the impact of the BRI on trade and growth using a general equilibrium model. They found that an improved transport and logistics network, and hence enhanced trade facilitation in regions along the BRI, may lead to an increase in gross domestic product (GDP) growth by between 0.1% and 0.7% in Central, West, and South Asia, and an increase in total exports from $5 billion to $135 billion per year. However, the distribution of benefits arising from the BRI varies across countries. Those along the transit route such as Pakistan and regions in Central Asia and Southeast Asia would gain significantly from the BRI.

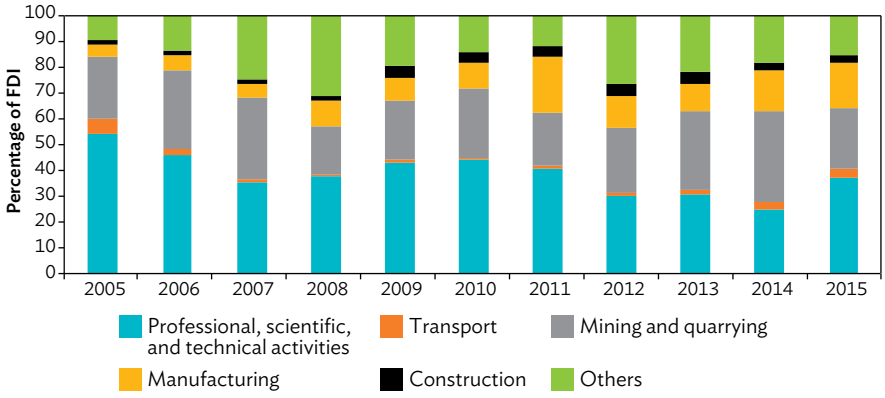
A trade policy that is adjusted to realize these objectives would signal Kazakhstan's willingness to engage internationally, and would attract foreign investors. Figure 5.11 shows that FDI inflows have been decreasing, suggesting that the volatility of FDI inflows is closely intertwined with the current fate of the oil industry. Figure 5.12 confirms that mining and quarrying accounted for a much smaller fraction of total FDI inflows in 2015 compared with 2014. Reducing the dependence of the Kazakhstan economy on this industry could thus also increase the stability of FDI inflows.

Figure 5.11: Cumulative Total Gross Foreign Direct Investment Inflows, Kazakhstan, 2005–2015 (%)



Source: National Bank of the Republic of Kazakhstan (2017).

Figure 5.12: Distribution of Foreign Direct Investment by Sector, 2005–2015 (%)



Source: National Bank of the Republic of Kazakhstan (2017).

The role of transport and logistics in transit, trade, and economic growth

While Kazakhstan borders the Caspian Sea, it is still considered a landlocked country, as the Caspian Sea itself is landlocked. The role of the transport sector is particularly relevant for landlocked developing countries. The World Bank (2014) has shown that these countries face a considerably higher cost of transport, which is explained by the distance to the final destination and the lack of connectivity to the international supply chain. By creating a more efficient transport and logistics sector, manufacturers in landlocked economies can be better integrated into GVCs.

In line with the argument of Banister and Berechman (2001), the World Bank notes that the creation of an efficient transport system requires more than an improvement of transport infrastructure. One additional requirement is the proper implementation of a transit system with neighboring countries. There is thus a clear interlinkage among transport, transit, and economic development. Additionally, procedural complexity needs to be reduced, and an efficient market for crucial services such as trucking needs to be created.

Faye et al. (2004) also underline the importance of good transport infrastructure in neighboring countries for the success of landlocked countries. Weak infrastructure in neighboring countries functions as a direct additional cost in bringing goods to the market. To ensure the success of transit trade, the administrative costs of border crossings need to be reduced. Good and stable political relationships between the countries are also required. Some landlocked countries in Southeast Asia have benefited from the use of the neighboring countries' transport infrastructure.

A lack of trade facilitation measures is major impediment to the efficient functioning of the transport industry. The time to clear imports and exports at the border is reported in Table 5.4 for several countries. Kazakhstan stands out with a particularly long time to clear imports at its borders. And in comparison with Uzbekistan, another landlocked country, Kazakhstan performs poorer in terms of both the time to clear exports and the time to clear imports.

Table 5.4: Clearance of Exports and Imports in Selected Countries, 2013

Country	Days to Clear Exports	Days to Clear Imports
Morocco	3.5	7.6
PRC	7.6	9.4
Uzbekistan	4.5	6.3
Kazakhstan	**7.2**	**11.8**

PRC = People's Republic of China.
Note: PRC = 2012.
Source: World Bank (2017).

In Table 5.5 we present indices measuring the Logistics Performance Index and the quality of port infrastructure as computed by the World Bank for the year 2016.[2] The PRC is included because it is actively involved in international trade and therefore functions as a benchmark for other countries. Kazakhstan scores better in terms of the Logistics Performance Index than the landlocked country of the Kyrgyz Republic.

[2] The Logistic Performance Index is constructed as a weighted average of the efficiency of clearance process, quality of trade infrastructure, ease of arranging competitively priced shipping, quality of logistics services, ability to track and trace assignments, and timeliness in shipments reaching destinations.

Nevertheless, the full potential of its logistics performance is still far from achieved, as it scores well below countries such as India and the PRC. The underdevelopment of its port infrastructure can be partly explained by its lack of access to a nonlandlocked sea. One of the underlying indices that make up the Logistics Performance Index

Table 5.5: Logistics Performance Index and Quality of Port Infrastructure in Selected Countries, 2016

Country	Logistics Performance Index (1 = low; 5 = high)	Quality of Port Infrastructure (1 = low; 7 = high)
PRC	3.8	4.5
Kazakhstan	**2.8**	**2.9**
Uzbekistan	2.4	-
Kyrgyz Republic	2.0	1.5
India	3.3	4.2

- = no data, LPI = logistics performance index, PRC = People's Republic of China.
Source: World Bank Indicators (World Bank 2016a and 2016b).

is the transport infrastructure index. However, for a high-quality transport infrastructure network to achieve its full potential it must equally link up with good infrastructure in neighboring countries to ensure that goods can be transported across borders. In Table 5.6 we list all countries that share a border with Kazakhstan or that can be reached via shipping across the Caspian Sea. While the Kazakhstan transport infrastructure scores slightly above average, the infrastructure in the surrounding countries is generally less qualitative. For transit to benefit the domestic Kazakhstan economy, a cross-border investment push is therefore required to improve the transport infrastructure. When accompanied with the necessary institutional harmonization, this type of policy cooperation can create the conditions for the formation of a transparent market for goods and services (EBRD 2003).

Table 5.6: Infrastructure Score Index of the Logistics Performance Index of Kazakhstan and Neighboring Countries

Country	Infrastructure Index (1 = low; 5 = high)
PRC	3.75
Kazakhstan	**2.76**
Iran	2.67
Russian Federation	2.43
Uzbekistan	2.45
Turkmenistan	2.34
Kyrgyz Republic	1.96

LPI = logistics performance index, PRC = People's Republic of China.
Source: World Bank Indicators (World Bank 2016a).

Summary

Kazakhstan has been relatively sheltered from most of the listed globalization trends so far:

- GVCs are relatively unimportant so far for Kazakhstan, as reflected in the "vertical specialization" index, i.e., the fraction of intermediate imports in exports as a share of gross exports. For countries such as the US, Japan, and the Russian Federation, this index is 14%, while for Kazakhstan it is only 7%. This suggests there is still a lot of progress to be made in terms of exploiting benefits from global production networks.
- While tariffs are coming down in Kazakhstan, nontariff measures are still considered an important constraint to trade. For instance, it takes 7 days to clear exports and 12 days to clear imports, which is much longer than in most other emerging economies.
- In terms of infrastructure and logistics performance, Kazakhstan can still improve a lot. Its World Bank infrastructure index is 2.76 (on a scale with a maximum of 5).
- Transit trade is still a very small fraction of total trade, which suggests it can potentially grow a lot in view of the BRI.

5.3. Spillovers from the Transport and Logistics Sector to the Rest of the Economy

It is clear from the previous discussion that the likely increases in trade flows, including transit trade, will trigger further development of the transport and logistics sector in Kazakhstan. The government has earmarked specific funds for developing such infrastructure as an integral part of its transformation program. Such investment in transport and logistics infrastructure is likely to result in positive spillovers to other sectors of the economy. In this section, econometric evidence is provided on the magnitude of such possible spillovers. We focus very specifically on a micro-econometric analysis of productivity spillovers. In Chapter 6 of this volume, a macroeconomic growth simulation is reported that quantifies the multiplier effects. Based on firm-level data, we analyze firm-level productivity growth and how that may benefit from better transport infrastructure. In other words, we look for evidence that transport infrastructure can also be an important trigger for economic development and hence go beyond the initial argument of just gaining revenue from attracting more transit trade.

Does transport boost productivity of firms? Productivity growth is a key measure of economic performance in firms. It indicates that firms produce more per unit of inputs. When a supporting sector like transport and logistics becomes more efficient, it is likely that this will generate spillovers to firms that rely on such supporting activities. Economic output is the result of using capital, labor, and (in the case

of primary production) land inputs in production. The efficiency of using these inputs is referred to as total factor productivity (TFP). The classical Solow model of economic growth points out that the economy can grow by using more inputs or by increasing the efficiency with which these inputs are used. The latter is referred to as technological progress or innovation. While the traditional Solow model assumes that this technological innovation is exogenous, recent endogenous growth models (Acemoglu 2009) relax that assumption. In particular, investment in human capital in these models can result in endogenous innovation. Likewise, one can consider investment in the logistics and transport infrastructure of a country as likely to affect the efficiency with which other inputs can be used in production, resulting in productivity growth (SACTRA[3] 1999). In particular, firms are likely to benefit from more efficient transport infrastructure. Better transport infrastructure is therefore relevant not only for attracting more transit trade in the context of the BRI, but also for giving other firms the opportunity to organize their production in a more efficient way.

To test this hypothesis, we first estimate TFP in the transport and logistics sector as well as in industry. To this end, we use unique firm-level data for Kazakhstan. We have access to a sample of roughly 2,000 firms for which information is available on employment, sales, value added, and tangible fixed assets over the period 2008–2014. These were obtained from Bureau van Dijck's Orbis database, which is a commercial database covering annual company accounts of firms in various countries (for more details see Duparcq and Konings 2016). We measure innovation as the growth rate in total factor productivity. This is a standard approach to measuring technological progress, which goes back to Solow (1963). In particular, consider the following production function,

$$Q_{it} = A_{it} F(L_{it}, K_{it}) \qquad \text{(Equation 2)}$$

where subscripts i and t refer to firm i at time t, L is labor input, K is capital input, and F is an increasing function in L and K. Hence, when a firm uses more labor and capital it will produce more output. The factor A_{it} refers to the "efficiency" or "productivity" of the firm. For instance, if two firms use the same amount of labor and capital, but in one firm A_{it}=1, but in the other firm A_{it}=2, then the latter firm produces twice as much despite using the same amount of inputs as the first firm. Hence, the second firm is more "efficient" or more "productive" than the first one. When A increases, we say that there is technological progress or productivity growth, i.e., a firm can produce more with the same amount of inputs.

[3] Standing Advisory Committee on Trunk Road Assessment

We start by estimating Equation 2 using our firm-level data. We take a log-linear approximation of Equation 2 to obtain the following expression, with lowercase letters denoting natural logarithms:

$$q_{it} = \alpha_i + \alpha_1 l_{it} + \alpha_2 k_{it} + \varepsilon_{it} \qquad \text{(Equation 3)}$$

We add a firm fixed effect, α_i, which captures unobserved factors specifically related to individual firms, such as managerial talent. Such unobserved firm fixed effects may, however, be important. When they are not taken into account, estimation of Equation 3 may result in an omitted variable bias, as it is likely that such unobserved fixed effects may be correlated with the choice of input factors. Since we have panel data, we are able to control for these unobserved firm fixed effects by applying a within-firm transformation of Equation 3. We impose constant returns to scale in Equation 3 and estimate two versions—one in which we include year fixed effects to control for business cycle fluctuations and general inflation, and one in which we include sector-year fixed effects, to control for different cycles in each 2-digit NACE sector.[4]

Table 5.7 provides the results. We can see that both specifications yield very similar results. The labor share, α_i, is estimated at about 60%, while the capital share is about 40%. We use the results of this estimation to compute firm-level TFP as defined in Equation 2, A_{it}.

Table 5.7: Fixed Effects Estimation of Firm Production—Full Sample

	(1)	(2)
α_1	0.57** (0.04)	0.57** (0.07)
α_2	0.43** (0.04)	0.43** (0.04)
Year dummies	Yes	Yes
Year x sector dummies	No	Yes
Adjusted R^2	0.66	0.67
Number of observations	5,654	5,654

Notes: Robust clustered (at the firm level) standard errors in brackets; ** denotes statistically significant at the 5% level.
Source: Author's calculations.

We next want to assess to what extent firm-level TFP growth is affected by TFP growth in transport and logistics. We therefore estimate how TFP growth in firm *i* is affected

[4] NACE (Nomenclature of Economic Activities) is the European statistical classification of economic activities. NACE groups organizations according to their business activities. Statistics produced on the basis of NACE are comparable at European level.

by average TFP growth in the transport sector. Table 5.8 shows the results. The first column shows the ordinary least squares results for the full economy, the second for manufacturing only, and the third column uses an instrument variables estimator for growth in TFP in the transport sector by using its lagged values.

The results in Table 5.8 point to important and statistically significant "spillover" effects from increased innovation or efficiency in the transport and logistics sector to productivity growth in the rest of the economy. Not surprisingly, the impact is larger in manufacturing. A 10% increase in productivity in the transport and logistics sector is associated with a 1.1% increase in productivity in the average manufacturing firm. Such spillovers matter. They indicate that innovation in transport infrastructure is not only relevant for supporting and attracting transit trade to Kazakhstan, but also for improving efficiency in industrial production. Thus, improving the country's transport infrastructure should be among the options considered as part of a transformation policy to foster industrial development.

Table 5.8: Productivity Spillovers—Firm-Level Results

	Δtfp Full Economy OLS	Δtfp Manufacturing OLS	Δtfp Manufacturing IV
$\Delta tfp_{transport}$	0.09*** (0.02)	0.12*** (0.04)	0.11* (0.07)
Time-fixed effects	Yes	Yes	Yes
Region-fixed effects	Yes	Yes	Yes
Sector-fixed effects	Yes	Yes	Yes
No. of observations	2,926	649	649

IV = instrumental variables, OLS = ordinary least squares, TFP = total factor productivity.
Note: In column 4, instruments are lagged TFP and lagged TFP growth.
Source: Author's calculations.

Summary

We use firm-level data to analyze whether a more efficient transport and logistics sector generates productivity gains for firms. We find evidence of positive productivity spillovers at the level of the firm. In particular:

- A 10% increase in the efficiency of transport infrastructure generates an increase in firm-level productivity of 0.9% on average.
- For firms operating in manufacturing this effect is slightly higher at 1.1% additional productivity on average.
- These results suggest that improving the efficiency of the transport and logistics sector could have nontrivial effects on the rest of the economy.

5.4. A Framework for a New Economic Policy

Conceptual framework

An important challenge for emerging countries including Kazakhstan is the design of economic policy to foster growth. The discussion in this chapter makes clear that good transport infrastructure in combination with openness to trade can stimulate growth. It can do so by promoting transit trade, but at the same time it can also raise the productivity of domestic firms.

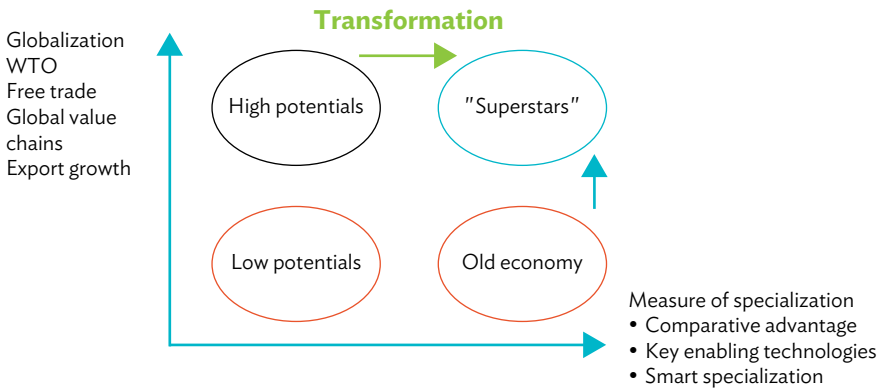
Eddington (2006) pointed out that the transport system's impact on economic development depends on the country's stage of development and space. Transport and logistics infrastructure investments, such as roads, railways and airports, will have a bigger effect in emerging and developing economies than in well-developed economies (Hilling 1996). Transport in this context is not simply a derived demand for one of the inputs required by firms, but it actually improves overall efficiency in production (as shown in section 5.3 above using detailed firm-level data). This is all the more important with the BRI, the emergence of GVCs, and accession to the WTO.

How does the importance of the transport and logistics sector affect a country's choice of economic policy? For a long time it was commonly thought that economic policy would be growth-constraining if it tried to "pick winners." Recent evidence, especially for developing and emerging economies, has shown that economic policy can result in higher economic performance, provided its design is chosen carefully (Rodrik 2010, Aghion et al. 2015). Especially for an emerging economy such as Kazakhstan, rich in oil and minerals, which has been going through a long transition from central planning toward a market economy, designing a new framework to guide economic policy may be worthwhile. Aghion et al. (2015) show that industrial policy in the PRC has led to a significant rise in productivity of PRC firms, especially when state aid is not disturbing market competition; when it benefits not one but a large group of firms; and when it is oriented toward those activities in which the country has more expertise, that is, a comparative advantage. If the government has solid knowledge about the sectors and activities in which a country is most specialized, that allows a better targeting of state aid. In contrast to traditional views of industrial policy, the focus needs to be not on choosing narrowly defined sectors, because firms perform in very heterogeneous ways even within such sectors (Konings and Vandenbussche 2005). They do so because many are multiproduct firms operating across several sectors, and they may produce not only for the domestic market but also for the global market, with some firms more involved in GVCs than others.

For Kazakhstan, recognizing the growing importance of GVCs and the increased importance of international trade is an important element in designing the right policies. We conclude with a conceptual framework for economic transformation that is motivated by two key drivers. The first is global trends as discussed in section 5.2; the second is the specialization or key enabling technologies that may be developed or are already present in the Kazakhstan economy. Such key enabling technologies include the emergence of efficient and innovative transport and logistics infrastructure.

We summarize this framework in Figure 5.13. The bottom left quadrant contains sectors and firms characterized by low potential to exploit GVCs. The product markets they are active in are niches in which the country does not benefit much from an innovative and well-performing transport and logistics sector. Arguably these type of sectors and firms have little growth potential. The top left quadrant indicates sectors and firms that have a lot of potential to exploit GVCs, but there is still little expertise or specialization in these types of activities in the country; or they do not enjoy access to a high-performing transport and logistics supporting infrastructure. These are typical candidate sectors and firms that have more potential to expand. By targeting state aid to these types of activities, barriers to growth may be lifted, which can generate increasing returns, as the innovation capacity of these sectors is high. Increasing their relative share could boost macroeconomic productivity growth and hence GDP. The top right quadrant is what we call the "superstars." It concerns firms that already benefit a lot from GVCs, in which the country has a lot of expertise, and for which an efficient supporting transport and logistics infrastructure is operating. These include the oil and mining companies in Kazakhstan. They do well and do not require extra support. The challenge is to get firms in the top left quadrant to turn into such superstars. And finally, the bottom right quadrant includes firms and sectors in which a country traditionally has been specializing a lot, but where there is not much innovation or potential for GVCs. We could also label this the "old economy." They are typical candidates to engage in a transformation process, i.e., to become more innovative. The type of state aid going to these sectors is clearly of a different kind, as it is about providing incentives to engage more in GVCs.

Figure 5.13: Conceptual Framework for Economic Policy



WTO = World Trade Organization.
Source: Authors.

The example of Hungary

The mechanisms of the proposed framework are illustrated by Hungary, a landlocked country that joined the WTO in 1995 and has benefited from free trade and global networks since. Hungary is an export-oriented market economy that since 1989 has attracted over one-third of all FDI in Central and Eastern Europe (OECD 2016). It is now considered a high-income economy and was ranked as the 56th largest economy in the world in 2016 (World Bank 2018).

The country has undergone considerable reforms in order to transition from the former central-planning to a market-based economy. With the collapse of the former Soviet Union, Hungary experienced a loss of 70% of its export markets in Eastern and Central Europe. It therefore pursued new trade opportunities. It first became a partner of the Central European Free Trade Agreement in 1992, and later—in 2004—it joined the EU. Prior to becoming a member of the EU, the country implemented major structural and institutional adjustments to its trade and investment policies, including strengthening its administrative and operational capacities, and establishing agreements at the international level to improve customs cooperation (UNOHRLLS[5] 2007). In addition, the accession of the country to the EU influenced the areas of transport policy and customs organization. The adoption of simplified and information technology-supported customs procedures was initiated, and administrative and

[5] United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States

operational capacities were improved, which substantially simplified the import, export, and transit of goods.

Hungary exploited its unique location between East and West and benefited from exploiting vast opportunities to develop its service sector, particularly in logistics. The country has borders with seven countries and connects to the emerging economies to the east. Its transit location and the well-established transit corridors were attractive to foreign investors, which eventually helped Hungary grow its exports and participate more in global networks, therefore increasing its competitiveness.

Policy implications

As noted in section 5.2, Kazakhstan is still lagging behind in benefiting from global production networks, reflected in the small fraction of its imported intermediate inputs that are used to produce exported goods. The current economic policy of the country is aimed at diversifying away from extractive industries and toward other sectors including agriculture and manufacturing (see Chapters 2 and 3). Such a transition would be facilitated by improved transport infrastructure, but it is important to prioritize such investments according to the existing transportation technologies. This is well illustrated by the case of transporting grain. Transport of grain has become increasingly problematic for Kazakhstan as a landlocked country with the closest access to international ocean freight being via Black Sea ports. Transport to those ports along the Russian Federation railway system is expensive. The Aktau seaport grain terminal is the most attractive point for exporting to Caspian Sea countries. Railways to Afghanistan, Turkmenistan, and Iran pass through Uzbekistan, where political tensions have provoked a series of rail service interruptions. And while Kazakhstan's railways own a sufficient number of cars for operations in years of average harvest, in peak periods shortages need to be compensated by expensive car rentals from Russian Federation companies. Exports to the PRC are impeded by high transportation costs and nontariff barriers for grain delivery (Petrick and Oshakbayev 2015).

5.5. Conclusions

With the advent of the BRI and the "100 concrete steps" to implement institutional reforms to accelerate the development of industry and modernize Kazakhstan in order to boost global competitiveness, large opportunities have opened up for transit trade and hence the development of related transport and logistics infrastructure.

This chapter has focused on the role the transport and logistics sector can play as an integral component of the country's economic transformation and development.

Economic transformation is affected by global trends and their impact on the country's comparative advantages or key enabling technologies. The main findings of this chapter can be summarized as follows:

(i) GVCs are increasingly important in the world economy. Kazakhstan is still a long way behind comparator countries in terms of exploiting benefits from global production networks.

(ii) While tariffs have been coming down in Kazakhstan, to an average of 9%, nontariff barriers are still high and are an important constraint on trade. For instance, it takes 7 days to clear exports and 12 days to clear imports in Kazakhstan, compared with 4 days and 6 days, respectively, in Uzbekistan and 3 days and 7 days, respectively, in Morocco.

(iii) In terms of infrastructure and logistics performance, Kazakhstan can still improve considerably. Its World Bank infrastructure index is 2.76 on a scale of 5, with 5 being the highest performing. The PRC scores 3.75 on this index. A similar index of logistics performance indicates 2.8 for Kazakhstan, compared with Singapore's 4.2.

(iv) Transit trade is still a very small fraction of Kazakhstan's total trade, which suggests that this segment can potentially grow a great deal in view of the BRI, provided constraints related to the above are removed.

(v) Using firm-level data for Kazakhstan, we find that a 10% increase in the efficiency of the transport infrastructure would generate a 0.9% increase in the productivity in firms, operating in other sectors of the economy. For manufacturing firms, this productivity improvement impact would be even higher at 1.1%. Hence, the transport and logistics sector should not be seen as just an additional input in the production process, but rather as a sector that can generate positive spillovers to the rest of the economy.

(vi) Targeting on transitioning to high-potential manufacturing export products could help the country's industrial development and facilitate transport growth.

Given the increasing importance of transport and logistics in a world of GVCs, the BRI, and trade opening, now is an appropriate time for the government to reassess the rates of return from various prospective public investments in transport and logistics infrastructure and prioritize such investments accordingly.

References

Acemoglu, D. 2009. *Introduction to Modern Economic Growth.* Princeton NJ: Princeton University Press.

Aghion, P., J. Cai, M. Dewatrpoint, L. Du, A. Harrison, and P. Legros. 2015. Industrial Policy and Competition. *American Economic Journal: Macroeconomics.* 7 (4). pp. 1–32.

Amiti, M. and J. Konings. 2007. Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia. *American Economic Review.* 97 (5). pp. 1611–38.

Antons, C. and R. M. Hilty. 2015. *Intellectual Property and Free Trade Agreements in the Asia-Pacific Region.* Berlin: Springer-Verlag.

Autor, D., D. Dorn, and G. Hanson. 2016. The China Shock: Learning from Labor Market Adjustment to Large Changes in Trade. *American Economic Review.* 8. pp. 205–40.

Banister, D. and Y. Berechman. 2001. Transport Investment and the Promotion of Economic Growth. *Journal of Transport Geography.* 9. pp. 209–18.

Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan. 2017a. *Trade* (in Russian) . http://stat.gov.kz/faces/wcnav_externalId/homeNumbersCommodity?_afrLoop=22059356510138062#%40%3F_afrLoop%3D22059356510138062%26_adf.ctrl-state%3D19hjbxsgsk_50.

_____. 2017b. *Transport* (in Russian). http://stat.gov.kz/faces/wcnav_externalId/homeNumbersTransport?_afrLoop=22059491454683086#%40%3F_afrLoop%3D22059491454683086%26_adf.ctrl-state%3D19hjbxsgsk_67.

De Backer, K. and S. Miroudot. 2014. Mapping Global Value Chains. *Working Paper.* 1677. Frankfurt: European Central Bank.

Dedrick, J., K. L. Kraemer, and G. Linden. 2010. Who Profits from Innovation in Global Value Chains? A Study of the iPod and Notebook PCs. *Industrial and Corporate Change.* 19 (1). pp. 81–116.

Donaldson, D. 2017. Railroads of the Raj: Estimating the Impact of Transportation Infrastructure. *American Economic Review.* Forthcoming.

Duparcq, P. and J. Konings. 2016. An Enterprise Map for Kazakhstan: A Guide for Industrial Policy. Economic Policy Paper. 1, Economics Department, Nazarbayev University.

Eddington, R. 2006. *The Eddington Transport Study.* London: Department for Transport.

European Bank for Reconstruction and Development (EBRD). 2003. *Transition Report 2003: Integration and Regional Cooperation.* London: EBRD.

Faye, M. L., J. W. McArthur, J. D. Sachs, and T. Snow. 2004. The Challenge Facing Landlocked Developing Countries. *Journal of Human Development.* 5 (1). pp. 31–68.

Hausman, W., H. Lee, and U. Subramanian. 2013. The Impact of Logistics Performance on Trade. *Production and Operations Management.* 22 (2). pp. 236–52.

Hilling, D. 1996. *Transport and Developing Countries.* London: Routledge.

Hong, J., Z. Chu, and Q. Wang. 2011. Transport Infrastructure and Regional Economic Growth: Evidence from China. *Transportation.* 38 (5). pp. 737–52.

Hummels, D. 2007. Transportation Costs and International Trade in the Second Era of Globalization. *Journal of Economic Perspectives.* 21 (3). pp. 131–54.

Hummels, D., J. Ishii, and K. Yi. 2001. The Nature and Growth of Vertical Specialization in World Trade. *Journal of International Economics.* 54 (1). pp. 75–96.

Johnson, R. C. 2014. Five Facts about Value-added Exports and the Implications for Macroeconomics and Trade Research. *Journal of Economic Perspectives.* 28 (2). pp. 119–42.

Kee, H. L., A. Nicita, and M. Olarreaga. 2009. Estimating Trade Restrictiveness Indices. *Economic Journal.* 119. pp. 172–99.

Konings, J. and H. Vandenbussche. 2005. Anti-dumping Protection and Market Power of Domestic Firms. *Journal of International Economics.* 65 (1). pp. 151–65.

Koopman, R., W. Powers, Z. Wang, and S. J. Wei. 2011. Give Credit to Where Credit is Due: Tracing Value Added in Global Production Chains. *NBER Working Paper.* 16426. Cambridge, MA: National Bureau of Economic Research.

Lamy, P. 2011. "Made in China" Tells Us Little About Global Trade. *Financial Times. 24* January.

Limao, N. and A. J. Venables. 2001. Infrastructure, Geographical Disadvantage, Transport Costs and Trade. *World Bank Economic Review.* 15 (3). pp. 451–79.

Milner, C., O. Morrissey, and E. Zgovu. 2008. Welfare and Adjustment Implications of EU-ACP EPAs: Some Evidence for Africa. In H. Asche and U. Engel, eds. *Economic Partnership Agreements: Devilish Undertakings or Just the Devil in the Details*? Leipzig: University of Leipzig Press. pp. 41–60.

Ministry of National Economy of the Republic of Kazakhstan.. Order No. 81 dated 17 February 2016 on approval of the List of goods in respect of which export customs duties, the amount of rates and the term of their validity are applied and the Rules for calculating the amount of rates of export customs duties on crude oil and goods produced from oil (in Russian). http://adilet.zan.kz/rus/docs/V1600013217.

National Bank of the Republic of Kazakhstan. 2017. *Direct Investments Statistics.* http://www.nationalbank.kz/?docid=469&switch=english.

National Development and Reform Commission of the PRC. 2015. Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road. http://en.ndrc.gov.cn/newsrelease/201503/t20150330_669367.html

_____. 2015. Vision and Proposed Actions Outlined on Jointly Building Silk Road Economic Belt and 21st Century Martime Silk Road. Https://reconasia-production.s3.amazonaws. com/media/filer_public/e0/22/e0228017-7463-46fc-9094-0465a6f1ca23/vision_and_actions_on_jointly_ building_silk_road_economic_belt_and_21st-century_maritime_silk_road.pdf

Nazarbayev, N. 2015. 100 concrete steps set out by President Nursultan Nazarbayev to implement the five institutional reforms. May. http://www.kazembassy.org.uk/en/pages/page/82 .

Nordas H. K., E. Pinali, and M. G. Grosso. 2006. Logistics and Time as a Trade Barrier. Trade Policy Working Paper. 35. Paris: Organisation for Economic Co-operation and Development (OECD).

Organisation for Economic Co-operation and Development. OECD.Stat. Global Value Chain Indicators – May 2013. https://stats.oecd.org/Index.aspx?DataSetCode=GVC_INDICATORS.

_____. 2016. OECD *Economic Surveys: Hungary.* https://www.oecd.org/eco/surveys/hungary-2016-OECD-economic-survey-overview.pdf.

Petrick, M. and D. Oshakbayev. 2015. Kazakhstan's Agricultural Development Constraints: Evidence from the Wheat, Beef and Dairy Sectors. In A. Schmitz and W, H. Meyers, eds. *Transition of Agricultural Market Economies – The Future of Kazakhstan, Russia and Ukraine*. Oxfordshire, UK: Commonwealth Agricultural Bureau International. pp. 15–26.

Rodrik, D. 2010. The Return of Industrial Policy. *Project Syndicate.* http://www.project-syndicate.org/commentary/the-return-of-industrialpolicy.

Solow, R. 1963. *Capital Theory and the Rate of Return.* Amsterdam: North-Holland.

Standing Advisory Committee on Trunk Road Assessment (SACTRA). 1999. *Transport and the Economy.* London: TSO.

Tarr, D. G. 2016. The Eurasian Economic Union among Russia, Belarus, Kazakhstan, Armenia and the Kyrgyz Republic: Can It Succeed Where Its Predecessor Failed?. *Eastern European Economics.* 54 (1). pp. 1–22.

United Nations Conference on Trade and Development (UNCTAD). 2015. *Review of Maritime Transport.* Geneva. http://unctad.org/en/PublicationsLibrary/rmt2015_en.pdf.

_____. 2016. *World Investment Report 2016: Investor Nationality Policy Challenges.* Geneva. http://unctad.org/en/PublicationsLibrary/wir2016_en.pdf.

_____. 2017. Trade Analysis Information System. http://databank.worldbank.org/data/reports.aspx?source=UNCTAD-~-Trade-Analysis-Information-System-(TRAINS)#.

United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UNOHRLLS). 2007. Trade, Trade Facilitation and Transit Transport Issues for Landlocked Developing Countries. New York. http://unohrlls.org/UserFiles/File/LLDC%20Documents/MTR/LLDCs%20Publication.pdf.

Villafuerte, J., E. Corong, and J. Zhuang. 2016. Trade and Growth Impact of One Belt, One Road on Asia and the World. Paper presented at the 19th Annual Conference on Global Economic Analysis. Washington, DC. June. https://www.gtap.agecon.purdue.edu/resources/download/8280.pdf.

World Bank. 2012. *Kazakhstan: Assessment of Costs and Benefits of the Customs Union for Kazakhstan.* Washington, DC. http://documents.worldbank.org/curated/en/836181468293149924/Kazakhstan-Assessment-of-costs-and-benefits-of-the-customs.

_____. 2014. *Improving Trade and Transport for Landlocked Developing Countries: A Ten-Year Review.* World Bank–United Nations report in preparation for the 2nd United Nations Conference on Landlocked Developing Countries. November. http://unohrlls.org/custom-content/uploads/2013/09/Improving-Trade-and-Transport-for-Landlocked-Developing-Countries.pdf.

_____. 2015. *Kazakhstan Trade Report: Improving the Regulatory Framework for Non-Tariff Measures.* Washington, DC. http://documents.worldbank.org/curated/en/567591467998193567/pdf/96863-WP-REPLACEMENT-P153472-KZ-Trade-Rprt-Policy-Note-3.pdf.

_____. 2016a. World Development Indicators. Washington, DC. https://data.worldbank.org/indicator/LP.LPI.INFR.XQ.

_____. 2016b. World Development Indicators. Washington, DC. https://data.worldbank.org/indicator/IQ.WEF.PORT.XQ.

_____. 2017. *Enterprise Surveys.* Washington, DC. http://www.enterprisesurveys.org/data/exploretopics/trade.

_____. 2018. Gross Domestic Product 2017. Washington, DC. http://databank.worldbank.org/data/download/GDP.pdf.

World Trade Organization (WTO). 2011. *World Trade Report 2011: The WTO and Preferential Trade Agreements: From Co-Existence to Coherence.* Geneva.

_____. 2016. *World Trade Report 2016: Levelling the Trading Field for SMEs.* Geneva.

_____. 2017. *Annual Report 2017.* Geneva.

Chapter 6
Key Structural Reforms in Selected Sectors: Assessing Their Impact on Economic Diversification

Edimon Ginting, Mark Horridge, Zhanna Kapsalyamova, and Deeptha Wijerathna

The high rate of economic growth during the past decade that transformed Kazakhstan into an upper-middle-income country was powered by the oil-and-gas sector. The global economic slowdown starting in 2013, which was followed by a sharp fall in oil and commodity prices, has weakened the country's growth significantly. Despite large fiscal support, economic growth during 2014–2016 averaged around 1% compared with 8% during 2001–2011. Facing sharply lower growth prospects, the government has developed a long-term development strategy that includes structural economic reform policies aimed at accelerating economic diversification to reduce dependence on oil and gas. For Kazakhstan, given its relatively small domestic market, economic diversification needs to be supported by "policies that facilitate" export diversification. As discussed in earlier chapters, these policies include measures to improve the productivity of the agriculture sector, support the expansion of priority manufacturing sectors, and enhance the efficiency of the transport and logistic sectors as well as other key service sectors that are essential for economic diversification.

This chapter seeks to quantify the potential impact of selected government structural economic reform measures on future growth and economic diversification. It uses a customized computable general equilibrium (CGE) model developed for Kazakhstan (KazORANI) that takes advantage of the country's rich and up-to-date input–output (supply use) data. The model includes 68 industries and regional disaggregation to allow for detailed analysis of industry and regional distributional effects of planned government structural reform policies. The simulation results suggest that, without reforms, Kazakhstan's economy is projected to grow by 2.3% a year to 2030. Consistent

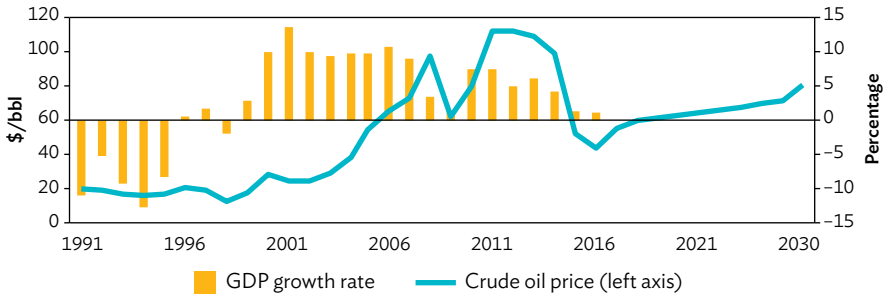
reforms in key sectors to improve the business climate, enhance competitiveness, and increase private sector participation would improve the country's growth rate by about 1.2 percentage points to 3.5% annually. The additional growth would be generated through widespread improvement in the productivity of both labor and capital, which would lead to increased exports from non-oil sectors such as priority manufacturing and agriculture.

The next section discusses briefly Kazakhstan's medium-term economic growth challenges. The key relevant sector reforms discussed in previous chapters are summarized in the second section to provide the basis for policy simulations to be presented. The third section outlines the structure of the Kazakhstan economy-wide model and how it is used to quantify and analyze the economy-wide effects of selected government sector reform policies. The fourth section presents the economy-wide effects of "some key" proposed policy changes on economic growth, industry outputs, export diversification, and regional income distribution. The last section presents some closing remarks.

6.1. Medium- and Long-Term Growth Challenges

The association between oil prices and the recent episode of high economic growth is clear from Figure 6.1. After the breakup of the former Soviet Union, Kazakhstan experienced a period of negative economic growth accompanied by high inflation from 1991 to 1995. However, the discovery of new oil fields in Kazakhstan and the rise in oil prices from the early 2000s turned the country's economic fortune around. Rising crude prices attracted large foreign direct investment (FDI) into the sector in Kazakhstan. The cumulative inward stocks of FDI in 2004 reached $32.5 billion, amounting to 42% of gross domestic product (GDP) (UNCTAD 2007). Oil and gas accounted for more than 50% of Kazakhstan's total exports. The investment in and revenue from the sector also boosted the economy through the construction sector and government spending. The sharp declines in crude oil prices during the 2008 global financial crisis and from 2014 following the global economic slowdown caused external imbalances in Kazakhstan, and economic growth dipped to only 2% during 2014–2016 despite large fiscal support.

Figure 6.1: Crude Oil Price versus GDP Growth Rate, 1991-2030
(Europe Brent spot price FOB [$/bbl])



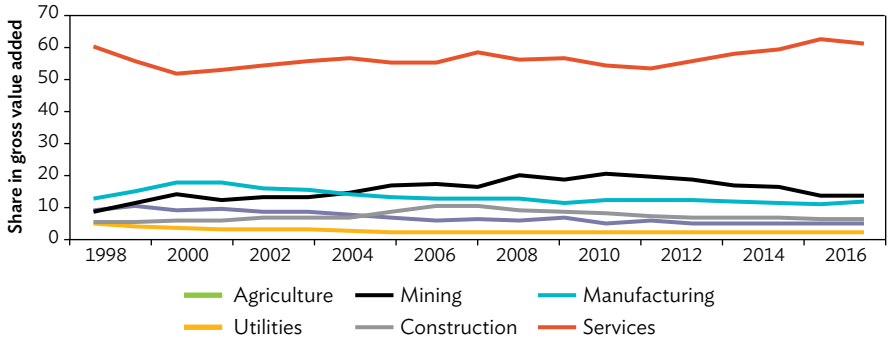
bbl = barrel of oil, FOB = freight on board, GDP = gross domestic product.
Sources: US Energy Information Administration; World Bank (2017a); Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2017a).

In resource-rich countries, as oil prices rise, the oil sector booms, but this leads to slower growth in other tradable sectors, which affects economic diversification and the evolution of non-oil sectors (Gelb 2010, Brewery 1985, Herb 2009, Hvidt 2013, Auty 2001, Papageorgiou and Spatafora 2012, Rodrik 2005, Gylfason 2006, Suryanata 2002, Albassam 2015). Corden and Neary (1982) found that the boom in the mining sector and the associated inflows of foreign exchange to an economy lead to the expansion of nontradable sectors and contraction of other tradable sectors due to real exchange rate appreciation, a phenomenon often termed the Dutch disease.

To manage the impact of the oil boom on the rest of the economy, the government set aside some of the oil-and-gas revenue in the National Fund of the Republic of Kazakhstan (NFRK), established to accumulate a part of oil revenue windfalls for future generations and support stabilization policies during future economic downturns. Overall, since its inception in 2001, the size of the NFRK increased from 6% of GDP to 63% in 2015 (National Bank of Kazakhstan 2017, World Bank 2017c). This was because the non-oil fiscal deficit was kept below 8% of non-oil GDP during 2005–2007. The NFRK has also been used to support plans and programs aimed at diversifying the economy.

Some experts still debate the extent of the presence of the Dutch disease in Kazakhstan. Yet despite the government's early efforts to diversify the economy, the contribution of manufacturing to GDP has been stagnant at around 11%, and the share of the agriculture sector has declined to around 5%, less than in other middle-income countries (Figure 6.2). This affects income distribution significantly, because 16% of Kazakhstan's labor force is still employed by the agriculture sector. On the export front, oil and gas exports still represent over 50% of the country's total exports.

Figure 6.2: The Composition of Kazakhstan's Economy, 1998–2016



Source: Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2017b).

The current vulnerability of the economy to low oil prices could have significant implications for Kazakhstan's long-term growth. Oil-led economic growth is likely to be unsustainable if, as currently projected, oil prices remain relatively low due to flourishing competition from shale gas extraction technologies and to moves in numerous high-income countries to replace fossil fuels with renewable energy sources. Considering recent developments in the oil-and-gas sector, the International Monetary Fund (IMF 2017) reduced its estimate for Kazakhstan's current growth to 3%. In the medium term, however, the country's growth potential could increase to 4% with continued measures to diversify the economy. The IMF study also suggests that past economic growth was supported mostly by the contribution of capital, consistent with the capital-intensive nature of the economy. The contribution of labor productivity averaged only around 2 percentage points even during the recent high-growth period.

6.2. Selected Structural Reforms to Support Economic Diversification

This section summarizes the government's structural reforms in selected key sectors to support efforts to diversify the economy over the medium to long term. This sets up the policy context for the policy simulations using the KazORANI model of the Kazakhstan economy.

Agriculture

The potential of agriculture was overlooked in the first years of independence. Overall, the agriculture sector continued to make modest progress, due primarily to growth in crop yields and increases in farm labor productivity. Significant investments in fixed assets and continued reductions in employment in the agriculture sector led to improvement in labor productivity by about 2.6 times between 2000 and 2016. Average yields for key agricultural products such as wheat are, however, very low by international standards. The yield gap for wheat is estimated at about 60% of attainable yield. With the sector contributing only around 5% of the country's GDP but employing a much larger share of the workforce (16%), labor productivity remains low.

As discussed in Chapter 2, Kazakhstan has enormous underutilized agricultural potential. Improving the productivity of the sector can contribute to economic diversification while making growth more inclusive. Recognizing this, the government has made agriculture and agribusiness key priority sectors in its "Kazakhstan 2050" Strategy. The strategy includes some large-scale modernization of the agriculture sector through increasing the area sown to crops, generating significant yield increases, improving the livestock fodder base, and encouraging the creation of new national brands of eco-friendly products.

In 2017, the government introduced a new "State Program for the Development of the Agro-industrial Complex 2017–21" to replace an earlier program called Agribusiness 2020. Under the new state program, by 2021 agricultural production is targeted to increase by 30%, productivity by 38%, and the annual agri-food trade balance by $1.42 billion, relative to 2015. Goals also include stimulating domestic trade and improving water use efficiency. Accession to the World Trade Organization (WTO) in 2015 has increased access to external markets and enhanced competition and vertical integration, which in turn should lead to higher productivity in the sector.

The agricultural reforms also include policies to update the principles of allocation of subsidies used extensively under Agribusiness 2020. Going forward, policies will focus more on developing production insurance; forming favorable conditions for integration of small farms into cooperatives; providing key infrastructure such as storage, transportation, and distribution; supporting efforts to increase productivity; improving efficiency in land use; and increasing investment in agricultural research.

Another potential increase of agricultural production can come from increased availability of land. As discussed in Chapter 2, based on official statistics, 20.6 million hectares (ha) of cropland were abandoned between 1991 and 1999. In 2015, the

total agricultural area was still 40% lower than in 1990. While it is unlikely that the agricultural area will return to historical levels, a fraction of the abandoned cropland could return to crop production without significant costs or major environmental tradeoffs (Swinnen et al. 2017).

Although it is well endowed with land, Kazakhstan is poorly endowed with water. In fact, it is one of the most water-scarce countries in the Eurasian continent, with most of its area located in the arid zone, where water is difficult to access. Much irrigation fell into disrepair because of limited irrigation reinvestment. The irrigated pasture and fodder area dramatically declined from more than 1,000,000 ha in 1993 to 207,000 ha in 2010. In 2014 and 2015, substantial investment in irrigation resumed. Improved irrigation and water management could significantly add more productive land. Under the state program, a target has been set to rapidly rehabilitate former irrigation systems covering 600,000 ha by 2021.

Manufacturing

Manufacturing makes a modest contribution to GDP: Its share fell from 18% in 2001 to 11% in 2009 and stayed there until 2015. In 2016, the share of manufacturing increased slightly, to 11.7%, largely due to the contraction of mining amid the falling prices of crude oil. Manufacturing contributes about 6% of total employment and around 30% of total exports. Its share of total investment in fixed assets is 11%, compared with about 30% for the mining sector.

To promote non-oil growth and diversification of the economy, in 2010 the government initiated the large-scale State Program of Industrial and Innovative Development of Kazakhstan (SPIID 2010–2014). The SPIID strategy intended to reverse the decline experienced by the manufacturing sector during the then-recent oil boom, and gear it toward the production of high value-added goods and associated services. During this period, the contribution of the manufacturing sector to GDP continued to fall due to rapid growth in the mining sector.

The subsequent SPIID (2015–2019) focuses on development of the manufacturing sector based on regional specialization (a cluster approach) and effective industry regulation. On 6 September 2016, the program was revised due to the changing external environment, and the list of priorities was reduced from 14 to 8: ferrous and nonferrous metallurgy, oil processing, petrochemistry and agrochemistry, food production, car manufacturing, and electro-technical machine building (OECD 2017).

The goal of SPIID 2015–2019 is to stimulate competitiveness in the manufacturing sector, oriented to labor productivity growth and an expansion of exports of manufactured products. The main objectives include

- creating effective basic industries through modernization of enterprises in the traditional sectors;
- developing new growth through implementation of large sector-systemic projects;
- providing conditions conducive for efficient, export-oriented industrial entrepreneurship and/or continuous improvement of labor productivity; and
- establishing preconditions for emergence of a critical mass of innovative businesses.

Targets for 2019 from a 2015 base include

- 19% real growth in manufacturing exports,
- 22% real growth in labor productivity in manufacturing,
- investment in fixed capital in the manufacturing sector of T4.5 trillion, and
- reduced energy consumption in manufacturing by at least 7% compared with 2014.

The program also supports a shift from protection of enterprises in the internal market to promotion of export-oriented enterprises, using methods eligible under international obligations, especially relating to WTO and Eurasian Economic Union (EAEU) memberships. Given global trends, the program emphasizes growth potential for exports of quality products made of ferrous and nonferrous metals, electrical equipment, food, agrochemicals, and petrochemicals. Entrepreneurship and small and medium-sized enterprises are listed as drivers of change. Macroeconomic stability and access to finance are key for their development and the realization of their potential.

Economic diversification is not conceivable without strengthening the rule of law and increasing state transparency and accountability. These are addressed in the government program, "100 Concrete Steps, a Modern State for All," initiated in 2015. This program puts an emphasis on promoting economic diversification and growth along with institutional reforms. Institutional reforms should foster an enabling environment for the development of a viable private sector, and enhance competitiveness in the non-oil sector overall.

To create a viable manufacturing sector, it is crucial to reduce the share of state-owned enterprises in the economy. The large presence of the public sector and state-owned enterprises has a crowding-out effect on the private sector. The presence of distorting mechanisms that support ineffective enterprises provides less incentive for private sector participation. The 2017 Presidential address put an emphasis on decreasing the share of the state in the economy to 15% of GDP, which is planned to be accomplished through privatization of major state companies.

Transport and logistics

Transport and logistics constitute a key to diversifying the economy, given Kazakhstan's landlocked position and vast territory. To improve accessibility and connectivity between local regions, the government initiated the State Program for Transport Infrastructure Development 2020, with the objective of developing efficient transport infrastructure and logistics. This program includes policies relating to railway, road, aviation, and water infrastructure.

Policies in the railway sector include enhancing its infrastructure, creating conditions for increased private participation by lessening price regulation, providing access to the infrastructure for private couriers, and providing targeted subsidies to socially significant services. Policies in the road sector include institutional reforms and sectoral liberalization aimed at enhancing the quality of roads and attracting private investment in infrastructural development in the sector.

Policies in the aviation sector include liberalization of air transit, attracting investment into infrastructure, and improvement of flight safety and aviation security. The policies aim to foster competition in the aviation sector and double the volume of transit by 2020.

Policies in the water transport sector include the development of water services infrastructure and the merchant fleet, and improving the safety of navigation.

Another state program, Nurly Zhol, puts an emphasis on the formation of efficient transport and logistics infrastructure based on a ray principle. Kazakhstani transportation infrastructure is largely a legacy of the former Soviet Union, during which the roads were built to enhance the connectivity between the South and the North of the country rather than connectivity among regions, which led to underdevelopment of cross-regional transport and communications infrastructure. Among the strategic goals of diversification of the economy, the State Program 2020 aims to reduce the share of transport costs in the cost structure of nonresource sectors by not less than 15%.

Goals in the railway sector focus on building new railway lines, decreasing the depreciation of railway assets, increasing the speed of freight trains, decreasing the share of transportation costs by rail in export production costs by 20%, and increasing the number of independent private operators in freight and passenger transportation.

In the road sector, the strategy puts an emphasis on building and reconstruction of auto roads and expects the transit traffic to more than double by 2020.

Air transport sector is expected to facilitate a competitive air transport market and a doubled transit traffic by 2020.

The priority will be given to the development of port and service infrastructure, the formation of a merchant fleet, the development of human capital, and improved safety of navigation in the water transport sector.

Kazakhstan is part of the Western Europe–Western China International Transit Corridor Project, and aims to upgrade about 2,787 kilometers (km) of its road sections connecting Europe and the Russian Federation to the People's Republic of China (PRC).[1] The project aims to improve road safety and services. The construction of the highway via Kazakhstan is financed by loans from international financial institutions with cofinancing from the republican budget. From 2009 to 2015, the road was completed from the border in the Russian Federation to Shymkent through the Aktobe, Kyzylorda, and South Kazakhstan regions with a length of 2,028 km. The full completion of the Western Europe – Western China transit corridor was initially expected in 2016 but has been revised to 2020.

As discussed in Chapter 5, improved efficiency in transport and logistics will allow Kazakhstan to maximize the benefits from trade liberalization associated with the creation of the EAEU and Kazakhstan's joining of the WTO in 2015. With the advent of the Belt and Road Initiative of the PRC and the completion of the Almaty–Astana highway, a large opportunity will open up for transit trade, which will develop the transport and logistics service sectors of Kazakhstan.

International experience provides convincing support for the positive effects of more efficient transport infrastructure on industrial production and development. According to Donaldson (2017), India's railways have resulted in a considerable reduction of the trade costs and interregional price gaps while increasing interregional and international trade and thereby real incomes of the country; and Hong et al. (2011) point out that improved water and land transport infrastructure made a significant contribution toward economic development in the PRC. Using firm-level manufacturing data, Konings (in Chapter 5) found that a 10% increase in productivity in the transport and logistics sector is associated with a 1.1% increase in productivity in the average manufacturing firm. This indicates that innovation in transport infrastructure is not only relevant for supporting and attracting transit trade to Kazakhstan, but also for improving efficiency in domestic industrial production.

1 New Way to Europe. http://www.europe-china.kz/news/10087.

Other services

The services sector's importance in Kazakhstan is increasing, with its share of GDP rising from 48.4% in 2000 to 56% in 2012. The sector also employs 63% of the country's labor force. The role of services in external trade, however, remains limited, with import services constituting 19% of total imports but export services contributing only 6% to total exports.

The importance of the services sector in further development of the country is highlighted in "Kazakhstan 2050." The 2050 Strategy aims to bring the share of the services sector in GDP to 70%, which would involve the reallocation of employment to more productive sectors. A major focus of the program is on nine key sectors: trade, transport and logistics, tourism, real estate, professional services, information and communication, financial services and insurance, education, and healthcare.

The medium-term goals for the services sector for 2020 include

- labor productivity improving by 25% from 2015 to 2020,
- the share of services in GDP increasing from 56% in 2015 to 59% in 2020, and
- employment increasing by 9% and the real rate of growth of exports rising by 50% over the same period.

The major contribution to GDP from services should come from the finance sector, whose share of GDP is expected to rise from 3% to 4.6%. Overall, the program stresses the importance of labor productivity, which is deemed crucial for achieving the targets for the services sector. The government is taking steps to improve the soundness and efficiency of the finance sector by addressing the existing problem of nonperforming loans and improving the competitive position of the banks (IMF 2017). Priorities include consolidation and capitalization of the system, strengthening banking resources and liquidity management, progressing toward risk-based regulation and supervision, increasing the supply of financial instruments, and improving financial literacy.

Considering the capital-intensive nature of Kazakhstan's economy, the development of a more efficient finance sector is key in supporting the expansion of the other sectors of the economy. Cojocaru et al. (2016) found that for transition economies, the efficiency and competitiveness of the finance sector are often more important than the availability of credit. For Kazakhstan, a more efficient finance sector can increase the speed of economic diversification and thus reduce economic volatility (Manganelli and Popov 2015).

6.3. Modeling Methodology

Analytical framework

The government's policy reforms summarized in the previous section, if implemented consistently, would have extensive impacts on Kazakhstan's economy. Policy reforms implemented to improve productivity in manufacturing would have direct effects on that sector, often called first-round effects. Productivity improvements in the manufacturing sector would also affect other industries using manufacturing outputs as inputs into their production processes. At the same time, a more competitive manufacturing sector would have positive effects on the final demand (domestic consumption and exports) of products. These effects are called second- and third-round effects of productivity/efficiency improvements in the manufacturing sector. All the policy reforms discussed in the previous section will have first-, second-, and third-round effects on the economy.

To analyze the economy-wide effects of these reforms, the study uses an economy-wide analytical technique called a CGE model, specifically developed for the Kazakhstan economy (KazORANI). The model is based on the Australian ORANI model developed by Dixon et al. (1982). The ORANI-type model and its advancements have been applied in many countries (Ginting et al. 2014, Wing 2004, Powell 1993, de Melo 1989, Decaluwe and Martens 1986, Partridge and Rickman 1998, Bandara 1991, Yusuf et al. 2014, Wijerathna 2015). Dixon and Jorgenson (2013) provided a comprehensive review of the use of CGE models in analyzing and supporting policy reforms. The KazORANI model is calibrated using Kazakhstan's 2015 Supply Use (input–output) table, which captures industry backward and forward linkages and the costs and sales structure of each industry. The next subsection outlines the key features of the KazORANI model, the database used to calibrate the model, and two types of simulations, called baseline and policy, that are used to quantify the impacts of policy reforms identified for study.

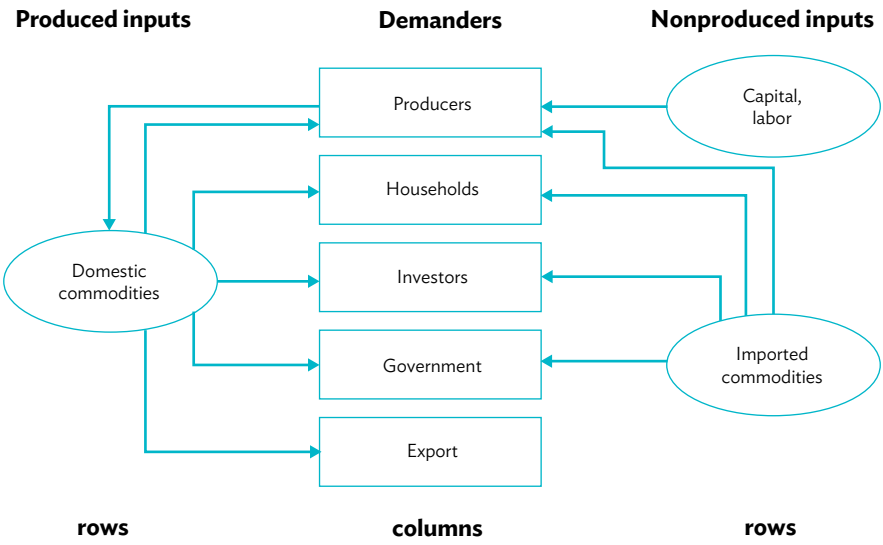
KazORANI

The KazORANI model is a comparative static, top–down, multiregion CGE model that follows the Australian ORANI model. The model is represented by a system of nonlinear equations with a number of endogenous and exogenous variables. The equations determine prices and quantities of final commodities and inputs (both the primary inputs of labor, capital, and land as well as intermediate inputs). The equations specified in the CGE model are a representation of optimizing rational economic agents—in this case, producers and consumers who interact in a competitive market

economy. They form the demand for and supply of commodities that are cleared in the marketplace as represented in the model, through market clearing conditions in equilibrium.

The interaction of key agents (producers and demanders) in the model and the commodity flows in the economy are presented in Figure 6.3. Producers in the economy demand commodities as intermediate inputs and combine them with primary inputs (land, labor, and capital) to produce various commodities.

Figure 6.3: Key Economic Agents and Material Flows



Sources: Dixon et al. (1982), Horridge (2013).

Producers are divided into a number of production sectors (or industries) based on the availability of data and purpose of the analysis. Households demand goods for their consumption, while investors demand goods and services to develop new production infrastructure that facilitates future production. The government also consumes some goods and services in providing administrative services, basic infrastructure, and welfare facilities for the public. Exporters represent the foreign demand for domestically produced goods and services. Importers are importing foreign-produced commodities for local consumption. More details on the theoretical structure of the model are presented in the Appendix 1. Horridge (2013) provides a complete discussion of the theoretical structure and equations used in the ORANI-type model.

The modeling framework of this study was developed in consultation with different stakeholders including the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan and the Economic and Research Institute, and in collaboration with Nazarbayev University in Kazakhstan.

Database and model calibration

The KazORANI is calibrated with Kazakhstan's Supply Use (input–output) table for the year 2015, produced by the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan. The input–output database has 68 industries and 68 products classified according to the standards of NACE Rev. 2 nomenclature.[2] The KazORANI model database reorganizes the conventional input–output database into a number of submatrices, and it also includes some additional and disaggregated data. The structure of the KazORANI model database is depicted in Figure 6.4.

Each cell of Figure 6.4 represents a submatrix in the model database. Dimensions of submatrices are given in column and row headings. The columns 1–5 represent the sales structure of output for the five key demanders of the economy identified in Figure 6.3. In column 6, inventories are added to record the value of the unsold part of current production remaining at the end of the base year. Both producer and investor columns are subdivided to represent intermediate and investment demand of each industry. The first row of Figure 6.4 includes the total basic value of commodities demanded by all users or demanders during the base year. The total value of trade and transport margins, which are added on to each user during the transfer of commodities from producers to users, is given in the second row. The total value of all domestic taxes on commodities is recorded in the third row. All basic, margin, and tax rows consist of 68 subrows to represent 68 products and two subrows for each product to represent domestic and imported commodities. Margin rows of each industry are divided into two to represent trade and transport margins added onto domestic sales of commodities. Each of those rows is again divided to represent different kinds of trade and transport margins. There are six categories of margins in our model: wholesale trade, retail trade, sale and repair of motor vehicles, land, water, and air transport.

[2] NACE is the acronym used to designate the various statistical classifications of economic activities developed since 1970 in the European Union (EU). NACE provides the framework for collecting and presenting a large range of statistical data according to economic activity in the fields of economic statistics (e.g., whereas production, employment, national accounts) and in other statistical domains. NACE is derived from ISIC (International Standard Industry Classification of the United Nations), in the sense that it is more detailed than ISIC. ISIC and NACE have exactly the same items at the highest levels, where NACE is more detailed at lower levels (http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Statistical_classification_of_economic_activities_in_the_European_Community).

Figure 6.4: KazORANI Database

		1	2	3	4	5	6
		Producers	Investors	Household	Export	Government	Changes in inventories
	Size	← I →	← I →	← H →	← 1 →	← 1 →	← 1 →
Basic flows	C	V1BAS	V2BAS	V3BAS	V4BAS	V5BAS	V6BAS
Margins	CxSxM	V1MAR	V2MAR	V3MAR	V4MAR	V5MAR	V6MAR
Taxes	CxS	V1TAX	V2TAX	V3TAX	V4TAX	V5TAX	V6TAX
Labor	1	V1LAB					
Capital	1	V1CAP					
Land	1	V1LAND					
Production Tax	1	V1PTX					

I	Number of industries
C	Number of commodities
S	Source - Domestic imported
M	Number of commodities used as margins
V	Value
BAS	Value in basic price
MAR	Margin
TAX	Sales taxes
LAB	Labor

	Joint production matrix
Size	I
C	Make

Source: Adapted from Horridge (2013).

The rows in the producers' column represent the cost of production structure. The costs of intermediate inputs, including margins and taxes, are included in rows 1-3. The V1BAS matrix shows the backward and forward linkages of industries. Total payment to labor by producers is included in the fourth row. It can be subdivided into different skill categories of labor, as the KazORANI model contains nine labor categories to represent three skill categories. The fifth and sixth rows include the rental value of land and the rental or user cost of capital resources used by producers. Production taxes and subsidies experienced by producers are recorded in row 7. The last row includes any other production costs not recorded in the above rows. The separate "make" matrix indicates the production of commodities by domestic producers, and it is equivalent to the "make" matrix in the supply table.

While all model equations are solved for 68 industries and products, both industries and products are aggregated to 16 industry and product groups for the ease of reporting. A detailed description of the 68 industries and the mapping for the 68 industries is given in Appendix 2. The GDP contributions of the 68 industries in the base year are given in Appendix 3.

Table 6.1 presents a summary of the cost structure of aggregated industries based on Kazakhstan's input–output data used in the model. As shown in the last row, the overall production structure in Kazakhstan is relatively capital-intensive, with capital costs representing 34.8% of overall production costs. Manufacturing is in general also capital-intensive. The same is true for the transport, logistics, and trade sectors. The agriculture sector, on the other hand, is land-intensive. Priority manufacturing, oil and gas, and construction have the highest backward linkages, through their use of domestic intermediate inputs in their production processes. Sectors such as priority manufacturing, other manufacturing, and construction use significant margins in their production processes.

The sales structure of the industries is presented in Table 6.2. The forward linkages of industries, measured by the use of their outputs as inputs to production by other

Table 6.1: Structure of Aggregated Industries in 2015 (% of total costs)

Industry	Intermediate Domestic Input	Intermediate Imported Input	Margin	Intermediate Consumption Tax	Payments to Labor	Cost of Capital	Land Rent	Production Tax
Agriculture	21.6	6.1	10.0	0.5	13.5	14.5	33.7	0.1
Forestry	33.1	3.4	2.4	0.7	41.2	14.2	3.9	1.1
Fishing	16.5	9.4	3.3	0.3	4.2	31.4	34.8	0.1
Coal	22.8	14.4	6.8	0.0	27.0	5.1	22.3	1.6
Oil and gas	29.3	4.3	8.0	0.8	8.5	22.6	23.4	3.1
Other mining	23.2	7.5	16.3	0.4	26.2	16.2	9.6	0.7
Priority manufacturing	29.9	4.3	18.3	0.1	15.1	31.5	0.0	0.8
Other manufacturing	16.8	15.5	17.4	0.6	15.5	34.1	0.0	0.3
Construction	28.6	7.2	17.3	0.3	21.0	25.4	0.0	0.2
Electricity, gas, water, and steam	27.5	9.0	12.9	0.2	26.7	22.8	0.0	0.9
Trade	21.3	5.6	2.1	0.1	24.8	46.0	0.0	0.2
Transport and logistics	19.4	8.8	10.2	0.8	16.3	44.0	0.0	0.7
Mining tech. services	11.5	15.0	13.1	0.4	30.0	29.1	0.0	0.9
Services to manufacturing	24.1	6.5	2.7	1.1	28.6	36.5	0.0	0.6
Government services	40.1	8.8	4.8	0.9	33.8	11.1	0.0	0.5
Other services	16.1	3.1	1.9	0.3	11.1	67.3	0.0	0.3
Average	24.8	6.2	8.1	0.5	19.9	34.8	5.0	0.8

tech. = technological.
Source: KazORANI database.

sectors, is shown in the second column. Output of industries such as electricity and water, services to mining, and manufacturing are largely used to support manufacturing and mining production processes. On the export orientation of industries, more than 80% of oil-and-gas output is exported, and other mining also has a relatively high export share. Priority manufacturing exports 18.5% of its output, while the agriculture sector exports much less at around 5%. Government services are used mainly by the government and households.

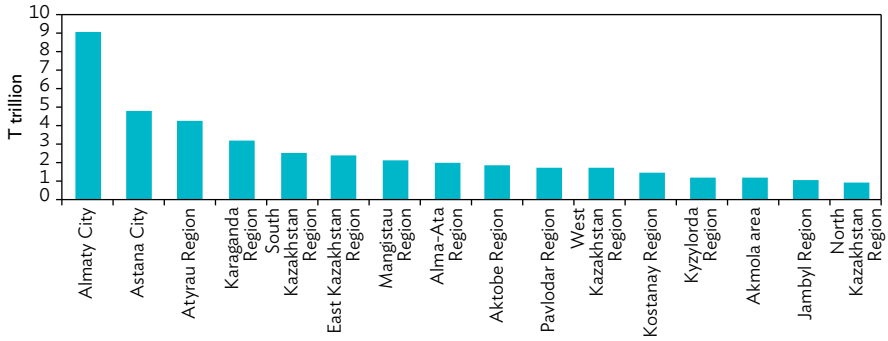
Table 6.2: Sales Structure of Aggregated Industries in 2015 (% of total sales)

Industry	Intermediate Demand	Investment Demand	Household Demand	Export Demand	Government Consumption
Agriculture	28.8	1.8	63.2	4.8	1.5
Forestry	27.2	0.0	4.5	0.3	68.0
Fishing	0.6	0.0	84.0	0.2	15.1
Coal	25.9	0.0	51.3	22.8	0.0
Oil and gas	16.9	0.0	1.9	81.2	0.0
Other mining	66.7	0.0	0.9	32.5	0.0
Priority manufacturing	38.8	18.0	24.6	18.5	0.0
Other manufacturing	24.6	20.9	51.3	3.3	0.0
Construction	23.1	72.8	2.5	1.4	0.2
Electricity, gas, water, and steam	51.4	0.0	42.8	3.3	2.5
Trade	5.3	0.0	4.8	0.1	0.0
Transport and logistics	34.4	0.0	31.5	13.3	7.0
Mining tech. services	100.0	0.0	0.0	0.0	0.0
Services to manufacturing	61.8	11.8	22.5	2.0	2.0
Government services	0.7	0.0	14.5	0.0	84.9
Other services	5.8	0.3	90.8	1.5	1.6
Average	27.2	10.7	25.8	14.1	6.7

tech. = technological.
Source: KazORANI database.

The database also includes regional shares for 16 (14 oblasts and the two largest cities Astana and Almaty) oblasts in Kazakhstan, based on data provided by the Committee of Statistics of the Ministry of National Economy of the Republic of Kazakhstan. The regional contribution to GDP in the base year is given in Figure 6.5. The behavioral equations of the model also use some elasticities, and for KazORANI they are adopted from the Kazakhstan section of the well-established Global Trade Analysis Project model database, supplemented by elasticities in CGE models for comparable countries.

Figure 6.5: Regional GDP in Base Year 2015

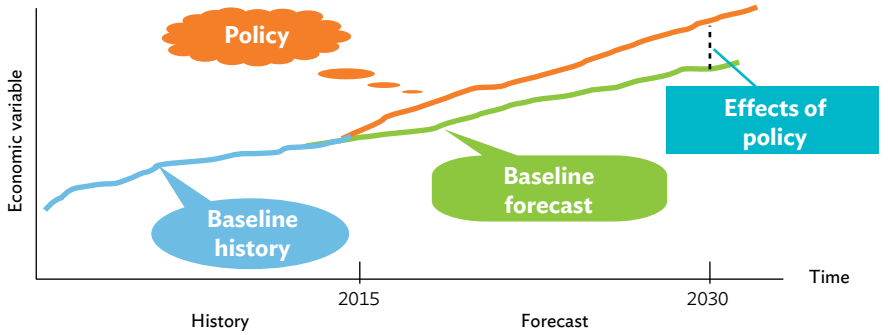


GDP = gross domestic product.
Source: Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2017).

Baseline and policy reform simulations

To quantify the economy-wide impacts of policy changes, simulations using KazORANI are carried out in two stages. First, a baseline simulation is carried out to represent improvements in the economy associated with natural dynamic changes (no-reform scenario). The baseline simulation will bring the economy to a new equilibrium from the 2015 initial conditions to a new time period, which is defined as 2030 in this study. Then a second policy reform simulation is run to introduce policy reform changes to the database for 2030, so as to quantify the prospective impacts of those reforms on the economy. The impacts of the policy changes are measured in terms of deviations from the baseline (see Figure 6.6).

Figure 6.6: Baseline and Policy Simulation



Source: Adapted from Mai (2005).

To measure the effect of the policy reforms on regional disparity, a weighted mean deviation index (MD_w) is calculated using the following formula:

$$MD_w = \left(\sum_{i=1}^{n} (|Yi - \overline{Y}|) \frac{P_i}{P} \right) / \overline{Y}$$

where Yi is the per capita GDP of the i-th province, Y is the per capita GDP of the country, P_i is the population of i-th province, N is the number of provinces, and P is the population of the country. MD_W has the value of 0 for a perfectly equal distribution and varies up to $2P(N-1)/P_i$ for a perfectly unequal distribution. This index is a measure that is widely used by researchers, including Wijerathna et al. (2014), Smith (2004), Williamson (1965), Kakwani (1988), and Shankar and Shah (2003). In some studies (e.g., Shankar and Shah 2003), this measure is called the relative mean deviation.

6.4. Model Simulation Results

Baseline simulation

Under the baseline scenario, Kazakhstan's economy is assumed to continue the past growth path with continued dependence on the oil-and-gas sector. Other variables that support growth are mainly those that have been observed in past trends. Key assumptions used to generate the baseline simulation are

- employment increases by 1% per annum,
- the number of households increases by 1% per annum,
- labor productivity increases by 1.5% per annum,
- land productivity increases by 1.5% per annum,
- export demand rises by 2% per annum with the growth in external economies, and
- the oil price increases by 1.6% per annum based on the World Bank's projection.

The level of employment and number of households are assumed to increase by 1% based on the observed population growth rate in recent history (Committee on Statistics the Ministry of National Economy of the Republic of Kazakhstan 2017b). Labor and land productivity improved gradually in the past in large part due to the reduction of labor force working in the agriculture sector. Considering the expansion of the economies of Kazakhstan's trading partners, the volume of exports to those countries is assumed to be increased by 2% per annum.

On the oil price assumption, the World Bank (2017) has released a commodity price forecast from 2014 to 2030. On average, oil price is projected to increase by 1.6% annually. Considering the uncertainties associated with the path of the oil price going

forward, an additional simulation with a lower oil price is also carried out to assess the risk in the baseline simulation.

Under the no-reform scenario, Kazakhstan's economy is projected to grow by 2.3% a year to 2030, with total GDP estimated to reach T59.5 billion (Table 6.3). That growth is driven mainly by labor productivity growth (1.0 percentage point), expansion in the workforce (0.7 percentage points), and land productivity (0.5 percentage points). The annual oil price increase of 1.6% per year contributes only 0.1 percentage point to that total GDP growth.

The composition of the economy in 2030 is little different from that in 2015 (Table 6.3). The share of the oil-and-gas sector is projected to increase slightly from 13% in 2015 to 16% in 2030. The services sector continues to be two-thirds of GDP, while the share of manufacturing declines from 9.7% to 8.8% over this period.

Table 6.3: Structure of the Kazakhstan Economy, 2015 and 2030

Sector	2015		2030 Baseline	
	T billion	%	T billion	%
Petroleum	5,168	13.0	9,382	15.8
Other mining	1,004	2.5	1,314	2.2
Agriculture	2,325	5.9	3,353	5.6
Manufacturing	3,868	9.7	5,243	8.8
Priority sectors	3,452	8.7	4,653	7.8
Other sectors	415	1.0	591	1.0
Services	27,354	68.9	40,218	67.6
Manufacture supporting	4,582	11.5	6,734	11.3
Construction	2,544	6.4	3,648	6.1
Trade	8,063	20.3	11,300	19.0
Transport and logistics	3,635	9.2	5,268	8.9
Electricity, gas, water, and steam	877	2.2	1,314	2.2
Government services	2,108	5.3	3,179	5.3
Other	5,546	14.0	8,774	14.7
Total GDP	**39,719**	**100.0**	**59,510**	**100.0**

GDP = gross domestic product.
Sources: KazORANI database and baseline simulation.

A key message from the baseline scenario is that the gradual increase of the oil price of around 1.6% annually, to reach $66/bbl in 2030, is far from sufficient to achieve the high growth experienced in the past. If the baseline scenario assumes an unchanged oil price from the current level, the baseline economic growth is projected to average 2.2% annually instead of 2.3%, generating a lower share of oil in the economy relative to the no-reform baseline. (The macro results of both simulations are given in Appendix 4 (Table A4.1 and the Table A4.2). This finding underscores the need to diversify the sources of future growth, which is the subject of the next subsection.

Policy reform simulations

The policy reform simulations will quantify the economy-wide effects of some of the government's policy initiatives to diversify the economy, as summarized above in section 6.2. These policy reforms are aimed mainly at improving overall productivity in sectors such as agriculture, priority manufacturing, transport and logistics, and selected services. The government in its medium-term development program includes a clear labor productivity improvement target. At the same time, as noted in section 6.2, the government is putting strong emphasis on increasing the role of the private sector to support future growth and gradually reducing the share of the state in the economy to 15% of GDP. This can be accomplished through privatization of major state companies. At the same time, an improved business climate, various efforts to improve competitiveness, and sounder lending practices in the banking system will lead to overall improvement in the productivity of capital in the country.

For the agriculture sector, the government is implementing policies aimed at improving productivity by 30% by 2021. Policies implemented to achieve this objective include redirecting subsidies toward agricultural investments, improving post-harvest facilities, reforming agricultural finance, and enhancing the business climate in the sector to increase private sector participation and investment. To capture the government's productivity improvement target in the agriculture sector, in the policy reform simulation we introduce a shock to increase primary factor productivity of the sector by 1.5% annually to 2030.

As noted in section 6.2, in 2015 the total agricultural area was 40% lower than in 1990. The government is now implementing policies to return a part of the abandoned cropland to crop production. The government is also resuming substantial investment in irrigation and improving water management. With these policy reforms, we assume that the stock of agricultural land will increase by 30% by 2030.

For the manufacturing sector, the government is also seeking improvements in labor productivity, by 22% by 2021. In the policy reform simulation, considering that target, increased private sector participation, an improved business climate, and enhanced competitiveness in the sector, we increase primary factor productivity by 1.5% per annum for the primary manufacturing industries, which include food and beverages, refineries, chemicals, plastics and rubber, ferrous metals, electrical equipment, and motor parts.

In the transport and logistic sectors, the government's strategic goals to support economic diversification include reducing the share of transport costs in the cost structure of nonresource sectors by no less than 15%. The government is expanding

the railway system with the aim of reducing by 20% the share of transportation costs by rail in export production costs. In the policy simulation, we assume that these reforms will produce an average increase of 1.5% per annum in the primary factor productivity of the transport sector.

In the services sectors, the government's medium-term goals include efforts to improve labor productivity by 25% and to increase the share of the services sector in GDP from 56% in 2015 to 59% in 2020.[3] The major contribution to increased GDP from the services sectors should come from the finance sector. The government is currently resolving the numerous nonperforming loans in the banking system. As discussed in section 6.2, the government is also taking steps to improve the soundness and efficiency of the finance sector by consolidating and capitalizing the system, strengthening banking resources and liquidity management, and progressing toward risk-based regulation and supervision. To capture the policy changes introduced in the services sectors supporting manufacturing, we introduce a 1.5% annual increase in labor productivity for selected services such as finance, insurance, communication, and science and technology.

As discussed above, the same productivity improvement shocks are introduced to all sectors, namely 1.5% annually. This in most cases is more conservative than the government's target in these priority sectors. A more conservative rate of improvement is chosen because in practice these reforms often take more time to implement than pronounced in the strategy document. In addition, the same size of productivity shocks across sectors is chosen in part to facilitate easy comparison of these sectors' response to policy changes and their potential contributions to economic growth and diversification.

Considering the current size of the oil-and-gas sector and its contribution to the economy, future prospects for the sector and associated government policies related to the NFRK and the revenue generated from the sector will affect the pace and the structure of economic growth going forward. Based on IMF estimates, if the government uses the NFRK to finance its current level of non-oil deficit (to keep the debt-to-GDP ratio constant), the NFRK assets could be exhausted by 2020. Recognizing this, the government has issued a new NFRK framework to maintain the sustainability of the fund. The policy includes preventing NFRK assets from falling below 30% of GDP from the current level of 43%. To achieve this objective, the government will consolidate its fiscal position by reducing the non-oil deficit to 6% of GDP in 2025, down from 8.3% in 2016. The IMF suggests that a lower non-oil deficit of 4%–5% is needed to ensure sustainability of the fund over the long term.

[3] The different GDP share from service sector in Table 6.3 is due to the different sector classification. For example, in Table 6.3, construction and utilities are included within the broad category of services.

In addition to the negative risks associated with oil price developments discussed in the baseline simulation, there are also potential positive risks coming from that sector going forward. The IMF projects that oil production could reach 2.12 million barrels by 2021, up from 1.64 million barrels in 2016 (IMF 2017). Under the new policy, the government will promote a zero balance in its budget over the medium term, and the NFRK will accumulate assets to facilitate intergenerational equity. Consistent with the medium-term policy of the NFRK, in the policy simulation we assume that government spending over time is constant in real terms. However, the government's efforts to reorient some of the spending toward infrastructure such as irrigation and the transport sector will help improve productivity, as discussed above.

Consistent with the government policy to ensure the intergenerational equity of the NFRK, in the policy simulation we endogenize the balance of trade between exports and imports to respond to relative price changes, which could otherwise result in a balance of trade surplus. For the labor market, it is assumed that the level of growth produced in the baseline simulation will not be sufficient to absorb all the new laborers coming into the market. Hence, in the policy simulation we allow employment to respond to changes in real wages and output in each industry.

As presented in Table 6.4, the cumulative increase in real GDP from the proposed reforms is 20.2% by 2030. The annualized increase is 1.2% per annum. That is, these reforms will raise GDP growth annually from 2.3% in the baseline to 3.5%. This is a bit lower than the 4% potential growth estimated by the IMF over the medium-term, as well the 5% target envisioned in Kazakhstan's 2025 Strategic Plan. One of the reasons for the lower GDP growth estimated by the model is because policy reforms introduced above cover only the main rather than all of the government's reform initiatives.

Table 6.4: Macroeconomic Impacts of the Policy Reforms by 2030

	All Policy Reforms	Agricultural Reform	Manufacturing (priority sectors) Reform	Service Sector Reform	Transport and Logistics Reform
Real GDP	20.2	5.9	5.3	3.3	5.7
Employment	8.5	3.7	1.8	1.1	1.9
Real wages	14.5	6.4	3.1	1.8	3.2
Real household income	13.8	4.0	3.6	2.3	3.9
Real investments	19.2	5.5	5.0	3.2	5.4
Real government purchases	13.8	4.0	3.6	2.3	3.9
Export volume	24.9	7.0	6.4	3.6	7.9
of oil	1.5	0.2	0.4	0.5	0.4
of priority manufacturing	75.3	10.7	38.4	10.5	15.7
Import volume	6.3	1.4	1.5	0.3	3.1

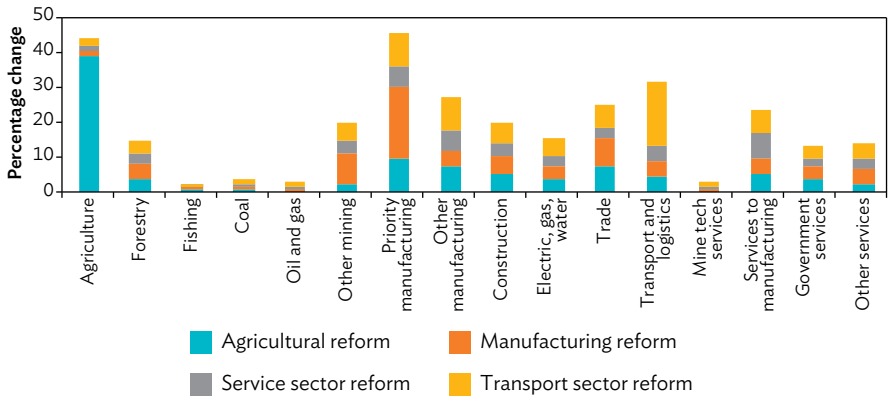
GDP = gross domestic product.
Source: KazORANI model simulation.

Productivity improvements and policies to increase agricultural land produce the largest contribution to annual growth (0.36 percentage point), followed by direct reforms in transport and logistics (0.35 percentage point), the priority manufacturing sectors (0.32 percentage point), and manufacturing supporting service sectors (0.20 percentage point).

The proposed policy reforms also have positive effects on both real wages (a boost of 14%) and employment (8%), driven largely by increasing employment opportunities in the manufacturing and agriculture sectors. On the trade front, exports expand by 25%, supported mainly by the priority manufacturing sector. Imports, on the other hand, increase by only 6%, which leads to an accumulated trade surplus of around 6.5% of GDP by 2030.

The impact of the proposed policy reforms across aggregated industries is shown in Figure 6.7, while the impact of the reforms on all 68 industries is given in Appendix 4 (Figure A4.1).

Figure 6.7: Impacts of the Policy Reforms on Industrial Output



tech = technological.
Source: KazORANI model simulation.

Naturally, the industries that experienced reforms such as agriculture, priority manufacturing, transport and logistics, and services to manufacturing record the highest growth. For the agriculture sector, the biggest contributor to its growth is the reforms implemented within the sector. However, it is interesting to observe that the reforms implemented in certain other sectors such as transport and logistics make a large contribution to the growth of many other sectors. Manufacturing benefits significantly from the reforms implemented in sectors such as agriculture and

transport and logistics. In addition, other sectors also benefit significantly from a more efficient priority manufacturing sector due to its large backward and forward linkages. Improved efficiency in the key services sector also produces significant benefits across sectors due to the capital-intensive nature of the economy.

The proposed reforms contribute significantly to export diversification. As presented in Table 6.5, the no-reform baseline simulation does not change the export structure of the country significantly. The share of oil exports increases by about 3% at the expense of priority manufacturing, agriculture, and other sectors. The policy reform simulation, on the other hand, generates significant changes in the export composition. While the share of oil-and-gas exports continues to be large at 46.8%, it declines by 13 percentage points relative to the baseline simulation in 2030. The share of other mining also shrinks, by 2.5 percentage points. Priority manufacturing, transport and logistics, and agriculture gain export shares by, respectively, 6.8, 4.9, and 3.7 percentage points. This diversification will reduce the current external vulnerability of Kazakhstan and expand productive employment opportunities toward manufacturing and key services sectors.

Table 6.5: Impacts of the Policy Reforms on Export Diversification
(% share in export basket)

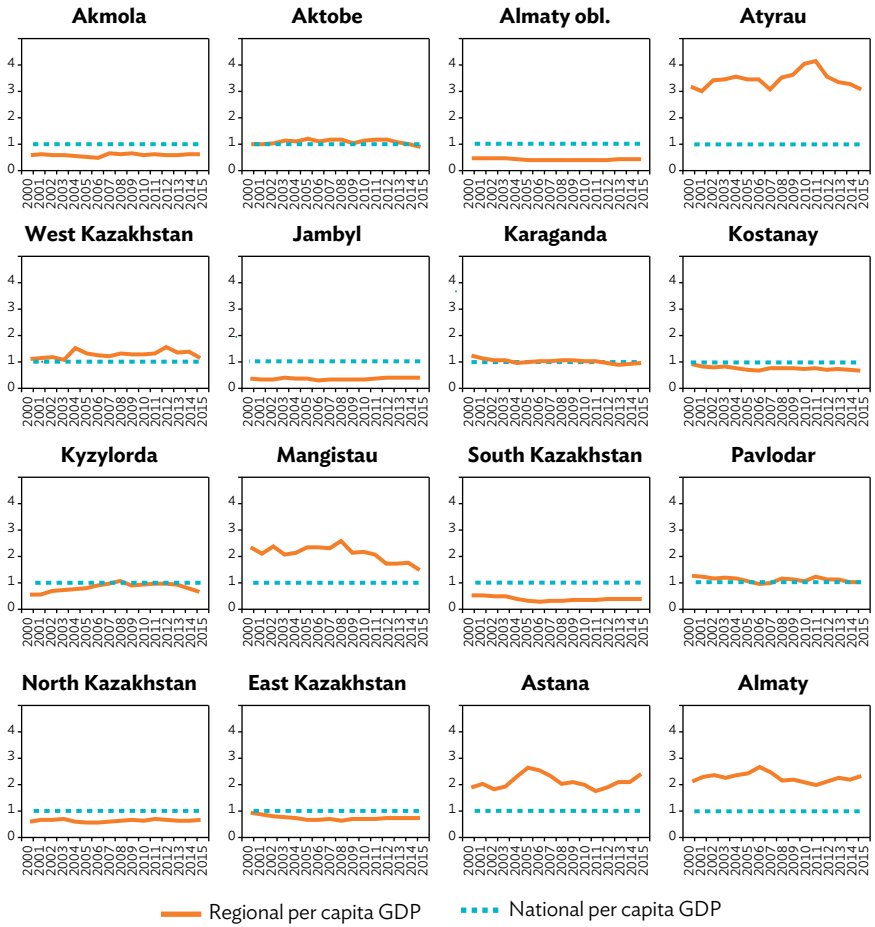
	2015	2030 Baseline	2030 with Reforms	Change in Percentage Points
Agriculture	1.8	1.4	5.1	3.7
Forestry	0.0	0.0	0.0	0.0
Fishing	0.0	0.0	0.0	0.0
Coal	0.8	0.5	0.3	(0.2)
Oil and gas	57.3	60.0	46.8	(13.2)
Other mining	6.2	6.3	3.8	(2.5)
Priority manufacturing	21.5	19.7	26.5	6.8
Other manufacturing	0.6	0.6	0.7	0.1
Construction	0.8	0.8	0.8	0.1
Electricity, gas, water, and steam	0.6	0.6	0.6	0.0
Trade	0.1	0.1	0.1	0.0
Transport and logistics	7.9	7.5	12.5	4.9
Services to manufacturing	1.6	1.6	2.0	0.4
Other services	1.0	1.0	1.0	0.0
	100.0	100.0	100.0	

( ) = negative.
Source: KazORANI model simulation.

With sources of growth concentrated around the oil-and-gas and construction sectors, Kazakhstan has significant regional economic disparities (Roudoi et al 2006). As shown in Figure 6.8, oblasts in which the major share of oil-and-gas production is located, such as Atyrau, Mangystau, and the main cities of Almaty and Astana,

have a higher GDP per capita relative to the national average, and this has remained unchanged during the past 15 years. The per capita GDPs of oil-rich Aktobe and Kyzylorda closely follow the national average, while that of West Kazakhstan is slightly above the national average. The non-oil regions, including the agricultural regions of North and East Kazakhstan, rural Alma-Ata, and Jambyl, continue to have per capita incomes below the national average. Per capita incomes in Almaty and Astana are above the national average, supported by high levels of employment in the services and construction sectors (Appendix Figures A4.2 and A4.3).

Figure 6.8: Regional Income Disparities



GDP = gross domestic product.
Source: KazORANI model simulation; Committee of Statistics of the Ministry of National Economy of the Republic Kazakhstan (2017b).

The impact of the proposed reforms on regional income disparities is measured by the MD_W index. As discussed above, a lower value of the MD_W index represents a reduction in regional disparities. The baseline simulation shows an increase in the value of the index relative to the base year 2015, suggesting increasing regional disparities by 3.3% (Table 6.6). This is because the no-reform growth strategy benefits the oil-rich oblasts such as Atyrau and Mangystau. The policy simulation reduces regional disparities by 3%–4% due to diversified and more spread-out drivers of growth across the oblasts in the country (Appendix Figure A4.4).

Table 6.6: Contributions of the Policy Reforms to Reducing Regional Income Disparities

	MD_w Index	Change (%)
Year 2015	0.5756	
Baseline	0.5945	3.28
With reforms in		
Agriculture	0.5698	(4.16)
Manufacturing (priority)	0.5713	(3.90)
Transport and logistics	0.5762	(3.08)
Services (manufacture supporting)	0.5715	(3.87)

( ) = negative, MD_w = weighted mean deviation.
Sources: KazORANI model simulation and authors' calculations.

6.5. Concluding Remarks

The simulations in this chapter reveal that a no-reform strategy of promoting continued reliance on the oil-and-gas sector would not produce as much growth as in the recent past, or come close to Kazakhstan's growth potential. With the oil price assumed to increase by only 1.6% annually, in line with the World Bank's projection, and labor productivity improving at the same rate as in the past, GDP growth is projected to average only 2.3% annually from now to 2030.

The chapter also finds that consistent reforms in key sectors to improve the business climate, enhance competitiveness, and increase private sector participation would improve the country's growth rate by about 1.2 percentage points annually. The additional growth is generated through widespread improvement in the productivity of both labor and capital, which would lead to increased exports from non-oil sectors such as priority manufacturing and agriculture. More diversified sources of growth reduce the country's current vulnerability to external shocks, while reducing regional income disparities.

The average 3.5% growth projected by the model from now to 2030 is lower than the 4% potential growth forecast by the IMF and the envisaged 5% GDP growth by the Kazakhstan 2025 Strategy. This is because the policy reform simulation conducted in this chapter uses policy shocks that are more conservative than the government's target, and includes only a selection of its policy reform initiatives outlined in its medium- and long-term strategic plans (Government of Kazakhstan 2012, 2017). The simulation is also conservative in the assumed contribution of the NFRK to support future growth. With less conservative assumptions about the extent and number of policy reforms, envisaged growth potentials may well be attainable.

References

Albassam, B. A. 2015. Economic Diversification in Saudi Arabia: Myth or Reality?. *Resources Policy*. 44. pp. 112–117.

Auty, R. M. 2001. The Political Economy of Resource-Driven Growth. *European Economic Review*. 45. pp. 839–846.

Bandara, J. S. 1991. Computable General Equilibrium Models for Development Policy Analysis in LDCs. *Journal of Economic Surveys*. 5. pp. 3–69.

Brewery, H. L. 1985. Measures of Diversification: Predictors of Regional Economic Instability. *Journal of Regional Science.* 25. pp. 463–470.

Corden W. and J. Neary. 1982. Booming Sector and De-Industrialisation in a Small Open Economy. *Economic Journal*. 92. December. pp. 825–848.

Cojocaru, L., E. M. Falaris, S. D. Hoffman, and J. B. Miller. 2016. Financial System Development and Economic Growth in Transition Economies: New Empirical Evidence from the CEE and CIS Countries. *Emerging Markets Finance and Trade*. 52 (1). pp. 223–236.

Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan. 2017a. GDP by Production Method in Current Prices (in Russian). Astana. http://stat.gov.kz/faces/wcnav_externalId/homeNationalAccountIntegrated?_afrLoop=8867762003606114#%40%3F_afrLoop%3D8867762003606114%26_adf.ctrl-state%3Dkofa1qi0a_43 (accessed 26 September 2017).

_____. 2017b. Gross Regional Product Database. http://stat.gov.kz/faces/wcnav_externalId/homeNationalAccountIntegrated?_afrLoop=14971890929800 45#%40%3F_afrLoop%3D14971890929800 45%26_adf.ctrl-state%3D3nkgpql2n_50 (accessed 26 September 2017).

_____. 2017c. Gross Regional Product by Economic Activity Database. http://stat.gov.kz/faces/wcnav_externalId/homeNationalAccountIntegrated?_afrLoop=14971890929800 45#%40%3F_afrLoop%3D14971890929800 45%26_adf.ctrl-state%3D3nkgpql2n_50 (accessed 26 September 2017).

_____. 2017d. Employed Population by the Type of Economic Activity Across Regions of Republic of Kazakhstan Database. http://stat.gov.kz/faces/wcnav_externalId/homeNumbersLabor?_afrLoop=14987057032919 17#%40%3F_afrLoop%3D14987057032919 17%26_adf.ctrl-state%3D3nkgpql2n_63 (accessed 26 September 2017).

Decaluwe, B. and A. Martens. 1986. CGE Modeling and Developing Economies: A Concise Empirical Survey of 56 Applications to 24 Countries. Working Paper. Montreal: Universite de Montreal, Departement de sciences economiques.

de Melo, J. 1989. Computable General Equilibrium Models for Trade Policy Analysis in Developing Countries: A Survey. *Journal of Policy Modeling*. 10. pp. 469–503.

Dixon, P. B. and D. Jorgenson, eds. 2013. *Handbook of Computable General Equilibrium Modeling*. Amsterdam: Elsevier.

Dixon, P.B and Rimmer, M.T. 2013. Validation in Computable General Equilibrium Modeling. *Handbook of Computable General Equilibrium Modeling*. Amsterdam: Elsevier.

Dixon, P. B. and B. R. Parmenter. 1996. Computable General Equilibrium Modelling for Policy Analysis and Forecasting. *Handbook of Computational Economics*. 1. pp. 3–85.

Dixon, P. B., B. R. Parmenter, J. Sutton, and D. P. Vincent. 1982. *ORANI: A Multisectoral Model of the Australian Economy*. Amsterdam: North-Holland.

Donaldson, D. 2017. Railroads of the Raj: Estimating the Impact of Transportation Infrastructure. *American Economic Review*. Forthcoming.

Gelb, A. 2010. Economic Diversification in Resource Rich Countries. Paper presented at the IMF High-Level Seminar: Natural Resources, Finance and Development. Algiers, Algeria. 4 November.

Ginting, E., A. A. Yusuf, M. Horridge, and P. Aji . 2014. Reducing Disparity through a Regions-Focused Development: A Modeling Approach of Assessing the Indonesian MP3EI. Working Paper in Economics and Development Studies. No. 201402. Bandung, Indonesia: Department of Economics, Padjadjaran University.

Government of Kazakhstan. 2012. *Kazakhstan 2050 Strategy*. Astana.

_____. 2017. *Technological Modernisation for Accelerated Growth and Better Quality of Life: Strategic Plan for Development of Kazakhstan until 2025*. Astana.

Gylfason, T. 2006. Natural Resources and Economic Growth: From Dependence to Diversification. In H. G. Broadman, T. Paas, and P. J. J. Welfens. *Economic Liberalization and Integration Policy: Options for Eastern Europe and Russia*. New York: Springer. pp. 201–231.

Herb, M. 2009. A Nation of Bureaucrats: Political Participation and Economic Diversification in Kuwait and the United Arab Emirates. *International Journal of Middle East Studies*. 41. pp. 375–395.

Hong, J., Z. Chu, and Q. Wang. 2011. Transport Infrastructure and Regional Economic Growth: Evidence from China. *Transportation*. 38 (5). pp. 737–52.

Horridge, M. 2013. *ORANI-G: A Generic Single-Country Computable General Equilibrium Model*. Australia: Centre of Policy Studies and Impact Project, Monash University.

Hvidt, M. 2013. Economic Diversification in GCC countries: Past Record and Future Trends. Research Paper. 27. London: Kuwait Programme on Development, Governance and Globalisation in the Gulf States, London School of Economics.

International Monetary Fund (IMF). 2017. Republic of Kazakhstan – Selected Issues. IMF Country Report No. 17/109. Washington, DC. https://www.imf.org/~/media/Files/Publications/CR/2017/cr17109.ashx.

Kakwani, N. 1988. Income Inequality, Welfare and Poverty in a Developing Economy with Applications to Sri Lanka. *Social Choice and Welfare*. 5 (2-3). pp. 199–222.

Mai, Y. 2005. The MONASH-Multi-Country (MMC) Model and the Investment Liberalisation in China's Oil Industry. Working Paper No. G-150. Centre of Policy Studies and Monash University.

Manganelli, S. and A. Popov. 2015. Financial Development, Sectoral Reallocation, and Volatility: International Evidence. *Journal of International Economics*. 96 (2). pp. 323–337.

National Bank of Kazakhstan. 2017. International Reserves and Assets of the National Fund of Republic of Kazakhstan. http://www.nationalbank.kz.

Organisation for Economic Co-operation and Development (OECD). 2017. Multi-Dimensional Review of Kazakhstan: Volume 2. In-Depth Analysis and Recommendations. *OECD Development Pathways*. Paris: OECD.

Papageorgiou, C. and N. Spatafora. 2012. *Economic Diversification in LICs: Stylized Facts and Macroeconomic Implications.* Washington, DC: IMF.

Partridge, M. D. and D. S. Rickman. 1998. Regional Computable General Equilibrium Modeling: A Survey and Critical Appraisal. *International Regional Science Review*. 21. pp. 205–248.

Powell, A. A. 1993. A Decade of Applied General Equilibrium Modelling at the University of Melbourne. *Economic Papers: A Journal of Applied Economics and Policy*. 12. pp. 87–103.

Rodrik, D. 2005. Policies for Economic Diversification. *Cepal Review*. 87. http://repositorio.cepal.org/bitstream/handle/11362/11111/87007023l_en.pdf?sequence=1&isAllowed=y.

Roudoi, A., J. Zislin, and B. Bolnick. 2006. *Kazakhstan Regional Disparities: Economic Performance by Oblast*. Washington, DC: Nathan Associates Inc.

Shankar, R. and A. Shah. 2003. Bridging the Economic Divide Within Countries: A Scorecard on the Performance of Regional Policies in Reducing Regional Income Disparities. *World Development*. 31 (8). pp. 1421–1441.

Smith, C. 2004. For Richer or Poorer: Recent Trends in Australia's Regional Income Dynamics. *Australasian Journal of Regional Studies*. 10 (2). pp. 195–223.

Suryanata, K. 2002. Diversified Agriculture, Land Use, and Agrofood Networks in Hawaii. *Economic Geography*. 78. p. 7186.

Swinnen, J., S. Burkitbayeva, F. Schierhorn, A. V. Prishchepov, and D. Muller. 2017. Production Potential in the "Bread Baskets" of Eastern Europe and Central Asia. *Global Food Security*. doi:10.1016/j.gfs.2017.03.005.

United Nations Conference on Trade and Development (UNCTAD). 2007. *World Investment Report: Transnational Corporations, Extractive Industries and Development*. New York and Geneva: UNCTAD.

United States (US) Energy Information Administration. Petroleum & Other Liquids. Europe Brent Spot Price FOB. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=rbrte&f=D (accessed 26 September 2017)

Wijerathna, D. 2015. Place-Based versus Place-Neutral Policies for Promoting Regionally Balanced Economic Growth: A Sri Lankan Case using CGE Simulations. PhD unpublished. Queensland, Australia: Griffith University.

Wijerathna, D., J. S. Bandara, C. Smith, and A. Naranpanawa. 2014. Regional Disparities in Sri Lanka: An Empirical Analysis. *Asia-Pacific Development Journal*. 21 (2).

Williamson, J. G. 1965. Regional Inequality and the Process of National Development: A Description of the Patterns. *Economic Development and Cultural Change*. 13 (4). pp. 1–84.

Wing, I. S. 2004. Computable General Equilibrium Models and Their Use in Economy-Wide Policy Analysis. Technical Note. No. 6. Cambridge, MA: Joint Program on the Science and Policy of Global Change.

World Bank. 2017a. Commodities Price Forecast (nominal US dollars). Released 24 January 2017. http://pubdocs.worldbank.org/en/926111485188873241/CMO-January-2017-Forecasts.pdf.

_____. 2017b. Commodity Markets Outlook: Investment Weakness in Commodity Exporters. Washington, DC. http://pubdocs.worldbank.org/en/820161485188875433/CMO-January-2017-Full-Report.pdf.

_____. 2017c. World Development Indicators. Washington, DC. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=KZ

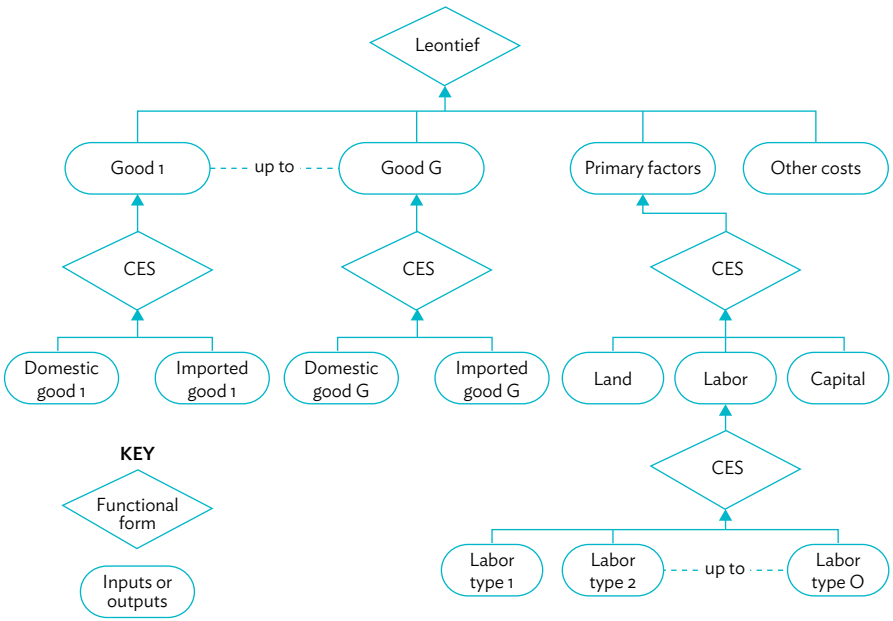
Yusuf, A. A., M. Horridge, E. Ginting, and P. Aji. 2014. *Reducing Disparity through a Regions-Focused Development: A Modeling Approach of Assessing the Indonesian MP3EI*. Bandung, Indonesia: Department of Economics, Padjadjaran University.

Appendix 1: Theoretical Structure and Model Equations

The KazORANI computable general equilibrium (CGE) model consists of a number of equation blocks to explain production and consumption patterns and macroeconomic relationships (Dixon and Jorgenson 2013, Horridge 2013).

The equations are derived by combining input–output relationships from economic theory. The income and expenditure side of gross domestic product (GDP) is based on input–output relationships, while supply and demand are modeled using the optimization concept of neoclassical theory. This modeling method is superior to Leontief's input–output modeling technique, because it models the behavior of agents, as opposed to using fixed input–output relationships.

Figure A1.1: Nested Production Structure



CES = constant elasticity of substitution.
Sources: Dixon and Jorgenson (2013), Horridge (2013).

Following the concepts of neoclassical theory, producers and consumers are expected to be rational with their profit and utility maximizing behavior, based on three key assumptions in the model: (i) the economy is perfectly competitive, (ii) nobody is

making pure profits, and (iii) there is no excess production. The production activity of the profit-maximizing industries is modeled with nested production functions. Figure A1.1 shows the nested structure of the production functions used in the model. At the bottom nest, a composite labor commodity is formed by combining and imperfectly substituting different skill categories of labor. KazORANI is calibrated for three skill categories and three age groups of labor.

Model closure

After constructing model equations in KazORANI, the process of solving it starts with the identification of exogenous and endogenous variables or the model closure. To solve the model mathematically, the number of equations in it must be equal to the number of unknowns. When the values of exogenous variables are known, values of the remaining endogenous variables can be calculated using the model equations. While there are some naturally exogenous variables such as tax rates and elasticity parameters, there are some other variables a modeler can define either as exogenous or endogenous according to the context.

The length of a simulation period must also be considered in defining the closure. A postsimulation time period in which the economy can come back to a new equilibrium by reallocating only variable inputs (without reallocating capital resources) is referred to as a short-run period. A time required for the economy to come back to a new equilibrium with reallocating capital resources to more productive sectors is called a long-run period (Dixon and Jorgenson 2013, Dixon et al. 1982, Horridge 2013). To analyze the impact of policies by 2030, a long-run model closure is selected.

Testing the validity of the model

The homogeneity test and a comparison of income and GDP aggregates are two common approaches used by CGE modelers in testing the constituency in the model equations, the database, and the calibration process (Dixon and Rimmer 2013, Dixon and Parmenter 1996). Both of the above tests are performed before employing KazORANI in policy simulations, so initial balance in the database and consistency in the model equations are assured.

Appendix 2: Sector Classification and Mapping for Aggregated Industries

	Sector	Description	Aggregated Sector
1	Agriculture	Crop and animal production, hunting, and related service activities	Agriculture
2	Forestry	Forestry and logging	Forestry
3	Fishing	Fisheries and aquaculture	Fishing
4	Coal	Mining of coal and lignite	Coal
5	Oil	Crude oil	OilGas
6	Gas	Extraction of natural gas	OilGas
7	FerrousOres	Mining of iron ores	OthMining
8	NonFerrOres	Production of nonferrous metal ores	OthMining
9	OtherMining	Other mining and quarrying	OthMining
10	MineTechSvcs	Support services to the mining industry	Mining_Tech
11	FoodBev	Manufacture of food products and beverages	Priori_Manuf
12	Cigarettes	Manufacture of tobacco products	Other_Manuf
13	Textile	Manufacture of textiles	Other_Manuf
14	Clothing	Manufacture of wearing apparel	Other_Manuf
15	Leather	Manufacture of leather and related products	Other_Manuf
16	WoodAndPulp	Manufacture of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Priori_Manuf
17	Paper	Manufacture of paper and paper products	Other_Manuf
18	Printing	Printing and reproduction of recorded media	Other_Manuf
19	Coke	Manufacture of coke ovens	Other_Manuf
20	Refining	Manufacture of refined petroleum products	OilGas
21	Chemical	Manufacture of chemicals and chemical products	Priori_Manuf
22	Pharma	Manufacture of basic pharmaceutical products	Other_Manuf
23	PlasticRubbr	Manufacture of rubber and plastic products	Priori_Manuf
24	Othnonmtlmin	Manufacture of other nonmetallic mineral products	Priori_Manuf
25	BasicFerrous	Production of pig iron, steel, and ferro-alloys	Priori_Manuf
26	SteelPipes	Manufacture of tubes, pipes, profiles, steel fittings	Priori_Manuf
27	OthSteelProd	Manufacture of steel products of first processing	Priori_Manuf
28	NonFerrPrec	Manufacture of basic precious and nonferrous metals	Priori_Manuf
29	MetalCasting	Casting of metals	Priori_Manuf
30	MetalPrdNEqp	Manufacture of fabricated metal products, except machinery and equipment	Priori_Manuf
31	ElctrncOptcl	Manufacture of computers, electronics, and optical products	Other_Manuf
32	ElectricEqp	Manufacture of electrical equipment	Other_Manuf
33	OtherEquip	Manufacture of machinery and equipment not elsewhere classified	Priori_Manuf
34	VehiclesPrts	Manufacture of motor vehicles, trailers and semitrailers	Priori_Manuf
35	OthTranspEqp	Manufacture of other transport equipment	Priori_Manuf
36	Furniture	Furniture manufacture	Other_Manuf
37	OthManufact	Other manufacturing	Other_Manuf
38	Repair	Repair and installation of machinery and equipment	Trade

Continued on next page

Appendix 2 continued

	Sector	Description	Aggregated Sector
39	Electricity	Generation, transmission, and distribution of electricity	ElecGasWater
40	GasDistrib	Fuel gas production and distribution	ElecGasWater
41	SteamHeat	Steam and air conditioning	ElecGasWater
42	WaterWaste	Water supply; sewerage system, control over the collection and distribution of waste	ElecGasWater
43	Construction	Building	Construction
44	TrdRepairMVP	Wholesale and retail trade of motor vehicles and motorcycles and their repair	Trade
45	OthWholesale	Wholesale trade, except of motor vehicles and motorcycles	Trade
46	OthRetail	Retail trade, except of motor vehicles and motorcycles	Trade
47	RoadPipeline	Land transport and transport via pipelines	Transport
48	WaterTransp	Water transport	Transport
49	AirTransp	Air transport	Transport
50	Warehouse	Warehousing and support activities for transportation	Transport
51	Post	Postal and courier activities	Ind_sup_Serv
52	Hotels	Services for the organization of accommodation	Trade
53	Restaurant	Services for providing food and beverages	Trade
54	Information	Information	Ind_sup_Serv
55	Communication	Communication	Ind_sup_Serv
56	Finance	Financial services, except insurance and pension funding	Ind_sup_Serv
57	Insurance	Insurance, reinsurance, and pension funding, except compulsory social security	Ind_sup_Serv
58	FinanceAux	Activities auxiliary to financial services and insurance	Ind_sup_Serv
59	RealEstate	Real estate activities	Ind_sup_Serv
60	SciTech	Professional, scientific, and technical activities	Ind_sup_Serv
61	AdminService	Activities in the field of administrative and support services	Ind_sup_Serv
62	GovDefence	Public administration and defense; compulsory social security	Govt_Serv
63	Education	Education	Govt_Serv
64	Health	Activities in the field of public health	Govt_Serv
65	SocialSvc	Social service	Other_Serv
66	ArtRecCultre	Arts, entertainment, and recreation	Other_Serv
67	OtherService	Other service activities	Other_Serv
68	Servants	Activities of households as employers of domestic workers and producers of goods and services for personal consumption	Other_Serv

Source: KazORANI model database.

Appendix 3: Industry Shares in National Gross Domestic Product

	Sector	Gross Value Added (T million)	GDP Share	Cumulative GDP Share
1	OthWholesale	5,104,384.47	12.85%	12.85%
2	Oil	4,428,178.23	11.15%	24.00%
3	RealEstate	3,891,466.39	9.80%	33.80%
4	RoadPipeline	2,730,221.19	6.87%	40.67%
5	Construction	2,543,671.15	6.40%	47.08%
6	Agriculture	2,241,017.67	5.64%	52.72%
7	OthRetail	1,904,647.54	4.80%	57.51%
8	SciTech	1,255,784.25	3.16%	60.67%
9	Finance	1,185,094.86	2.98%	63.66%
10	OtherService	1,107,145.00	2.79%	66.45%
11	FoodBev	1,065,421.08	2.68%	69.13%
12	Education	906,730.13	2.28%	71.41%
13	NonFerrPrec	863,653.51	2.17%	73.58%
14	Communicatin	780,232.95	1.96%	75.55%
15	NonFerrOres	773,981.21	1.95%	77.50%
16	GovDefence	773,418.20	1.95%	79.45%
17	Warehouse	729,459.32	1.84%	81.28%
18	AdminService	694,813.24	1.75%	83.03%
19	Electricity	545,665.48	1.37%	84.40%
20	TrdRepairMVP	522,262.25	1.31%	85.72%
21	BasicFerrous	518,569.69	1.31%	87.03%
22	Refining	414,886.83	1.04%	88.07%
23	Health	374,019.17	0.94%	89.01%
24	Insurance	368,714.52	0.93%	89.94%
25	MineTechSvcs	324,664.33	0.82%	90.76%
26	Othnonmtlmin	264,011.89	0.66%	91.42%
27	Information	234,297.25	0.59%	92.01%
28	Restaurant	223,028.08	0.56%	92.57%
29	Coal	215,649.58	0.54%	93.12%
30	Repair	178,830.62	0.45%	93.57%
31	ArtRecCultre	178,470.11	0.45%	94.02%
32	Cigarettes	154,127.26	0.39%	94.40%
33	SteamHeat	149,311.05	0.38%	94.78%
34	Chemical	147,958.80	0.37%	95.15%
35	AirTransp	146,209.99	0.37%	95.52%
36	FerrousOres	141,654.20	0.36%	95.88%

Continued on next page

Appendix 3 continued

	Sector	Gross Value Added (T million)	GDP Share	Cumulative GDP Share
37	Hotels	129,733.31	0.33%	96.20%
38	WaterWaste	118,005.65	0.30%	96.50%
39	Gas	109,498.33	0.28%	96.78%
40	MetalPrdNEqp	108,715.71	0.27%	97.05%
41	OtherEquip	97,627.55	0.25%	97.30%
42	Pharma	91,099.85	0.23%	97.53%
43	OtherMining	88,390.44	0.22%	97.75%
44	PlasticRubbr	83,462.08	0.21%	97.96%
45	VehiclesPrts	67,010.10	0.17%	98.13%
46	Fishing	65,299.84	0.16%	98.29%
47	ElectricEqp	64,124.14	0.16%	98.45%
48	GasDistrib	63,522.42	0.16%	98.61%
49	SocialSvc	53,760.29	0.14%	98.75%
50	OthTranspEqp	44,658.55	0.11%	98.86%
51	Servants	44,338.66	0.11%	98.97%
52	ElctrncOptcl	41,237.66	0.10%	99.08%
53	Post	36,983.68	0.09%	99.17%
54	Clothing	32,668.24	0.08%	99.25%
55	Printing	31,360.72	0.08%	99.33%
56	WaterTransp	29,445.88	0.07%	99.40%
57	SteelPipes	28,879.30	0.07%	99.48%
58	Coke	27,023.76	0.07%	99.54%
59	FinanceAux	26,009.72	0.07%	99.61%
60	Paper	24,735.58	0.06%	99.67%
61	Textile	23,918.91	0.06%	99.73%
62	OthSteelProd	21,310.34	0.05%	99.79%
63	Furniture	20,754.75	0.05%	99.84%
64	Forestry	18,681.35	0.05%	99.89%
65	WoodAndPulp	15,722.50	0.04%	99.93%
66	OthManufact	13,690.05	0.03%	99.96%
67	Leather	10,861.16	0.03%	99.99%
68	MetalCasting	5,174.89	0.01%	100.00%

GDP = gross domestic product.
Source: KazORANI model database.

Appendix 4: Model Simulation Results

Table A4.1: Macro Results: Baseline Simulation with World Bank Projected Oil Price

		Contribution from Each Shock					
	Baseline	Shock 1	Shock 2	Shock 3	Shock 4	Shock 5	Shock 6
Real GDP	39.9	12.0	0.1	18.2	8.3	0.1	1.2
Employment	16.1	16.1	0.0	0.0	0.0	0.0	0.0
Real wages	20.9	(6.8)	(1.1)	14.4	11.1	1.1	2.1
Real household income	48.5	12.4	0.0	18.9	7.5	1.4	8.1
Real investments	39.9	11.5	0.1	17.4	9.0	0.1	1.8
Real government purchases	39.9	12.0	0.1	18.2	8.3	0.1	1.2
Export volume	25.9	9.1	0.5	13.7	10.4	0.5	(8.3)
Import volume	44.9	8.3	0.5	12.6	10.0	5.0	8.5

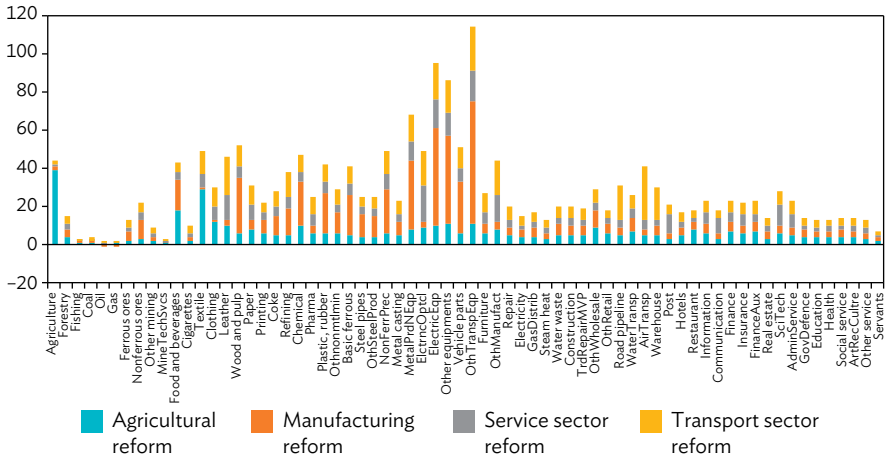
( ) = negative, GDP = gross domestic product.
Note:
Shock 1 - Employment increases by 1% per annum
Shock 2 - The number of households increases by 1% per annum
Shock 3 -Labor productivity increases by 1.5% per annum
Shock 4 - Land productivity increases by 1.5% per annum
Shock 5 - Export demand rises by 2% per annum with the growth in external economies
Shock 6 - The oil price increases by 1.6% per annum based on the World Bank's projection
Sources: KazORANI policy simulations.

Table A4.2: Baseline with Constant Oil Price

		Contribution from Each Shock					
	Baseline	Shock 1	Shock 2	Shock 3	Shock 4	Shock 5	Shock 6
Real GDP	38.9	12.4	0.1	18.8	7.5	0.1	0.0
Employment	16.1	16.1	0.0	0.0	0.0	0.0	0.0
Real wages	18.8	(6.5)	(1.1)	14.7	10.7	1.0	0.0
Real household income	39.4	12.5	0.1	18.9	6.5	1.5	0.0
Real investments	38.3	11.8	0.1	18.0	8.2	0.1	0.0
Real government purchases	39.4	12.5	0.1	18.9	6.5	1.5	0.0
Export volume	36.1	9.9	0.5	15.1	10.1	0.4	0.0
Import volume	35.7	8.5	0.5	12.9	8.8	4.9	0.0

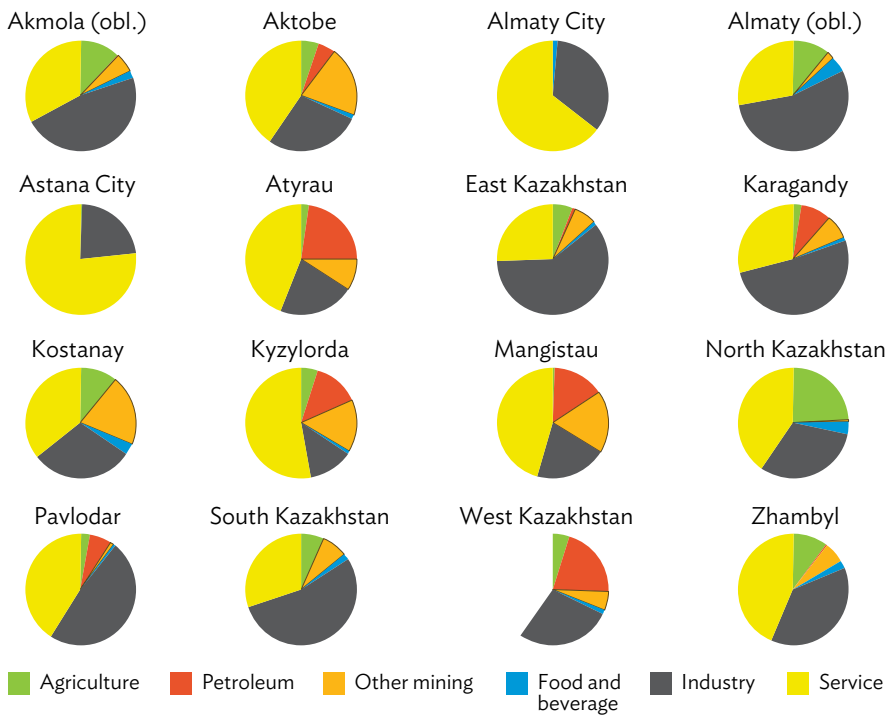
( ) = negative, GDP = gross domestic product.
Note:
Shock 1 - Employment increases by 1% per annum
Shock 2 - The number of households increases by 1% per annum
Shock 3 -Labor productivity increases by 1.5% per annum
Shock 4 - Land productivity increases by 1.5% per annum
Shock 5 - Export demand rises by 2% per annum with the growth in external economies
Shock 6 - The oil price increases by 1.6% per annum based on the World Bank's projection
Sources: KazORANI policy simulations.

Figure A4.1: Industry Impacts of Policy Reforms



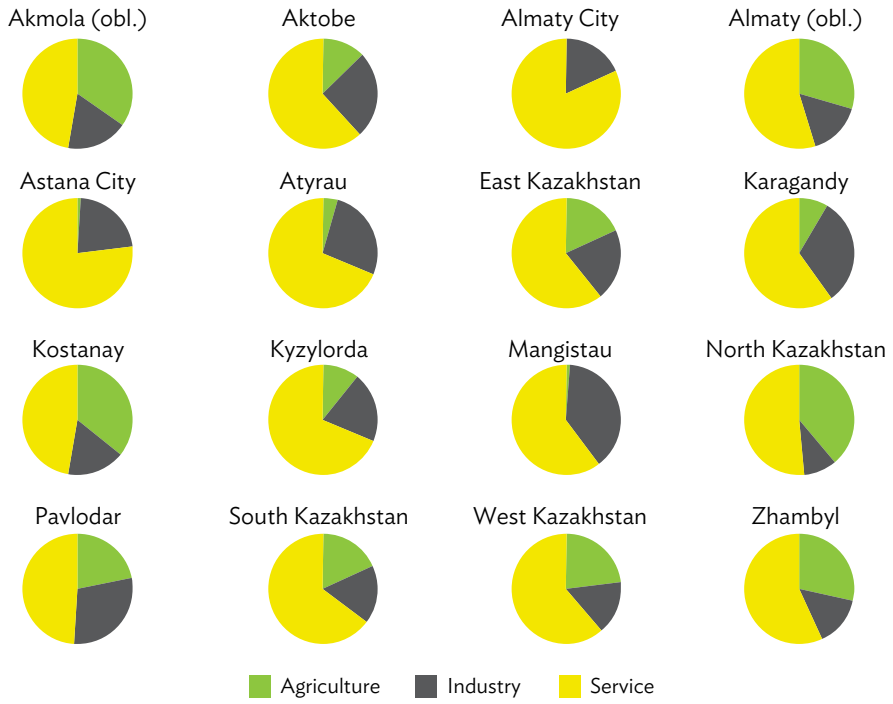
Sources: KazORANI policy simulations.

Figure A4.2: Industry Shares in Regional Gross Domestic Product



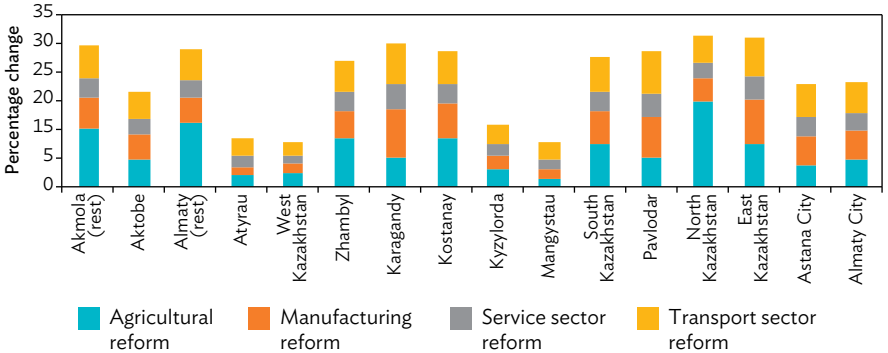
GDP = gross domestic product.
Source: Committee of Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2017c).

Figure A4.3: Industry Shares in Regional Employment



Source: Committee of Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2017d).

Figure A4.4: Regional Gross Domestic Product Impact of Policy Reforms



Sources: KazORANI policy simulations.

KAZAKHSTAN
Accelerating Economic Diversification

Kazakhstan has the potential to become an economic leader in Central Asia. Relying on oil and gas alone, however, will not produce the long-run level of growth needed to meet this potential. Reforms geared to improve the business climate, enhance competitiveness, and increase private sector participation are essential.

This book examines reforms to accelerate economic diversification in the country. This involves not only modernizing and using public resources in agriculture more efficiently to increase productivity, but also transitioning of manufacturing toward high-potential exports to help the country's industrial development and create employment opportunities. Upgrading innovation of oilfield services and improving transport and logistics are important to increase participation in the global value chains.

About the Asian Development Bank

ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. Established in 1966, it is owned by 67 members—48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

ADB

ASIAN DEVELOPMENT BANK
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
www.adb.org