JUSTUS-LIEBIG UNIVERSITY GIESSEN

FACULTY 09

Agricultural Sciences, Nutritional Sciences and Environmental Management

Institute of Agricultural Policy and Market Research

Professorship for Agricultural and Food Market Analysis

AGRICULTURAL DEVELOPMENT IN THE KYRGYZ REPUBLIC:

THE IMPACT OF DOMESTIC POLICIES, CHANGING MACROECONOMIC CONDITIONS, AND INTERNATIONAL MIGRATION

Inaugural dissertation

To attain the doctoral degree (Dr. agr.) at the Faculty 09:

Agricultural Sciences, Nutritional Sciences and Environmental Management, JLU Giessen

presented by

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Giessen, 26.10.2017

ACKNOWLEDGEMENTS

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AFC   Agricultural and Food Corporation

ATT   Average Treatment Effect on the Treated

CIS   Commonwealth of Independent States

CPI   Consumer Price Index

CU   Customs Union

DAC   Development Assistance Committee

DD   Dutch disease

ECA   Europe and Central Asia

ER   Exchange Rate

EU   European Union

FAO   Food and Agriculture Organization of the United Nations

FDI   Foreign Direct Investment

FEZ   Free Economic Zone

GAO   Gross Agricultural Output

GDP   Gross Domestic Product

GMM   General Method of Moments

HIPC   Heavily Indebted Poor Countries

HS   Harmonised System

IMF   International Monetary Fund

IOM   International Organization for Migration

IV   Instrumental Variable

KGS   Kyrgyz som

KR	Kyrgyz Republic
LiK	Life in Kyrgyzstan
MFN	Most Favoured Nation
NBKR	National Bank of the Kyrgyz Republic
NEER	Nominal Effective Exchange Rate
NELM	New Economics of Labour Migration
NRA	Nominal Rate of Assistance
NSC	National Statistical Committee of the Kyrgyz Republic
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
PPI	Producer Price Index
PSM	Propensity Score Matching
RBER	Real Bilateral Exchange Rate
REER	Real Effective Exchange Rate
SURE	Seemingly Unrelated Regression Estimator
TNT	Tradable-to-Nontradable Ratio
UN Comtrade	United Nations Commission on Trade
USSR	Union of Soviet Socialist Republics
WFP	World Food Programme
WTO	World Trade Organization
WUA	Water User Association

1   INTRODUCTION

1.1   Research area: the Kyrgyz Republic

The Kyrgyz Republic (KR) is a small landlocked mountainous[1] country in Central Asia and one of the fifteen successor states of the former USSR. After the breakdown of the Soviet Union and the country's independence in 1991, the KR has experienced a major economic crisis that was related to the disruption of former economic ties within the former USSR and was marked by hyperinflation (of up to 850% in 1992) (Pomfret 2006). Each of the successor republics chose an own path in terms of a transition from central planning to a market-based economy. The national strategy chosen by the Kyrgyz Republic was closely linked to recommendations made by the World Bank and IMF (Christensen and Pomfret 2007). It involved rapid economic reforms, including the introduction of an own national currency, som, in May 1993, privatization of land, housing and enterprises, individualization of agriculture, liberalization of policies and accession of the KR to the World Trade Organization (WTO) in 1998.

These reforms seemed to have yielded a positive response in the economic development at first, especially in the agricultural sector. The Kyrgyz Republic was one of the first among the post-Soviet republics which took the hyperinflation under control by 1995 (Pomfret 2006). The GDP grew at 5.7% in 1996 for the first time since independence, the budget and current account deficits were declining by 1997 and the country was slowly moving towards macroeconomic stability (World Bank 1998). More than a decade later, however, the outcomes of the liberal policy of the government were evaluated as rather disappointing, especially in terms of export performance, which was attributed to the poor quality of institutions and infrastructure, widespread corruption, as well as the reliance of the economy on primary sectors such as agriculture, mining and hydroelectric power (World Bank 2007). Government policies were not followed by a timely adjustment and establishment of institutions required for an appropriate functioning of the newly created market economy resulting in sluggish economic growth (Pomfret 2007). Enormous transit and transport costs due to landlockedness and inadequate road

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[1] About 90% of country's territory is mountainous.

infrastructure constrained access of Kyrgyz exports to international markets and can explain partly why liberal policies did not succeed in fostering economic growth (Light 2007).

Figure 1.1: Administrative map of the Kyrgyz Republic

Source: www.nationsonline.org

Donor aid was one of the most important sources of foreign exchange for the KR until the early 2000-s. The external debt of the Kyrgyz Republic skyrocketed from zero in 1991 to 102% of GDP in 2000, and is the highest in Central Asia[2] (Pomfret 2006). Starting from the beginning of 2000-s, remittances sent by Kyrgyz workers abroad started to play a more important role in

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[2] A very large ratio of external debt to GDP has led to a proposal by the World Bank and the International Monetary Fund to include the KR in the list of heavily indebted poor countries (HIPC) under the Multilateral Debt Relief Initiative with a potential of a significant debt release conditional upon strict reforms. However, the proposal was declined by the government of the Kyrgyz Republic in 2007.

covering the trade deficit (Pomfret 2006).

The overall economic development in the KR has been affected by a number of economic and political crises over the last two and a half decades. Initial economic recovery within 1991-1997 was compromised by the Russian financial crisis in 1998 and a following domestic banking crisis, as well as the external debt crisis in 2001 (Christensen and Pomfret 2007). The "tulip revolution" in 2005 started the period of political instability, with several constitutional amendments in 2006 and 2007, a second revolution in April 2010, and an ethnic violence in the South in May-June 2010. The new constitution was adopted in June 2010, on the basis of which the political system was shifted from a presidential to a parliamentary system. Some believe that it was the global financial crisis in 2008 with many migrants returning home, deteriorating economic situation and the food crisis in 2008-2009 that led to political unrests in 2010. The food crisis in 2008 was partly caused by regional droughts in 2007 and 2008 that strongly affected agricultural sector performance (World Bank 2011). Poverty rates across the country remain high. The national poverty rate in 2015 was at 32.1%, but was much higher in the Southern *oblasts* (provinces) of Batken (41.2%) and Jalalabad (45.1%) (NSC 2015).

1.2   Policy and development issues in the agricultural sector

Agriculture was the first sector to recover from the economic recession during the transition period. In the second half of the 1990-s, agriculture became a "driver" of economic growth in the KR: its share in GDP grew from 32% in 1992 to 47% in 1997 (World Bank 1998). The sector grew at an average rate of 9.5% during 1995-2001 and reached the pre-1990 output level by 2001, but the growth began to slow down significantly after 2001 with an average annual growth rate for 2002-2006 being only 1.5% (Light 2007). In the following years the contribution of agriculture to the Kyrgyz economy has fallen from 37% of GDP in 2000 down to 16% in 2015, mainly due to the growth of the service sector, which comprised 57% of GDP in 2015, and the large-scale gold mining sector (WDI 2017). However, 66% of the population still lives in rural areas (as of December 2015) depending mainly on agriculture for their livelihoods (NSC 2016).

A majority of Kyrgyz farmers are smallholders. In 2015, 98.7% of the Gross Agricultural Output (GAO) was produced by peasant farms and household plots (NSC 2016). As of 2008, the average size was 3.8 ha for peasant farms and 0.1 ha for household plots (Lerman and Sedik 2009). Arable land is a scarce natural resource in the KR: only 6.6% of the total country area is suitable for crop cultivation, of which 82% is irrigated (FAO 2010). During the times of high unemployment and urban to rural migration, reorganization of large-scale state farms into small-scale farms allowed agriculture to become a "safety net" for the large share of the KR's population: subsistence agriculture for many was the only means to sustain themselves (Light 2007).

The shift from subsistence agriculture to commercial farming was expected after the transition reforms had been implemented and the economy had stabilized, but that seems to be hindered by a number of unresolved market failures and weak governance. Prohibitively high transaction costs in agricultural marketing and agricultural trade are mainly the result of the smallness of scale, also marked as the "curse of smallness" (Lerman and Sedik 2009) and a very poor quality of both hard and soft infrastructure (Pomfret 2006). Low farm mechanization and a resulting low agricultural productivity were caused by underinvestment in farm machinery (40% deficit of tractors and 45% deficit of combine harvesters) because of smallness of scale and limited access to rural credit (FAO 2009). The use of agrochemicals was also way below the requirements: in

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2010, the average fertilizer use per ha for the KR comprised 78kg/ha, which was less than half of the amount required (FAO 2010).

Weak agricultural support services represent a further important constraint to agricultural sector growth in the KR (Akramov and Omuraliev 2009). A considerable improvement in agricultural finance has been achieved through the establishment of the rural bank, *Ayil Bank*, and numerous micro-finance organizations (MFO), but with the concentration on livestock production (World Bank 2011). Despite this improvement, only 10-15% of farmer requests for micro credits are fulfilled by the commercial banks, and the larger proportion of farmers is forced to lend under much higher interest rates from the MFO at the 18% up to 59% interest rate *per annum* (FAO 2010). Apparently, on the one hand, commercial banks are not willing to provide credits to smallholder farmers because agricultural activities are evaluated as "highly risky", while on the other hand, due to the smallness of scale, the minimum credit sizes from the commercial banks could be "too large" for a smallholder farmer, and finally, an appropriate collateral for the bank loan might be difficult to provide (Expert 02, Personal communication, January 26, 2015).

Public investment in agriculture has been on decline since 2005 which raises concerns about the adequate maintenance of irrigation and drainage systems and their rehabilitation (World Bank 2011). The adjustment of the institutional framework for irrigation services has been slow in meeting the needs of the newly-created smallholder farms, and recent efforts include the establishment of self-sustaining Water User Associations (WUA) which are responsible for the on-farm irrigation management (Akramov and Omuraliev 2009).

As a small open economy, the KR remains vulnerable to external shocks related to weather conditions (because of its reliance on gold mining and agriculture) and global commodity prices (due to a widening agricultural and food trade deficit and dependence on oil imports) aggravated not only by deficient infrastructure and an imperfect financial system, but also by an unstable socio-political situation (WTO 2013a). Low rural income, lack of opportunities for nonfarm employment and poor quality of services (medical services, schools and poor electricity supply) were among the main reasons that fostered steady outmigration from rural areas (IOM 2006). A decreased supply of labour in agriculture without improved intensification may have led to a reduced agricultural output. On the other hand, migrants most of the times were likely to keep

close ties with the remaining residents, send back remittances and invest in rural production (World Bank 2011). Remittances from workers abroad, however, can also be a source of an external shock since the majority of migrants leave to Russia, and the amount of remittances sent home depends strongly on the economic situation of the single important host country for Kyrgyz migrants.

The pattern of agricultural development in the Kyrgyz Republic is clearly intermingled with a number of sector-specific and economy-wide trends that in some way have been unique in this country. Agricultural policies remained fairly liberal with some indirect support to farmers through subsidized credit and inputs, though the support was not provided on a regular or systematic basis (Christensen and Pomfret 2007, Azhibekov 2011). With the background of drastic reforms, frequent economic and political shocks, and a rather erratic government support, it is hard to single out the effect of individual factors on agricultural development. The FAO special report identifies the lack of analytical support to the Ministry of Agriculture of the Kyrgyz Republic necessary for undertaking appropriate policies, especially in the areas of food security, farm productivity, determinants of agricultural growth and market development (FAO 2010).

1.3 Research objectives and research questions

The overview of policies within the last two and a half decades since independence indicates that agricultural policies in the KR have not been based on a specific long-term strategy. They rather dealt with the short-term issues, such as input support to farmers during weather shocks or infrequent interventions in food markets during price peaks. Political instability was apparently a major factor contributing to the inconsistent policy development. At the same time, as it has been mentioned before, there is limited analytical or research support provided to the policy-makers in the Kyrgyz Republic, including the agricultural sector. The purpose of this PhD thesis is to contribute to filling this gap by conducting empirical analyses on several major factors that are important for agricultural sector development in the KR. In doing so, I also take into consideration economy-wide changes and trends that have likely affected the agricultural sector in the Kyrgyz Republic, too.

The main goal of this dissertation is to investigate the effects of agricultural and food policies, as well as general macroeconomic conditions, and international migration on agricultural development in the Kyrgyz Republic (KR). Specific research objectives include:

i. an overview of agricultural and economy-wide policies in the Kyrgyz Republic over the last two and a half decades;

ii. an analysis of changes in Kyrgyz agricultural trade following the WTO accession;

iii. an empirical analysis of agricultural price gaps between the domestic and world market prices to identify the extent of direct government policies in agriculture;

iv. a theoretical and empirical analysis of agricultural incentives taking into account general macroeconomic developments in the Kyrgyz Republic using the "true-protection" concept;

v. exploring the impacts of migration and remittances on the agricultural sector:

- the impact of international migration and workers' remittances on crop production and rural income;

- macroeconomic effects of remittances on the Kyrgyz economy, including the effect of workers' remittances on the real exchange rate, and the link between an increasing inflow of remittances and structural changes in the Kyrgyz economy.

An overview of agricultural and economy-wide policies in the Kyrgyz Republic

An appropriate background on government policies both in the agricultural sector and on the overall economy level is crucial for the subsequent analyses conducted within this dissertation. That is the purpose of Chapter 2 which provides an overview of agrarian reforms in the Kyrgyz Republic since independence in 1991 and of government support to the agricultural sector, as well describes agricultural development, trade policy, and non-policy barriers to trade in the country. What were the main reforms implemented in the agricultural sector? What kind of support does the Kyrgyz government provide to farmers in the KR? How did the agricultural sector develop within the last two decades? What are the main pillars of the macroeconomic policy in the KR? It is these questions that I attempt to answer in Chapter 2. Given the remoteness and landlockedness of the country, and the smallness of the Kyrgyz economy, the non-policy factors are also likely to play an important role in the development of the agricultural sector. Therefore, a discussion of main non-policy barriers to trade completes the Chapter 2.

An analysis of changes in Kyrgyz agricultural trade following the WTO accession

One of the important steps during the transition period and on the path towards the liberalization of economic policies in the KR was the accession to the World Trade Organization (WTO) in December 1998. The expectations from joining the WTO were that it would improve market access for the Kyrgyz economy which had suffered from the dissolution of the USSR and a breakdown of economic ties between the former Soviet republics. The agricultural sector as one of the major export sectors in the country was supposed to gain from the WTO-membership as it would help to reduce transaction costs and risks due to improved market access. Whether this indeed was the case is the main question asked in Chapter 3. In order to answer this question, the overall patterns of agricultural and food trade development in the KR is analysed. This involves description and discussion of changes in the structure of agricultural and food imports and exports. Did the focus of Kyrgyz agricultural and food exports and imports change and why? To which extent can these changes be appointed to the WTO-membership? Moreover, I look at the trade performance of the individual branches of the agricultural sector, including crop production, livestock products, and food-industry products. This helps to receive an idea how each of these branches may have responded to joining the WTO. Changes in market access can also be detected by looking at the main trade partners of the Kyrgyz Republic in agricultural and food

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trade. Therefore, I compare the key destinations of exports and main origins of imports for agricultural and food products before and after the WTO accession in 1998.

An analysis of the impact of WTO accession on Kyrgyz agricultural and food trade serves as an important basis for the research objectives in Chapter 4 and Chapter 6. For instance, it helps to explain the general trends in main explanatory variables in Chapter 4 when it concerns the price indices for agricultural and non-agricultural exports. Moreover, findings of Chapter 3 are also important for explaining the price gaps calculated in Chapter 4. A detailed analysis of the development of Kyrgyz agricultural trade is also very helpful for the explanation of results of the macroeconomic models in Chapter 6.

An analysis of agricultural price gaps between the domestic and world market prices

Although the direct interventions into agricultural markets have been abolished, the Kyrgyz government uses a number of indirect instruments in order to support the farmers and to achieve certain policy goals in the agricultural sector. If these policy interventions significantly affect agricultural prices, they also affect the farmers' incentives to produce and hence, the structure and growth of agricultural output. Yet how large are these price changes induced by direct agricultural policies? How do the price gaps between the domestic and world markets differ among the major agricultural commodities in the KR? Does the government favour specific branches and why? These questions are elaborated in the first part of Chapter 4.

A theoretical and empirical analysis of agricultural incentives taking into account general macroeconomic developments in the Kyrgyz Republic

Agricultural incentives are likely to be influenced by both direct policies in the agricultural sector and by the economy-wide policies in the country (Krueger, Schiff and Valdés 1988). The indirect effects of, for instance, protecting other sectors or macroeconomic interventions that affect relative incentives within the economy can have an important impact on the development of the agricultural sector, too (Schiff and Valdés 1992). The goal of the second part of Chapter 4 is therefore to elaborate on a theoretical and empirical level the impact of economy-wide policies and general macroeconomic trends on the agricultural sector in the Kyrgyz Republic. The main macroeconomic trends considered in the theoretical analysis are (1) the increasing dependence on oil imports and a resulting exposure to oil price shocks on the world market; (2) the increasing

inflow of migrant remittances into the Kyrgyz economy and resulting effects on the local currency, som; (3) the increasing dependence on gold exports and the effect of gold price shocks on the world market. The most important question is, in the occurrence of any of these shocks, how will the incentives in the agricultural sector be affected relative to the other economic sectors?

The impact of international migration and workers' remittances on crop production and rural income

One of the most important macroeconomic trends influencing the economic development in the Kyrgyz Republic is the massive outmigration of labour abroad and a resulting large inflow of migrant remittances into the Kyrgyz economy. The overall number of migrants from the KR is estimated to be over half a million people, which is a huge number for the nation of just 5.7 million. Given that most of the migrants come from rural areas, where labour-intensive smallholder agriculture is the major employer, there are some concerns that outmigration could reduce total agricultural output. On the other hand, the inflow of remittances are likely to positively affect incomes of households with migrants abroad and on the overall economy level represent a crucial source of foreign exchange earnings for the KR. Therefore, it seems of great importance to better understand the implications of international migration and resulting remittances on the agricultural sector. The goal of Chapter 5 is to investigate the impacts of international migration on crop production, on rural income and other indicators of households' economic welfare for the case of smallholder farmers in the KR. The New Economics of Labour Migration (NELM) predicts that migration can have a two-fold effect on agricultural production: it may reduce the farm output through the reduced labour input, but it may also boost agricultural production if remittances received by the farm household are invested in better technologies and thus help to overcome credit and insurance constraints. The empirical analysis conducted in Chapter 5 tests these hypotheses for the case of KR.

Macroeconomic effects of remittances on the Kyrgyz economy

If the previous part of the thesis deals with the microeconomic effects of international migration and remittances, Chapter 6 focuses on the impacts of remittances on the overall economy level. The ratio of remittances into the Kyrgyz Republic to its GDP is one of the highest in the world

and comprised 25% in 2015 (World Bank 2016). Being one of the largest sources of foreign exchange, remittances play an important role in covering the trade deficit of the KR. At the same time, huge and stable money transfers from migrants abroad can create moral hazard problems for the remaining residents or for the government in the home country, while the large inflow of foreign exchange certainly raises Dutch-disease concerns for the remittance-receiving economy (Barajas *et al*. 2009). The objective of Chapter 6 is therefore to test whether any Dutch disease symptoms can be detected for the case of Kyrgyz Republic as a result of the inflow of workers' remittances. Did the remittances lead to a real appreciation of the domestic currency in the KR? How did the remittances affect individual economic sectors in the KR? Can the deindustrialization of the Kyrgyz economy be associated with the increasing inflow of remittances? It is these questions that I seek to answer within Chapter 6.

1.4   Materials and methods

This section gives a quick overview of empirical methods and data employed in this thesis. Different empirical approaches and data sources are used in specific parts of this dissertation and a detailed description is given within the corresponding chapters.

The second chapter is based on an extensive overview of scientific publications, government reports and official documents, and reports from donor organisations related to economy-wide, agricultural and food policies in the Kyrgyz Republic. Statistical information on the structure and development of the agricultural sector in the KR, as well as available reports on the government support to agriculture are then analysed together with the overview of policies.

In the third chapter, I use statistical data on agricultural trade in the Kyrgyz Republic from the National Statistical Committee, FAOSTAT and UN Comtrade databases to analyse the potential changes in the structure and development of agricultural and food trade in the Kyrgyz Republic due to the accession to the World Trade Organization (WTO) in 1998. Descriptive statistics are used to illustrate trends, structural changes and any shifts in export destinations and origins of imports in agricultural and food trade in the KR.

An empirical approach in Chapter 4 comprises two steps. First, data on domestic and world market prices for major agricultural commodities are employed in order to analyse the impact of agricultural policies on agricultural prices in the KR by estimating Nominal Rates of Assistance (NRA). The commodities analysed include wheat, potatoes, tobacco, cotton, maize, milk and wool, which altogether make up 50% of the total agricultural output in the KR. Time series of domestic agricultural prices, production quantities and values are obtained from the National Statistical Committee (NSC) and the Food and Agriculture Organization of the United Nations (UN FAO). Export and import unit values and quantities are retrieved from the United Nations Commodity Trade Statistics Database (UN Comtrade). Information on the exchange rates is obtained from the National Bank of the Kyrgyz Republic (NBKR). The second step in the empirical analysis in Chapter 4 involves an estimation of a regression model based on the true-protection concept. Aggregate price indices for the exportable, importable and nontradable sectors are calculated based on the data from the NSC and NBKR and serve as a basis for the construction of both the explanatory and the dependent variables for this model. In order to

double check the empirical results obtained from this part (Chapter 4), interviews with the experts in the field of agricultural policy, extension services, development aid to the agricultural sector, and smallholder farming are conducted. These interviews also help to guide the next steps of my thesis which focus on the micro- and macroeconomic impacts of international migration on the Kyrgyz economy and on the agricultural sector in particular.

The methodological framework for Chapter 5 of this dissertation includes an estimation of a system of equations and the Propensity Score Matching (PSM) approach in order to evaluate the impact of international migration and workers' remittances on the rural economic welfare in the KR. The data for this part is taken from the *Life in Kyrgyzstan* household survey which contains information on the socio-economic situation of households, their agricultural production and marketing, consumption, expenditure and income sources, as well as outmigration and remittances. The system consists of equations for the crop production value, remittances, and the number of migrants and is estimated using the General Method of Moments Three-Stage-Least-Squares Estimator (GMM-3SLS). In the second step, PSM is used to quantify the effect of international migration on different indicators of households' economic welfare, including total income, income from non-agricultural activities, and asset endowment.

In Chapter 5, I investigate whether the large inflow of workers' remittances received by the Kyrgyz Republic imposes any Dutch disease effects on the Kyrgyz economy. In order to do so, I first estimate the effect of remittances on the real exchange rate in a macroeconomic model controlling for other determinants of the real exchange rate. In the second step, the impact of remittances on structural changes in the economy is analysed. This involves the estimation of the impact of remittances on the tradable-to-nontradable ratio (TNT) of the Kyrgyz economy, as well as the estimation of the impact of remittances on the output of agriculture, manufacturing and service sectors. The data used for this part are retrieved from the NSC and NBKR and include time series on various measures of real exchange rate, sectoral outputs, standard macroeconomic indicators such as, GDP, government expenditure, Foreign Direct Investment (FDI) and non-FDI inflows, export and import price indices, and the inflow of workers' remittances.

1.5   Structure of the thesis

This PhD thesis consists of seven chapters including the introductory and the concluding chapter. The next part of the thesis provides an overview of agricultural and macroeconomic policies in the Kyrgyz Republic since independence, including agrarian transition reforms, a summary of government support to agriculture, trade and exchange rate policies and non-policy constraints to trade.

Chapter 3 focuses on agricultural trade and provides an analysis of the impact of joining to the World Trade Organization in 1998 on Kyrgyz Republic's trade performance in agricultural and food products. It also summarizes the general developments in agricultural trade, as well as specific trends in the individual branches of agriculture and food processing industry.

Chapter 4 then looks at direct and indirect distortions to agricultural incentives. Nominal Rates of Assistance are calculated to analyse the extent of direct agricultural distortions imposed by government policies in the agricultural sector. The true-protection concept, on the other hand, allows an analysis of indirect distortions to agricultural incentives through an empirical estimation of interlinkages between the relative incentives (prices) across the different sectors in the Kyrgyz economy. Theoretical effects of external shocks to relative incentives are also discussed with the example of rising gold prices, an increase in the oil prices or migrant remittances.

International migration and resulting migrant remittances are a very important source of income for Kyrgyz households which have migrants abroad, and a significant source of foreign exchange crucial for covering the widening trade deficit in the KR. In Chapters 4 and 5, the implications of international migration on the agricultural sector at the household and at an aggregate level are analysed.

In Chapter 5, a micro-econometric analysis of migration effects on crop production, crop income and non-farm income is conducted.

Chapter 6 looks at the effect of workers' remittances on the exchange rate and tests for possible Dutch disease effects of remittances for the case of Kyrgyz Economy.

Chapter 7 provides conclusions, a summary of important findings and policy recommendations.

2 Agricultural policy and development in the KR

2.1 Agrarian reforms since independence

Reforms in the agricultural sector in the Kyrgyz Republic following the dissolution of the Soviet Union have included a number of drastic changes, such as restructuring of collective and state farms, elimination of state support to agriculture and agricultural price liberalization. Privatization of land was one of the crucial steps which were undertaken from 1991 to 2000 and involved redistribution of state-owned land to private owners (World Bank 2004). It involved a de-collectivization of approximately 500 state and collective farms into 300 thousand smallholder peasant farms and around one million household plots. If before the reform only 2% of the arable land was controlled by individual peasant farms, by 2008, their share of the total arable land in the country was 75% (Lerman and Sedik 2009). The private land market started functioning after the government lifted a moratorium on the sales of land in 2001.

Subsidies to the agricultural sector during the Soviet times depended largely on the transfers from Moscow and were received mainly by the livestock and cotton sectors (Christensen and Pomfret 2007). Government support to agriculture has diminished rather quickly after 1995 and agricultural prices were liberalized. Some support remained until 1995 to smooth down the process (Christensen and Pomfret 2007). By 1998, no input or output prices in agriculture were regulated, foreign trade has been largely liberalized, and the state procurement system was removed (World Bank 1998). Yet despite these substantive reforms, markets were not yet well-established and competitive and local administrations were reported to intervene substantially in agricultural production (World Bank 1998).

Even though the agrarian reform in the KR was largely successful in introducing private ownership and redistribution of land, it was not supported with necessary changes in the institutional framework and infrastructure for the agricultural sector and its new actors (Lerman and Sedik 2009). The needs of the newly created smallholder farms were different from the needs of the large-scale state and collective farms and required adjustment in agricultural services, including irrigation infrastructure, services cooperatives, and extension services (Lerman and Sedik 2009). For instance, the on-farm irrigation infrastructure during the Soviet times was

operated and maintained by the state and collective farms, and after the de-collectivization of agricultural land, no institution was responsible for on-farm irrigation services. The government attempted to transfer the tasks of water distribution and maintenance of on-farm irrigation structures to local councils, which lacked capacity to fulfil the task (Akramov and Omuraliev 2009). The Water User Associations (WUA) were introduced in 2005 based on the new Water Code, under which farmers have a responsibility for maintaining and operating on-farm irrigation networks, whereas the government undertakes the maintenance of main irrigation canals between the farms. However, the recent evidence suggests that WUAs remain very weak and encounter big difficulties in collecting water fees necessary for an adequate maintenance of irrigation networks (Akramov and Omuraliev 2009).

2.2   Government support to agriculture

Until the establishment of the Agricultural and Food Corporation (AFC) in 2008, the government assistance to farmers in the Kyrgyz Republic was restricted to input-related support. Such input-related assistance consists of subsidies for purchasing agricultural machinery, distribution of seeds, material and technical resources by prices lower than the market prices, providing means for operation and maintenance of water facilities, and other instruments. There is no detailed information on how much actual support is received by individual branches of the agricultural sector reported by the government. Table 2.1 presents the compilation of collected records of governmental support to farmers in the Kyrgyz Republic reported in different literature sources.

The government has also attempted to improve access to finance in agriculture through providing support to credit unions, often with international donor assistance. This approach has been criticized, however, because financial resources allocated for subsidizing interest rates were likely to be insufficient to cover a target population. The fact that only a limited number of farmers can receive this support could motivate rent-seeking activities, which in the end might shift resources away from competitive "business-worthy" borrowers (FAO 2009).

A range of incentives for the agricultural sector are also provided by the new Tax Code introduced as of 1 January 2009. First, income received from sales of agricultural produce grown in the KR is exempt from income tax. Profit tax exemptions are received by farms producing berries, fruits and vegetables for industrial processing. A three-year exemption from the profit-tax is also provided to food processing enterprises. The supply of some agricultural chemicals as approved in the special government's list was identified tax-exempt, whereas supply of domestically produced agricultural equipment was subject to tax exemption for three years period starting from 2009. Agricultural producers including agricultural goods and services cooperatives are all exempt from the sales tax (FAO 2009).

Food insecurity is still an important issue in the Kyrgyz Republic. According to the World Food Programme Report in 2011, more than 760 thousand individuals, or around 14% of households in Kyrgyzstan were estimated to be food-insecure at the time of assessment during the lean season[3]

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[3]This indicates that those households had inadequate dietary consumption based on cereals and potatoes, and with

(WFP 2011). Objectives to achieve food security are outlined in the Food Security Concept (2009) and the Food Security Program (2009) of the government. In order to achieve a long-term food security, the Kyrgyz government would have to address the causes of the problem: low agricultural productivity and poverty, especially in rural areas (WFP 2011). In addition, as a country with a small open economy, Kyrgyzstan is vulnerable to external shocks, including food and energy price peaks (World Bank 2011). In response to the food price crisis in 2008, approaches implying market interventions have been adopted by the Kyrgyz Government. The 2008 Food Security Law serves as a legal basis for implementing food security monitoring, food distribution, and price and trade interventions. The implementation of these tasks has been assigned to the AFC.

The AFC was established in 2008 with the vision to stabilize domestic food prices and was authorized to fulfil a broad range of functions, starting from food market interventions and developing market infrastructure for food commodities, up to the implementation of investment projects in the agricultural industry (The Governmental Decree as of 31 July 2008 on the Establishment of the Agricultural and Food Corporation (AFC)). However, whether sufficient funds can be provided by the government to finance above-mentioned activities of the AFC remains unclear. Some of its activities cause direct distortions to agricultural commodity prices affecting competitiveness of domestic producers. For instance, it was reported in 2009, that the AFC purchased 20,000 tons of wheat at the price ten KGS per kg, when the market price was about six KGS per kg (World Bank 2011).

In summary, the Kyrgyz government does not seem to be following a medium-run strategy in promoting particular branches of agriculture via continuous market price support. Instead, there are discontinuous agricultural policy measures that shed some light on the implicit preferences of the Kyrgyz government. As Christensen and Pomfret (2007) suggest, a general encouragement for grain producers from local authorities may have existed during the 1990s and early 2000s following food self-sufficiency goals. Second, it is likely that activities of the AFC attempting at

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income available for food consumption below the extreme poverty level. A larger number of households were considered as moderately food-insecure, and some of the food-secure households could potentially be at risk of food insecurity if food crises or price shocks take place (WFP 2011).

food self-sufficiency had price-raising impact on the domestic prices of staple foods considered in the study, such as wheat and potatoes. Since the information on the extent of the interventions is incomplete, it is not possible at this point of time to estimate the magnitude of impact arising from short-run interventions. These considerations have to be kept in mind when analysing the estimates of NRAs in Section 4.3.1.

Table 2.1: Records of agricultural support measures in the Kyrgyz Republic in the period of 1992-2012

Years	Type of support	Description of the support measure	Source of information
1993	Subsidy	Bread subsidy of 70.6 mln. KGS; other food subsidies 3.9 mln. KGS; 78.8 mln. KGS enterprise support	Christensen and Pomfret (2007)
1994-2002	Indirect subsidies	Low charges for irrigation water or electricity Through the research institutes that deliver new seed varieties to farms Through the distribution of inputs received by the government as aid (fertilizers (1994-1997) and tractors (1995-2001) from Japan) or in barter deals (e.g. tractors from Belarus in 2002)	Christensen and Pomfret (2007)
1995	Budget loans	To oblasts (regions) for bread price support and to Agroprombank amounting 814.1 mln. KGS	Christensen and Pomfret (2007)
1996	Directed credits	Through banks to agricultural enterprises and to the Ministry of Agriculture and Melioration, 240.9 mln. KGS	Christensen and Pomfret (2007)
1997	Directed credits	Through banks to agricultural enterprises and to the Ministry of Agriculture and Melioration, 277.8 mln. KGS	Christensen and Pomfret (2007)
1998	Interest-free credit	Governmental Act as of 18 June 1998 No.367 for strengthening capacities of seed and livestock breeding farms, 30 million KGS for 5 years	Ministry of Agriculture (2011)
1998	Directed credits	Through banks to agricultural enterprises and to the Ministry of Agriculture and Melioration, 83.1 mln. KGS	Christensen and Pomfret (2007)
1999-2000	Export tax	Seasonal export tax on wheat (July-November)	Christensen and Pomfret (2007)
2000-2003	Subsidized credits	To agricultural enterprises through the banking system, between 7 -24mln. KGS per year, eliminated in 2004	Christensen and Pomfret (2007)
2003	Subsidy	10.9 mln KGS for cattle breeding farms, Governmental Act as of 7 October 2003 No.628	Ministry of Agriculture (2011)
2003	Subsidy	Governmental Act as of 22 May 2003 No.292, 6.7 mln	Ministry of

		KGS to 3 stud farms	Agriculture (2011)
2004	Subsidized credit	Governmental Act as of 23 July 2004 No.550, 6.6 mln. KGS	Ministry of Agriculture (2011)
2007	Commodity credits	10,000 tons of milling wheat seeds (soft wheat) for 62.0 mln. KGS; 5321,5 tons of wheat and barley seed varieties for 59.9 mln. KGS; 70 combine harvesters "Niva" for 130.6 mln. KGS	Azhibekov (2009)
2007	Subsidy	Distribution of 5000 m³ fuel under the lower than market prices from the State Material Reserve, amounting 75.0 mln. KGS	Azhibekov (2009)
2008	Price stabilization	Establishment of the Agricultural and Food Corporation (AFC)	Governmental Decree as of 31 July 2008, No. 417
2008	Commodity credits	Wheat and barley seed varieties, 1885.1 tons amounting 31.5 mln. KGS Nitrogen fertilizers, 3585.5 tons amounting 30.0 mln. KGS 306 universal tractors and 102 carriages for tractors, amounting 200.0 mln. KGS	Azhibekov (2009)
2008	Subsidy	Distribution of 15,000 m³ fuel under the lower than market prices from the State Material Reserve, amounting 365.0 mln. KGS	Azhibekov (2009)
2009	Purchase	Through AFC: 20,000 tons of wheat purchased at 10 KGS/ton, whereas the market price was 6 KGS/ton	World Bank (2011)

Source: Own compilation based on the literature review

2.3   Agricultural sector: structure and development

Agricultural producers

Decollectivization led to a shift of roles between the main agricultural producers in the KR. At the end of 1980s, about 45% of the Gross Agricultural Output (GAO) was produced by the peasant farms and household farms, whereas in 2008, these farms produced 98% of the GAO (Lerman and Sedik 2009).

Figure 2.1: Production of main agricultural commodities by farm type in 2013
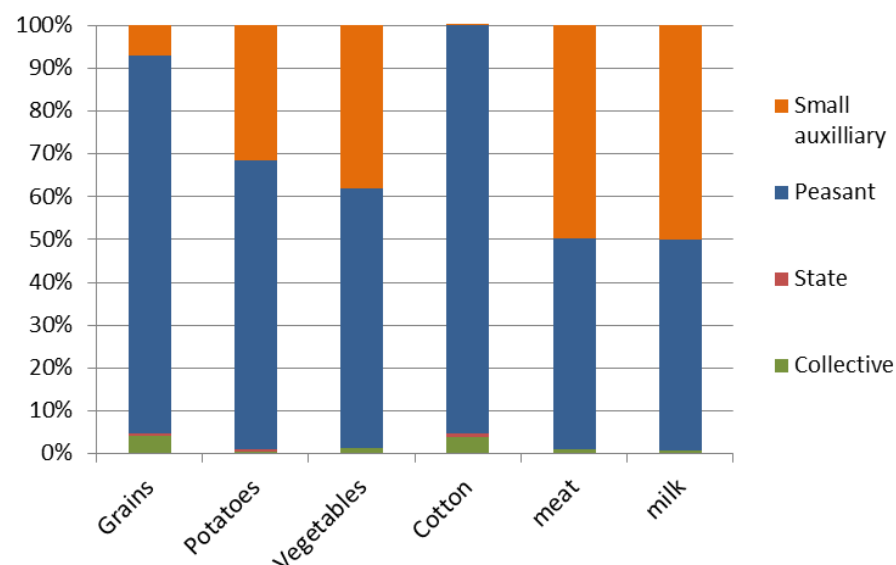
Source: Own illustration based on the data from the National Statistical Committee of the KR

Household plots (small auxiliary farms) played a stronger role in the production of vegetables and livestock products, whereas cotton was produced almost only by the peasant farms (Figure 2.1). The distinction between the peasant farms and household plots (small auxiliary farms/individual farms[4]) is somewhat vague. The FAO definition states that "household plots" are "small (less than 0.5 ha) family farms producing mainly for subsistence and selling their surplus output in the market; managed by rural residents[5]" and focusing more on livestock, whereas "peasant farms" are "mid-sized family farms (1-10 ha) created outside the corporate

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[4] The three definitions are used interchangeably for the case of Kyrgyz Republic and other post-Soviet economies.

[5] During the Soviet times these residents were at the same time employees of the state and collective farms or rural services, as well as the pensioners (Lerman and Sedik 2009).

framework[6] under new (post-1992) legislation on land allocated from state reserves to qualified applicants; mainly commercial farming with predominance of crop production" (Lerman and Sedik 2009).

Agriculture and the rest of the economy

The share of agriculture in the total economic output has been on decline since 1996 and was only 14.6% by 2013 (down from 46.2% in 1996). Employment in agriculture is also substantially smaller than in the 1990s (Figure 2.2). This is partly due to outmigration of labour out of rural areas, and partly due to the growth of the service sector.

Figure 2.2: Contribution of agriculture to GDP and total employment
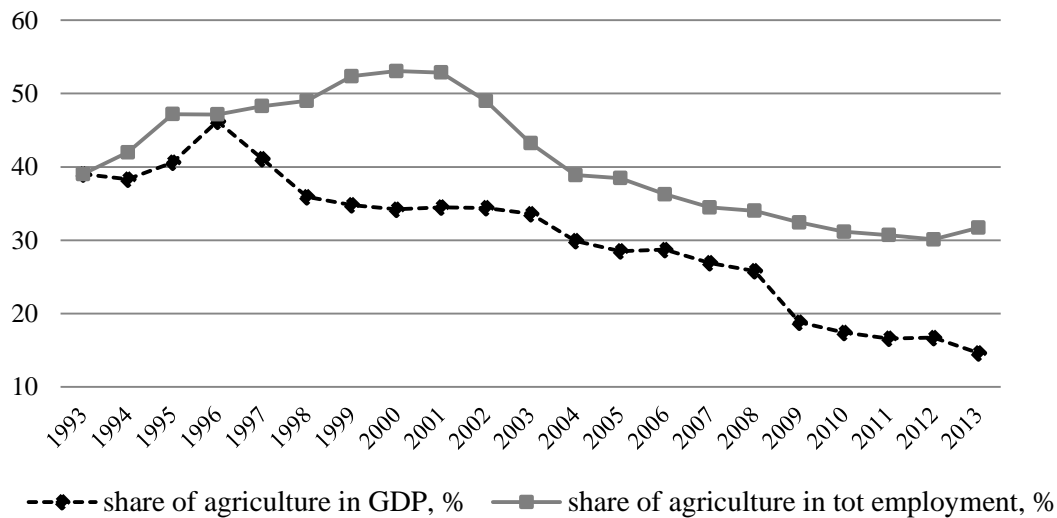
Source: Own illustration based on the data from the National Statistical Committee of the KR.

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[6] The "corporate network" here is the former network of state and collective farms.

2.4 Macroeconomic policy

2.4.1 Trade policy

The Kyrgyz Republic has one of the most liberal policy environments for trade in the Central Asian Region (WTO 2006a, WTO 2013b). The openness index or the ratio of total imports and exports to GDP in 2012 constituted 106.5% (NBKR 2012). Main policy objectives of the Kyrgyz Republic related to trade are a better access to world export markets, export diversification and an improved integration of domestic markets into the world market (WTO 2013b).

The KR is a signatory to a number of multilateral and bilateral trade agreements, most of which have been signed with the Commonwealth of Independent States (CIS) member countries. The formal trade regime has been substantially liberalized after the accession of the KR to WTO in 1998. The main trade instrument, a tariff, has been significantly reduced. The average Most-Favoured Nation (MFN) rate[7] was 4.9% in 2006, compared to 8.7% in 1999. The domestic Value-Added Tax (VAT) does not discriminate against imports (WTO 2006a; 2013a). Import charges and export subsidies for agriculture are set to zero. The WTO reported that KR did not apply any anti-dumping or countervailing measures in the period of 1998 to 2013; and the safeguard duties have been introduced only for wheat flour in the period of November 2009 to November 2010 (WTO 2006a; 2013a).

In an attempt to prevent critical scarcity of goods in the domestic market that are of significant importance for the country, several temporary export prohibitions and export duties have been introduced in the period of 2008 to 2012. Export of fuel and lubricants was prohibited in 2011-2012, whereas wheat grain and wheat flour were prohibited to export in 2012. Export duties have been applied to selected products, including coal, non-treated animal skins, wool and woollen fabric, wheat flour, wheat grain, sunflower seeds, vegetable oil (in 2008) among others. The listed export duties have been eliminated according to the Country Report of the KR to WTO as of 2013 (WTO 2013b).

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[7] MFN rates are imposed by WTO member-countries on imports from other WTO members, unless another preferential trade agreement is in place (http://wits.worldbank.org/).

Customs procedures have been improved since the new Customs Code was adopted in 2004. New procedures are based on independent assessment, selectivity and post-customs control. In customs control procedures, i.e. collecting duties and taxes by customs officials, application of information technologies have been advanced (WTO 2013b). Furthermore, the framework for operating in Free Economic Zones (FEZ) is part of the customs legislation. Special regimes apply to these zones, the beneficiaries of which receive advantages for external trade and business activities. Companies or entities, which have the right to operate in the zone, enjoy a lower tax burden, and are exempt from non-tariff measures. Wholesale import and export, production and storing of goods, and banking operations comprise the largest part of activities in FEZs (WTO 2013a; 2013b).

2.4.2 Interventions in the exchange rate market

The economy is highly "dollarized": in 2005 the share of bank assets in US dollars was 72.6%. The exchange rate system for the Kyrgyz som is a "managed floating" (as of 2006), and no exchange rate paths are pre-announced. Daily exchange rates against the US dollar, which are set in the interbank market, are published by the National bank of the Kyrgyz Republic. The som - US$ exchange rate is determined by interbank quotations.

Figure 2.3: Real and Nominal Effective Exchange Rate Indices for 2000-2013
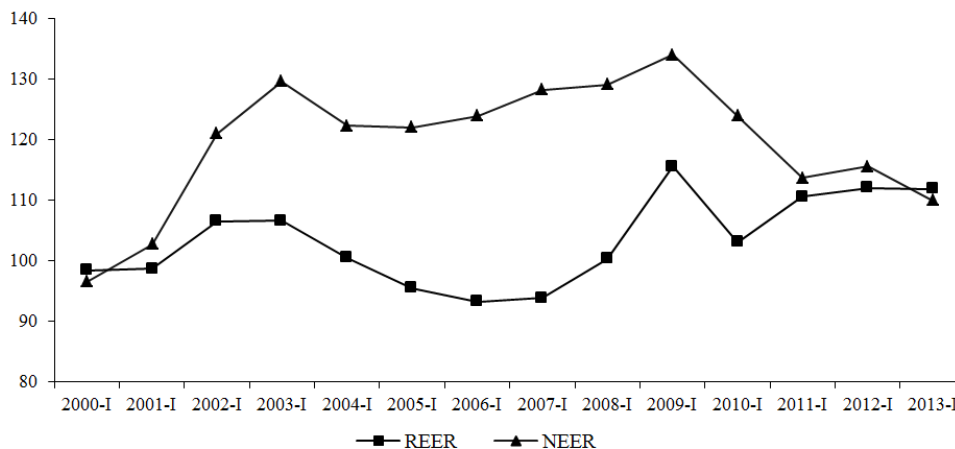
Source: Own illustration based on NBKR (2013b).

Currently, only those interventions are undertaken by the NBKR which help to smooth down

sharp currency fluctuations. According to the Law on Operations in Foreign Exchange (as of 1995), transactions in foreign exchange are unrestricted (WTO 2013a).

According to IMF, the nominal exchange rate flexibility policy with limited interventions has had positive effects on the economy, especially in light of the recent crises of 2007-2008 (fuel price shocks and resulting food crisis) and of political instability in 2010 and related border closures (IMF 2011). Figure 2.3 shows that the real effective exchange rate index has been kept broadly stable, that is within the 20% fluctuation band over the period of 2000-2013. Food and fuel price shocks of 2007-2008 have caused a 20% increase in import prices, which quickly passed to domestic prices. In 2010, the prices again rose by 25% responding to international price increases. The higher import bill deteriorated the current account balance. The NBKR allowed the nominal exchange rate to depreciate, which reportedly helped to partly compensate the negative effects of the price shocks and to sustain export competitiveness (IMF 2011).

2.4.3   Non-policy barriers to trade

In the case of the Kyrgyz Republic, natural barriers to trade are likely to affect the country's trade performance to a great extent. The fact that 95% of the country is mountainous and its landlockedness require that transport infrastructure is of sufficient quality to ensure the country's access to world markets (World Bank 2007). However, this is not the case in reality, and poor transport infrastructure contributes to tremendous trade costs. Doing Business reports[8] indicate that both costs to import and costs to export are considerably higher in the KR compared to other countries in Europe and Central Asia (ECA region) (excluding OECD high income countries). For instance, border compliance costs[9] to export for the KR were US$ 445 compared to US$195 for the ECA region, and border compliance costs to import were US$512 compared to US$202 for the ECA region in 2016 (World Bank 2017).

Even though, the Kyrgyz Republic has implemented substantial trade policy liberalization, this

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[8] Doing Business database is available on www.doingbusiness.org

[9] These costs include "the time and cost for obtaining, preparing and submitting documents during port or border handling, customs clearance and inspection procedures" (World Bank 2017).

was not accompanied by a corresponding increase in exports and a better integration into world markets (World Bank 2005). The obvious reason behind is that there are a number of other external and domestic barriers to trade which cannot be resolved by trade policy alone. Since 1991, the Kyrgyz Republic was subject to many external trade barriers in terms of antidumping, safeguards, and contingent protection, e.g. imposed by Kazakhstan (on cement), Uzbekistan (excise taxes on different agricultural products), and Ukraine (on electric bulbs) (World Bank 2005). Moreover, Kyrgyz exports are mostly shipped using road transport and face transit barriers (e.g. though Kazakhstan) which may involve extra taxes and informal payments (making up to 70% of total costs) contributing to enormous transport costs (World Bank 2005). Additional external impediments are likely to come from trade restrictions of transit countries, for instance Uzbekistan (WTO 2006a). Domestic trade barriers on the other hand are related to the quality of infrastructure and services that are crucial for trade development. Poor quality of roads and a weak development of other transport modes, technical and administrative barriers including widespread corruption, and an inadequate access to finance are among the major internal constraints to trade in the KR (World Bank 2007).

3 Potential impacts of WTO accession on agricultural trade in the KR[10]

3.1 Introduction

The Kyrgyz Republic (KR) joined the World Trade Organization (WTO) on 20 December 1998. It was expected that WTO accession would help to improve market access for Kyrgyz exports which suffered from the collapse of the Soviet Union and a following breakdown of traditional marketing channels. Given the small size of the domestic market, an export-oriented development strategy has been recognized as the most feasible one for the young Kyrgyz economy. Improved market access was supposed to contribute to the reduction of transaction costs and risks involved with foreign trade, including trade in agricultural and food products.

WTO commitments have straightforward implications for designing domestic economic and trade policies. In this study, we will have a look on how WTO membership may have affected trade performance of the agricultural sector in the Kyrgyz Republic. Agriculture still plays an important role in the economic development of the Kyrgyz Republic, although it is no longer "a driver" of economic growth as it had been in the second half of 1990s (Light 2007). About a third of the economically active population in Kyrgyzstan is employed in agriculture, whereas half of the total population depends directly or indirectly on the sector for their livelihoods (NSC 2013a, Christensen and Pomfret 2007). The share of agriculture in GDP has dropped from an average 50% in the first decade of transition to about 17% in 2012 (NSC 2013a). In total, the agricultural sector grew much slower than other economic sectors: during 2000-2012, average annual growth rate for agricultural output was 0.2%, while the economy in total grew by 4.2% (output of the industry increased by 1.2% annually mainly because of gold mining, while the service sector grew by 9.9% each year) (WDI 2014).

It has been widely argued that despite substantial liberalization of commercial policies taken place in the Kyrgyz Republic, its export performance has been rather disappointing. Agricultural sector was not an exception. Indeed, a trade deficit in agricultural and food products has

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[10] This study was conducted by the author with the support of the UN FAO research project "Facilitating the understanding and adoption of WTO principles and commitments in agriculture".

expanded rapidly over the last decade. The WTO membership was an attempt to strengthen Kyrgyz integration into world markets. Whether this has had a real impact on agricultural trade development in Kyrgyzstan is a relevant question given this background.

This study was part of the Food and Agricultural Organization (FAO) project "Facilitating the understanding and adoption of WTO principles and commitments in agriculture in the CIS countries". The purpose of the project is to help CIS countries to meet their WTO obligations regarding the changes in agricultural trade policy through improved understanding of the WTO rules and procedures related to agriculture. Within the framework of this project, the objective of the current study is to identify potential impacts of joining the WTO on agricultural trade of the Kyrgyz Republic.

The study is structured as follows. Next section will give an overview of the most important trends and developments in agricultural trade in the KR over the last two decades. Whether the WTO accession was followed by a significant change in the geographical distribution of agricultural exports and imports in the KR is analysed in Section 3.3. The discussion about the development of agricultural trade in the KR after WTO accession is given in section 3.4. Section 3.5 provides a short summary and concludes.

3.2   Agricultural trade development

3.2.1   General trends

From 1994 to 2004, the Kyrgyz Republic was a net exporter of agricultural and food products, with the trade surplus being on average higher during 1995 to 1998 (Figure 3.1). A rapid export increase in agricultural and food products trade during 1992 to 1996 was due to increasing agricultural output which grew in response to land privatization (World Bank 1998). Good weather in 1996 and 1997 has helped to improve agricultural sector performance, too. Another important factor contributing to agricultural production growth was the shift of labour from urban to rural areas as former employees of shutdown industries moved to villages to undertake subsistence agriculture. The Russian 1998 crisis affected all sectors of the Kyrgyz economy, including agriculture. The Kyrgyz financial sector crises followed the Russian financial crisis in 1998, which had a negative impact on the development of the whole economy. Both imports and exports after 1998 have faced a downturn to recover only in 2003 and 2004 (Figure 3.1).

Figure 3.1: Development of agricultural and food trade
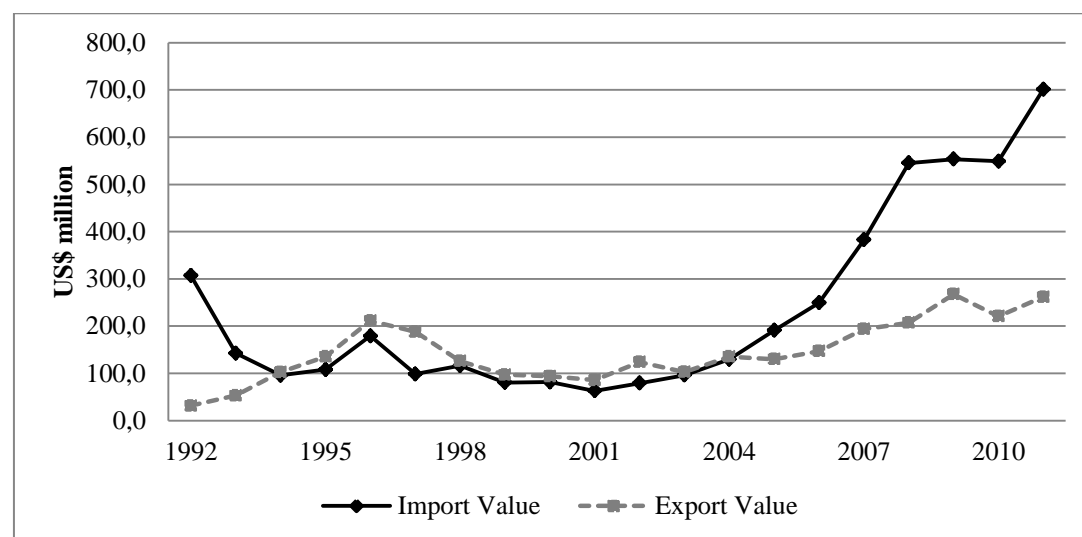
Source: FAOSTAT

In response to significant trade policy liberalization and increasing demand for higher quality foodstuffs, imports of processed food products have been rising dramatically since 2001 (Figure 3.1). At the same time, output of the agro-processing industry has declined strongly. Low

competitiveness of the agro-processing sector in terms of technology, product variety and quality led to an extensive gap between agricultural and food imports and exports. Starting from 2004, the Kyrgyz Republic became a net importer of agricultural and food products (World Bank 1998).

The exports of raw materials have developed differently from the exports of processed food products. The increase in primary agricultural exports was fourfold during 1993 to 1997, whereas the increase in processed food exports comprised 39% during the same period (World Bank 1998).

The composition of exports and imports of agricultural and food products has also changed significantly over the last 20 years (Figures 3.2 and 3.3). In 1995, the most important agricultural export products were: ethyl spirits (17%), unmanufactured tobacco (13%), fruits and vegetables (11%), uncombed cotton (13%), uncombed wool (11%), and refined sugar (9%)[11]. Tobacco and cotton were important cash crops even before the collapse of the Soviet Union, and during the past two decades they remained among the top 5 agricultural exports, although their relative importance in total agricultural exports has declined. The most important exports in 2004 were uncombed cotton, cane/beet sugar, unmanufactured tobacco and kidney beans. Wool lost its position in leading exports because of the dramatic decline of the sheep industry. By 2013, the most important exports of the agricultural sector were fruits and vegetables. Exports of kidney beans accounted for 28% of total agricultural exports, followed by other fruits and vegetables (27%). uncombed cotton (7%), and unmanufactured tobacco (5%). Fruits and vegetables sector seems to have recovered from the initial loss of export markets and the deterioration of the agro-processing industry and a resulting decline in output during the first decade of independence. Moreover, increasing import demand in neighbouring Kazakhstan and Russia has contributed greatly to increasing exports of fruits and vegetables.

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[11] In the World Bank's "Agricultural Policy Review" report on the Kyrgyz Republic it was argued that ethyl spirits and refined sugar were not export items in which the KR had a comparative advantage in the long run because of the lack of raw materials and technological advantage to produce these products. The allocation of the production of spirits in the Kyrgyz Republic was an outcome of the Soviet planning (World Bank 1998).

Figure 3.2: Changes in the structure of agricultural and food exports by product
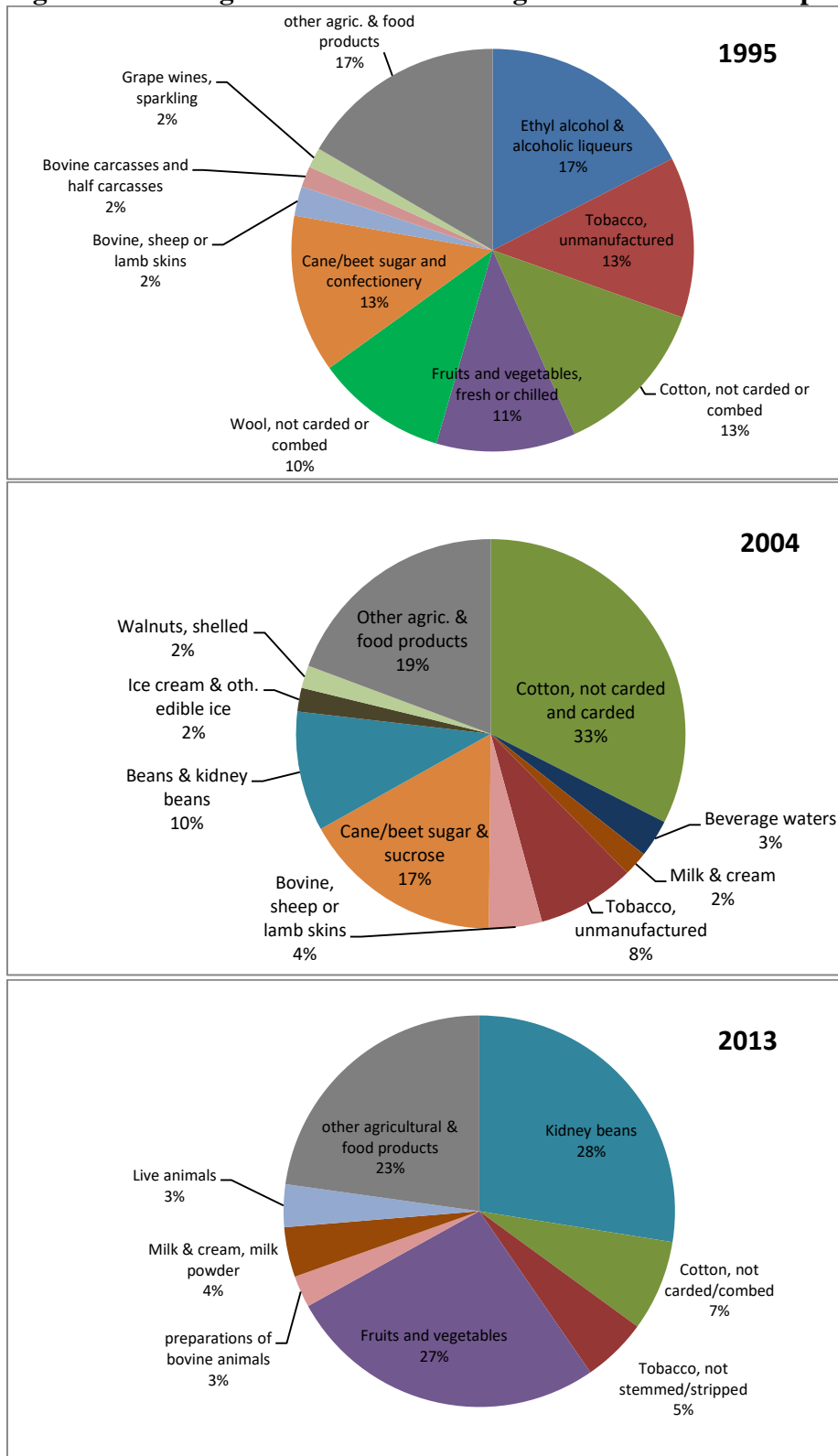
Source: Own illustration based on the UN Comtrade database

Figure 3.3: Changes in the structure of agricultural and food imports by product

1995

- other agric. & food products 20%
- Rice in the husk 2%
- Beverage waters and beer 5%
- Veg fats & oils nes 2%
- Chocolate & cocoa preps 3%
- Sunflower or safflower oil 2%
- Cotton, not carded or combed 4%
- Ethyl alcohol & alcoholic liqueurs 5%
- Raw and refined sugar, cane 28%
- Durum wheat 12%
- Wheat or meslin flour 10%
- Sugar confectionery & cane molasses 7%

2004

- Other agric. & food products 34%
- Non-alcoholic beverages, incl. waters 3%
- Wheat or meslin flour 2%
- Tobacco 2%
- Sugar confectionery 3%
- Sunflower seed/safflower oil & cotton seed oil 8%
- Cane/beet sugar & chemically pure sucrose 17%
- Cigarettes cont. tobacco 10%
- Beer made from malt 10%
- Chocolate & oth. food preps. cont. cocoa 7%
- Cuts & edible offal of chicken, frozen 4%

2013

- Cigarettes cont. tobacco 9%
- Cane/beet sugar 8%
- Cuts & edible offal of chicken, frozen 7%
- Sunflower seed/safflower oil 7%
- Chocolate 6%
- Wheat or meslin flour 6%
- Food preparations, n.e.s. 3%
- Sugar confectionery 3%
- Beverage Waters 3%
- Sweet biscuits 3%
- Preparations for infant use 3%
- Other agricultural and food products 42%

Source: Own illustration based on the UN Comtrade database.

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Agricultural and food imports increased to meet the growing demand in the domestic market. Main growth was in wheat and wheat flour from Kazakhstan, dairy products from Russia and fruit from China (World Bank 2011). On the import side, one can observe a shift from the imports of mainly primary products, such as raw cane sugar (25%) and durum wheat (12%) in 1995, to the imports of more processed products in 2004 and later in 2013 (Figure 3.3). The contribution of single import products to total imports value has been decreasing, while the number of imported items and the total value of imports have increased strongly. This diversification of imports is a result of an open trade policy and an increasing domestic demand for high-quality and larger variety of food industry products. The next section will look at the development of individual branches of agriculture and their export performance over the considered period in detail.

3.2.2 Traded output of crop production

Cotton

Cotton is one of the traditional exports not only in the Kyrgyz Republic, but in the Central Asian region in total. Marketing of cotton is also relatively more integrated into world markets compared to other traded commodities (Christensen and Pomfret 2007). The value of cotton exports remained relatively stable over the period 1995-2013, yet the relative importance of the crop in total agricultural exports has declined (its share in total agricultural exports fell from 13% in 1995 to 7% in 2013) (Figures 3.2 and 3.4). The area under cotton has also declined from 46.3 thousand ha in 2004 to 31 thousand ha in 2012. This led to a drop in the production quantity of raw cotton by about 30% within the same period (NSC 2009, 2013b). The main exported product of the subsector is cotton not carded or combed, while combed or carded cotton exports are negligible.

Fruits, vegetables and nuts

Due to the loss of traditional export markets and a general drop in import demand in the CIS region following the Soviet Union collapse, fruits and vegetable sector experienced a major deterioration during 1991-2004. Exports of the subsector started to recover only from 2005 onwards, and their value by 2013 was about 12 times the amount a decade earlier. The most

important fruits and vegetables exported in 2013 were: carrots and turnips (the share in total agricultural exports was 4.5%), apples (3.9%), apricots (3.5%), walnuts (3.3%), cherries (2.9%), potatoes (2.9%), onions (2.1%) and cabbages (1.9%) (UN Comtrade).

Figure 3.4: Trends of trade in major crop products
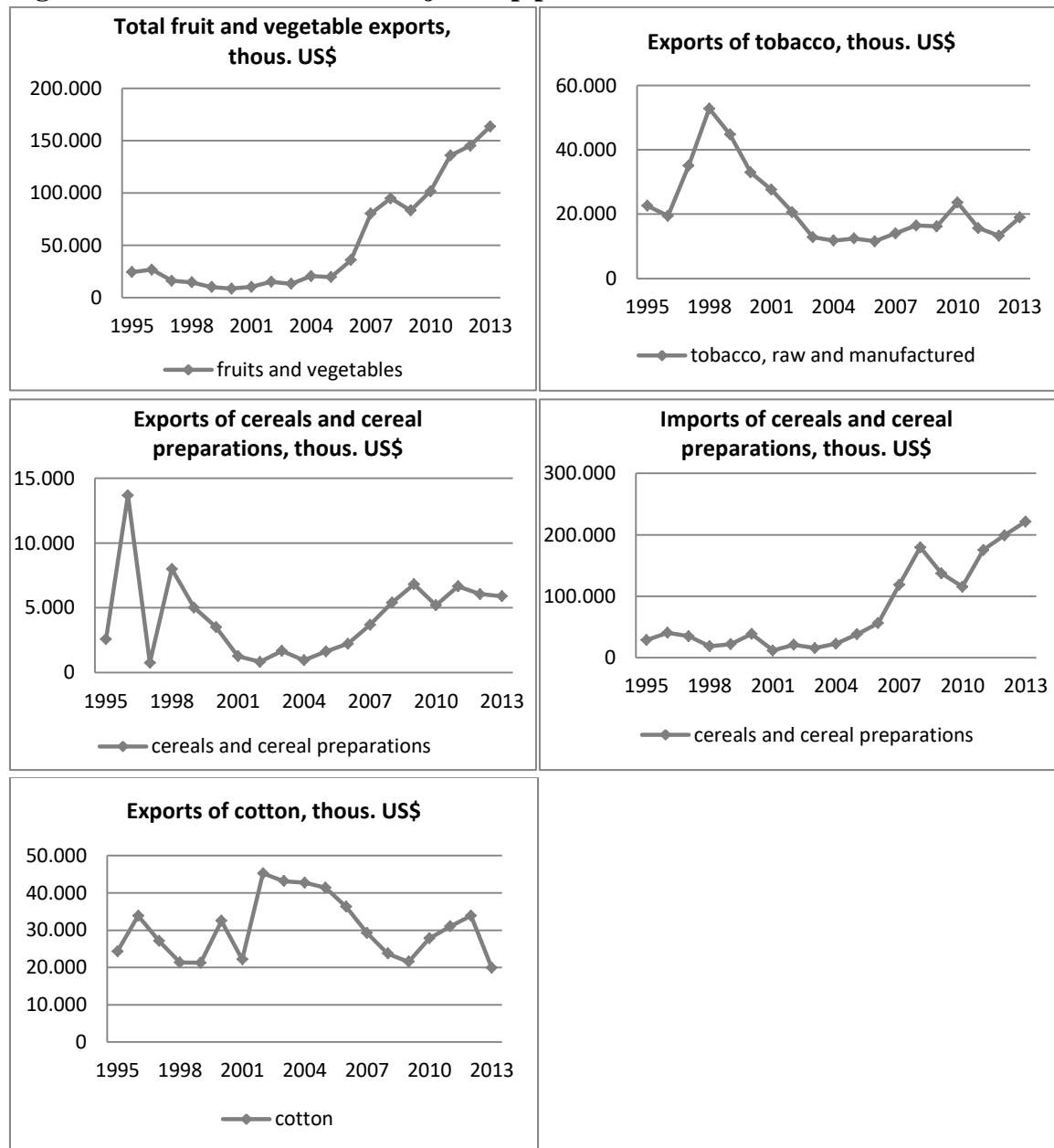
Source: Own illustration based on the UN Comtrade database

That production of higher value crops such as fruits and vegetables picked up so rapidly over the last decade indicates an improved market access for farmers in the Kyrgyz Republic. Increasing

demand in neighbouring countries, like Kazakhstan and Russia has contributed to growth of fruit and vegetables exports. In 2013, 30% of vegetable exports and 77% of fruit and nuts exports were delivered to Kazakhstan. Turkey imported 46% of total vegetable exports from Kyrgyzstan. Among key destinations for vegetable exports in 2013 were also Bulgaria (7.7%) and Russia (4.1%), whereas China (6.4%) and Iran (5%) were among the major importers of Kyrgyz fruits and nuts (NBKR 2014).

The boom in bean exports is a recent success story of Kyrgyz agricultural exports. Kidney beans accounted for 28 % of total agricultural and food exports in 2013 supplying mostly to Russia, Turkey and Bulgaria. As beans are high value crops, growth in their production and exports has had a significant positive impact on the welfare of farmers involved in bean production (Pomfret 2014). It is also argued that together with the technology transfer and investment from Turkey, policy certainty and a liberal trade regime associated with the WTO membership have helped to achieve this progress (Pomfret 2014).

Tobacco

Tobacco was an important export crop of the Kyrgyz Republic in the Soviet economy. After independence, its contribution to total agricultural output has declined to insignificance, as areas under food crops have expanded dramatically. The area under tobacco has shrunk from 19 thousand ha in 1990 to only 4 thousand ha in 2011 (NSC 2014). As a result, the share of tobacco in total exports fell from 13% in 1995 to 5% by 2013.

Grains

During Soviet times, the Kyrgyz Republic has heavily relied on grain imports. A large increase in the area under wheat during the first decade of transition resulted from the difficulties of trade with Kazakhstan after the dissolution of the Soviet Union, the overall shift to food crops production in subsistence agriculture and a shift away from perishable products because of the lack of storage facilities and a breakdown of traditional marketing channels (Christensen and Pomfret 2007). The area sown to wheat has increased from 194 thousand ha in 1990 to 325 thousand ha in 2012, with a peak of 402 thousand ha in 2008 as a response to the food crisis. However, wheat yields per hectare declined by about 30% during the period 2004-2012 (NSC 2009, 2013b).

Unmilled wheat and meslin are the most imported grains. Growth in wheat and flour imports contributed to the rising agricultural and food imports. 92.7% of total wheat imports in 2013 came from Kazakhstan (NBKR 2014).

Other important grains cultivated in the Kyrgyz Republic include barley, maize, and rice. Maize production has increased due to an ongoing recovery of the livestock sector: the area sown to maize expanded by around 30% during 2004-2012 (NSC 2009, 2013b). The share of imported maize in domestic production and consumption is close to insignificance. Imports of rice have increased sharply between 1995 and 2013 from 3,505 tons to 21,658 tons respectively. In 2012, 51% of rice imports came from Russia, 39% from Kazakhstan and 10% from China (UN Comtrade database).

3.2.3 Livestock sector products

Live animals, meat and meat products

Output for all livestock products dropped significantly from 1990 to 1997, the decline being particularly strong for poultry, sheep, goats and pig industries (World Bank 1998). From 1997 to 2003, the lowest trade in live animals can be observed (Figure 3.5). A large drop in meat and livestock export volumes occurred when Russia and Kazakhstan imposed sanitary measures on meat imports from the Kyrgyz Republic. Nevertheless, substantial smuggling of livestock products is reportedly taking place at the Kyrgyz-Kazakh border (World Bank 2011, Ibragimova et al 2012). A recent survey by the National Bank of the Kyrgyz Republic reported that the average annual value of live animals' exports to Kazakhstan in 2009-2010 was about US$ 22.3 million, which is 5 to 6 times higher than the official numbers for exports of live animals (Ibragimova et al 2012). Official data also reveals a positive trend in exports of live animals which can be observed over 2003-2013.

Milk and dairy products

Both imports and exports for this group increased over the last decade (Figure 3.5). The rapid growth in milk and dairy exports has concentrated on exports to Kazakhstan, which received almost the entire amount of milk and cream and milk products exported by the Kyrgyz Republic over the last 5 years (NBKR 2014). A downward trend in dairy exports in 2012-2013 was due to

the import ban imposed by Customs Union member-countries during that period (NBKR 2014).

Figure 3.5: Trends of trade in major livestock products
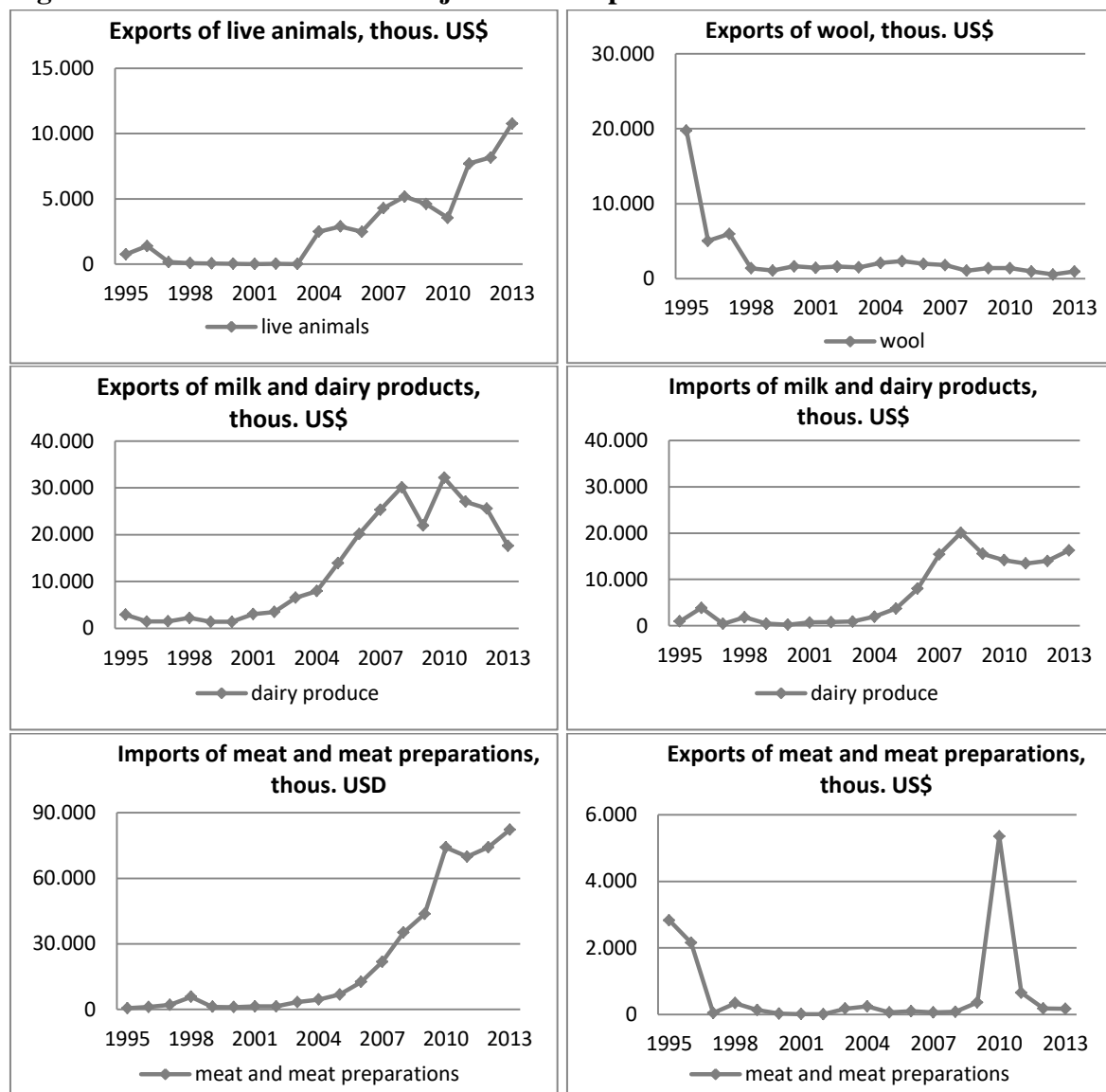
Source: Author's illustration based on UN Comtrade database.

Wool

In 1995, the share of wool in total agricultural and food exports was 11% (Figure 3.2). A decade later its contribution dropped to negligible. A dramatic decline over the first decade of economic transition is explained by substantial deterioration in the sheep and goats subsectors. The quality of produced wool has also declined: the composition of herds moved towards sheep breeds, which produce wool of lower quality and are raised mainly for their meat (Christensen and

Pomfret 2007). Because of the high share of informal sales of wool through cash payments by local and foreign buyers, the actual decline in subsector's output might be smaller than what is reported in official data (Christensen and Pomfret 2007).

3.2.4 Trade in food-industry products

The agro-processing industry in Kyrgyzstan experienced severe crisis after independence. The annual production for most products of the industry (with the exception of wheat flour and sugar) dropped by 90% during 1990-1996 (World Bank 1998). The sector faced numerous barriers which made its recovery very difficult. Breakdown of marketing chains, lack of technology and investment, low competitiveness, inadequate supply of raw materials among other factors contributed to a sluggish recovery of the agro-processing sector after transition (World Bank 1998, 2004).

Exports of food products include mostly dairy products (milk and cream, cheese and curd). Taking advantage of abundant pasture resources and a favourable location to the growing Kazakh market, milk processing grew stronger in the northern part of the country. However, there is considerable room for further expansion given the fact that large amounts of raw milk are still being regularly transported to Kazakhstan for processing (World Bank 2011). Difficulties that Kyrgyz dairy processors face while establishing milk supplies include: large differences between milk supply in winter and summer as poor animal nutrition during winter times strongly affects the amount of milk produced, inadequate or lacking storage and testing facilities, low milk quality and lack of animal health verification (World Bank 2011).

The value of sugar and sugar confectionery exports dropped dramatically from about US$ 20 million in 2004 to less than US$ 1 million in 2013 (Figure 3.6). In 1998, the Kyrgyz Republic exported molasses for US$ 2.3 million, of which 76% went to Kazakhstan, 13% was imported by Uzbekistan, and about 8% by Turkmenistan. Sugar exports in the same year comprised US$ 8 million, and again the main importer of Kyrgyz sugar was Kazakhstan (69%), followed by Uzbekistan (13%) and Lithuania (12%). In 2013, total exports of sugar and confectionery equalled about US$ 616 thousand, of which more than US$ 500 thousand was imported by Kazakhstan (UN Comtrade).

Figure 3.6: Trends of trade in key food-industry products

Exports of sugar and confectionery, thous. US$

— sugar and confectionery

Imports of sugar and confectionery, thous. US$

— sugar and confectionery

Exports of beverages, thous. US$

— beverages

Imports of beverages, thous. US$

— beverages

Imports of wheat flour, thous. US$

— wheat flour

Imports of vegetable oil, thous. US$

— vegetable oil
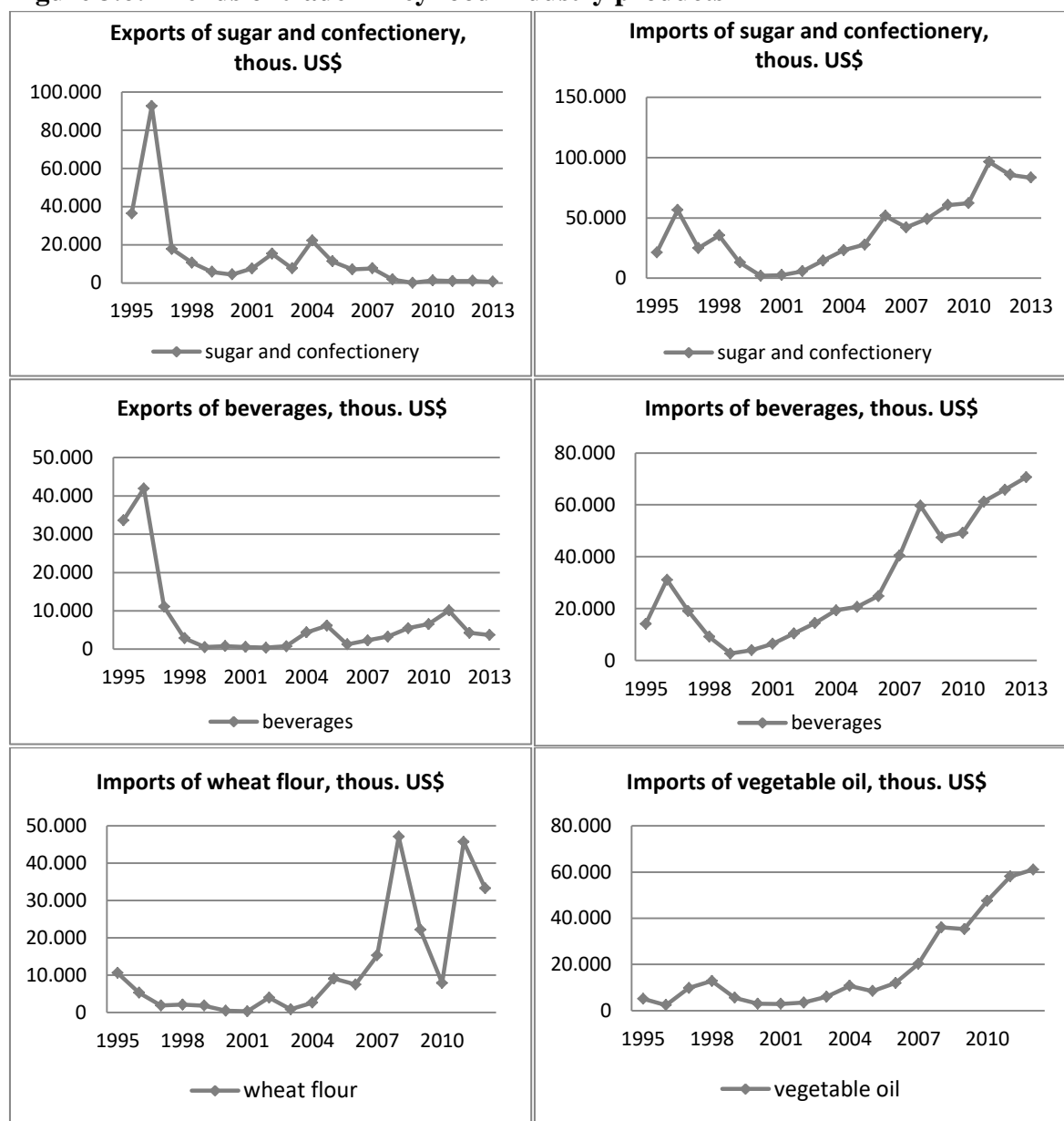
Source: Author's illustration based on UN Comtrade database

Processed agricultural and food imports grew rapidly over the last decade, particularly in flour imports from Kazakhstan and dairy imports from Russia and Ukraine (World Bank 2011). The most important food imports during 2008-2013 included: meal and flour of wheat; cereal preparations of flour or starch of fruits or vegetables; sugar confectionery; coffee, tea, cocoa and manufactures thereof; beverage waters; beer made from malt; and cigarettes containing tobacco (NBKR 2013a, 2014).

The total number of single product items has increased both for exports and imports over 1995-2013. The total number of exported products (by HS 6-digit classification) in 1995 was 102, with the number of exports over US$ 1 million being only 26. On the import side, it was 96 products in total and 21 for imports over US$ 1 million. In 2013, those numbers for exports of agricultural and food products were 214 (38 items with the value over US$ 1 million), whereas for imports they increased up to 448, of which 80 products had a value exceeding US$ 1 million. Diversification of imports of agricultural and food products was much larger than for exports.

3.3 Main partners of the Kyrgyz Republic in agricultural and food products trade

This chapter focuses on main changes in the destinations of exports and origin of imports that occurred since the accession of the KR to WTO. The share of agricultural and food exports to CIS-countries in 2013 was smaller compared to 1998 (Table 3.1). The drop, however, is not large, and the CIS members continue to be very important for Kyrgyz agricultural exports. The share of Turkey has increased largely due to increasing bean exports to this country, while the share of agricultural and food exports to China, EU and other countries has declined over 1998-2013.

Table 3.1: Key destinations of agricultural and food exports from the Kyrgyz Republic in 1998 and 2013

1998		2013	
Trade partners	**Share, %**	**Trade partners**	**Share, %**
CIS	**67.3**	**CIS**	**53.7**
Russian Federation	39.5	Kazakhstan	40.3
Kazakhstan	14.6	Russian Federation	9.5
Uzbekistan	4.7	Tajikistan	2.3
Tajikistan	3.5	Uzbekistan	1.1
Ukraine	3.0	Ukraine	0.3
Other CIS	2.0	Other CIS	0.2
China	**6.9**	**China**	**4.5**
Turkey	**2.9**	**Turkey**	**25.6**
EU-28[a]	**18.4**	**EU-28**	**4.5**
Czech Rep.	6.2	Bulgaria	3.6
Lithuania	4.9	Latvia	0.3
Other EU-28	7.3	Other EU-28	0.6
Other	**4.5**	**Other**	**11.7**
Total: US$ 125.7 mln.	**100.0**	**Total:** US$ 237.2 mln.	**100.0**

Source: Author's compilation based on the UN Comtrade database. [a] EU-28 is kept here for comparison reasons.

Russia was the most important export destination in 1998 receiving around 40% of total agricultural and food exports (Table 3.1). Exports to Russia in 1998 comprised mainly fruits and vegetables, raw tobacco and uncombed cotton, and molasses (NBKR 2002). Imports from the

Russian Federation accounted for 8.7% of total agricultural and food imports in the same year. Over the last 15 years, agricultural and food imports from Russia increased dramatically, whereas the value of exports to Russia was only one ninth of the value of imports from Russia to Kyrgyzstan.

Table 3.2: Main origins of agricultural and food imports to the Kyrgyz Republic in 1998 and 2013

1998		2013	
Trade partners	**Share, %**	**Trade partners**	**Share, %**
CIS	**26.8**	**CIS**	**75.6**
Russian Federation	8.7	Kazakhstan	33.7
Kazakhstan	11.7	Russian Federation	25.8
Uzbekistan	2.6	Ukraine	9.7
Azerbaijan	2.4	Belarus	3.3
Ukraine	1.1	Uzbekistan	1.7
Other CIS	0.4	Other CIS	2.8
China	**3.5**	**China**	**7.5**
Brazil	**12.2**	**Brazil**	**0.3**
USA	**12.7**	**USA**	**6.6**
Cuba	**10.7**	**Ecuador**	**1.4**
Turkey	**5.3**	**Turkey**	**1.6**
EU-28	**15.3**	**EU-28**	**2.6**
Germany	4.7	Germany	0.5
Denmark	1.6	Poland	0.5
Other EU-28	9.0	Other EU-28	1.6
Other	**13.5**	**Other**	**1.3**
Total: US$ 113.4 mln.	**100.0**	**Total:** US$ 712.6 mln.	**100.0**

Source: Author's compilation based on the UN Comtrade database

Both in terms of agricultural and food imports and exports, Kazakhstan is one of the largest trade partners of the Kyrgyz Republic over the entire period after independence. The most important export items to Kazakhstan include: live animals, milk and cream and dairy products, cheese and curd, fruits and nuts, vegetables, drinks and tobacco. Exports of live animals have increased dramatically during 2009-2013 from US$ 1.6 million to US$ 7.8 million, and, as mentioned before, these numbers can be significantly underreported. Drinks and tobacco exports are erratic,

they increased from US$ 3.5 million in 2009 to US$ 8 million in 2010 only to drop to US$ 1.6 million in 2013 (NBKR 2014). Kyrgyzstan mostly imports wheat and wheat flour, sugars, molasses and honey, cigarettes containing tobacco, and water beverages from Kazakhstan.

Kazakhstan and Russia are the two major partners for the KR in agricultural and food products trade, and they also constitute the largest members of the Customs Union (CU). Agricultural trade with Belarus, a third full member of CU, is relatively small: share in total agricultural exports in 1998 and 2013 was 1.5% and 0.1% respectively, whereas the share in imports was 0.1% in 1998, and 3.3% in 2013. Altogether, half of agricultural and food exports of the Kyrgyz Republic was delivered to CU markets, while more than 60% of agricultural and food imports originated from the Customs Union members in 2013.

The share of exports to non-CIS export destinations, such as China and Europe has declined over 1998-2013; for China the decrease in the share was about 30%, while the share of agricultural and food exports to EU has dwindled fourfold. Imports from China increased both in absolute and relative terms over 1998-2013, its share in agricultural and food imports comprised 7.5% in 2013 compared to 3.5% in 1998. USA lost about 50% of its share in Kyrgyz food imports, importance of EU and Turkey in agricultural and food imports has also declined during 1998-2013 (Table 3.2).

Figure 3.7: Share of agricultural trade with WTO and non-WTO countries
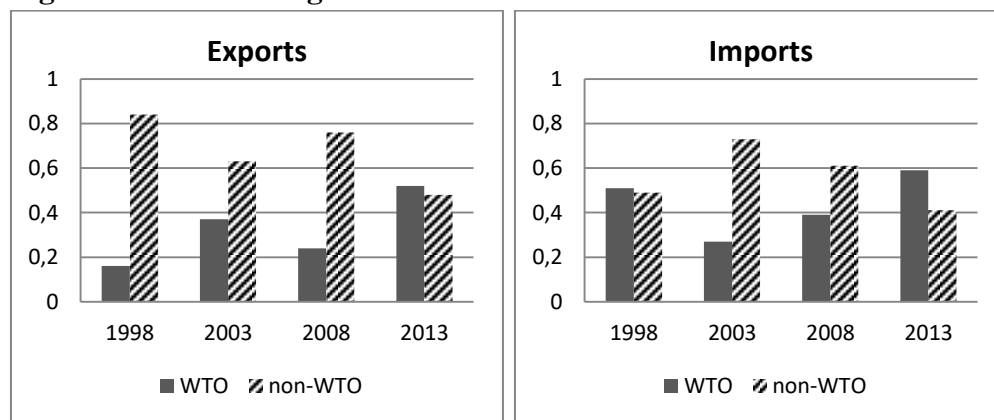
Source: Author's illustration based on the UN Comtrade database.

Relative importance of agricultural trade between Kyrgyz Republic and other WTO members has changed greatly since the WTO accession in 1998. Shares of non-WTO and WTO members in total agricultural exports are close to equal by 2013, which is a significant change compared to

1998, when more than 80% of agricultural exports went to non-WTO countries. The starting point at the import side was the other way round: in 1998, the share of non-WTO and WTO countries was about the same, whereas by 2013, imports from non-WTO member countries comprise two thirds of imports from WTO members. Accession of WTO by Russia and Tajikistan has contributed to the changes that occurred between 2008 and 2013.

3.4 WTO accession and agricultural trade in the KR

Given the development of agricultural trade in the Kyrgyz Republic since 1998, it appears that the country may not have been able to benefit strongly from its WTO membership. In total, the Kyrgyz Republic's total trade in agricultural and food products has increased dramatically since the WTO accession; however, this increase in trade turnover was rather driven by the rapid growth of imports than exports. Thus, agricultural sector in Kyrgyzstan became a net importer of agricultural and food products with a trade deficit in 2013 of about US$ 460 million, which is almost double the size of agricultural and food exports in the same year.

The structure of exports has shifted to one that concentrates more on exports of fresh and unprocessed commodities, whereas the composition of imports has moved towards the imports of higher-value processed food products, and has become more diverse. Moreover, the number of countries for both agricultural and food exports and imports has increased since 1998, whereby the geographical expansion of imports was larger than that of exports. These 15 years, however, were also full of challenges not only for agriculture, but to the entire Kyrgyz economy, which had to face the negative impacts from the Russian crisis in 1998, political crises in 2005 and 2010, and the 2008 food crisis. Droughts in 2007 and 2008, political insecurity and border closures related to political crises have affected agricultural sector performance substantially (World Bank 2011).

The share of WTO members in total agricultural and food products has changed, but it was mainly due to the fact that its traditional trading partners like Ukraine, Russia, China and Tajikistan also joined WTO over 2001-2013. Overall, CIS countries continue to be important for both agricultural and food imports and exports of the Kyrgyz Republic. Due to geographical, political and cultural reasons, it is clear why KR's trade volume with CIS countries is larger than with non-CIS countries.

Joining WTO did not mean that market access for Kyrgyz exports would be improved immediately. WTO commitments of the Kyrgyz Republic are important as a basis for implementing consistent liberal policies, but are not enough to guarantee a friendly business environment and a provision of transport, financial, communications and other services vital for

trade in both goods and services (World Bank 2005). Thus, significant barriers remain, and they are not related to trade or investment policy climate in the country. Low competitiveness of agriculture requires that significant efforts have to be undertaken to adopt new technologies and innovations, which would help to improve quality of the output of agricultural and agro-processing sectors. Yet, public expenditure on agriculture is declining. For instance, during 2003-2009, a decline in overall agriculture expenditure in real terms was 17%, although recurrent expenditure in the sector has increased in total over these years, the drop in public investment in agriculture was much bigger (World Bank 2011).

High trade costs are another obstacle for growth of Kyrgyz exports. Geographical factors, such as remoteness to world markets and landlockedness, are just one part of the story. Transiting through neighbouring countries has been complicated, particularly because of informal charges over the territory of Kazakhstan, Russia and Uzbekistan. Unannounced border closures and complex customs clearance procedures, particularly from the Uzbek side, have increased time costs (Christensen and Pomfret 2007). In the late 1990s, unofficial payments of US$ 1700 per truck on average were reportedly charged while transiting goods from Kyrgyzstan to Russia through Kazakhstan, but the situation has improved significantly since Kazakhstan ratified the International Transport Agreement in early 2005 (Christensen and Pomfret 2007). Poor quality of transport infrastructure is an important factor, too. Light (2007) argued that future growth of the agricultural sector in Kyrgyzstan would depend more on strengthening regional integration and improving transit infrastructure, especially those reducing transport costs.

Benefits from WTO membership are still to be fully utilized. Accession of WTO by Russia and Tajikistan will very likely have positive implications for KR's trade performance. Trade relations between Kyrgyz Republic and Russia, which is one of the major trading partners of the KR in agricultural and food products trade, are now subject to WTO rules. As of year 2000, KR was a member of WTO, sharing borders with countries, which were not WTO members. Because of this reason, the KR could not benefit from the degree of protection implied by WTO rules while transiting goods through neighbouring countries (World Bank 2005). Two out of four neighbouring countries, China (2001) and Tajikistan (2013) acceded to WTO by 2013. Nevertheless, transit through Uzbekistan and Kazakhstan are currently more important for

Kyrgyz exports: (1) western China's largest urban centre is easier to transit through Kazakhstan because of high mountains at the Kyrgyz-Chinese border, (2) transit through Tajikistan and Afghanistan to the growing markets of South Asia is considered to be more risky (Christensen and Pomfret 2007).

3.5   Conclusions

The objective of this section was to analyse the implications of WTO accession for agricultural trade development in Kyrgyzstan. Analysis of agricultural production and trade statistics combined with literature review resulted in the following conclusions. First, structural changes in agricultural and food products trade that occurred between 1998 and 2013 are substantial. These changes, however, are not favourable for agricultural and food exports. As of 2013, exports are concentrated on raw materials and fresh products, whereas imports consist more of higher value processed food products. Second, Kyrgyz Republic's key trading partners in agricultural and food products trade remain in the CIS region. Russia and Kazakhstan are KR's largest trade partners, which is why the relative importance of trade with the Customs Union members is also large. The share of WTO countries in total agricultural trade grew during 1998-2013 as Kyrgyzstan's important trading partners also joined the organization. Third, diversification of exports of agricultural and food products' trade was smaller than for imports. Agro-processing industry in the KR faces sizable problems, most of which are related to lack of technology and resulting low competitiveness. Fourth, significant barriers remain which dramatically increase trade costs and impede Kyrgyz export growth substantially. Addressing these barriers involves efforts aiming at better regional cooperation, as key transit countries, such as Uzbekistan and Kazakhstan are not WTO-members yet. Improved infrastructure, particularly for transporting goods, will help to reduce these trade costs, too.

Finally, WTO benefits for the KR's trade development, including trade performance of the agricultural sector, are very likely to become larger when neighbouring countries join the organization, too. Positive changes include accession of WTO by China, Russia and Tajikistan over the last 10 years.

4 Agricultural incentives in the KR: The impact of direct policies and economy-wide developments[12]

4.1 Introduction

Taking into account that the livelihoods of around half of the population in the Kyrgyz Republic depend on agriculture, the significance of the sector for the Kyrgyz economy is evident. Just like the rest of the economy, the agricultural sector has undergone crucial reforms during the transition period following the collapse of the Soviet Union, including land privatization, individualization of large-scale state and collective farms, and an elimination of subsidies to agricultural producers as important reform steps. Agriculture was the first sector with a positive growth rate in 1996, and for the period of 1996 to 2001 served as a driver of economic growth. Starting from 2002, however, the agricultural growth has been slowing down (Light 2007). Low agricultural productivity leading to poor returns from farming and hence, to limited private investments has created a vicious circle. Mechanization remained low (FAO 2009), and land and labour resources have been fully employed implying that further growth depends on improved productivity of labour either through the adoption of better technologies and/or strengthened capital stock (Light 2007). Agricultural productivity being closely linked to rural poverty has largely suffered from the smallness of scale, which seemed to be the major drawback that hindered farmers' possibility to invest into own machinery and inputs (Lerman and Sedik 2009).

Agricultural policies[13] in the KR have focused on four main pillars: food provision, stability of agricultural markets, achieving competitiveness and improving trade, and environmental preservation and food safety (World Bank 2011). Although the direct interventions into agricultural markets have been abolished, the government uses a number of indirect instruments in order to support farmers and to achieve its strategic sectoral goals. As far as these policies

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[12] This study was conducted as a part of the larger "Land Use, Ecosystem Services and Human Welfare in Central Asia" research project funded by the Volkswagen Foundation. The earlier version of this chapter, published as Zhunusova and Herrmann (2014), was co-written with Prof. Dr. Roland Herrmann.

[13] A detailed overview of agricultural policies in the Kyrgyz Republic is given in Chapter 2.

affect agricultural producer prices and, thus, incentives for farmers to produce, they have straightforward implications for farmers' welfare. If the governmental policies affect agricultural prices, they also alter farmers' earnings and their land-use decisions. It seems of high relevance to evaluate how large these price incentives or price disincentives are which are caused by implemented policies. The outcome of such an analysis could serve as a useful basis for designing future policies, as they can shed light on the intended and actual effects of policies on agricultural land use.

In general, agricultural incentives are influenced both by governmental policies directly targeting the agricultural sector and by other economy-wide policies that affect agriculture indirectly (Krueger, Schiff and Valdés 1988). Policy measures such as agricultural import or export taxes, subsidies and quantitative restrictions, domestic input and output taxes and subsidies as well as consumer subsidies, affect farmer incentives directly through the influence on agricultural prices and earnings (Schiff and Valdés 1992; Anderson and Martin 2009). The indirect effects of governmental policies arise from the protection of other industries and macroeconomic interventions that discriminate against agriculture relative to tradable and nontradable sectors outside agriculture (Schiff and Valdés 1992). Thus, in order to receive a full picture of all factors influencing agricultural price incentives, the effects of both direct interventions and indirect factors should be investigated.

There is only one study available which provides a quantitative analysis of agricultural protection for the Kyrgyz Republic (see Christensen and Pomfret 2007). The Nominal Rate of Assistance (NRA) as the measure of protection rate was calculated for six major agricultural commodities including wheat, cotton, maize, cow milk, poultry meat and wool for the period of 1995-2004. Domestic prices for grains were found to be generally above the border prices indicating positive assistance to grain growers by the government. Large differences between the domestic and world market prices were reported particularly for wheat during the 1990s and early 2000s. Part of the positive gap between the domestic wheat price and the border price for the crop were attributed to a general encouragement by regional authorities to wheat growers, although it remained unclear which measures have been used to promote growth in wheat production. The study of Christensen and Pomfret (2007) focuses on the price distortions in agriculture arising from sectoral policies only, whereas the effect of other macroeconomic policies is not considered.

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The term "agricultural price distortion" as used in Christensen and Pomfret (2007) refers to price gaps between the domestic and world market prices of agricultural commodities after accounting for all other transaction costs, i.e., NRA estimates. An agricultural price distortion shows any deviation of the domestic agricultural price from the world market agricultural price induced by a government intervention in agricultural markets (Anderson and Martin 2009). However, one should keep in mind that even though NRAs represent the effect of a government intervention to alter agricultural producer prices, the implementation of these interventions may have been necessary given the presence of certain market failures. For instance, remoteness and landlockedness of the country, as well as poor infrastructure and the smallness of scale contribute to anecdotally high transaction costs for Kyrgyz farmers.

Apart from price distortions due to direct agricultural policy, it was elaborated in the literature on agricultural protection that agricultural incentives in developing countries were distorted also indirectly by macroeconomic policies by the end of 1980s (Krueger, Schiff and Valdés 1988; Wiebelt et al. 1992). In particular, import-substitution strategies for the manufacturing sector had strong impacts on the exchange rate and factor prices and led to a further discrimination against the tradable agricultural sector. When the implications of direct and indirect agricultural policies were added up, discrimination against the agricultural export sectors was especially high. The follow-up World Bank project led by Anderson revealed that discrimination against agriculture in developing countries, particularly against exportables, has substantially declined since the late 1980s (Anderson 2010).

As it was mentioned in Section 2.4, macroeconomic policies in the Kyrgyz Republic changed several times and included a number of trade-policy and exchange-rate interventions, but there was no clear systematic distortion of the exchange rate in one particular direction as a consequence of domestic policies. Therefore, we do not compare NRAs due to policy-induced distortions of the exchange rate. However, we show in Section 4.2.2 that the Kyrgyz Republic, although being a landlocked country, is highly dependent on international economic development. The major factors here are a strong dependence on international prices such as the gold price on the export and the oil price on the import side, as well as an increasing inflow of workers' remittances. It can be expected that these macroeconomic variables affect agricultural

incentives, too. A concept that captures effects of trade policy and macroeconomic shocks on price ratios between different sectors in the economy is the concept of true protection. We will apply this framework, which is based on the seminal work of Dornbusch (1974) and Sjaastad (1980), to the case of the Kyrgyz Republic.

The goal of this paper is to analyse the factors influencing agricultural price incentives in the Kyrgyz Republic including both agricultural and economy-wide policies and macroeconomic conditions. In doing so, first the Nominal Rates of Assistance are estimated for major agricultural crops in order to examine the magnitude and development of agricultural price incentives (disincentives) over the last eleven years for which data were available. In the second step, the true-protection concept is employed in order to evaluate the effect of other economy-wide policies and macroeconomic developments on agricultural incentives.

The remainder of the chapter is structured as follows. The next section outlines the analytical framework of this study, including the theoretical background and previous work on the application of NRAs and the true-protection concept, estimation techniques employed, and a description of the data. Empirical results are presented and discussed in Section 4.4. Findings are summarized and conclusions are drawn in Section 4.5.

4.2 The analytical framework

4.2.1 Estimating Nominal Rates of Assistance in the agricultural sector

This section is mainly based on the methodology of the recent World Bank study that reported estimates of agricultural distortions for the case of 75 countries covering 70 different farm products for the period of 1955-2007 thereby establishing the largest global agricultural distortions database[14]. The study of Christensen and Pomfret (2007) mentioned in the previous section was part of this World Bank research project.

For a small, open economy with perfect competition, no externalities, transaction costs and exchange rate distortions, Anderson and Martin (2009) show that the government would maximize national welfare by allowing the domestic and consumer prices of a farm product to be equal to the world market price of that product. Any deviation from this equality arising from a government-imposed measure would be welfare-reducing for such an economy (Anderson and Martin 2009).

In the first step of this study, direct changes to agricultural incentives are estimated that result from sector-specific policies of the government, in this case from agricultural policies (Krueger, Schiff and Valdés 1988). Price-distorting instruments can be imposed at the country border through the introduction of trade measures, such as an import tariff attempting to protect a domestic sector which competes with imports, or an export subsidy following export promotion goals. If an *ad-valorem* tariff on imports is levied, it would be an equivalent of a production subsidy and a consumption tax, both at the rate, t_m. If this is the only distortion present, then the support of the government to the farm product's border price can be measured as the Nominal Rate of Assistance (NRA) (Anderson and Martin 2009):

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[14] The outcomes of the research project for individual countries delivered in numerous working papers have been compiled and published in the following books: Anderson (2009), Anderson and Swinnen (2009), Anderson and Valdes (2008), Anderson and Masters (2009), and Anderson and Martin (2009).

$$NRA_{BS} = \frac{E \cdot P(1+t_m) - E \cdot P}{E \cdot P} = t_m \qquad (4.1)$$

where NRA_{BS} indicates Nominal Rate of Assistance to farmers through the border price support, which is then the difference between the distorted price, $P(1 + t_m)$, and the undistorted price, P, times the exchange rate, E, as a share of the undistorted price.

Governments can also provide a direct production subsidy or impose a production tax. If that is the only distortion, then the domestic price support NRA_{DS} can be calculated using the formula above. If price distortions exist both at the domestic and border levels, then the total NRA would be the sum of NRA_{BS} and NRA_{DS}.

Calculation of NRAs also takes into account exchange-rate distortions resulting from governmental actions in the domestic market for a foreign currency. For instance, in the case of a dual exchange rate system, the choice of the exchange rate used for the calculation of NRAs would depend on whether the product is an importable or an exportable, while if the system exhibits multiple exchange rates, it would depend on the specific rate applied to the product in each period (Anderson and Martin 2009).

The distortion is measured relative to the situation which would have occurred had there been no governmental intervention, that is a free-trade situation (Krueger, Schiff, and Valdés 1988). This means that a domestic price (supposedly distorted by governmental interventions) is compared to the reference price which represents a hypothetical price that should have prevailed in the case of no interventions. For tradable commodities, border prices on a free-on-board (f.o.b.) or cost-insurance-freight (c.i.f.) basis usually serve as reference prices. However, since the two prices to compare are valid in different points of the marketing chain, the border price has to be adjusted for all the marketing margins including transportation costs, storage costs, wholesaler or processing costs that arise between the border and a producer location, as well as quality and variety differences (Anderson and Martin 2009; Krueger, Schiff, and Valdés 1988; Westlake 1987).

NRAs as the indicators of direct distortions to agricultural price incentives in the Kyrgyz Republic were estimated for seven major agricultural commodities for the period of 2001 to 2011

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following the methodology described in Anderson (2009, p.575). The formula below is used for calculating NRAs for individual agricultural commodities:

$$NRA = \frac{P_{FG} - (P_W \cdot E - C_T - C_H - C_M)}{P_{FG}} \tag{4.2}$$

where P_{FG} is the farmgate price of a commodity in soms; P_w is the world market price or the reference price for the commodity in US\$; E is the nominal exchange rate between the KGS and US\$; C_T, C_H, and C_M stand for transport, handling/processing and marketing costs respectively, associated with the delivery of a product from the farmgate point to the border or vice versa.

Being rather simple in calculation, and less demanding in data requirements, this measure, however, has several important drawbacks. Due to the unavailability of detailed information on all the potential domestic trade costs, as well as quality concerns about the officially reported data on domestic and reference prices, the estimates of NRA are to be treated as rough calculations[15]. Assumptions had to be made on the size of marketing, handling and transportation costs for individual crops based on a literature review. The analysis of NRAs over the studied period attempts to elaborate a general trend and a direction of governmental assistance to or discrimination against the producers of specific crops, rather than looking at precise magnitudes of distortions in particular branches of the agricultural sector.

4.2.2 The true-protection concept

It had been observed for many developing countries that a broad range of policy measures existed which included import-substitution strategies on the one and export-promotion policies on the

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[15]Concerns remain that the official data on trade values and quantities are biased from actual figures because of substantial illegal trade going on at the border. In 2012, the National Bank of the Kyrgyz Republic undertook a survey on border trade and re-export of goods not covered by official statistics at the customs posts and markets (Ibragimova et al. 2012). The mirror statistics of imports of goods to Kyrgyzstan from China in 2007 has revealed a tenfold divergence of figures: official statistics in KR showed US\$ 356 mln., whereas Chinese authorities reported US\$ 3.67 billion. The major part of the unregistered external trade consists of live animals, fruits and vegetables, cattle meat, and consumer goods.

other hand (Greenaway and Milner 1987). Given this background, it was often difficult to identify how policies in one sector affected incentives in another sector and which sector carries the major burden arising from a country's trade policy. The true-protection approach can provide answers to such questions. Using the true-protection concept, it is possible to investigate how the burden of protecting one sector is shifted to another sector. Its application to trade policy in developing countries was surveyed by Greenaway and Milner (1987) and by Wiebelt et al. (1992, pp. 36 et seq.), and empirical applications of the concept referred to Cameroon (Milner 1990), Colombia (Garcia 1981), Côte d'Ivoire (Greenaway 1989), Malaysia and Peru (Herrmann, Sulaiman and Wiebelt 1990), Mauritius (Greenaway and Milner 1986), Nigeria (Oyejide 1986), Pakistan (Dorosh and Valdés 1990), the Philippines (Bautista 1987), Saudi Arabia (Milner, Presley and Westaway 1995), Zaire (Tshibaka 1986) and Zimbabwe (Wiebelt 1992). It is possible, too, to apply the concept of true protection to exogenous shocks on the foreign-exchange balance on commodity markets, rather than to changes in trade policy alone. Therefore, Dutch-disease phenomena can also be addressed with the true-protection concept.

The basic theoretical model is a small general-equilibrium model capturing three commodities or sectors: an importable, an exportable and a nontradable (home) good that are produced and consumed domestically. The model is based on the following basic assumptions (Dornbusch 1974). First, the country considered is a small country with an open economy, with given factor endowments and constant real income. Second, trade is initially balanced, and the relative prices of both exportables and importables compared to the nontradable sector are flexible as market clearing occurs in the home-good sector. Third, trade policy interventions are represented by uniform tariffs on imports and/or uniform subsidies on exports. It was shown theoretically by Dornbusch (1974) that an import tariff raises the price ratio between the importable and the exportable sectors relative to the nontradable sector. Apparently, import tariffs tax the nontradable compared to the importable sector, but even more so they tax the exportable sector compared to the importable and the nontradable sector. It is this latter finding that was confirmed in various empirical true-protection studies.

Before we address the measurement of true protection, basic linkages between macroeconomic variables and incentives for agricultural protection shall be explained with Figures 4.1 and 4.2.

Macroeconomic shocks may arise from changing world prices of major non-agricultural exportables or importables of a country. A major export good of the Kyrgyz Republic is gold. Therefore, Figure 4.1 illustrates implications of an **increasing world market price of gold** for the price ratios between sectors in the domestic economy. In Figure 4.1a, we assume that the Kyrgyz Republic is a price-taker on the gold market and that the price-elastic export demand for gold rises due to a booming demand on the world market, i.e. from *ED* to *ED'*. Gold export supply of the country increases from q_0 at the export price p_0 to q_1 at the new price p_1. Export earnings in the gold sector rise and, thus, the supply of foreign exchange in Figure 4.1b is raised from *S* to *S'*.

The new equilibrium on the currency market yields a lower exchange rate, i.e. e_1 rather than e_0. Apparently, a boom in the major export sector leads to an appreciation of the domestic currency. The impact on the exchange rate is one element of the so-called Dutch disease. An appreciation of the domestic currency, initiated by a boom in the leading sector, leads to lower prices of other tradable sectors such as agricultural importables and exportables.

The given world price for agricultural tradables, denominated in US-$, has to be multiplied by a lower exchange rate to derive import and export prices in domestic currency (p^D). Thus, p^D declines in Figure 4.1ca from p_0^D to p_1^D. Imported goods like grains experience a higher consumption and a lower production. The self-sufficiency ratio falls. In Figure 4.1ca, imports increase from $(q_0^D - q_0^S)$ to $(q_1^D - q_1^S)$. Analogously, price incentives for exporters worsen in domestic currency due to the exchange-rate effect. In Figure 4.1cb, this is illustrated by a price fall from p_0^D to p_1^D. Domestic production declines from q_0^S to q_1^S, domestic consumption rises from q_0^D to q_1^D, and exports diminish from $(q_0^S - q_0^D)$ to $(q_1^S - q_1^D)$.

Figure 4.1d shows how the nontradable sector is affected by the boom in the gold sector. The market of the nontradable sector clears - by definition - domestically and the price in the nontradable sector is not determined by a given international price as in the tradable sector. A rising gold price raises income and, to a certain extent, the domestic economy will participate in this income increase. A demand effect occurs by shifting demand for nontradables such as

Figure 4.1: Agricultural incentives and Dutch-disease effects: A rising gold price

a) Boom in the gold sector:

b) Impacts an the market for foreign exchange:

c) Implications for the Market for Agricultural Tradables:

ca) Imports:

cb) Exports:

d) Effects for nontradables:
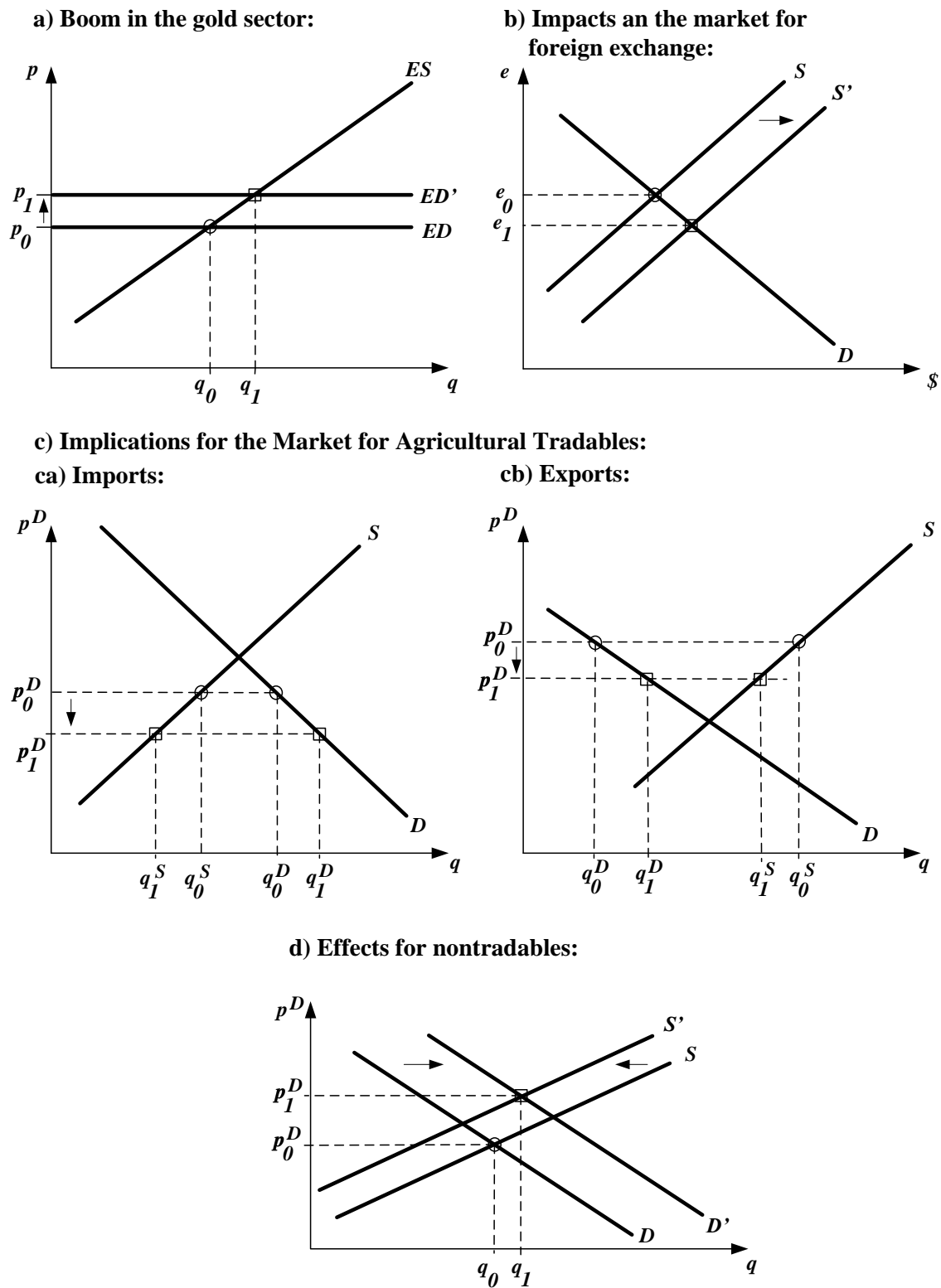
Source: Own illustration.

construction and services from D to D'. As the booming sector raises factor prices, supply of nontradables will shift to the left from S to S'. Apparently, the price in the nontradable sector increases from p_0^D to p_1^D. The price ratio between the nontradable sector and the tradable agricultural sector increases.

Equally important for the Kyrgyz Republic is another possible source of a Dutch-disease effect, i.e. remittances from the country's labour migrants[16]. Like a rising gold price, an increasing **inflow of migrant remittances** in the Kyrgyz Republic would raise the supply of foreign exchange as illustrated in Figure 4.1b. The domestic currency would appreciate, and the falling exchange rate would depress the international price in domestic currency for agricultural tradables as well as non-agricultural tradables. As shown in Figures 4.1ca and 4.1cb, imports would rise and exports would diminish due to the exchange-rate effect. On the market for nontradables, a demand shift due to rising income transfers would raise the price level. The nontradable sector would gain from improved price incentives relative to the non-agricultural and agricultural tradable sectors.

Another macroeconomic shock on imports of the Kyrgyz Republic could result from **changes on the oil market**. Some likely implications of a booming oil price for the price structure in the Kyrgyz Republic are illustrated in Figure 4.2. We posit in Figure 4.2a a rising world demand for oil as a consequence of economic growth in large Asian countries like China or India.

We further assume that the Kyrgyz Republic is a price-taker on the world oil market. The world price increases from p_0 to p_1 and so does the Kyrgyz import price in Figure 4.2b under full price transmission. It is very likely that the demand for oil in the Kyrgyz Republic is price-inelastic.

Thus, we can expect that a rising oil price will boost import expenditures, too. This leads to a higher demand for foreign exchange, i.e. D' rather than D in Figure 4.2c. Initially at e_0, the equilibrium exchange rate goes up to e_1. Apparently, a soaring price of a major import good such as oil will lead to a depreciation of the domestic currency.

Again, the change in the exchange rate affects prices in the tradable agricultural sector.

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[16] The results of an empirical analysis of Dutch disease effects of remittances are reported in Chapter 6.

Figure 4.2: Macroeconomic shocks and agricultural incentives: A rising oil price

a) World oil market:

b) Kyrgyz oil imports:

c) Foreign-exchange market:

d) Agricultural imports:

e) Agricultural exports:

f) Nontradables:
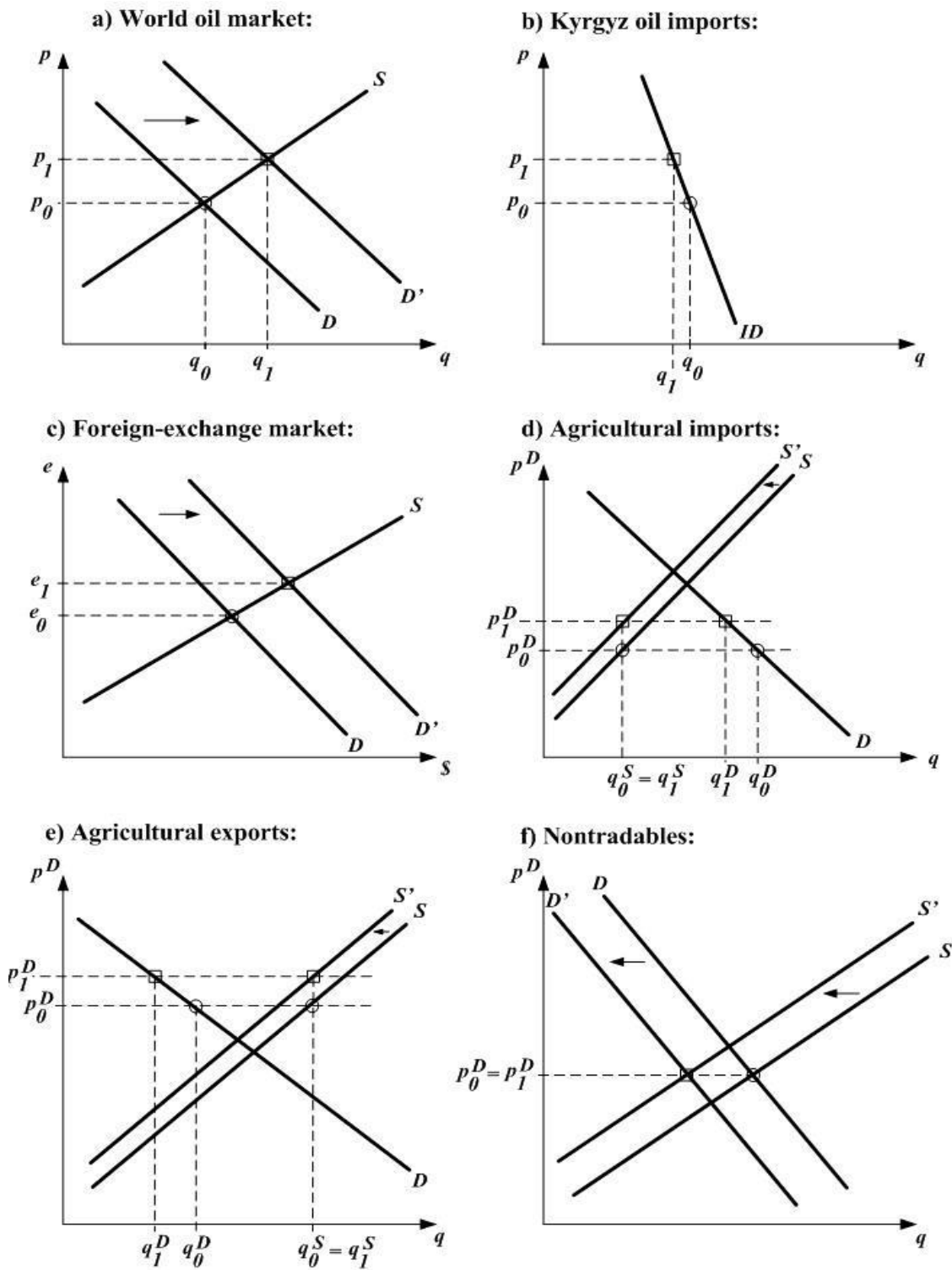
Source: Own illustration.

As Figures 4.2d and 4.2e illustrate, prices of agricultural importables and exportables in domestic currency increase from p_0^D to p_1^D as the world prices in international currency are now multiplied by a higher exchange rate.

Consumers lower demand from q_0^D to q_1^D. Supply will shift upward from S to S' due to higher marginal costs and we posit that the supply quantity remains constant $(q_0^S = q_1^S)$. Thus, agricultural imports in Figure 4.2d decline from $(q_0^D - q_0^S)$ to $(q_1^D - q_1^S)$, i.e. by $(q_0^D - q_1^D)$. Agricultural exports in Figure 4.2e increase from $(q_0^S - q_0^D)$ to $(q_1^S - q_1^D)$, i.e. again by $(q_0^D - q_1^D)$.

On the market for nontradables, a rising oil price will also lead to higher marginal costs. In Figure 4.2d, the supply curve of nontradables shifts upward from S to S'. With given total expenditures and higher expenses for oil and fuels, it can be expected that the demand effect will be negative. The demand curve shifts also to the left - from D to D'. The price on the market for nontradables may fall or rise or remain constant as a function of the relative shifts of the supply and the demand functions. Figure 4.2a captures the special case of a constant price for nontradables. We can summarize that a rising oil price may improve the price ratio between agricultural tradables and the nontradable sector.

In the literature on true protection, Sjaastad's incidence parameter ω is often used to measure the incidence of protection across sectors:

$$\omega = \frac{\Delta(P_H/P_X)}{P_H/P_X} \bigg/ \frac{\Delta(P_M/P_X)}{P_M/P_X} \tag{4.3}$$

where P_M (P_X) measures the price index in the import (export) sector, P_H is the price index in the nontradable or home-good sector, ω is the percentage change of the price ratio between nontradables and exportables due to a one-percent change in the price ratio between importables and exportables. ω ranges between 0 and 1 and, the higher the ω, the more is the burden of import protection or an exogenous import price boom shifted to the export sector. Under the extreme case of $\omega=1$, only the export sector would experience unchanged prices, whereas prices in the importable and nontradable sectors would rise by the same rate under either import price

protection or an import price boom. With $\omega=0$, the burden of import protection or the import price boom would be placed on the exportable and nontradable sector equally.

The regression model in the three-sector equilibrium model would typically be formulated as:

$$\ln(P_H/P_X) = \alpha_1 + \omega \ln(P_M/P_X) + \alpha_2 Z + \mu_1 \qquad (4.4)$$

where Z is a vector of exogenous shifters and μ_1 is a random error term.

Often, more disaggregation is needed and the exportable sector is divided into the non-agricultural and agricultural export sector. Price indices are P_{XNA} and P_{XA} respectively. Then, the regression model could be changed to:

$$\ln(P_H/P_{XA}) = \alpha_1 + \omega_1 \ln(P_M/P_{XA}) + \omega_2 \ln(P_{XNA}/P_{XA}) + \alpha_2 Z + \mu_2 \qquad (4.5)$$

Z is again a vector of shifters and μ_2 is the random error term. Now, two incidence parameters are included: $\omega_1(\omega_2)$ measures the percentage change of the price ratio between nontradables and agricultural exportables due to a one percent change in the price ratio between the importables (non-agricultural exportables) and agricultural exportables.

4.2.3 Data

Data for estimating Nominal Rates of Assistance are compiled as follows. Time series of domestic agricultural prices, production quantities and values are obtained from the National Statistical Committee of the KR (NSC) and the Food and Agricultural Organization of the UN (FAO). Data on export and import unit values and quantities are from the United Nations Commodity Trade Statistics Database (UN Comtrade). Exchange rates are from the National Bank of the KR (NBKR).

Products considered in the distortion analysis cover altogether around 50% of total agricultural output in Kyrgyzstan and include wheat, potatoes, maize, cotton, tobacco, milk and wool. Based on the share of exports and imports in domestic production and consumption respectively, agricultural commodities considered in this study are classified into three groups: exportable, import-competing and home goods. Reference prices for traded goods are derived from the value and quantities traded of that good in terms of export and import unit values. For nontradable

goods, exported and imported quantities are not sufficient to derive adequate reference prices. Therefore, border prices available for the neighbouring Kazakhstan were used as reference prices for nontradable products instead of actual export and import unit values. Kazakhstan is chosen for its relatively liberal policies compared to other neighbouring countries and due to the fact that it is the major importer of a number of agricultural commodities, such as cow milk and milk products, vegetables and fruits. For instance, 99.9% of milk and dairy products exports went to Kazakhstan in 2012 (NBKR 2013a).

Data needed for the true-protection analysis are based on the Producer Price Index (PPI) and Consumer Price Index (CPI) obtained from the National Statistical Committee. Weights used for deriving average price indices for each year are calculated on the basis of the Balance of Payments information from the National Bank of the Kyrgyz Republic.

Descriptive statistics of the variables used for the true-protection analysis are given in Table 1. The data used are on a quarterly basis from the fourth quarter of 2002 to the first quarter of 2013 for which information on price indices was available.

Table 4.1: Summary statistics of variables employed in the regression analysis[a]

Variable	Description of the variable	Mean	Std. deviation	Trend
Pm	The price index for importables (IV2002=100) is a weighted average of price indices for machinery and transport equipment, mineral fuels, and manufactured goods	173.07	37.50	2.75*** (0.269)
Px	The price index for exportables (IV2002=100) is a weighted average of price indices for metallurgy, textile and garment, agriculture and power generation	256.86	155.96	19.48*** (2.366)
Ph	The price index for nontradables (IV2002=100) is an average of price indices for housing services, outpatient services, transport services, and catering and hotel services	152.02	51.42	7.58 *** (0.916)
Pxa	The price index for agricultural exports (IV2002=100)	178.19	67.49	6.31*** (0.956)
$Pxna$	The price index for non-agricultural exports (IV2002=100)	215.19	121.15	14.45*** (1.899)

BT	Balance of trade, mln. USD	-125.96	102.39	-7.85*** (1.382)
GDP	Gross domestic product, mln. USD	993.20	466.14	31.99*** (3.933)
ln*(Ph/Px)*	Natural logarithm of the price ratio *Ph/Px*	-0.39	0.28	-0.02*** (0.003)
ln*(Pm/Px)*	Natural logarithm of the price ratio *Pm/Px*	-0.24	0.39	-0.04*** (0.004)
ln*(Ph/Pxa)*	Natural logarithm of the price ratio *Ph/Pxa*	-0.14	0.12	-0.002 (0.005)
ln*(Pm/Pxa)*	Natural logarithm of the price ratio *Pm/Pxa*	0.02	0.19	-0.02*** (0.005)
ln*(Pxna/Pxa)*	Natural logarithm of the price ratio *Pxna/Pxa*	0.11	0.22	0.02** (0.006)
ln*(BT/GDP)$_{t-1}$*	Natural logarithm of the absolute value of the ratio of BT to GDP with a one period lag	-2.47	0.798	0.05*** (0.011)

[a] Numbers in the last column are the coefficient estimates for the time trend variable in a univariate regression model. Standard errors are in parenthesis. *** and ** indicate p-values at the 0.01% and 0.05% confidence levels respectively. Source: Authors' estimations.

The trends in Table 4.1 represent the general development in the macroeconomic variables for the Kyrgyz Republic. The positive trends in GDP, in the prices for importables, exportables and nontradables are as expected. The price index for non-agricultural exportables seems to have grown much quicker than the price index for agricultural exports, apparently because of the dominance of the gold sector in non-agricultural exports and increasing world market prices for gold during 2000-2013. The negative trend in the trade balance indicates a growing deficit over the years in absolute terms, but in relation to GDP, it became smaller over the last decade.

4.3 Results and discussion

4.3.1 Analysis of agricultural price gaps between the domestic and world market prices

The estimates of Nominal Rates of Assistance obtained for seven agricultural commodities for the period of 2001 to 2011 are presented in Table 4.2.

Table 4.2: Nominal Rates of Assistance, %

Commodity	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Wheat	56	63	52	34	52	43	31	35	27	8	29
Potatoes	72	63	-8	12	12	52	55	37	52	62	51
Tobacco	-77	-131	-108	-149	-141	-117	-127	-152	-211	-238	-188
Cotton	-17	-10	-4	34	22	38	33	31	29	24	52
Maize	41	16	36	18	21	41	52	18	-13	-5	27
Milk	18	10	4	-39	-63	-34	-14	-15	-45	-69	-71
Wool	35	0	-44	-42	-69	-3	32	21	26	-34	84

Source: Authors' estimations.

Grains

As can be seen from Table 2, food crops, such as wheat and potatoes, generally have positive NRAs which indicate that their producers enjoy assistance from the government, apparently targeted at food self-sufficiency goals. This is particularly valid for wheat for which NRAs remained positive over the whole period considered. It was reported that wheat production was particularly encouraged by the government in response to supply disruptions from Kazakhstan in the mid-1990s attempting at less dependence from grain imports. Wheat was favoured by farmers as less risky compared to perishable commodities and also because domestic prices for wheat remained relatively stable (Pomfret 2007). Area sown with wheat has increased dramatically within 1990s: it was only around 194 thousand ha in 1990, but by 2000 it was extended to over 505 thousand ha (NSC 2012). However, starting from 2001, the area under wheat started to decline, possibly indicating that farmers were now turning to the production of more profitable higher-value commodities such as vegetables and fruits whose markets started to develop. NRA

estimates for wheat could reflect government's efforts to stabilize wheat prices during the food crisis of 2008 and political crises in 2005 and 2010 that led to temporary border closures with neighbouring countries. The gap between domestic and border prices could have been even higher if certain measures such as releases from the State Material Reserve into domestic markets, or subsidized flour imports by the AFC were not implemented.

Potatoes

NRAs estimated for potatoes also show that domestic prices for this crop were generally higher than border prices over the entire period considered in the study. Potatoes are an important staple food in the KR: according to the FAO, Kyrgyzstan was the second-largest consumer of potatoes per capita (143 kg) in the world after Belarus in 2005 (FAO 2008). A long-term assessment of price instability for potatoes in KR carried out by the World Bank (2011) concluded that price variability between 2003 and 2009 was highest for potatoes compared to wheat, sugar or sunflower. Price gaps for potatoes were substantial and positive in 2001 and 2002 in favour of domestic producers. However, the NRA fell sharply in 2003 and remained negligible over the following years, before starting to increase in 2006. Until 2009, potatoes have been a nontradable product, meaning that trade in potatoes was insignificant relative to production and consumption quantities. It became an exportable in 2010 and 2011, when the share of export in production reached 6-7 %. The fact that it remained nontradable between 2001 and 2009 has implications for identifying adequate reference prices, as mentioned before[17]. The potato sector has rapidly grown during the studied period: production was around 360 thousand tons in 1990, became over one million tons in 2000, and it was 1.38 million tons in 2011.

Cotton

NRAs for cotton were negative, though not large in relative terms in the early 2000s, whereas the

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[17] In the case of potatoes in particular, export unit values for the crop from neighbouring Kazakhstan were used as reference prices, which are significantly different from actual export and import unit values for that small quantity of potatoes traded during 2001 and 2009. This means that if actual border prices were taken as reference prices for this period, NRAs for potatoes would have deviated strongly in both directions. Anderson (2009) suggests the use of alternative reference prices if the trade in the product is very low and trade unit values are not representative.

sign of NRAs changed in the other direction in 2004[18]. Apparently, positive NRAs for cotton starting from 2004 could be attributed to improved integration of the Kyrgyz cotton market into the world market (Christensen and Pomfret 2007). Cotton is a critical sector in Central Asian agriculture. In Kyrgyzstan and Kazakhstan, the cotton sector is basically market-driven compared to the situation in Uzbekistan, Tajikistan and Turkmenistan, where large rents are subtracted from the sector to contribute to public revenues (Pomfret 2007). A better integration of local markets was facilitated by the growing number of gins: 23 in 2005 compared to only 3 before independence. Prices offered by ginners to cotton producers seem to become more correlated with world market prices, since local prices have been tied to the *Cotlook A* cotton world price index recently (Pomfret 2007).

Tobacco

Distortions to domestic prices of tobacco according to estimated NRAs seem to be very high and negative. The market for this crop is relatively small; there has been a dramatic decrease in the production from about 54 thousand tons in 1990 to 10 thousand tons in 2011. Currently, only two out of four large tobacco-processing plants are still operating, and therewith at 30% of their production capacities. It is very likely that tobacco producers are affected by the so-called "curse of smallness" the most, which is also valid for all individual small-scale farmers in the KR[19]. Large negative NRAs indicate a direct taxation of tobacco producers by the governmental policies. An excise tax is applied for tobacco products; however, it was only introduced in 2011. Hence, it could not have contributed to the estimated price distortions. The potential reason for large distortions in the tobacco sector could be linked to the monopoly for cigarette production (as of 2006) according to the WTO report. Kyrgyztamekisi is a state-owned enterprise, which issues licenses to engage in processing and manufacturing raw tobacco. The enterprise also

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[18] Estimates of Nominal Rates of Assistance for the period 2001-2004 for cotton, maize and wheat are broadly consistent with those reported in Christensen and Pomfret (2007).

[19] Small output sizes make it difficult for farmers to find buyers for their produce, to transport produced commodities to markets, or to afford inputs to which prices were also too high relative to their income (Lerman and Sedik, 2009). Thus, it is often the intermediaries undertaking the task of marketing agricultural produce from the farmgate to regional markets or to the border.

administers prices for tobacco leaf (WTO 2006a). Few companies are reportedly engaged in tobacco manufacturing and tobacco exports. They often offer interest-free credits and assistance with seeds and fertilizers for tobacco growers who then have to return the credits at the time of harvest. Preliminary observations show that just in 2011, the domestic price for 1kg of raw tobacco was 65 soms, whereas the world price was 120 soms. The major part of the price difference is attributed to wholesaler/processor margins. The large magnitude of transport and marketing costs related to the smallness of scope also contribute to this price gap. So far it seems that farmers who grow tobacco are highly dependent on tobacco-exporting companies, and can only take prices set by them at the farmgate, as marketing costs of delivering own produce for export are too high to make it worthwhile.

Livestock products

Concerning obtained NRA estimates for milk and wool, there does not seem to be a clear pattern of governmental assistance to these sectors. For milk, assistance was positive though not substantial in the beginning of 2000s, but then became negative in 2004 and remained so over the rest of the studied period. The estimates for wool are rather erratic over the entire period, and magnitudes of distortion estimates are generally not large on both directions. It could be explained by the fact that wool is an exportable product and traded in a relatively undistorted environment. There are no direct policies on markets for milk or wool, and general support to the livestock sector is reduced to efforts targeting improvement in epizootic situation in the country. Kyrgyzstan remained the only net exporter of livestock products in Central Asia (mainly live animals), but most of that trade was claimed to be unregistered (Pomfret 2007). Distortions to domestic meat prices, the most important sector output, are not considered in this study, because the variety and quality differences between the farm gate and the border point seemed to be extremely high. Vegetables and fruits are not included in the NRA analysis for the same reason.

4.3.2 Regression Results

Various regression models were estimated to evaluate the incidence of protection in the Kyrgyz Republic and two of those are presented in Table 3. In the first model, aggregate price ratios are used to investigate the effect of the price ratio of importables to exportables on the relative price between the nontradable and the exportable sectors.

Table 4.3: Regression estimates of true protection models, 2002-2013[a]

Independent variables:	Dep. Variable: $\ln(Ph/Px)$	Dep. Variable: $\ln(Ph/Pxa)$
$\ln(Pm/Px)$	0.522*** (0.066)	
$\ln(Pm/Pxa)$		0.41*** (0.085)
$\ln(Pxna/Pxa)$		0.36*** (0.076)
$\ln(BT/GDP)_{t-1}$	-0.001 (0.012)	-0.002 (0.012)
Constant	-0.321*** (0.054)	-0.212*** (0.048)
F-test	32.23***	25.31***
Durbin-Watson Statistic	1.88	1.61
Adjusted R²	0.62	0.65
Number of observations	40	40

[a] The Cochrane-Orcutt procedure is applied in both models. *** indicates p-value at the 0.01% confidence level. Standard errors are in parentheses. Source: Authors' estimations.

In the second model, agricultural and non-agricultural sectors are considered separately, where the price ratio of nontradables to agricultural exportables is used as a dependent variable and the effect of import protection and non-agricultural export promotion on agricultural export incentives is evaluated. In both models, a significant share of the variation of the dependent variable can be explained by the regression equation.

All incidence parameters estimated, i.e. the coefficients of $\ln(Pm/Px)$, $\ln(Pm/Pxa)$, and $\ln(Pxna/Pxa)$, are statistically different from zero. They have positive signs, too, as in almost all earlier studies of true protection in developing countries and as expected by Dornbusch (1974) and Sjaastad (1980) in their theoretical analyses.

According to the first equation in Table 4.3, a one-percent change in the price ratio between importables and exportables raises the price ratio between nontradables and exportables by 0.52%. A protection of the import-substituting sector induces an implicit tax for the export sector equal to 52% of the import protection. All other prices would rise more in percentage terms than those of the exportable sector. We can conclude for the Kyrgyz economy that protection in the importable sector or an exogenous upward shift on prices of importables will lead to higher percentage increases of the prices in the nontradable compared to the exportable sector. This implies that an import price boom will place the highest relative burden on the export sector.

It is interesting to look at the second equation additionally in which non-agricultural and agricultural exportables are distinguished. The result reveals that both incidence parameters are significantly positive. A one-percent increase in the price of importables as opposed to agricultural exportables raises the price ratio between nontradables and agricultural exportables by 0.41%. Again, agricultural tradables are implicitly taxed if protection in the manufactured sector or an exogenous import price boom occurs. This holds not only relative to the importable sector, but also to the nontradable sector. A one-percent rise in the price ratio of non-agricultural exports relative to agricultural exports leads to an upward change of the price ratio between nontradables and agricultural exportables by 0.36 %. This means that, e.g., a price boom on the gold market will deteriorate the price of agricultural exportables not only relative to the booming sector but also relative to the nontradable sector. The econometric evidence points to the existence of several intersectoral linkages and to the importance of Dutch-disease phenomena in the Kyrgyz economy.

The coefficient estimate of the combined balance-of-trade and income variable $\ln(BT/GDP)_{t-1}$ was not statistically significant, which means over the years considered in this analysis it did not have a significant impact on the price ratio of nontradables to exportables.

In order to check for the robustness of estimated results, different specifications of regression models have been performed. In all of the models, the estimated incidence parameters were positive and statistically significant, and the magnitude of the coefficient estimates was very similar to those presented in Table 4.3.

4.4   Conclusion and policy implications

The goal of this paper was to analyse the impact of agricultural policies and changing macroeconomic conditions on agricultural incentives in the Kyrgyz Republic. Nominal Rates of Assistance were estimated in order to quantify the direct distortions to agricultural prices resulting from the policies in the agricultural sector. In the second step, the true-protection concept was employed in order to analyse the implications of changing macroeconomic conditions and economy-wide policies on agricultural incentives in Kyrgyzstan.

Summarizing the findings on governmental support to agriculture over the years since independence, one could conclude that the assistance to farmers has been concentrated mostly to input-related support. Approaches applying output market interventions have been adopted only in 2008. However, their effect on market prices remains unclear because of limited resources available for implementing these instruments. The NRA estimates show that deviations of domestic prices from international prices of agricultural commodities exist in both positive and negative directions. NRAs for wheat, potatoes and maize are generally positive pointing at a support or encouragement of food crop production from the government to achieve food self-sufficiency goals. Furthermore, according to the NRAs, tobacco is prone to the highest price distortions compared to other crops. These distortions are likely to come from the existing system, where only few corporations are entitled by the government to purchase the raw tobacco from farmers and to further market and export this commodity. Lacking detailed information on domestic trade costs, the implications derived from the magnitude of distortion estimates have to be made carefully. But based on both the summary of agricultural policies and the estimates of NRAs, it seems safe to conclude that the governmental support to farmers in total and to specific branches of the agriculture is not based on a continuous medium-run policy of market price support. There were many individual policy actions for individual years or a few years which were then revised again. Despite this discontinuous policy approach, food crops seem to be favoured compared to tradable agricultural products based on the sum of agricultural policy measures and a lack of market integration of the exportables. Political instability in the KR has caused frequent changes in the government composition (15 times over the last 23 years). This was obviously a major obstacle for consistent policy development and implementation not only in

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the agricultural sector, but also in the rest of the Kyrgyz economy.

Regression results demonstrate that a significant part of the increase in the prices in the importable sector is shifted on to the exportable sector as an implicit tax. This finding suggest that for the case of the Kyrgyz economy, protection in the importable sector or an exogenous upward shift on prices of importables will lead to higher percentage increases in the nontradable compared to the exportable sector, i.e. an import price boom will place the highest relative burden on the export sector. When non-agricultural and agricultural exportables are distinguished in the regression model, the results show that agricultural tradables are implicitly taxed with protection in the manufactured sector or if an exogenous import price boom occurs. This means that, e.g., a price boom on the gold market will deteriorate the price of agricultural exportables not only relative to the booming sector but also relative to the nontradable sector.

Strong intersectoral linkages between the prices in the nontradable and tradable sectors have straightforward implications for designing future policies, as they indicate the extent by which each sector would be affected by a certain commercial policy or a general macroeconomic development that affects prices in the importables sector. Since the Kyrgyz government seeks to promote exports, findings from the present study could serve as a useful scientific background for future trade and agricultural policy development.

5 The impact of international migration and remittances on crop production and rural welfare in the KR[20]

5.1 Introduction

International migration is omnipresent in today's world. It plays an important role in the development of both countries that supply and countries that receive worker migrants. This study contributes to research on the impacts of international migration on the economic development of "sending" countries.

Similar to neighbouring countries in Central Asia, the Kyrgyz Republic has experienced large labour out-migration over the last two decades. Poor economic prospects and unemployment were among the major drivers of out-migration in the KR (IOM 2006). The amount of remittances sent home by migrants has also increased sharply. In 2013, the share of workers' remittances to GDP was 31.4%, ranking as the second highest in the world after Tajikistan (World Bank 2014). There are both positive and negative effects to be expected from increasing out-migration in the KR. The large number of migrants (between 0.25 to 0.5 million people in a country of 5.7 million according to IOM (2006)), most of which come from rural areas means less labour for agriculture, whereas the large amount of remittances have certainly contributed to improved livelihoods for migrant households and have become an important source of foreign exchange for the Kyrgyz economy as a whole.

Theoretical research on international migration and its impacts has not achieved consensus yet. Within the last half-century, views on migration impacts on economic development of sending countries have shifted back and forth from very pessimistic to more positive expectations (De Haas 2007). The models of Todaro (1969) and Harris and Todaro (1970) are usually referred to as the basis for neoclassical migration theory, in which migration is a function of expected income differential between sending and receiving communities (e.g. rural and urban sectors). The later modifications of the Harris-Todaro model included human capital characteristics, as

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[20] This chapter is based on the paper that was co-authored with Prof. Dr. Roland Herrmann and is currently under a peer-review process.

well as costs and risks related to migration to explain different propensities to migrate (or selectivity of migration) (De Haas 2007). The argument that international migration is mainly driven by wage differences also implies that migration can be controlled through regulation of labour force in receiving and sending countries, whereas the influence of other markets on migration flows is ignored (Massey *et al.* 1993). These views have been criticized as far from realistic in the context of market imperfections in developing countries, where, for instance, constraints in capital or insurance markets can also play an important role in migration (De Haas 2007, Massey *et al.* 1993).

In the New Economics of Labour Migration (NELM) which emerged in the 1980s, the role of market failures and imperfections was introduced in explaining migration and its impacts on sending communities in developing countries. Migration is seen as a joint household decision and as an instrument to diversify household income in response to uncertainty and risk, whereby remittances can fulfil the role of insurance and source of capital in countries where these markets are of limited access (Stark 1991, Stark and Bloom 1985). The NELM hypothesis related to rural productivity implies that migration through remittances can help rural households overcome financial constraints and achieve transition from smallholder to commercial production (Stark 1991). At the same time, removal of labour from local production to migration is not necessarily replaced in the case of limited labour markets (e.g. smallholder farming based on family labour) and thus can lead to a reduced local production due to migration (Stark 1991). Studies which investigated the impact of migration on rural productivity reported mixed results. Many argued that migration had an overall negative impact on agricultural or crop income (Rozelle *et al*. 1999, Taylor *et al*. 2003, Atamanov and van den Berg 2012) and farm technical efficiency (Sauer *et al*. (2015), whereas others concluded that migration did not lead to substantial agricultural change in the smallholder agriculture context (Jokisch 2002, Gray 2009).

The goal of this study is to look at the impact of international migration and remittances on rural welfare on the microeconomic or household level. We empirically test the effect of international migration on different indicators of agricultural production and overall households' welfare, such as crop production and crop income, assets and livestock, as well as the total income of the household farm. How does international migration affect crop production of smallholder farmers in the Kyrgyz Republic? What is the impact of remittances on crop production? What is the

overall impact of international migration on crop production and rural welfare in total? It is these questions that this paper attempts to answer using the cross-sectional data on smallholder household farms from the Kyrgyz Republic. In order to do so, we first estimate jointly a system of equations for crop production, number of migrants and remittances with a General Method of Moments Three-Stage-Least-Squares (GMM 3SLS) estimator. Even if migration would negatively affect households' crop production or crop income, the overall impact of migration on households' economic welfare could be positive through the inflow of remittances. In the second step, we employ the Propensity Score Matching (PSM) method to check for the average effect of international migration on a number of indicators of rural households' welfare, such as total household income, income from non-agricultural enterprises and asset endowments. The ultimate goal of the paper is to explore and gain deeper understanding of the wider developmental impacts of international migration and remittances associated with it on rural communities in the Kyrgyz Republic which are also the main source of Kyrgyz migrants going abroad.

Our study contributes to current research in several ways. First, we extend the previous study by Atamanov and van den Berg (2012) by elaborating the impact of international migration on additional indicators of rural welfare rather than only crop income. Second, using a more up-to-date household survey, we can also control for more independent variables to explain crop production value and crop income compared to the previous study. Finally, we argue that using crop income as an indicator for total crop production can be inadequate in the case of semi-subsistent farming and empirically show that the impact of international migration on the total crop production value can be substantially different compared to crop income. In the results section we elaborate on the reasons why this could be the case.

This paper is organized as follows. The next section looks at the theoretical framework for explaining the effect of migration on agricultural production, whereas Section 5.3 revises empirical findings on the impact of migration and remittances on agricultural production. Section 5.4 presents the estimation approach, describes data and variables used in the empirical model. Socio-economic characteristics of migrant workers, migrant and non-migrant households and their agricultural production are described in Section 5.5. Results of empirical modelling are presented and discussed in Section 5.6. Section 5.7 concludes.

5.2   International migration and a farm household: Theoretical considerations

Depending on the proportion of family labour versus hired labour input used and the proportion of output sold versus consumed at home, Nakajima (1986) differentiates between four types of farms: a farm household, a subsistence production farm, a farm firm and a commercial farm. Based on this classification, most farms in the KR can be referred to as "farm households", which means that they consume a large proportion of their output at home and use mostly family labour for agricultural production. This definition has important implications for our theoretical analysis.

Suppose that a farm household's utility function is given as follows:

$$U = U\,(A, Y) \tag{5.1}$$

where A is family labour and Y is the total income of the farm household in kind and in cash. It is assumed that $U_A < 0,\ U_Y > 0$ (Nakajima 1986).

A farm household can allocate its family labour between farm work (A_f), migration (A_m) and leisure (L).

$$A = A_f + A_m + L \tag{5.2}$$

Due to the non-separability condition (Singh et al. 1986), i.e. no perfect substitutability for family labour[21], an increase in A_m will likely reduce A_f. There is a potential trade-off between migration and agriculture (Wouterse and Taylor 2008). The expectation that migration would reduce labour used in farm work and thus negatively affect farm production has been outlined within the New Economics of Labour Migration (NELM) framework by Stark and Bloom (1985).

The total income of the farm household (Y) consists of farm income (Y_f) and income from migration (Y_m), i.e. remittances:

$$Y = Y_f + Y_m \tag{5.3}$$

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[21] Labor markets are likely to be constrained in the sense that familial labor is not easy to replace with hired labor which might be more expensive and less-productive or even not available in the developing country context.

Another expectation within NELM is that an increase in Y_m can lead to an increase in Y_f. First, remittances sent by migrants can be invested in high-return activities because liquidity and credit constraints can be resolved. Moreover, migration is also seen as an instrument to diversify farm household's income portfolio to reduce uncertainty and risk. Thus, just having a migrant abroad plays a role of insurance and can allow a farm household to invest in riskier activities which yield higher returns (Stark and Bloom 1985). Hence the positive effect of remittances on total farm household income might lead a multiplier effect, if remittances bring more investments.

The effect of Y_m on Y_f can also be negative. Because of increasing remittances, incentives to work in agriculture may decrease. Since $U_A<0$, an increase in total income (Y) will reduce the equilibrium amount of family labour input for a farm household. An increase in total income is associated with an increase in the marginal valuation of family labour, thus in order to keep the same utility level, the amount of family labour input can be smaller than before the increase in total income took place. This also implies that while migration and remittances can reduce farm income, total income may still be increased from remittances.

Farm income is given by a production function, where X refers to farm household characteristics, production inputs and assets which also affect farm income:

$$Y_f = f(A_f, A_m, Y_m, X) \tag{5.4}$$

Under the assumption of perfect markets, the effect of A_m and Y_m on Y_f would be zero because hired labour would perfectly substitute for the lost-labour effect from migration and no credit or insurance constraints would be binding. In the context of imperfect markets and market failures facing smallholder farm households such as in the KR, the effect of A_m and Y_m on farm income is expected to be nonzero. Yet the direction of their impact on farm income would be an empirical question due to the reasons stated above.

5.3 Past research on the relationship between migration, remittances and crop production

Researchers who looked at the impact of migration on rural production reported mixed results. Some claimed that migration had an overall negative effect on crop production or income (Rozelle *et al*. 1999, Taylor *et al*. 2003, Atamanov and van den Berg 2012). Others argued that migration did not lead to substantial agricultural change in a smallholder context (Jokisch 2002, Gray 2009). It has also been shown that even if the effect of migration on agricultural output was negative in the short run, this could become positive in the long term. Lucas (1987) showed for the case of Botswana, Lesotho, Malawi, Mozambique and the South African "homelands" that migration was linked to smaller crop production in the short run, yet in the long run it improved crop productivity and livestock accumulation when workers' remittances have been invested.

Sauer *et al.* (2015) looked at the effect of outmigration (measured by migration intensity) on farm efficiency in rural Kosovo and found that migration diminished farm efficiency. The effect was even larger for households with better educated family members. Moreover, since only a small part of remittances had been invested in improving agricultural assets, it was not likely that remittances had any significant compensating impact on farm technical efficiency (Sauer *et al.* 2015). However, the latter conclusion was based not on an empirical test of the effect of remittances on farm technical efficiency, but was rather an expectation based on descriptive analysis.

Some studies doubted that international migration would strongly affect agricultural output, especially in the context of smallholder farming which proved to be resilient to different types of shocks (Jokisch 2002). In his research on international migration in Ecuador, Jokisch (2002) found that migration did not lead to any significant change in agriculture despite the loss of labour and substantial amount of remittances received by migrant households. Migrant households were more likely to spend remittances to "demonstrate one's success with a large home", rather than using them for cultivation, which was not considered by households as profitable investment (Jokisch 2002). Another study on Ecuador reported that remittances were associated with higher use of chemical inputs, hired labour and, consequently, with larger yields (Gray 2009). However, similar to Jokisch (2002), Gray (2009) concludes that despite these

effects, overall, out-migration and remittances did not seem to lead to substantial changes in smallholder agriculture.

Simultaneous positive and negative effects from international migration on agricultural output were reported by several studies (e.g. Rozelle *et al*. (1999), Taylor *et al*. (2003) and Atamanov and van den Berg (2012)). Rozelle *et al.* (1999) looked at the effects of migration and remittances on maize yields in China and found that migration in total had significant negative effect on yields, despite the countervailing positive impact of remittances. Using the same dataset as Rozelle *et al*. (1999), Taylor *et al*. (2003) applied a slightly different approach by differentiating between different sources of income of rural households in China and found that migration was not associated with smaller crop yields, but it did have a negative effect on crop income of households, although remittances compensated for part of this loss. Wouterse and Taylor (2008) found that migration impacts were different depending whether migration was continental or intercontinental in Burkina Faso. Whereas continental migration did not have a significant impact on agricultural and livestock activities, intercontinental migration was negatively associated with staple crop production and nonfarm activities. At the same time, intercontinental migration was also a source for larger remittances and led to improved livestock production in rural areas of Burkina Faso (Wouterse and Taylor 2008).

To our best knowledge, the only study on the impact of international migration on crop income in the Kyrgyz Republic has been conducted by Atamanov and van den Berg (2012). Similar to Taylor *et al*. (2003), the authors found that international migration led to a significant decrease in crop income, whereas remittances had a positive impact on crop income balancing out the lost-labour effect. The effect of remittances differed depending on the land size and was smaller for larger farms (Atamanov and van den Berg 2012). Moreover, the total effect of migration (the lost-labour effect plus effect of remittances) was also different depending on whether migration was seasonal or permanent: in total, permanent migration led to a reduction of crop income, whereas seasonal migration was associated with higher crop income (Atamanov and van den Berg 2012).

Migration literature contains studies which differentiate between seasonal and permanent migration (Atamanov and van den Berg (2012), continental and inter-continental migrants

(Wouterse and Taylor 2008), and short and long-term effects of migration on rural production (Lucas 1987). The long-term effect of migration cannot be captured with our cross-sectional data, whereas seasonal and intercontinental migration seems of little relevance with regard to international migration in the Kyrgyz Republic, where the majority of migrants leaves to Russia. Main occupations of migrants are in the service sector, including construction, which means that the peak activities in the destination area and in local production coincide (Atamanov and van den Berg 2012) and moreover, the costs of returning home to help with local (crop) production would be very high compared to returns.

Previous literature investigating microeconomic impact of international migration on agriculture used either yields for a specific crop or crop income per farm household as an indicator for crop production. We claim that neither of these indicators is perfect for this purpose in the context of smallholder agriculture. First, since a farm household consumes also part of its crop output, crop income will not include the in-kind income from crop production, but only cash income and thus it will not capture total income from crop production. Yields for a specific crop would also not reflect total crop production, because usually smallholder farm households do not focus on a single crop, but rather undertake diverse cropping activities. Therefore, we use the total crop production value as a proxy for total crop production, calculated as the amount harvested for each crop by a farm household multiplied by the average producer price for that crop. Contrary to Atamanov and van den Berg (2012), we argue that a negative impact of international migration on crop income does not necessarily imply that the total crop production of the household decreases. Moreover, extending the discussion of developmental impacts of international migration in the KR, we additionally test for the effect of migration on several indicators of rural economic welfare, such as total income, livestock and physical assets, as well as income from non-farm enterprises. This allows us to have a broader view on the complex relationship between international migration and rural production and welfare.

5.4 Methodological framework and data

5.4.1 Estimation approach

5.4.1.1 Estimating a simultaneous system of equations

Our estimation strategy consists of two parts. First, we estimate *Crop production value* (and *Crop income*), *Number of migrants* and *Remittances* together in a system to examine the effect of both outmigration and remittances on crop production. In the second stage, we use the Propensity Score Matching (PSM) method to estimate the Average Treatment Effect on the Treated (ATT) of international migration on different indicators of households' economic welfare, including households' total income and asset endowment.

We estimate a system of equations for *Crop production value* (and *Crop income*), *Remittances amount* and *Number of migrants* following the model of Rozelle *et al*. (1999):

$$Y^C = \gamma_0 + \gamma_1 M + \gamma_2 R + \gamma_3 Z_Y + \varepsilon_Y \qquad (5.5)$$

$$R = \alpha_0 + \alpha_1 M + \alpha_2 Z_R + \varepsilon_R \qquad (5.6)$$

$$M = \beta_0 + \beta_1 Z_M + \varepsilon_M \qquad (5.7)$$

where Y^C is *Crop production value* (*Crop income*), R stands for *Remittances amount*, M stands for *Number of migrants*; Z_i *(i=Y, R, M)* stands for households' demographic, human- and physical-capital variables. The system is estimated with a Generalized Method of Moments Three Stage Least Squares (GMM 3SLS) estimator, which allows to address issues of endogeneity (migration and remittances are endogenously determined with crop production value), takes into account cross-equation correlation and is more efficient in the presence of heteroscedasticity compared to other system estimation methods, e.g., the Three Stage Least Squares (3SLS) estimator (Wooldridge 2002, Greene 2003).

Since households make a decision about whether to send a migrant(s) abroad or not based on different factors, including asset endowments and preferences, selectivity of migration is rather explicit (Stark and Bloom 1985). Hence, the migration decision is non-random and implies that households with migrants and households without any migrants abroad are very likely to be

systematically different from each other according to various socio-economic characteristics which influenced the migration decision in the first place. This complicates the estimation of the impact of migration on crop production (crop income/total income or any other outcome variable) and requires an appropriate measure to account for a self-selection bias. McKenzie *et al.* (2010) conducted a study comparing different non-experimental methods which have been used to deal with the self-selection bias in estimating income gains from migration. The conclusion was that using a good instrumental variable and propensity score matching helped best in reducing the self-selection bias (McKenzie *et al.* 2010)[22]. Both tools are employed in this study to achieve robustness of our results.

5.4.2 Estimating Average Treatment Effects on the Treated (ATTs) with PSM

In order to estimate and compare effects of international migration on different indicators, as well as to assure robustness of results from the first step, we estimate the Average Treatment Effect on the Treated (ATT) using propensity score matching (PSM). PSM will allow us to double-check the results from the first stage, by using a different way to estimate the average effect of international migration on *Crop Production Value* and *Crop Income*. At the same time, in order to check the effect of migration not only on crop production, but on the overall economic welfare of the household as well, we estimate the Average Treatment Effect of international migration on different "outcomes", such as total value of assets, total value of livestock owned, and total income of a household farm. The households can be divided into treated (with a migrant) and untreated (without a migrant) groups.

Our parameter of interest is the difference between the outcome for a household *I* that has received a treatment ($Y_{1i}/D=1$) and the hypothetical outcome for the same household *I* had it not

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[22] Other methods which have been tested by McKenzie *et al.* (2010) included single-difference estimator and difference-in-differences approach. Yet, all of the tested measures, including the instrumental-variable approach, overstated the effect of migration on income compared to the estimates based on experimental data (McKenzie *et al.* 2010).

received a treatment $(Y_{0i}/D=1)$[23]:

$$E(Y_{1i}-Y_{0i}/D=1) = E(Y_{1i}/D=1) - E(Y_{0i}/D=1) \qquad (5.8)$$

Since $E(Y_{0i}/D=1)$ cannot be observed in reality, we need to construct an appropriate counterfactual or a control group (Sianesi 2001, Caliendo and Kopeinig 2008).

According to the "unconfoundedness" assumption, given selection into treatment is based on a set of observed covariates X, and given we can control for them in our dataset, the potential outcomes Y_{1i} and Y_{0i} are independent from the treatment (Rosenbaum and Rubin 1983, Caliendo and Kopeinig 2008):

$$Y_{1i}, Y_{0i} \perp D/X, \forall X \qquad (5.9)$$

Hence, if we can select a control group among the non-treated households such that the distribution of observed covariates X is as similar to that of a treated group (i.e. balance or match two groups according to X), we can potentially remove the self-selection bias and can infer that the difference between the treated and a control group is truly from the treatment and not due to all other differences between those groups.

In the Propensity Score Matching, this balancing is done through a propensity score, which is estimated as the conditional probability for an individual household to receive a treatment (to have a migrant abroad) given a set of observed covariates (Rosenbaum and Rubin 1983):

$$p(X)=P(D=1/X) \qquad (5.10)$$

$$0< P(D=1/X)<1 \qquad (5.11)$$

where expression (5.11) is the so-called common support condition which ensures that households with similar X have a chance of both receiving and not receiving a treatment (Rosenbaum and Rubin 1983).

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[23] In our case, we would like to find out what would have happened to a migrant household in terms of crop production (or any other outcome) had it not sent a migrant abroad.

Assuming that both the unconfoundedness and common support conditions hold, the Average Treatment Effect on the Treated (ATT) using PSM is estimated as (Caliendo and Kopeinig 2008):

$$ATT^{PSM} = E_{P(X)/D=1}\{E[Y_{1i}/D=1, P(X)] - [E(Y_{0i}/D=0, P(X)]\} \tag{5.12}$$

Thus ATT is the mean difference of outcomes between treated and non-treated groups after the groups have been balanced based on the propensity score. The ATTs have been estimated with a PSM command **psmatch2** in Stata.

5.4.3 Data source and description of variables

The data used in this paper stem from the "*Life in Kyrgyzstan*" (LiK) panel survey conducted between 2010 and 2013 by the German Institute for Economic Research (DIW Berlin), the Centres of Social and Economic Research SOCECONIC and CASE-Kyrgyzstan. The LiK survey has been implemented on individual, household and community levels. For this study we employ mostly the household cross-sectional data for 2012 (the only wave/year with detailed information on agricultural production), and, to a limited extent, individual data to capture certain socio-demographics for household heads and migrants, as well as information on individual subjective well-being used as an instrument for remittances.

LiK is a country-wide survey. The overall sample in 2012 included 2 816 households from all 7 oblasts in the country, covering both urban and rural population (41% and 59% respectively). The household section of the survey covers information on the socio-economic situation of the households, agricultural production and markets, consumption, expenditure and income sources, shocks that households are exposed to, as well as migration and remittances. Since our primary goal is to analyse the impact of migration on crop production, we include only those households from the survey which were involved in crop production activities, which makes 1 224 households. 17.4% (213 households) of these had one or more migrant abroad.

Crop production value is calculated in order to aggregate the overall amount of crops produced by a household farm. *Crop production value* is calculated as the sum of amounts harvested for each crop by a farm household multiplied by the average producer price for that crop. The LiK survey allows us to use average producer prices at the community level. For those crops, for which producer prices are not available from the LiK survey, we use National Statistical

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Committee producer price data at the regional (*oblast*) level. Another possibility would be to compare yields or productivity of individual crops between migrant and non-migrant households. However, our data show that Kyrgyz farmers do not focus on specific crops, but demonstrate relatively high diversification while the most important crop for each household farm varies widely across the regions within the KR. Moreover, comparing migrant and non-migrant households according to production of a specific crop would not cover the information on all other cropping activities of the household, and would reduce the sample size for the analysis substantially.

Remittances amount and *Number of migrants* are the dependent variables for equations (5.6) and (5.7) respectively from the system of equations described in the previous section. Control variables common for all three equations include: socio-demographics and assets (Household Size, Age of the Household Head, Age of Household Head squared, a dummy for a university degree of a household head, Dummy for Kyrgyz Ethnicity, Total Value of Assets and Land under crops per capita); infrastructure variables (distance to the nearest road, distance to the nearest market, and distance from the plot to the dwelling); shocks that households have experienced during the study period (the number of weather and climate shocks, the number of family-related shocks, and the number of shocks related to socio-economic and political situation), and regional fixed effects (dummies for *oblasts*/regions in the KR). Equation (5.5) also includes in addition variables reflecting the use of different inputs for crop production (Dummy variables for irrigation, fertilizer use and machinery use). *Remittances* were instrumented using the variables *Subjective Well-being of the Household*[24] and *Activeness of Participation in Financial Groups*[25]. Some studies recommend using village norms to remit to instrument *Remittances amount* (e.g.

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[24] This variable is a factor score calculated from 4 original variables: *Overall Satisfaction with Life of a Household Member*, *Relative Overall Situation of a Household Member*, *Satisfaction with Current Economic Situation of the Household*, and *Satisfaction with Relative Economic Situation of the Household*. Responses from adult members of the household are aggregated and then used to create one factor score, higher values of which indicate overall better well-being of a household as perceived by household members themselves.

[25] It is a factor score calculated from variables: *Number of adults per household participating in credit or saving groups* and the *Hours per month spent by household members with the credit or savings group*.

Rozelle *et al*. 1999). However in our case, this variable, calculated as the average amount of remittances per community (village) excluding the observed household, turns out to be correlated not only with *Remittances amount*, but also with *Crop production value* as well. Thus, it cannot be used as an instrument for *Remittances amount*. *Number of migrants* was instrumented with variables *Activeness in social or political organizations*[26] and *Reliance on family and friends as the main source of information*[27]. All models pass Hansen's *J* test of overidentifying restrictions indicating that variables used to instrument *Remittances amount* and *Number of migrants* are correctly excluded from the corresponding equations.

The model used to estimate propensity scores is the same as equation (5.7), only the dependent variable now is a binary variable, *Migration Dummy* (equals "1", if a household has at least one migrant abroad, and 0 otherwise).

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[26] Again, this variable is a factor score calculated from the number of adults per household participating in (each a separate variable): an NGO, a civic group, a political party or a local self-defense unit and hours spent in total by household members with each of these groups.

[27] A factor score generated from variables: Number of adults whose main source of information are family members and Number of adults whose main source of information is friends and colleagues. Higher values indicate stronger reliance on these sources of information on "issues related to the community, Kyrgyzstan and the world" (as defined in the LiK questionnaire). This factor is negatively correlated with reliance on media and internet as the main source of information.

5.5 International migration and agriculture in the KR: Insights from the LiK survey

5.5.1 Migrants from the Kyrgyz Republic

According to the LiK dataset, 14.7% out of 2816 interviewed households in 2012 had at least one migrant abroad (referred further as "migrant households"). In the same year, 73.2% of migrant households came from rural areas. The share of households involved in agricultural activities in the total sample (of 2816 households) was 44%. Among migrant households the same share comprised 54%. This number was higher for migrant households because the majority of migrants came from rural areas, where many households undertook agriculture for their livelihoods (68% of all rural households were involved either in crop production and/or livestock grazing).

Figure 5.1: Characteristics of migrants
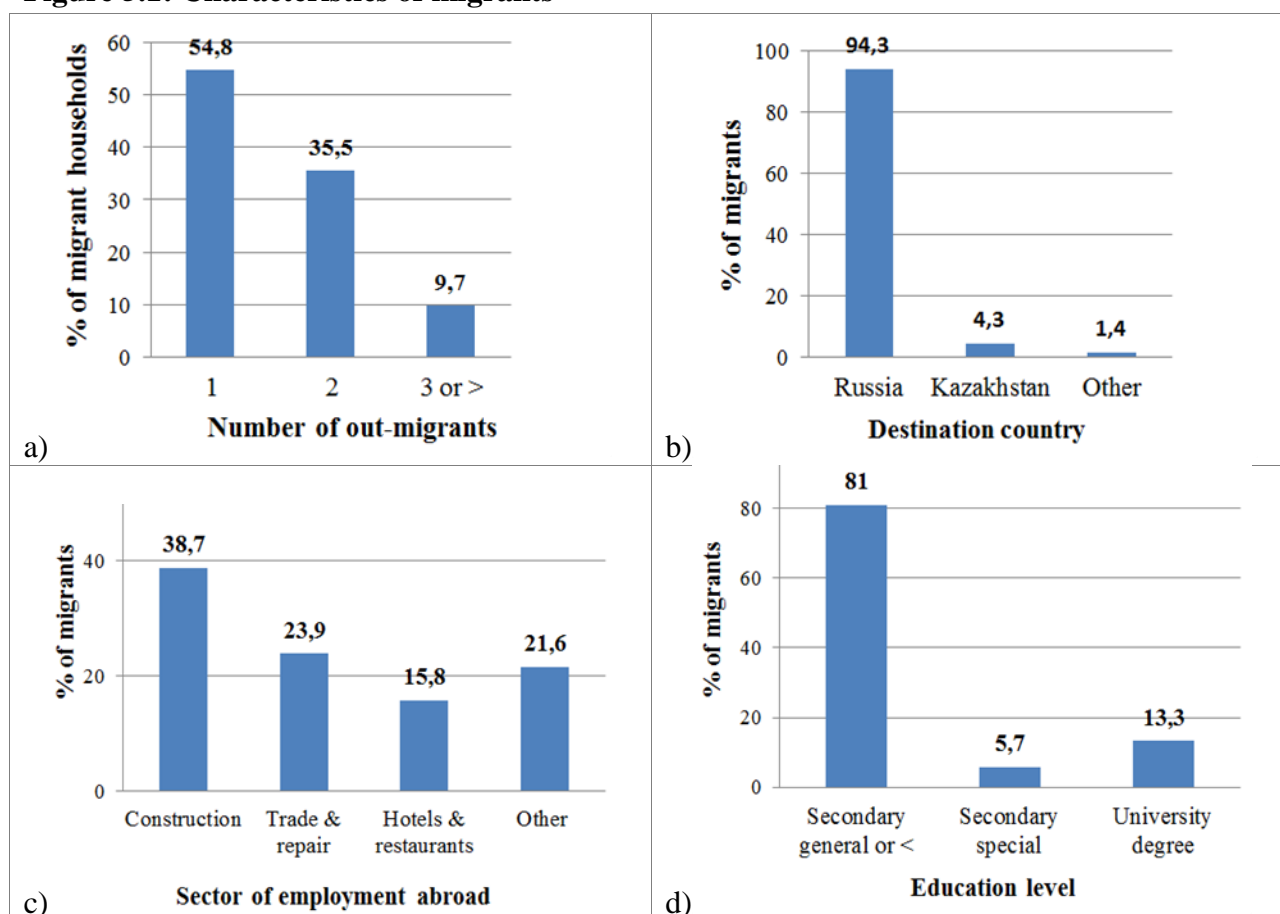
Source: Own illustration based on the LiK data

Most of the migrant households had one or two members abroad, a majority of which left to

Russia and were employed in construction or services sectors (Figure 5.1). Only 13.3% of migrants had a university degree (Figure 5.1d). Most of the migrants used their savings (54.6%), help from family members and loans from relatives (24.6%) or sold assets (7.2%) to fund travel costs to go abroad (LiK dataset). Family, relatives or friends abroad (71%) were migrants' main source of information on migration.

5.5.2   Differences between migrant and non-migrant households

If we are to analyse the effect of migration and remittances on crop production, we have to account for effects of all other factors that also influence crop production in the Kyrgyz Republic. The question is whether the households which decided to send migrants abroad differ significantly from the households which did not have any international migrant. In this paragraph we divide households into two groups, i.e. migrant and non-migrant, and analyse differences between these groups according to various aspects. It is very likely that some factors influencing crop production were also important drivers of migration. As we can see in Table 5.1, there are a number of different characteristics by which an average migrant household differs from an average non-migrant household. First, it seems that migrant households have a larger household size (before migrants left), and the size of migrant household after migration is significantly smaller than that of a non-migrant household. Moreover, migrant households seem to be relatively better-off than non-migrant households judging by the value of physical assets (total value of real estate, vehicles, household assets) and total income per month, whereas value of livestock owned was about the same for both groups. Migrant households have a significantly smaller size of crop land per household and per capita than non-migrant households.

Land size as an indicator for land scarcity is expected to be one of the important determinants of migration. A simple comparison of means of indicators of total crop production (crop income and crop production value) does not reveal any substantial differences between migrant and non-migrant households. However, it has to be noted that the mean crop income is almost as high as the mean crop production value, although for subsistent and semi-subsistent household farms the value of crops sold and particularly the income from selling crops would be expected to be much smaller than the total crop production value. This leads to a guess that crop income asked from the farmers in the survey might indicate total cash revenues from crop sales for the given period

rather than income generated from crop enterprises, and it would not reflect the extent of total crop production.

Table 5.1: Socio-economic characteristics of non-migrant and migrant households

	Non-migrant	Migrant	Mean Difference
	(1)	(2)	(1)-(2)
Household size	5.54	6.49	-0.95***
Household size minus migrants	5.54	4.90	0.64***
Age of household head	52.9	55.7	-2.76***
Schooling years, HH head	9.56	9.66	-0.092
Physical assets, value	93 369	136 097	-42 727***
Value of livestock	149 726	144 037	5689
Crop land	1.21	0.82	0.39***
Crop land per capita	0.41	0.32	0.091***
Crop income annual	43 264	46 167	-2902.5
Crop production value annual	60 247	67 418	-7171
Income from off-farm employment per month	4 023.7	2 579.7	1 444***
Total income per month	12 498.8	17 082.6	-4 584***

Source: Own estimates based on the LiK data. N stands for number of observations; *,**,*** significant at 0.1, 0.05 and 0.01 confidence levels respectively.

Income from off-farm employment was much higher for non-migrant households suggesting that the lack of off-farm income was likely to be associated with migration (Table 5.1). Overall, migrant households had significantly higher total income per month than non-migrant households potentially benefiting from the inflow of remittances from migrants abroad.

Migration rates (the number of migrant households over the total number of households) differ considerably among oblasts. Higher population density, smaller land size per household and higher poverty rates in the South are potential reasons for large out-migration in this part of the country. Average poverty rate in 2014 in southern oblasts (Osh, Batken, and Jalalabad) was 39.6% compared to 30.6% average figure for the whole country (NSC 2015). Figure 5.2 indicates a negative correlation between the land available for crops and migration intensity across the

regions in the KR.

Figure 5.2: Average crop land and migration rate across regions
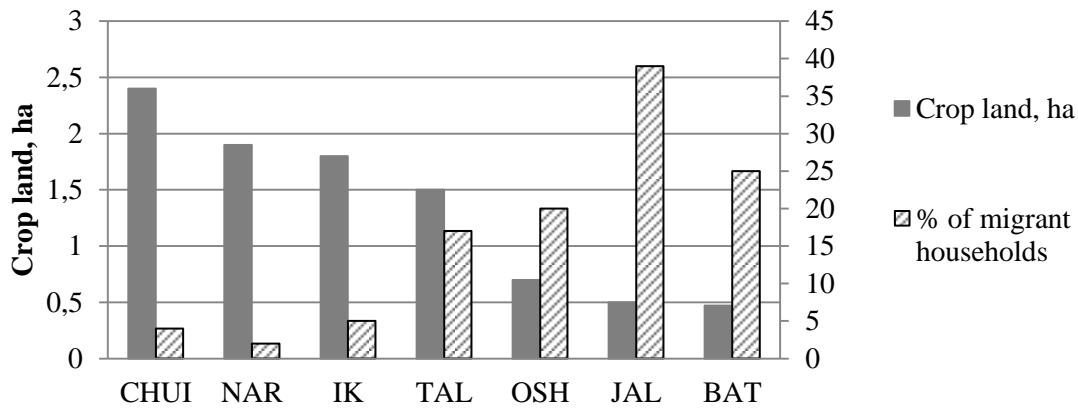
Source: Own illustration based on the LiK data

The size of land available per household differs strongly between the regions in the Kyrgyz Republic. It is linked to land privatization and redistribution processes of the 1990s. Because of higher population density and limited availability of irrigated land, farm households in the southern oblasts (Osh, Batken, and Jalalabad) had on average less land at their disposal than household farms located in the northern region (Pomfret 2006).

If migration affects crop production via removed labour, the amount and type of crops produced are likely to be affected, too. Table 5.2 shows comparisons of mean amounts produced of different crops between non-migrant and migrant households. Only mean production of potatoes was substantially higher for non-migrant households, whereas for all other crops the mean differences were not significant (Table 5.2). Information on the use of production inputs for specific crops is not captured in the LiK dataset.

Moreover, the number of observations for some crops is relatively small, for instance, for cotton, tobacco or beans (Table 5.2), which makes it difficult to analyse the effect of migration on yields for individual crops. This is one of the reasons why we use aggregated numbers such as crop production value or crop income per household farm in order to estimate the effect of migration on crop production.

Table 5.2: Production of crops by migrant and non-migrant farm households

Crops produced, kg	Total N	Non-migrant		Migrant		Difference
		Mean	N	Mean	N	
Wheat	243	1698	206	1376	37	322
Grains	417	1736	311	1564	106	171.5
Potatoes	732	2091	623	1424	109	666**
Beans	72	1182	60	1764	12	-582.2
Apples	462	810	369	704	93	106
Tobacco	50	695	41	622	9	72.9
Cotton	45	1831	26	2287	19	-455

Source: Own estimates based on the LiK data. N stands for number of observations; ** statistically significant at 0.05 confidence level.

5.5.3 Remittances

Within the study sample, 86% (178 households) of migrant households received remittances from their family members who were working abroad in 2012. We estimate the total inflow of remittances as the sum of money transferred through a bank/transfer agency or carried by migrant/relatives/friends and the value of goods that a migrant sent or brought home from abroad (only seven households received goods). On average, a migrant household has been receiving remittances for 11.7 years indicating also a relatively long migration experience of households with migrant(s) abroad. Among households which received remittances, 27% relied more on remittances than a year ago, for 34% it stayed the same, and only 8.9% responded that they relied less on remittances than a year ago. A majority of migrant households (65%) believed that remittances helped to improve the education level and the health situation of a household.

Migrant households have also been asked about spending of remittances. The way households use remittances has important implications on the overall effect of migration and remittances on economic development of migrant-sending communities. The bars in Figure 5.3 show the percentage of households which replied "Yes" when asked whether the remittances were spent for given purposes (e.g. current expenditure, education, etc.).

A majority of households (55.5%) used remittances to finance current expenditures, e.g. food, electricity or rent. A large group of migrant households (41.1%) put part of the remittances into

savings.

Figure 5.3: Spending of remittances by migrant households
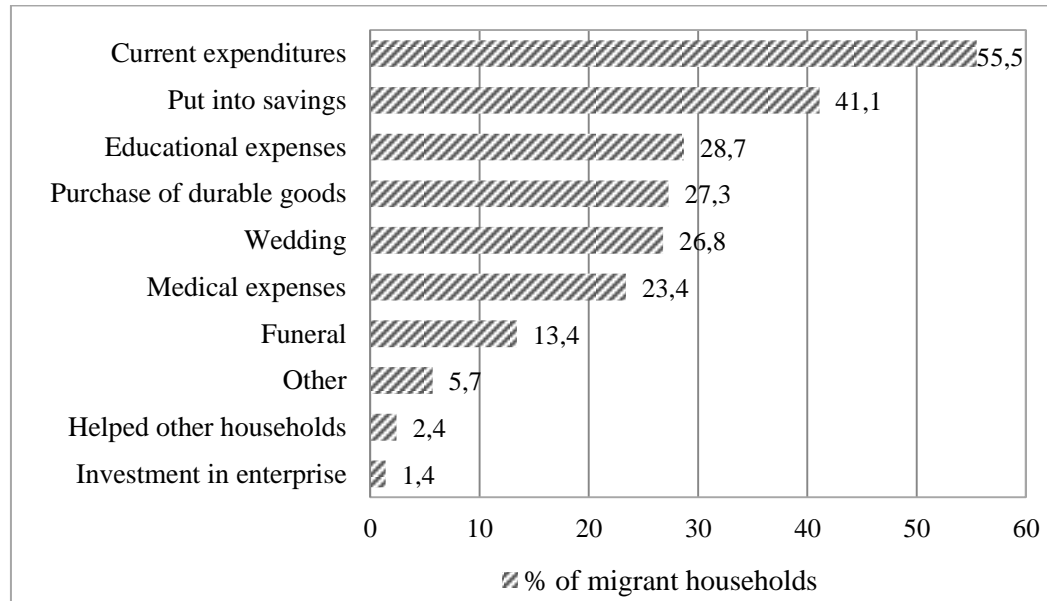
Source: Own illustration based on the LiK data.

Many used remittances to finance education of household members (29%), medical services (23.4%) or to pay for big festivities or events. Reeves (2012) points out the magnitude of expenses on weddings and other festivities in the Batken oblast in the KR that in the case of some migrant households used up remittances earned for several years. The same picture seems to be common for other parts of the country. Only 1.4% of migrant households indicated that they have invested remittances in an enterprise (including agricultural activities).

5.6 Empirical estimation of the impacts of international migration

5.6.1 GMM-3SLS results

Different specifications of the GMM-3SLS model have been estimated: a) using *Crop income* as the dependent variable for equation (5.5)[28]; b) using logarithms of *Remittances amount* and *Crop*

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[28] Full estimation results for equation (5.5) using Crop Income as dependent variable are reported in the Annex Table A1.

production value; c) replacing *Number of migrants* with *Migration intensity*[29] estimated as the ratio of the number of out-migrants to the total household size. The standard errors are adjusted for heteroskedasticity.

Our parameters of interest, i.e. impact of migration on crop production and impact of remittances on crop production, come from equation (5.5). It should be kept in mind, however, that equations (5.6) and (5.7) are crucial for correctly estimating (5.5). According to our results as reported in the third column of Table 5.3, migration (*Number of migrants*) increases with household size, value of physical assets, being of Kyrgyz ethnicity, and the age of household head. A household is more likely to send out migrant(s) abroad, the more it is exposed to weather and climate shocks. This also shows that migration can be a coping strategy with respect to different shocks (uncertainty) that affect crop production, which is the main source of income for most rural households. The likelihood of having a migrant is higher in the southern regions of the KR (Osh, Batken, Jalalabad) compared to the northern region around the capital, Chui. Significant coefficient estimates for regional dummies for equation (5.7) confirm the importance of regional differences in land availability and employment possibilities in explaining different migration rates across the regions in the KR. The second column in Table 5.3 shows that number of migrants, age of household head, distance to the nearest market and being located in southern regions in the KR positively influenced the amount of remittances sent home by migrants.

As expected, total crop production value increased with total available land for crop production for a farm household. Irrigation, fertilizer and machinery use were all associated with higher crop production value. Value of livestock negatively affected crop production value, because the two activities are potentially competing for family labour when hired labour is not readily available. Crop production value increased with household size and the value of physical assets, but again the coefficients were not significant. Larger distances to the nearest market, nearest road and having a plot far away from the dwelling negatively affected total crop production value. It seems reasonable to expect that with increasing transport (transaction) costs and given small crop

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[29] Using *Migration intensity* instead of *Number of migrants* reduces the explanatory power of equation (5.7). Because of this and for the reasons of interpretation we keep the *Number of migrants* in the model.

outputs, smallholder households have even fewer incentives to deliver their produce to the market which then could push them towards more subsistence production with staple crop activities. On average, being exposed to different kind of shocks related to weather, family or general socio-economic situation in the communities is associated with smaller crop production value, but only the coefficient for *Weather and climate shocks* is statistically significant at the 10% confidence level.

Differences in crop production values between the seven oblasts in the Kyrgyz Republic are large. There are several possible explanations behind this. Because of different agro-climatic conditions, the types of crops produced by households differ between the regions. For instance, tobacco and cotton are grown mostly in the South of the country, whereas beans are more prevalent in the Talas *oblast*. A recent export boom in beans also explains why the Talas *oblast* was the only region which had on average higher *Crop production value* than Chui. The reference *oblast* Chui has on average higher crop production values than most of the other *oblasts*, which could also be explained by proximity to the border and to export markets and to the capital, Bishkek. Of course, as mentioned in section 5.5.2, the size of crop land varies highly between the North (Chui, Talas, and Issykkul) and the South (Osh, Batken, and Jalalabad) of the country, too. However, the variable *Land under crops* should capture this effect already.

Finally, our results indicate that with every migrant leaving abroad, the total crop production value decreases by about 21 thousand soms[30], yet the coefficient is not statistically significant. The effect of *Remittances amount* on crop production value is positive, and indicates that with every som of remittances sent back, the total crop production value increases by 1.1 soms. Again, the coefficient for *Remittances amount* is not significant at 10% confidence level.

These results show that even though in general our estimates go in line with NELM predictions (on negative "lost labour" effect of *Number of migrants* and positive effect of *Remittances amount* on crop production), we do not confirm the finding of the previous study by Atamanov and van den Berg (2012) that international migration significantly affected crop production in the Kyrgyz Republic.

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[30] Based on the official exchange rate as of August 10, 2016, this number was equal to about US$ 305.7.

Table 5.3: GMM-3SLS results: a joint estimation of crop production value, remittances and migration

Independent variables:	Dependent variables:		
	Crop production value, soms	Remittances amount, soms	Number of migrants
	Equation (5)	Equation (6)	Equation (7)
Constant	126 147.7**	-45 878.5**	-2.78***
	(54 259.9)	(21 411.6)	(0.35)
Number of migrants	-20 908.7	35 849.2***	
	(27 757.4)	(8 276.8)	
Remittances amount, soms	1.09		
	(0.72)		
Input use			
Land under crops, log value	24 836.8***	-813.4	0.003
	(3 073.1)	(1 584.3)	(0.025)
Irrigation (1=Yes)	36 734.3***		
	(13 816.1)		
Fertilizer use (1=Yes)	5 121.7		
	(7 284.8)		
Machinery use (1=Yes)	4 282.5		
	(6 608.9)		
Socio-demographics			
Household size	1 629.3	258.5	0.09***
	(1 457.2)	(782.7)	(0.02)
Age of household head	-2 661.4	1 743.1**	0.07***
	(1 745.5)	(700.9)	(0.01)
Age of household head sqrd.	23.09	-15.48**	-0.001***
	(15.28)	(6.25)	(0.0001)
University degree (1=Yes)	-4 811.9	2 126.4	-0.003
	(5 808.2)	(3 303.2)	(0.052)
Kyrgyz ethnicity (1=Yes)	-12 666.9*	-9 833.4*	0.11**
	(6 761.5)	(3 853.4)	(0.06)
Value of physical assets, thous. soms	16.7	-11.8	0.0004**
	(14.8)	(11.7)	(0.0002)
Value of livestock, thous. soms	-18.4*	2.57	0.0001
	(10.9)	(5.65)	(0.0001)
Infrastructure			
Distance to the nearest road, m	-3.32***	0.40	-0.0001
	(1.08)	(0.72)	(0.0001)
Distance to the nearest market, m	-0.48	0.35**	0.0001
	(0.32)	(0.17)	(0.0001)
Distance from the plot to the dwelling, m	-0.97*	-0.04	0.0001
	(0.55)	(0.33)	(0.0001)
Shocks			
Weather and climate shocks (number)	-4 652.4*	-1 816.1	0.04***
	(2 576.3)	(1 287.4)	(0.02)
Family shocks (number)	-1 827.5	-730.7	-0.09**
	(4 175.5)	(2 448.1)	(0.04)
Shocks related to socio-economic and political situation (number)	-3 280.1	1 922.2	0.02
	(2 534.8)	(1 447.6)	(0.02)

Table 5.3 continued			
Independent variables:	Crop production value, soms	Remittances amount, soms	Number of migrants
Regional fixed effects[a]			
Osh	-28 231.1* (14 490.1)	6 275.9* (3 472.9)	0.36*** (0.06)
Batken	-25 716.6 (18 681.5)	15 711.7*** (5 224.0)	0.31*** (0.09)
Jalalabad	-21 615.9 (20 475.9)	19 799.4*** (6 988.9)	0.51*** 0.09)
Naryn	-52 860.8*** (12 725.4)	2 826.1 (4 757.1)	0.10 (0.08)
Talas	33 508.1** (13 661.3)	3 143.8 (5 522.9)	0.18** (0.08)
Issykkul	-49 516.9*** (11 936.4)	3 811.5 (3 248.0)	0.06 (0.05)
Instruments			
Subjective well-being of the household		2 924.1*** (1 108.8)	
Activeness of participation in financial groups		-2 107.1** (976.3)	
Activeness in local social or political organizations/groups			0.04** (0.02)
Reliance on family and friends as main source of information			-0.26*** (0.04)
Test of overidentifying restriction: Hansen's J chi2 (3)= 4.28, p =0.233			

Source: Own estimates based on the LiK Survey. *,**,*** significant at 0.1, 0.05 and 0.01 confidence levels respectively. Robust standard errors are in parentheses. [a] Chui *oblast* is the reference category.

We ran the same set of equations using *Crop income* as dependent variable for equation (5.5).

The estimates for parameters of interest are reported in Table 5.4. The *Number of migrants* had no significant impact (at 10% confidence level) on *Crop production value* or *Crop income*. Yet both coefficient estimates are negative and on average, *Number of migrants* affected *Crop income* twice as strong as it affected *Crop production value*. If we would only use *Crop income* as an indicator for total crop production, we would come to a false conclusion that the *Number of migrants* had on average (large) negative impact on crop production. However, *Crop income* covers only marketed output of the farm household, and does not include output consumed by the household itself. When we use *Crop production value* that takes into account total crop output of the farm household, we no longer observe a strong negative effect from the *Number of migrants* (Table 5.3). *Remittances* on the other hand were associated with higher *Crop income,* possibly because they allowed farm households to invest in better inputs. *Remittances* may also release the

cash pressure for a migrant household such that it can afford waiting for better prices rather than selling crop output immediately after harvesting.

Table 5.4: The effect of international migration on crop production value and crop income

	Crop production value, soms	Crop income, soms
Number of migrants	-20 908.7	-43 079.1
	(27 757.4)	(28 749.6)
Remittances amount, soms	1.09	1.19*
	(0.72)	(0.69)

Source: Own estimates based on the LiK Survey. *,**,*** significant at 0.1, 0.05 and 0.01 confidence levels respectively. Only numbers for equation (5.5) are reported. For space reasons, regression output for control variables (variables on input use, socio-demographics and assets, infrastructure and shocks, and regional fixed effects) has been omitted in Table 5.4, but are reported in the Appendix (Table A1). Robust standard errors are in parentheses.

What do our results imply? Why does *Number of migrants* have a different effect on *Crop income* and *Crop production value*? One potential explanation could be that because the total income of the migrant household increases from remittances, its incentives to invest more effort into crop production and their marketing could be reduced, especially since returns to crop production are likely to be low. Reduced marketing or commercialization could mean that a larger proportion of own output is consumed by a farm household or used as livestock feed, but not necessarily[31]. Own output could be exchanged for other crops/goods informally between the neighbouring farms which would not be counted as *Crop income*. It is also likely that due to the small size of land available for crops (0.8 ha for migrant households) and large family sizes (more than 6 for migrant households), members leaving abroad were either not strongly involved in crop production before migration, or the labour lost due to migration can still be replaced by remaining household members. All in all, these arguments could explain why in total *Crop production value* was not significantly affected by *Number of migrants*, and why *Crop income* was affected stronger than *Crop production value*.

5.6.2   Results from Propensity Score Matching

Looking at the estimates of the Average Treatment Effects of international migration on migrant

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[31] Whether migrant households' consumption patterns do change due to migration is an interesting empirical question for future migration research in the KR.

households (ATTs), we can now explore more about how overall households' economic welfare changed due to international migration. Table 5.5 below shows the average effect of having a migrant abroad on different outcome variables. The probit model employed for estimating propensity scores is reported in the Table A2 in the annex. We use the **pstest** to check for the balancing quality between the treated and control groups, whereby the median bias estimated as the average mean difference between the covariates after matching has been implemented is equal to 4% (Table A3). This indicates at a relatively good matching quality.

First of all, we can compare now the effect of migration on *Crop Production Value* and *Crop Income* estimated via PSM and with the results from GMM-3SLS model. As Table 5.5 shows, ATTs for both indicators of crop production are not statistically significant. But since the effect captured in the ATT includes both the impact of out-migration and the impact of remittances, this result seems to make sense and could imply that on average, the effect of lost labour and the positive impact of remittances cancel each other out.

Table 5.5: Average effect of international migration on migrant households' income and economic welfare

Outcome variables:	ATT coefficient	Bootstrapped std. error	z-stat
Total annual income of the household, soms	60 903.9***	13 338.3	4.57
Annual income from wage employment, soms	-1 599.1	7 143.2	-0.22
Annual amount of social transfers received, soms	-1 448	4 109.4	-0.35
Annual amount of material aid (incl. remittances), soms	61 805.2***	6399.7	9.66
Annual income from non-agricultural enterprises, soms	-18 214.9**	8 852.9	-2.06
Value of physical assets, soms	29 600	27 500	1.07
Value of livestock, soms	-40 698***	20 267	-2.01
Crop production value, soms	6 060.9	5 761.5	1.05
Crop income, soms	2 035.5	5 006.9	0.41

Source: Own estimates based on the LiK Survey. *,**,*** significant at 0.1, 0.05 and 0.01 confidence levels respectively.

Thus overall, international migration does not seem to significantly affect the total crop production per household farm for the case of the Kyrgyz Republic. In the context of smallholder

agriculture with rural labour surplus and where crop production is not an attractive investment due to a myriad of reasons, this result sounds plausible. At the same time, international migration had a substantial positive impact on migrant households' total income. Thus, through increased total income, households are immediately better off from migration, whereas remittances could also be invested into productive activities and thus improve the well-being of the migrant household even more. Having this in mind, we check for the effect of international migration on the value of physical assets and livestock. The average effect of international migration on physical assets was insignificant, but it did reduce the value of livestock substantially.

Moreover, the annual income from non-agricultural enterprises (individual small enterprises or businesses) was negatively affected by migration. This could be explained by the "lost labour" effect of migration on livestock activities or non-agricultural activities which outweighed a potentially positive impact of remittances on income from these activities. Remittances do not seem to be invested into improving productive assets, but rather spent either to support current consumption needs or invested in human capital in terms of education and health (as indicated by farmers themselves). Investigating impacts of international migration on human capital of rural farmers could be an interesting extension of the current study in further research and can contribute to a broader discussion of development impacts of international migration.

5.7   Conclusions

The goal of this paper was to analyse in detail the impact of international migration and remittances on different aspects of rural welfare in the Kyrgyz Republic, including the total income of a household, asset endowments, crop production value and crop income. Based on the cross-sectional data from the *Life in Kyrgyzstan* survey for smallholder farms in the Kyrgyz Republic, we use the GMM -3SLS and PSM methods to achieve this objective.

The data show that Kyrgyz migrants mostly leave to Russia to undertake jobs in construction, trade and service sectors. Almost every fifth household in rural areas had at least one migrant abroad in 2012. Migrant households had on average a smaller size of land but larger families than non-migrant households. Remittances received comprised a substantial part of migrant households' total income and have reportedly contributed to an improved health and education for those households. According to the LiK survey, only few migrant households (1.4%) indicated that they spent remittances for investing into any individual enterprise including crop production. In our paper we empirically test the impact of international migration on income from different activities undertaken by rural households with migrants abroad.

GMM-3SLS results showed that the number of migrants per household was negatively linked to crop production value and crop income, but the negative impact on crop income was double as strong. Remittances were associated with higher crop production value and crop income. Only the effect of remittances on crop income was statistically significant at the 10% confidence level. Even though in general our results do confirm the expectations from the NELM theory, we conclude that overall, international migration did not have a significantly negative effect on crop production of farm households in the Kyrgyz Republic, as opposed to the previous study on KR.

With the help of the PSM approach, we check the average effect of international migration on different outcome variables, such as households' income from different sources and asset endowments. PSM results confirm that international migration does not affect significantly crop production value or crop income. It does, however, have a significantly negative effect on income from other activities of rural households. Thus, international migration reduced significantly the value of livestock assets and income from non-agricultural enterprises possibly due to the "lost labour" effect. Yet in total, migrant households' annual income increases significantly due to

international migration.

Policy implications from our study could differ depending on the strategic policy goals of the Kyrgyz government. If the goal is to improve the domestic production of food crops in order to secure food self-sufficiency and food security goals, then general policies facilitating an increased investment of remittances in agricultural production by smallholder farmers could be useful. In this regard, additional support might be needed to help smallholder farmers with marketing of their produce, which could include, e.g. efforts to reduce transaction costs related to transport costs and the smallness of output size.

According to our findings, total income of migrant households improves much due to international migration, and this in turn has positive implications for reducing rural poverty. Rural poverty is another important target of the Kyrgyz rural economic policy. Additional research is needed though to account for the general equilibrium effects of international migration on different actors and sectors of the Kyrgyz economy. If income of migrant households in rural areas improves, an increased spending associated with it may indirectly benefit non-migrant households as well.

Furthermore, our study has implications with respect to new developments in regional economic cooperation between the Kyrgyz Republic and its neighbouring countries. The expectation from the recent accession of the Kyrgyz Republic to the Eurasian Economic Union (EAEU) of Russia, Belarus and Kazakhstan is that the number of out-migrants from the Kyrgyz Republic to Russia and Kazakhstan (especially to Russia) will grow even further. At the same time, reducing trade barriers with these countries, that have always been important trade partners for the KR, is likely to increase exports of agricultural commodities. This could lead to an increased demand for labour in agriculture. Given current conditions in the agricultural sector and in the economy as a whole, migration seems to be a more attractive strategy for Kyrgyz farmers than involvement in commercial crop production, unless returns from agriculture will also increase and become less volatile. Since the Kyrgyz government sets a goal to improve exports, including agricultural exports, any efforts to diminish constraints and risks of smallholder farmers would be of great use to achieve that goal. In this regard our results show that infrastructure, machinery use and land size were very important in determining total crop production per household farm. These three

factors can be understood as smallholders' issues related to high transport costs, lack of technology and smallness of scale. Promoting cooperatives has already been recognized as an important measure to address all of these factors. Another possibility could be to help migrant households to accumulate remittances funds as e.g. micro-credit groups on a local level. This could help migrant households to generate additional profits from remittances, whereas small-size credits from a community-based micro-credit union could be more accessible and have more trust than a bank loan among smallholder households.

In sum, our paper shows that the impacts of international migration can be mixed and not straightforward. For semi-subsistent farm households like in the KR, NELM predictions may not necessarily hold true for crop production. International migration seems to affect negatively livestock assets and non-agricultural income, but not crop production.

6   Dutch disease and workers' remittances: Evidence from the Kyrgyz Republic

6.1   Introduction

Remittances - monetary transfers by migrant workers to their "source communities" where they come from - are one of the most important outcomes of international migration. Within the last four decades, remittances received worldwide have experienced almost exponential growth (Figure 6.1). Remittances have far overtaken the total donor aid worldwide: in 2014, the size of personal remittances received globally comprised US$552.1 billion (World Bank 2016), whereas the official development assistance (ODA)[32] to the developing world totalled US$137.2 billion (OECD 2016). Being one of the key sources of foreign exchange for many low-income economies (Figure 6.2), remittances are likely to play an important role in the economic development of those countries. They surely help to enhance incomes and to reduce poverty in remittance-receiving communities, contribute to increased consumption and investment in human capital, for example in health and education. In some cases, remittances play a crucial role for covering trade balance deficits (Glytsos 2002).

**Figure 6.1: Remittances received worldwide, million US$**
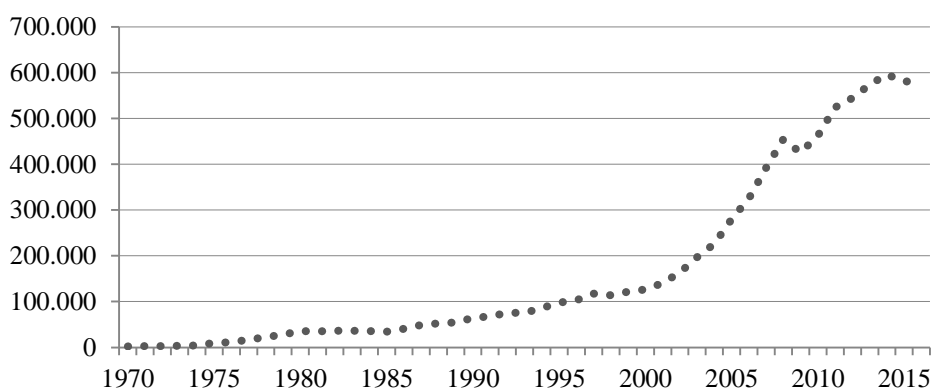
Source: Own illustration based on the World Bank's Annual Remittances Database

On the other hand, potentially negative effects might include moral hazard problems for the remaining residents or for governments in the countries of origin, while the large inflow of

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[32] Donor assistance from the OECD Development Assistance Committee (DAC) countries

foreign exchange could cause Dutch disease-like impacts[33] (through real exchange rate appreciation) on the source economy (Barajas *et al*. 2009). Remittances can also exacerbate inflation and reduce labour force participation (Catrinescu *et al*. 2009). The negative effects resulting from the inflow of remittances have also been referred to as the "paradox of gifts" (Amuedo-Dorantes and Pozo 2004). A crucial question on the development agenda thus is, how to employ the positive effects of international migration and remittances in a best way to improve economic development in the "source communities" (Taylor 2006).

It is clear that an accurate analysis of potentially negative effects from remittances to minimize or balance out their impact on remittances-receiving economies will be of great importance in this case. As can be seen in Figure 6.2, the magnitude of remittances and their relative importance in many developing economies is very high. As with any large capital inflow, remittance flows raise concerns about their negative impact on the competitiveness of the receiving economy (Acosta *et al*. 2009; Lartey *et al*. 2008). This effect could be similar to that of the Dutch disease: the large inflow of foreign exchange could lead to a real appreciation of the exchange rate which in turn undermines international competitiveness of the domestic economy. The loss of competitiveness then would affect the tradable sectors, such as manufacturing, and could result in de-industrialization of the remittance-receiving economy.

The Kyrgyz Republic is one of the highest ranking countries in the world with respect to the ratio of remittances to GDP (Figure 6.2). The Dutch-disease concerns related to remittances could hardly be more relevant than in the KR. Yet there is no study which empirically tests for the presence of Dutch-disease symptoms resulting from remittances for the case of KR. The Kyrgyz Republic is a small landlocked post-Soviet country in Central Asia, which experienced massive outmigration within the last two decades. In 2015, remittances received by Kyrgyz residents were equal to 25% of GDP. Even though there are no exact figures available when it comes to the number of migrants, approximately 300,000 to 500,000 Kyrgyzstanis are estimated to be working

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[33] The term "Dutch disease" refers to negative effects of a boom in the natural gas sector on Dutch manufacturing in the 1960s which led to a real exchange rate appreciation of the Dutch currency and sluggish economic growth in the Netherlands (Corden 1984).

abroad (IOM 2006; Pomfret 2006) and this number is likely to be underestimated due to persistent illegal migration. This is still a huge number for a country with the total population of only 5.7 million people. Most of the Kyrgyz migrants leave to Russia. Reasons for migration include a poor economic situation at home, unemployment and low incomes (IOM 2006). These factors are exacerbated by political instability and high levels of corruption which undermine investment inflows and development of the domestic economy.

Figure 6.2: Countries with the highest remittances to GDP ratio (%) in the world
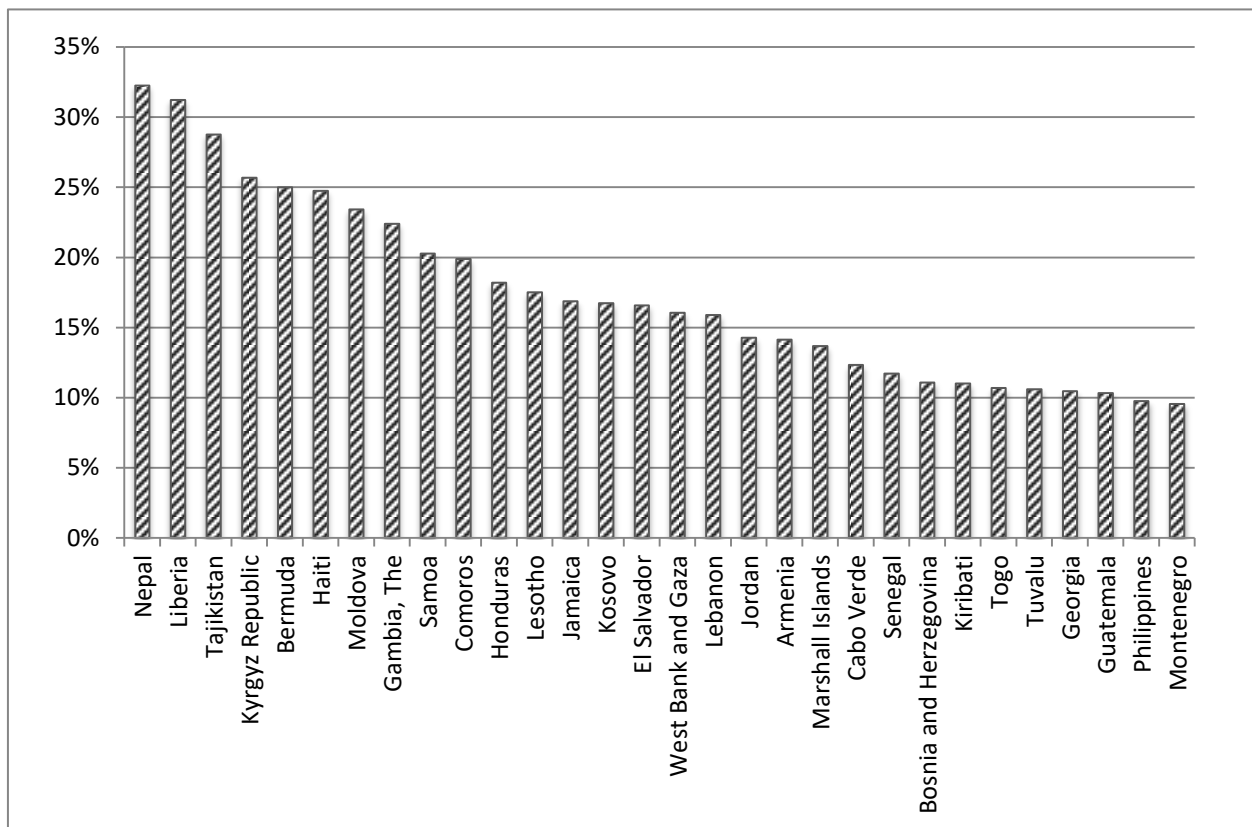
Source: World Bank's Annual Remittances Database.

The goal of this study is to empirically test for the presence of Dutch-disease (DD) effects from remittances on the Kyrgyz economy. The DD effects can be transmitted through two channels: the spending effect and the resource-movement effect.

The **spending effect** arises due to the increasing income level because of remittances, which in turn positively affects demand and the relative price for nontradables eventually leading to a real appreciation of the domestic currency. This has an adverse effect on the international

competitiveness of domestic industries. In order to test for the spending effect in the current study, the impact of remittances on the real exchange rate is estimated using econometric methods. The real exchange rate is proxied by the Real Effective Exchange Rate which is an aggregate index and is a weighted average of bilateral exchange rates between the Kyrgyz som and the basket of currencies of the major trade partners of the KR adjusted for inflation[34].

The **resource-movement effect** in turn occurs when labour moves away from the tradable sector (e.g. manufacturing) into the nontradable sector (e.g. services) due to increased demand and relative price for nontradables and can potentially result in further de-industrialization of the economy (Corden 1984). This effect can be tested by estimating the impact of remittances on the tradable-to-nontradable output ratio of the Kyrgyz economy and on the output of individual tradable and nontradable sectors in the Kyrgyz Republic.

A number of steps are undertaken to ensure robustness of empirical estimates. First, I calculate and use alternative measurements of the real exchange rate, including the Real Effective Exchange Rate index (REER) for all trade partners of the KR, the REER decomposed into the Commonwealth of Independent States (CIS) region and the non-CIS region, bilateral real exchange rates (RBER) between the Kyrgyz som and the Russian rouble as well as between the Kyrgyz som and the US dollar[35]. Second, I calculate and use an alternative measurement of the real exchange rate employing the GDP deflator instead of the Consumer Price Index (CPI). The econometric models are estimated using the Two-Stage-Least-Squares (2SLS) and the Three-Stage-Least-Squares (3SLS) estimators based on the instrumental variable (IV) approach to control for the endogeneity issues related to remittances and to correct for heteroskedasticity.

Studies which investigated potential Dutch-disease effects of remittances mostly use cross-country datasets. However, individual conditions within a country are likely to be important in determining the way remittances affect the receiving economy. A cross-country study in such a

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[34] A detailed calculation of REER is given in Section 6.4.2.

[35] The RBERs are estimated as an exchange rate index between the Kyrgyz Som and a foreign currency (i.e., units of foreign currency for 1 Kyrgyz Som) adjusted for inflation. An increase in the RBER index compared to the base period indicates an appreciation of the Kyrgyz Som against the given foreign currency.

case would help little to understand the impact of those individual conditions. The current study seeks to fill this gap.

This paper is structured as follows. The next section elaborates the theoretical framework of this study, while Section 6.3 summarizes empirical findings on Dutch-disease effects of workers' remittances. Materials and methods are described in Section 6.4. Own findings for the case of the Kyrgyz Republic are reported in Section 6.5 followed by conclusions given in Section 6.6.

6.2   Theoretical background

6.2.1   Remittances and economic growth in remittance-receiving countries

The analysis of Dutch-disease effects of remittances covers only a fraction of all possible effects remittances could have on economic growth of a receiving country. Using the "growth accounting" framework, Barajas *et al.* (2009) elaborate three potential channels though which remittances can affect the receiving economy. These are changes in the labour force, in capital accumulation and in the total factor productivity in the economy (Figure 6.3). As Figure 6.3 shows, it is hard to predict whether the positive effects of remittances on economic growth of a remittance-receiving country outweigh the negative consequences of remittances. Even though the effect of remittances on capital accumulation is generally expected to be positive, this could be outweighed by the likely negative effects of remittances on labour force participation and total factor productivity. The empirical evidence and theoretical views on the impact of remittances on economic growth in the existing literature remain mixed (Glytsos 2002).

Figure 6.3: Potential impact of remittances on economic growth
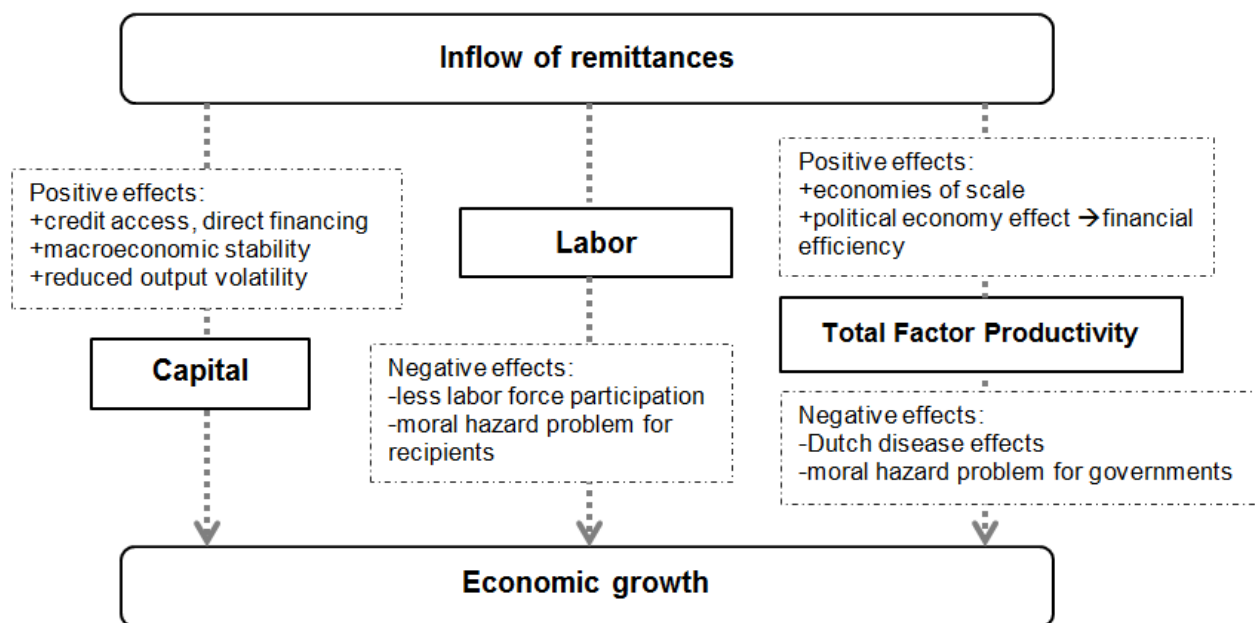
Source: Own illustration based on Barajas *et al.* (2009).

The positive effect of remittances on capital accumulation is disputed by a number of researchers

which claim remittances are mostly used for immediate consumption rather than being invested in productive activities (see e.g., Jokisch 2002; Cohen 2005). Remittances received are often spent for covering daily expenses, such as utility bills, food purchases or for purchasing luxury items, home construction and repairs (Cohen 2005). However, even if remittances are not invested, there are many indirect ways remittances can contribute to local development. For instance, the inflow of remittances can increase liquidity of banks and enhance credit possibilities, as well as improve human capital, and create multiplier effects from consumption spending (Glytsos 2002).

International migration and remittances can also affect labour use in the economy through the impact on labour participation. In addition to the reduction of labour available for domestic activities because of its movement abroad, remittances might reduce efforts of remaining residents which receive these transfers. Chami *et al*. (2005) show in their theoretical model that when remittances increase, the recipient of remittances reduces his or her effort invested into a local activity, that is, the labour income is substituted with remittances. This substitution of labour creates a potential for a moral hazard problem for recipients of remittances. Chami *et al*. (2005) show that remittances negatively affect recipient's efforts not only when remittances are altruistically motivated, but also when remittance transfers are based on self-interest and are an instrument of risk-sharing strategy between the migrants and the relatives left behind.

Remittances can also foster increased economies of scale in financial intermediation if remittances are invested and foster financial development (Barajas *et al.* 2009). In times of poor economic situation at home, migrants tend to share the burden, whereby the inflow of remittances becomes a safety net for migrant households. This may create another moral hazard problem, this time for the government in the remittance-receiving country, and can negatively affect the quality of institutions there (Barajas *et al.* 2009). Finally, remittances, as a source of large foreign exchange inflow, can lead to Dutch-disease effects in the home countries of migrants and adversely affect the total competitiveness of the economy via real exchange rate appreciation and following de-industrialization. Next section elaborates on theoretical impacts of remittances on the domestic economy within the Dutch-disease framework.

6.2.2   The Dutch disease concept

The Salter-Swan-Corden-Dornbusch model has been widely used as a theoretical framework for explaining Dutch-disease effects of capital inflows for the case of a resource-dependent country, also known as the dependent economy model (Acosta *et al*. 2009). The large inflow of foreign exchange in terms of remittances can have similar effects to that of a large inflow of foreign exchange related to a booming energy sector as described in Corden and Neary (1982).

Corden and Neary (1982) provide a theoretical analysis of the impact of a booming sector on structural changes in an economy. The main assumptions of the model are as follows. First, a small open economy produces two tradable goods, the prices of which are given by world market prices and a nontradable good, the price of which is determined by domestic demand and supply. All three goods are used for final consumption only. The two tradable goods are labelled as the energy good, X_E and manufactures, X_M, and the nontradable good is labelled as services, X_S. Second, the trade is balanced and only relative prices in terms of the given prices of tradable goods are determined in the model. Third, commodity and factor markets do not face any distortions so that there is full employment and real wages are flexible. Finally, each of the sectors uses only two production factors: capital and labour; labour is mobile between sectors, while capital is assumed to be a sector-specific factor[36].

The question asked here is, if a boom takes place in X_E, how does that affect the manufacturing sector and how is the income from the boom distributed among the different sectors of the economy? Corden and Neary (1982) make a distinction between the two effects of the boom, the *spending effect* and the *resource-movement effect*. Once a boom takes place in X_E, the marginal product of labour (the mobile factor) increases in that sector which leads to a shift of resources from other sectors into the booming sector. The rest of the economy adjusts to these changes via the real exchange rate. This is the resource-movement effect. Due to higher disposable income, spending on services increases and hence their relative price increases as well leading to further

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[36] In further elaborations of this model, this assumption is relaxed and alternative scenarios are considered such as when capital is mobile between manufacture and services, as well as when capital is mobile between all three sectors.

adjustments in the economy. This effect is called the spending effect.

These two effects are illustrated in Figures 6.4 and 6.5. Point *A* in Figure 6.4 represents the pre-boom equilibrium. L_S, L_M, and L_T are the labour demand functions for services, manufacturing and the tradable sectors (manufacturing and energy together) and they are assumed to have a negative relationship with the wage rate, *w*. O_SO_T is the economy's total labour supply, where distance from O_S shows labour used in X_S and the distance from O_T shows labour inputs into two tradable sectors, i.e., L_T is the sum of L_M and L_E.

Figure 6.4: Changes in the labour market following the boom
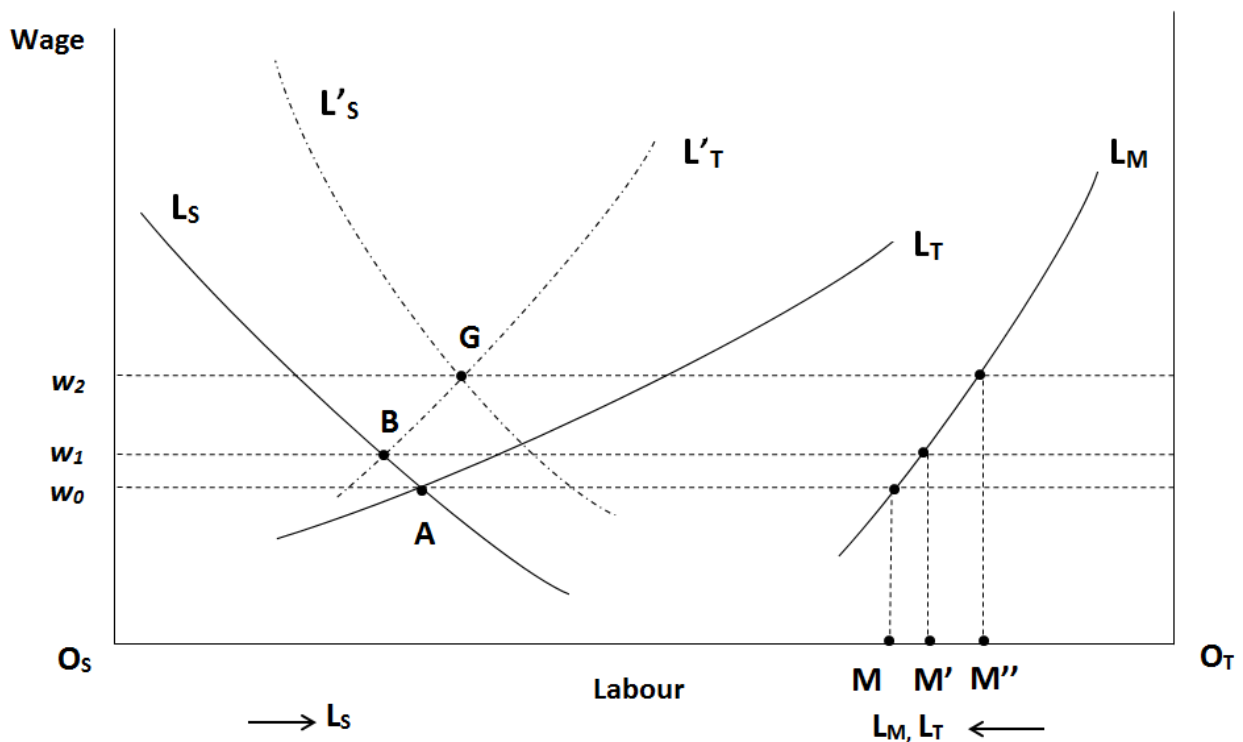
Source: Adapted from Corden and Neary (1982).

When a boom in X_E takes place, labour demand in the energy sector shifts the labour demand in the tradable sectors, L_T, upwards to L'_T and the new equilibrium is obtained at *B*. This shift in labour demand leads to an increase in the wage rate to w_1 and thus labour moves away from both the manufacturing and services sector. The manufacturing sector now has less labour input (O_TM') and thus a *direct de-industrialization* takes place.

Figure 6.5 presents a production possibilities curve (*TS* before the boom and *T'S* after the boom)

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for an economy producing a composite traded good (vertical axis) and a nontradable good, i.e. services (horizontal axis). The boom changes the maximum output of tradable goods to OT', but the maximum output of services, OS, stays unchanged. The production point is moved from a to b which represents the resource movement effect: because of less labour input the services sector produces smaller output than before, i.e., b is located left of a. Based on the assumption that the income elasticity of demand for services is zero, and the income consumption curve is a vertical line intersecting $T'S$ at point j, the resource movement effect leads to an excess demand for services. The economy restores the equilibrium via the appreciation of the real exchange rate because the prices in the services sector must rise to accommodate the excess demand for services.

Figure 6.5: Changes in the commodity market following the boom
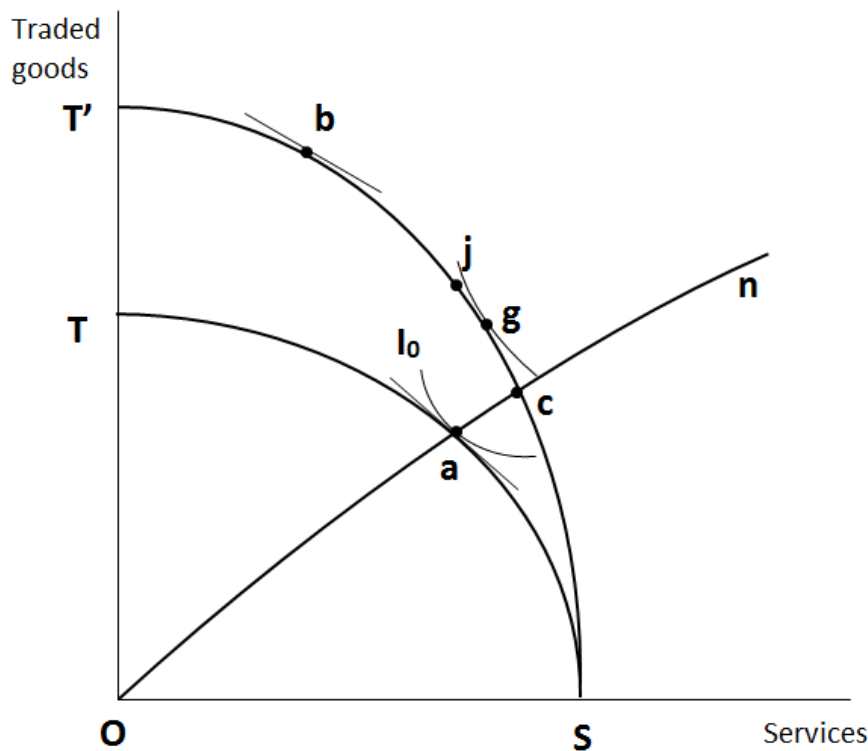
Source: Adapted from Corden and Neary (1982).

In order to explain the spending effect separately from the resource movement effect, we must assume that the energy sector does not use any labour or that the boom does not have any effect on the labour market. We further assume that services are a normal good, i.e., demand for

services rises with increasing income. Then the income-consumption curve looks like *On* crossing *T'S* at point *c*, which is the initial after-boom equilibrium. The boom leads to excess demand for services again and the real exchange rate has to appreciate. The new equilibrium must be located somewhere between *j* and *c* (for instance at *g*) indicating an increase in the output of the services sector resulting from the boom. This increase in the output prices of the service sector, if we look back at Figure 6.4, leads to in **increased demand for labour in services** (a move from L_S to L'_S). Thus *G* is the final equilibrium in Figure 6.4, which increases the wage rate to w_2 and **reduces the labour use in the manufacturing sector** (a further move from O_TM' to O_TM''), a process labelled as *indirect de-industrialization* by Corden and Neary (1982).

In the case of workers' remittances, the spending effect is likely to occur in the sense that higher real income from remittances will increase demand for nontradable goods and increase their price. We can test for this effect by looking at the impact of remittances on the real exchange rate. The resource movement effect in this context would correspond to the labour leaving abroad from both the tradable and the services sector, where the export of labour could be considered as the "booming" tradable sector and traditional tradable sectors could be considered as the "lagging" sectors[37]. The hypothesized effect of out-migration and remittances on the structure of the economy is that whether because of rising prices and demand for nontradables, labour from traditional tradable sectors moves further away into the nontradable sector. The author's approach to test this hypothesis includes estimations of models for the tradable-to-nontradable ratio in the economy to identify the impact of remittances, as well as testing the impact of remittances on relative sizes of individual economic sectors in the Kyrgyz Republic.

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[37] The terms "booming sector" and "lagging sector" are used by Corden and Neary (1982) with respect to the energy and manufacturing sectors, respectively.

6.3   Empirical evidence on Dutch-disease effects of remittances

There are at least two general directions of research which look at the effect of workers' remittances on economic development of sending economies. The first direction investigates how remittances affect economic growth of a remittances-receiving country and report mixed evidence for different regions and for different cross-section of countries (e.g. Barajas *et al*. 2009, Glytsos 2002, Chami *et al*. 2005, Catrinescu *et al*. 2009 and Imai *et al*. 2014). The second direction deals with the Dutch-disease concerns related to remittances, where empirical evidence remains very limited (e.g. Acosta *et al*. 2009, Amuedo-Dorantes and Pozo 2004, and Lartey *et al*. 2008).

Studying the effect of workers' remittances on the economic growth of 84 remittance-receiving countries, Barajas *et al*. (2009) argue that remittances at best did not have any significant impact on economic growth, while for the case of some countries, remittances may have even detained economic growth. Glytsos (2002) considers the cases of Egypt, Greece, Morocco, Jordan, and Portugal and points at different effects of remittances between the countries or for the same country over specific time periods. For instance, remittances induced total output growth in Jordan and Portugal, but intensified recession in Greece and Morocco during 1975-1998. Moreover, the fall in remittance inflows seems to have had a stronger negative impact than the positive impact from an increase in remittance inflows in these economies (Glytsos 2002). This finding provides an argument for a country case study where specifics of a given economy can be taken into account.

Using the data for 24 Asian countries during 1980-2009, Imai *et al*. (2014) find that the magnitude of remittances had a positive impact on economic growth in these countries, but their volatility was one of the external sources of output shocks. At the same time, the inflow of remittances led to a substantial decline in poverty rates (Imai *et al*. 2014). Salahuddin and Gow (2015) analyse recent panel data on remittances and GDP for Bangladesh, India, Pakistan and the Philippines and provide evidence on a positive long-run correlation between remittances and economic growth. The effect of other macroeconomic variables, however, is not taken into account in their study.

Chami *et al*. (2005) provide evidence for negative correlation between remittances and GDP

growth based on the panel data analysis for 113 countries. Both the theoretical model and empirical findings of Chami *et al*. (2005) imply that remittances have a compensatory nature, which means that they are countercyclical and tend to increase when the migrants' home economy is experiencing poor economic growth. Moreover, because of their negative correlation with the GDP growth, remittances cannot be considered to have the same effects on economic growth as other sources of capital flows, such as the inflow of Foreign Direct Investment (FDI) or portfolio investments.

Catrinescu *et al.* (2009) claim that it is the policy and institutional environment that is crucial for the positive effects of remittances to be realized. If governments implement policies which induce recipients of remittances to invest transfers in productive activities, the impact of remittances on economic development is likely to be positive. Their empirical estimates support this view and show that when the quality of institutions is controlled for in the econometric model, remittances have a significantly positive impact on long-term macroeconomic growth (Catrinescu *et al*. 2009).

Summarizing findings of past research on Dutch-disease effects from different foreign exchange shocks, including remittances, Magud and Sosa (2010) report that the evidence on remittances lowering the tradable-to-nontradable output ratio and overall economic growth was ambiguous, but more studies found that remittances contributed to an appreciation of the real exchange rate. Acosta *et al*. (2009) use a two-sector dynamic stochastic general equilibrium model to analyse the effect of remittances on resource allocation and the Real Exchange Rate (RER). Using the data for El Salvador and the Bayesian approach, they look at the evolution of the RER and the tradable-to-nontradable ratio and their relationship with the inflow of remittances. They detect Dutch-disease symptoms for the El Salvador economy: labour supply decreases with higher remittances, whereas consumption demand of nontradables increases which leads to an expansion of that sector and to a shift of labour away from the tradable sector. At the same time, remittances improve welfare of households via increased consumption and leisure levels and smoother income flows (Acosta *et al*. 2009). The study of Lartey *et al.* (2008) reported similar results based on a panel data analysis for 109 developing economies for the period 1993-2003. They disaggregate data by economic sectors and provide statistical evidence for the presence of both the spending and the resource movement effects induced by the inflow of workers' remittances in

the given developing countries. Looking at the case of the Philippines, Tuaño-Amador *et al*. (2007) conclude that the Dutch-disease effects could be only partially observed there. Following the real appreciation of the peso, labour in the Philippine economy has shifted from the tradable sectors to nontradables, although the output of manufacturing was not significantly affected by that (Tuaño-Amador *et al*. 2007).

Amuedo-Dorantes and Pozo (2004) provide evidence on the real exchange rate appreciation induced by the inflow of remittances. Using panel data for 13 Caribbean and Latin American countries, they show that an increase in remittances had a significant link to real exchange rate appreciation, adversely affecting international competitiveness of those countries. An opposite effect is observed by a study on small island economies by Amuedo-Dorantes *et al*. (2010). Here, remittance inflows led to a depreciation of the real exchange rate suggesting that remittances are used differently in remote small island countries and spent mostly on traded goods compared to other countries. Thus, the Dutch-disease effects do not have to be present in all countries where remittances inflows are relatively large (Amuedo-Dorantes *et al*. 2010).

The limitation of most existing studies lies in the failure to adequately control for the endogeneity of remittances by using valid instruments and dealing with the omitted variable bias referring to the quality of political and other institutions in determining the effect of remittances on economic growth of recipient countries (Catrinescu *et al*. 2009).

Few studies have looked at the impact of remittances on economic development in the Kyrgyz Republic. Aitymbetov (2006) argues that remittances in the KR have had a positive significant impact on aggregate consumption and national income between 1996 and 2005, but their impact on investment was not significant. Atamanov *et al.* (2009) use a Computable General Equilibrium (CGE) framework to simulate the effect of changes in migration and remittances on several economies in the Commonwealth of Independent States (CIS). For the case of the Kyrgyz Republic the authors report that if remittances exhibit a strong increase (in this case an increase by 40% was simulated), everything else being equal, this will raise private consumption and the output of those sectors, the output of which is consumed domestically, whereas the output of export and import-competing sectors decline because of the real exchange rate appreciation. However while the mechanism behind the real exchange rate appreciation is not clear, the study

concludes that the effect of remittances on GDP overall was negligible (Atamanov *et al*. 2009). There is no study which explicitly tests for Dutch-disease symptoms in the Kyrgyz economy resulting from remittances using econometric methods.

6.4 Methodology and data

6.4.1 The empirical approach

In order to investigate whether remittances in the Kyrgyz Republic impose any Dutch-disease effects on the Kyrgyz Economy, two steps are undertaken. In the first step, the effect of remittances on the real exchange rate is estimated in a macroeconomic model including other determinants of the real exchange rate. In the second step, the effect of remittances on structural changes in the Kyrgyz economy is analysed. This involves the estimation of the impact of remittances on the tradable-to-nontradable output ratio and the impact of migrant transfers on the individual sectors of the economy, such as sectoral outputs of agriculture, manufacturing and services. A detailed description of variables employed in all models is given in the next section. The macroeconomic models estimated in this study are similar to those employed by Lartey *et al*. (2008) and Amuedo-Dorantes and Pozo (2004).

Real exchange rate and remittances

In the first set of equations, the Real Effective Exchange Rate (REER) is used as a dependent variable:

$$REER_t = \alpha R_t + \beta X_t + \mu T_t + \varepsilon_{t,} \qquad t=1,2,....\ T \qquad (6.1)$$

$$REER_t = \alpha R_{t-1} + \beta X_t + \mu T_t + \varepsilon_t \qquad (6.2)$$

where R_t (R_{t-1}) stands for workers' remittances in period t (t-1), and X_t is the set of all the control variables included in the model in period t; T stands for the time trend, and ε_t is the error term. Control variables include: real GDP growth rate, money supply (M2), terms of trade, trade openness, Foreign Direct Investment inflows, non-FDI inflows, government expenditure growth rate, foreign aid, and crisis/political instability.

Before the inferences on the effect of remittances on the real exchange rate can be made, it is crucial that all other possible determinants of real exchange rate changes are controlled for. The literature on the determinants of the real exchange rate considers technological progress, the terms of trade, the world interest rate, government expenditures and foreign aid as important

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explanatory variables (Amuedo-Dorantes and Pozo 2004). An additional important variable which is relevant for explaining the impact of remittances on economic growth should include information capturing the quality of institutions and the policy environment. Studies which do not consider the economic structure of developing countries and the level of financial and institutional development, including political stability, are likely to obtain biased results (Rapoport and Docquier 2005). While the quality of institutions is hard to capture in a country case study, the variable **Crisis/political instability** is established in this study with the aim to account for effects of recent economic and political crises in the KR, such as the revolutions in 2005 and 2010, financial crisis in 2008 and 2009, and the ethnic conflict in the Southern part of the country in 2010. The expected sign of this variable on the REER is negative, i.e., political instability or economic crisis is likely to exacerbate inflation in the country, which, given price stickiness, can be transmitted into the real depreciation of the exchange rate.

Additional dependent variables include REER for the CIS and the REER for non-CIS countries. Alternative calculation of the Real Exchange Rate using the GDP deflator for Kyrgyz Republic, Russia and the United States (i.e. bilateral real exchange rates for rouble and US Dollar) is done to provide robustness of results. Moreover, GDP deflator captures only domestic goods, whereas the CPI includes also import goods. Possible different effects of remittances on the RER could be attributed to the price index that was used to compute it in the first place.

Estimating bilateral real exchange rates for the rouble and the US dollar is an important contribution of this study. These two currencies are of high importance for the KR because Russia is the major host country for Kyrgyz migrants, but also a very important trade partner. The US dollar on the other hand plays a major role for external trade transactions and domestically as the hard currency.

Tradable-to-Nontradable ratio and remittances

The next set of regressions is estimated for the **Tradable-to-Nontradable ratio** in the KR.

$$TNT_t = \alpha R_t + \beta X_t + \mu T_t + \gamma Q + \varepsilon_t, \qquad t=1,2,\dots T \qquad (6.3)$$

$$TNT_t = \alpha R_{t-1} + \beta X_t + \mu T_t + \gamma Q + \varepsilon_t \qquad (6.4)$$

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In addition to equations (6.1) and (6.2), the *TNT* equations include quarter dummies, *Q*.

Sectoral outputs and remittances

The final set of regressions estimated for the individual sector outputs is as follows:

$$Agriculture_t = \alpha R_{t-1} + \beta X_t + \mu T_t + \gamma Q + \varepsilon_t, \qquad t=1,2,.... T \qquad (6.5)$$

$$Manufacture_t = \alpha R_{t-1} + \beta X_t + \mu T_t + \gamma Q + \varepsilon_t \qquad (6.6)$$

$$Services_t = \alpha R_{t-1} + \beta X_t + \mu T_t + \gamma Q + \varepsilon_t \qquad (6.7)$$

These three equations (6.5 to 6.7) are estimated jointly as a system of equations to account for cross-equation correlation which is likely to be present since all three sectors are exposed to the same exogenous shocks. Since sectoral outputs are likely to need some time to respond to remittances inflows, only the lag of remittances (R_{t-1}) is used here.

Endogeneity problems and solutions

There is evidence that the appreciation of the domestic currency leads to increased remittance transfers for the peso and Philippines case (Tuaño-Amador *et al.* 2007), i.e. the endogeneity of remittances is expected, such that reverse causality may exist between remittances and the real exchange rate. The macroeconomic nature of other explanatory variables which are jointly determined with the real exchange rate and sectoral output variables makes it difficult to choose appropriate instruments (Lartey *et al.* 2008). Using lagged levels of explanatory variables as internal instruments causes concerns for weak instruments, because the changes in the macroeconomic variables over time span over several years and do not occur during one period only (Lartey *et al.* 2008). That is why this study combines internal instruments (lags of endogenous variables) with an additional variable that indicates economic situation in the host country for Kyrgyz migrants. In our case it is the Real Russian GDP and its lags.

Estimation techniques

The Two Stage Least Squares (2SLS) estimator is used to estimate equations (6.1) to (6.4), while the General Method of Moments 3SLS (GMM 3SLS) is used for estimating the system of

equations described in (6.5), (6.6) and (6.7). The 2SLS estimator allows a two-step estimation using instrumental variables (IV) to deal with the endogeneity issues related to remittances and other explanatory variables. Moreover, the 2SLS estimator can correct for heteroskedasticity in the standard errors. Since equations (6.5) - (6.7) are estimated jointly as a system, the GMM-3SLS is more appropriate here. It involves the two steps from 2SLS, whereas the third step is similar to the procedure implemented by the Seemingly Unrelated Regressions Estimator (SURE) which accounts for cross-equation correlation between these equations. All estimations are performed in Stata.

6.4.2 Data sources and description of variables

The data for this study have been compiled from the reports of the National Statistical Committee and National Bank of the Kyrgyz Republic. The World Bank's Annual Remittances Database is also used as an alternative source of data on remittances. The variables employed in the models are based on quarterly information on:

- nominal exchange rates between Kyrgyz som and US dollar and between Kyrgyz som and the Russian rouble
- Real Effective Exchange Rate (REER)
- Real Bilateral Exchange Rate (RBER)
- sectoral outputs for agriculture, manufacturing, services and industry
- inflow of workers' remittances
- Gross Domestic Product (GDP)
- money and quasi money (M2)
- price indices for exports and imports
- value of exports and imports, government expenditure
- Foreign Direct Investment (FDI) and non-FDI inflows
- foreign aid inflows.

The period considered in the study is strongly related to data availability and includes 15 years or 60 quarters from 2000Q1 to 2014Q4.

Some of these indicators are included directly in the model, while others have been calculated by the author. Information on the calculation of selected variables is given below.

The **Real Effective Exchange Rate** taken from the Bulletin of the National Bank of the KR is calculated as follows (NBKR 2014):

$$REER_t = (RBER_{1t})^{W1t} * (RBER_{2t})^{W2t} ... (RBER_{nt})^{Wnt} \qquad (6.8)$$

where $RBER_{it}$ is an index of Real Bilateral Exchange Rate for currency i ($i=1, 2, … n$) in period t. W_{it} is a corresponding weight in external trade (both imports and exports) with a trade partner country using the currency i. Thus the Real Effective Exchange Rate is a weighted average of Real Bilateral Exchange Rates between the Kyrgyz som and the currencies of main trade partner-countries for the Kyrgyz Republic. An increase (a decrease) in the REER index compared to the base period indicates that the Kyrgyz Som appreciated (depreciated) against the currencies included in the REER basket.

The **Real Bilateral Exchange Rate** is calculated using the formula below (for the example of the US dollar):

$$RBER_{US\$t} = 100*(ER_{USt}/ER_{US0}) * (CPI_{KYRt}/CPI_{USt}) \qquad (6.9)$$

where ER_{USt} is the nominal bilateral exchange rate between the Kyrgyz som and US dollar (**units of US dollar per 1 Kyrgyz som**) in period t, ER_{US0} is the nominal bilateral exchange rate between the Kyrgyz som and US dollar in the base period; CPI_{KYRt} (CPI_{USt}) is the Consumer Price Index for the Kyrgyz Republic (for the United States).

An alternative estimation of the RBER for the Russian rouble and the US dollar is done using a GDP deflator instead of the CPI in formula (6.9). The use of the GDP deflator ensures that only domestically produced goods are included in the price index, whereas CPI includes both domestic and imported goods.

REER CIS includes only the countries in the Commonwealth of Independent States (CIS), whereas the **REER non-CIS** variable includes countries outside the CIS region.

Remittances, % of GDP are money transfers sent by Kyrgyz migrants abroad calculated as the

share of GDP.

Terms of trade are calculated as a ratio of the price index for exports from the KR with respect to the price index for imports into the KR.

Tradable-to-Nontradable ratio is a ratio between the tradable output (the sum of agricultural and manufacturing output as % of GDP) and the nontradable output (services output as % of GDP).

Trade Openness is the total trade volume (exports and imports of goods and services) as % of GDP.

The variable **Foreign Direct Investment, % of GDP** used in this paper represents the inflow of investments into the Kyrgyz Republic in the form of a direct ownership of equity or a business by residents or enterprises from another country.

Non-FDI inflows, % of GDP consists of all other investment inflows including "portfolio investments", "financial derivatives" and "other investments" as reported in the Balance of Payments of the KR.

Crisis/political instability is a dummy variable, equals "1" when a political or an economic crisis takes place, "0" otherwise.

6.5 Results for the Kyrgyz Republic

6.5.1 Real exchange rate, remittances and the Kyrgyz economy

As it can be seen in Figure 6.6, a somewhat positive correlation can be observed between the evolution of the Real Effective Exchange Rate and the ratio of remittances to GDP in the Kyrgyz Republic over the last 15 years. The remittances-to-GDP ratio has increased dramatically over the given period from 0.1% in 2000 to 28.1% in 2014. At the same time, the aggregated real exchange rate, the REER index, had appreciated during the same period, and was about 20% higher compared to the base period.

Figure 6.6: Real exchange rate and remittances-to-GDP ratio in the KR (2000-2014)
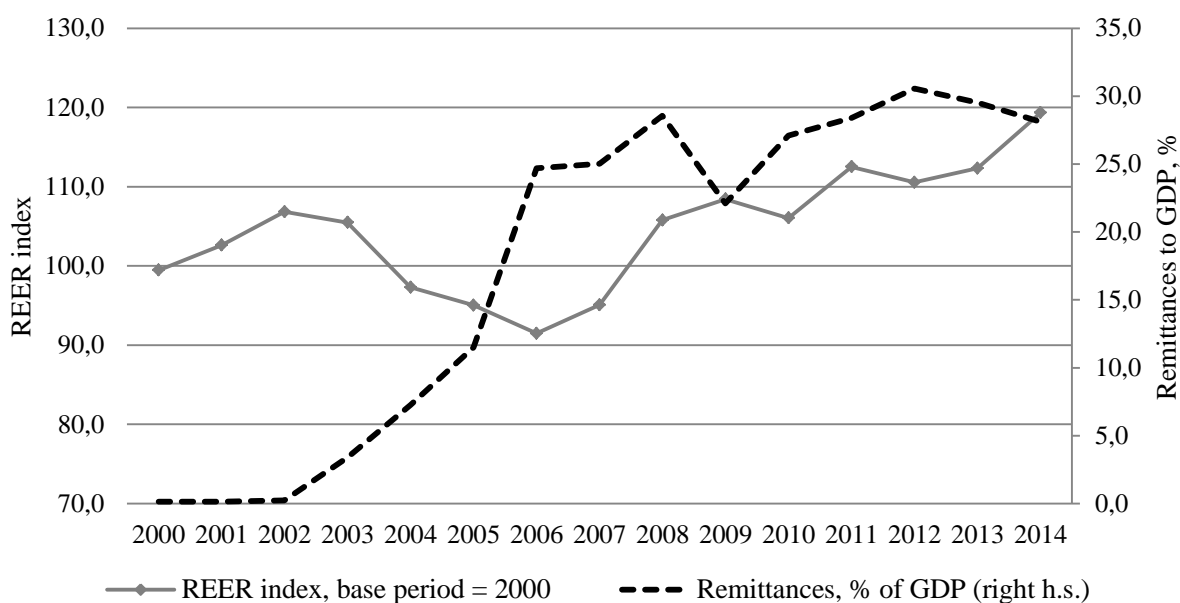
Source: Own illustration based on the data of the NBKR.

Since the REER index contains exchange rates between the Kyrgyz som and all currencies of major trade partners of the Kyrgyz Republic, a more disaggregated measure of the real exchange rate helps us to understand better the contribution of individual foreign currencies. If we decompose the REER into two regions, the CIS and non-CIS countries, the changes in the real exchange rate over the last two and half decades look more substantial. When the exchange rate index includes only the currencies from the CIS region, one can see that the Kyrgyz som has experienced a real depreciation against the currencies of the CIS region compared to the base

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period (Figure 6.7).

In sharp contrast is the development of the REER index for the currencies outside the CIS region, where a strong appreciation of the Kyrgyz som against these currencies can be observed (Figure 6.7).

Figure 6.7: REER with respect to the currencies in the CIS and non-CIS countries
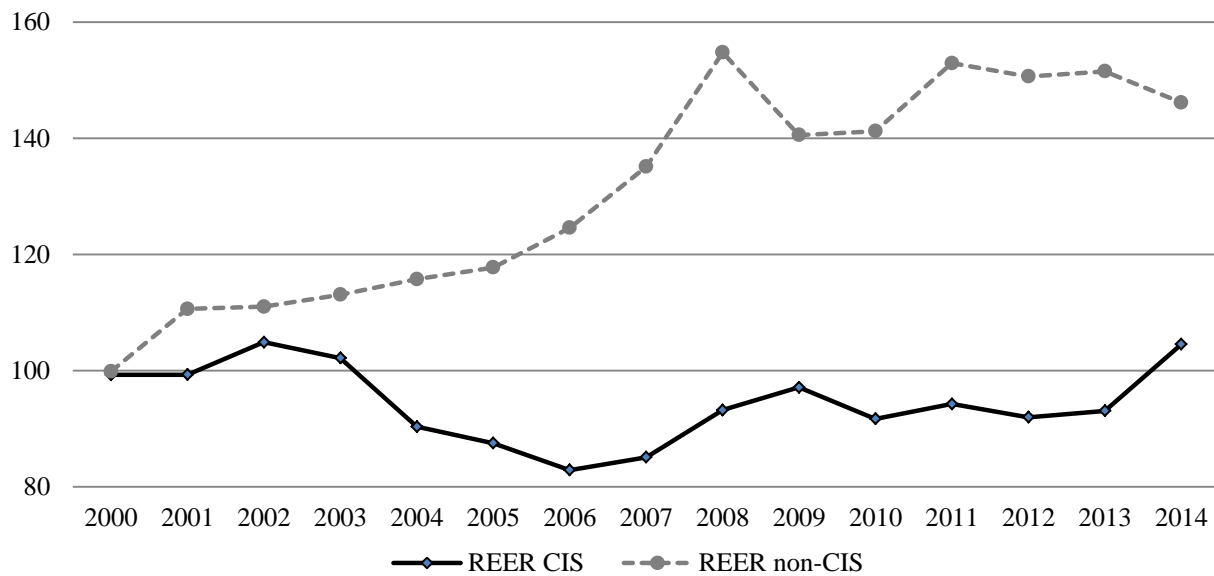
Source: Own illustration based on the data of the NBKR.

Why does the Kyrgyz som behave so differently with respect to the currencies from the two regions? While the Russian rouble has a substantial weight in the **REER CIS**, the US Dollar has a large weight in the **REER non-CIS**[38]**.** In Figure 6.8 we can see the development of the nominal exchange rates (Nominal Bilateral Exchange Rates) between the Kyrgyz som and rouble and between the Kyrgyz som and the US dollar. During the period of 2008 – 2011, the Kyrgyz som depreciated against both foreign currencies. The depreciation of the domestic currency during this period can be linked to the financial crisis of 2008 and the political crisis in 2010. One of the effects of financial crisis on the exchange rates is likely to be through the decreased inflow of

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[38] That is also why the Bilateral Real Exchange Rates for these two currencies are used as additional dependent variables for equations (6.1) and (6.2).

workers' remittances during 2008 – 2009 as one can observe in Figure 6.6.

Figure 6.8: Nominal and Real Bilateral Exchange Rates (som - rouble and som - US$)
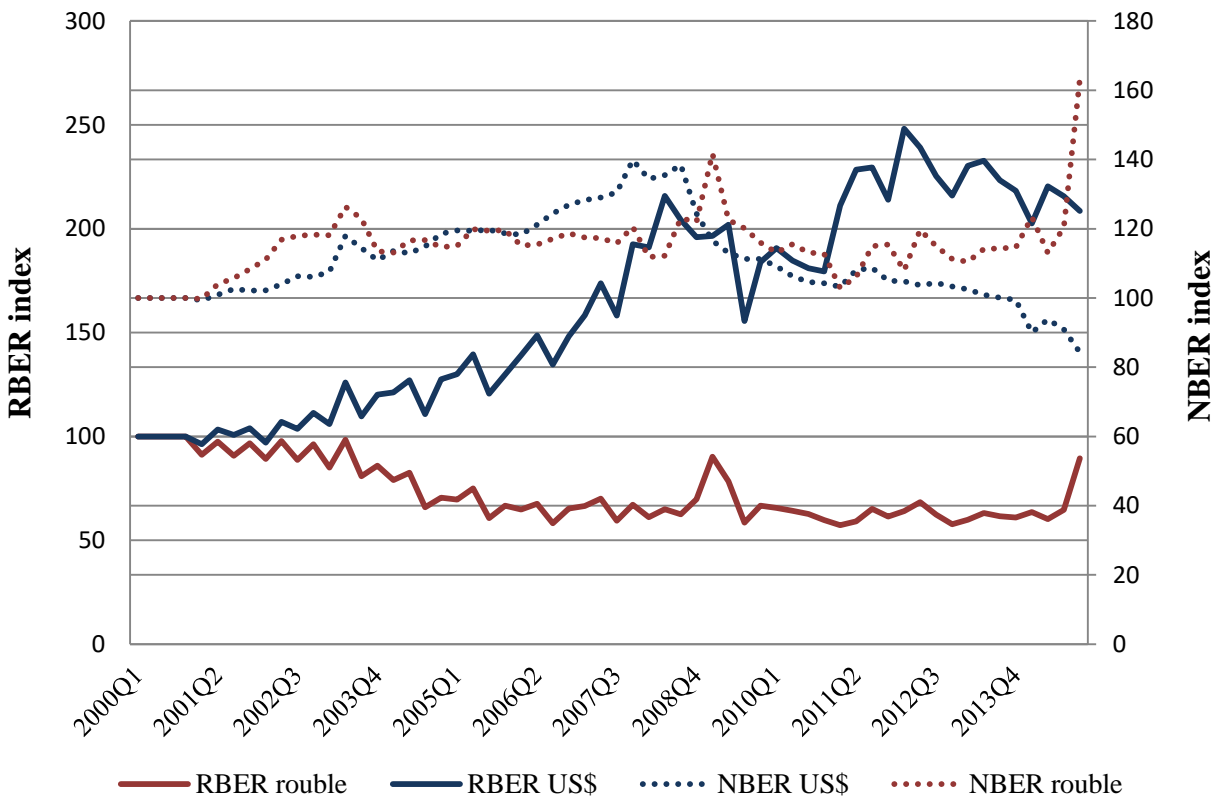
The development of the real exchange rates between the Kyrgyz som and rouble and between the Kyrgyz som and US dollar differ strongly from the trends in the nominal exchange rates. If we look at the next graph in Figure 6.9, we can see that this was due to the stark differences in inflation rates between the Kyrgyz Republic, Russia and the United States. Thus, the nominal depreciation of the Kyrgyz som against the US dollar was outweighed by much higher inflation rates in the Kyrgyz Republic compared to the United States. As a result, the Kyrgyz som has appreciated in real terms against the US dollar over the period 2000 – 2014 (Figure 6.8). On the other hand, the NBERs show us that som appreciated against rouble compared to the base period. However, in real terms som has actually depreciated against the rouble during the same period because of inflation rates being several times higher in Russia than in the Kyrgyz Republic over the considered time span (Figure 6.9).

Figure 6.9: Inflation rates in the Kyrgyz Republic, Russia and the United States
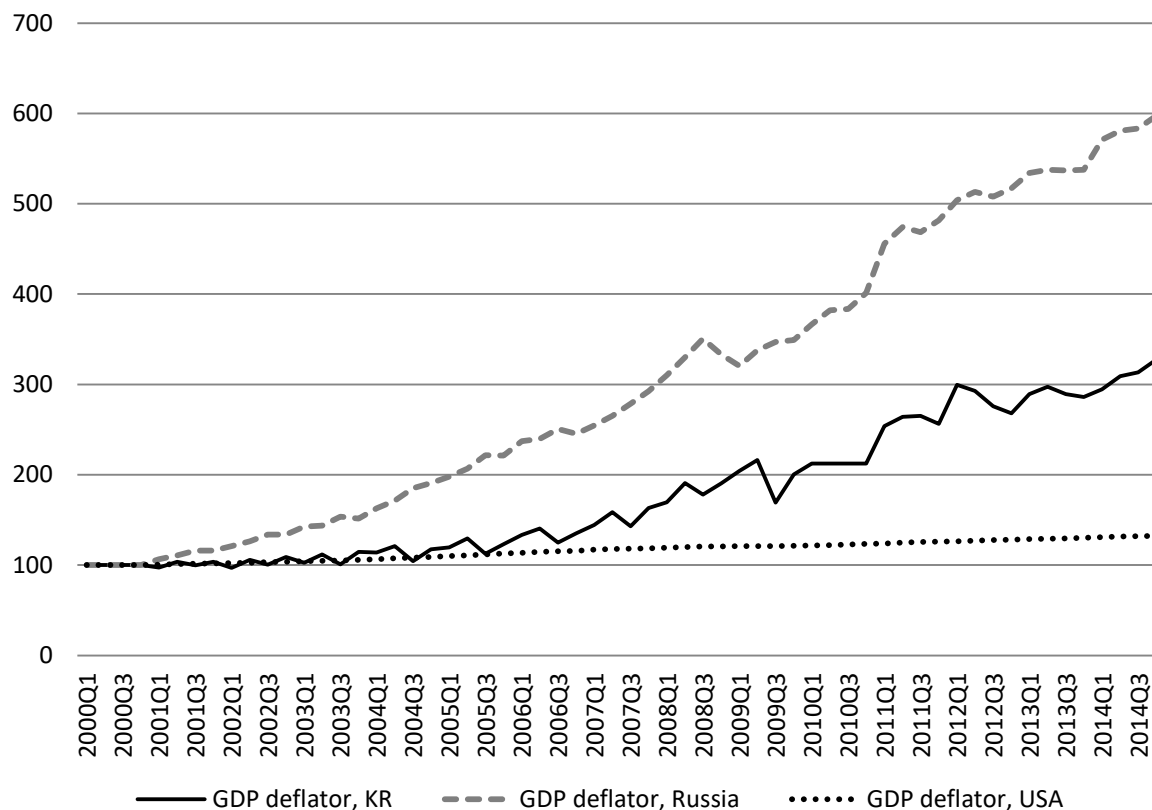
Source: Own illustration based on the data of the NBKR.

The observations from Figures 6.8 and 6.9 are important for explaining econometric results on the effects of remittances on the real exchange rate reported in the next section.

The resource movement effect within the Dutch disease theoretical framework implies that remittances can lead to de-industrialization of the receiving economy. Due to increasing demand for nontradables, labour shifts away from the tradable sectors into the nontradable sector. All other things being equal, the changes in the labour inputs will be reflected in the output of individual sectors. Figure 6.10 shows the development of agriculture, manufacturing and service sectors in the Kyrgyz Republic together with the remittances-to-GDP ratio since the beginning of 2000-s. While the remittances-to-GDP ratio skyrocketed within less than a decade, the share of services in GDP increased from 40 to more than 60%. At the same time, the relative output of agriculture shrunk twofold from 30% to 14% in 2014, and the relative output of the manufacturing sector decreased down to only 13% of GDP in 2014 (Figure 6.10).

Figure 6.10 indicates that a substantial de-industrialisation of the Kyrgyz economy has taken place during 2000 - 2014 which coincided with the boom of workers remittances.

Figure 6.10: Remittances and structural changes in the Kyrgyz economy
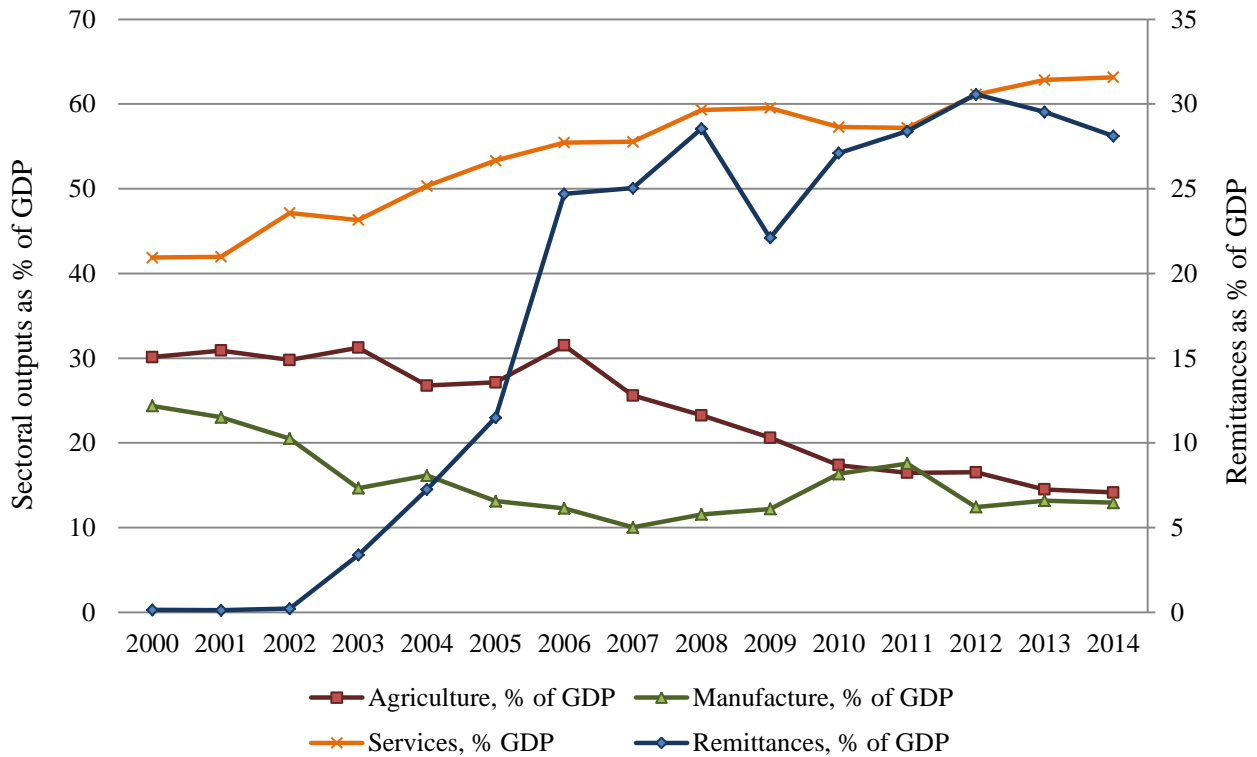
Source: Own illustration based on the data of the NBKR and the NSC.

At a more aggregate level, Figure 6.11 indicates also a possible resource movement effect induced by the inflow of remittances. The correlation between the TNT ratio and remittances seems to be negative, i.e. the nontradable sector grew stronger than the tradable sector over the given period and that could be associated with the increased volume of remittances.

If we compare other sources of foreign exchange inflow to the KR with the inflow of remittances, one can see that remittances are still the largest source, followed by the total export earnings, which in turn depend largely on gold export earnings (Table 6.1). Yet gold earnings are not expected to have a significant effect on the real exchange rate, because only half of the foreign exchange that is earned from gold exports flows back into the domestic economy given the shares with the foreign mining company. The resource-movement effect from gold mining is also rather

negligible because of the limited employment capacity of the sector (only 2,900 people[39] are employed in gold mining compared to at least a half a million Kyrgyz migrants abroad). Other important sources of foreign exchange include foreign aid and FDI inflows.

Figure 6.11: Tradable-to-Nontradable ratio and remittances (2000-2014)
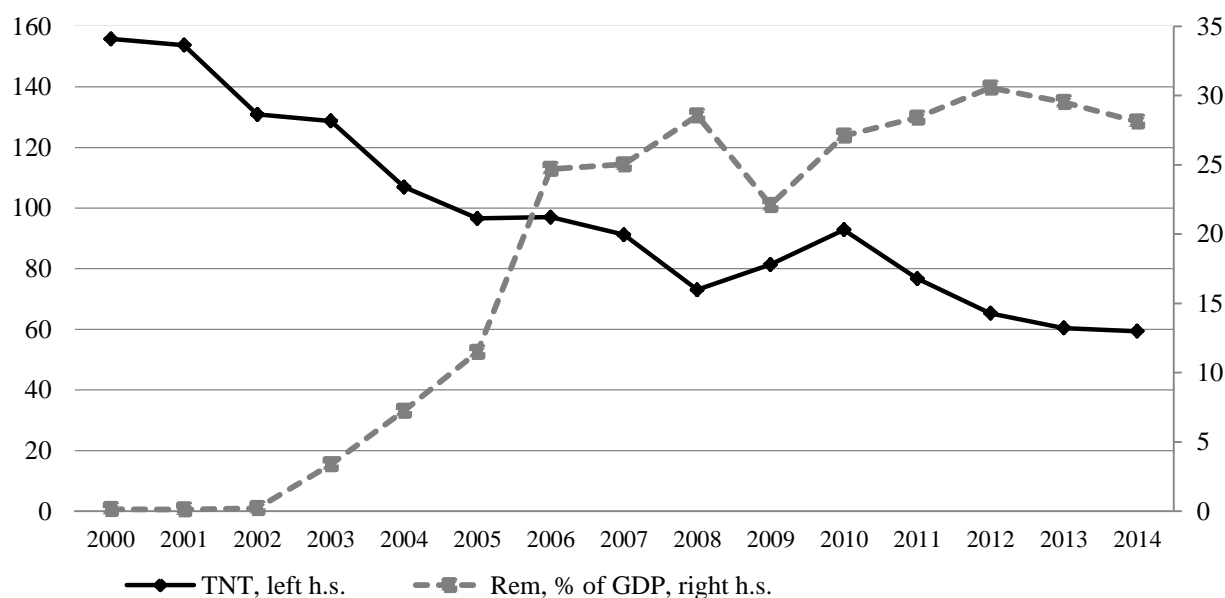
Source: Own illustration based on the data of the NBKR.

Table 6.1: Sources of foreign exchange inflows to the KR with respect to GDP

	2004	**2009**	**2014**
Ratio of remittances to GDP (%)	7.3	22.1	28.1
Total export of goods to GDP, ratio (%)	32.5	30.7	22.1
Gold export earnings to GDP, ratio (%)	13.0	11.3	9.6
Foreign aid to GDP, ratio (%)*	14.2	10.1	8.3
Foreign direct investment to GDP, ratio (%)	2.0	4.0	2.8

Source: Balance of Payments data from the NBKR and World Bank data. *Foreign aid is proxied by net flows on external debt data.

However, the relative importance of both of them has been on decline since the beginning of

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[39] As indicated at the official webpage of the gold mining company Kumtor Centerra Gold: www.kumtor.kg

2000s. Both foreign aid and FDI inflows are used as additional explanatory variables in the empirical models. In 2014, the share of remittances to GDP was larger than the ratio of total export earnings to GDP (Table 6.1). This indicates also that remittances must play an important role in covering the growing deficit of the trade balance of the KR, which in 2014 was roughly US$ 1.8 billion versus US$ 1.9 billion of total export earnings (NBKR 2015).

6.5.2   Empirical results

Results of the econometric model estimations are presented in Tables 6.2 to 6.6. As it was mentioned in the earlier sections, the real exchange models are estimated using two alternative measurements (one based on the CPI index and another one based on the GDP deflator), as well as using decomposed REER indices for the CIS and non-CIS regions. Robustness of the results was also ensured via various specifications of the models. Hansen's *J* test was employed to test for overidentifying restrictions in the 2SLS and GMM 3SLS estimations, where the p-values larger than 0.05 (chosen as the critical value) indicate that the instruments are excluded correctly from the model, i.e., the instruments used are valid for a respective model. Most of the models presented in Tables 6.2 – 6.6 pass the *J* test, and possible explanations are given later when this is not the case. All models (except for the system of equations for sectoral outputs where R squared cannot be estimated) show good explanatory power.

The signs of the control variables used in the models are in line with previous empirical findings and theoretical expectations. An increase in **Terms of trade** leads to a real exchange rate appreciation of the Kyrgyz som when the coefficient for this variable is positive and significant (Tables 6.2 and 6.4). This effect, however, seems to be only significant when the **REER non-CIS** or the **RBER for the US dollar** is considered, and is insignificant for the **RBER for Russian rouble** and for **REER CIS** (Tables 6.2 and 6.3). This could be explained by the fact that it is the US dollar in which most external trade transactions (e.g. export earnings and import bills) are concluded. Moreover, the domestic economy is also highly dollarized, especially when it concerns transactions with real estate, durable and luxury goods.

The **Trade openness** variable has also a positive significant effect on the real exchange rate in most of the model estimations (Tables 6.2 to 6.4). This means that less restricted trade, other things being equal, led to an appreciation of the real exchange rate in the Kyrgyz Republic. This could come through the effect of trade policies on prices of imports and a resulting impact on the price of nontradables. If import prices decrease due to lower import tariffs, demand for all goods and services will increase through a positive income effect, including the demand for nontradables (Lartey *et al*. 2008). This increases their price and leads to a real exchange rate appreciation.

Table 6.2: Real Effective Exchange Rate and Remittances

Independent variables:	REER		REER CIS		REER non-CIS	
	(1)	(2)	(3)	(4)	(5)	(6)
Remittances, % of GDP	-0.850** (0.281)		-1.123*** (0.287)		1.583*** (0.459)	
Remittances, % of GDP (t-1)		-0.535** (0.261)		-0.688*** (0.257)		1.657*** (0.552)
Real GDP growth rate, %	0.039 (0.032)	0.010 (0.034)	0.048 (0.034)	0.008 (0.035)	-0.062 (0.043)	-0.079 (0.058)
M2, % of GDP	-0.068 (0.064)	-0.208*** (0.055)	-0.060 (0.069)	-0.246*** (0.081)	-0.277*** (0.107)	0.055 (0.085)
Terms of trade	0.377** (0.179)	0.445** (0.199)	0.155 (0.205)	0.249 (0.230)	0.679*** (0.223)	0.773*** (0.255)
Trade openness	0.204*** (0.069)	0.162* (0.094)	0.225*** (0.079)	0.169 (0.105)	0.057 (0.100)	-0.077 (0.172)
Foreign Direct Investment, % of GDP	-0.213* (0.109)	-0.284*** (0.107)	-0.208* (0.118)	-0.301*** (0.115)	-0.255* (0.139)	-0.098 (0.122)
Non-FDI inflows, % of GDP	-0.022 (0.072)	-0.102 (0.069)	0.029 (0.073)	-0.075 (0.069)	-0.290** (0.117)	-0.129 (0.088)
Government expenditure growth rate, %	0.004 (0.018)	-0.009 (0.019)	0.008 (0.019)	-0.009 (0.021)	-0.006 (0.028)	0.025 (0.019)
Foreign aid, mln. US$	-0.005 (0.013)	-0.005 (0.013)	-0.014 (0.014)	-0.013 (0.015)	0.010 (0.024)	0.033 (0.029)
Crisis/political instability	-2.619* (1.402)	-4.040*** (1.374)	-2.234 (1.418)	-4.151*** (1.427)	-6.303** (2.718)	-4.991** (1.978)
Time trend	0.746*** (0.119)	0.781*** (0.166)	0.586*** (0.146)	0.619*** (0.194)	0.237 (0.164)	-0.226 (0.340)
Constant	44.338** (18.041)	45.329** (18.502)	64.865*** (19.896)	65.879*** (20.943)	42.318* (22.769)	32.395 (22.864)
No. of observations	59	58	59	58	59	58
Wald chi2	242.86***	235.67***	78.26***	63.88***	755.42***	657.81***
R-squared	0.717	0.687	0.595	0.520	0.877	0.877
Test of overidentifying restrictions	1.785 (p=0.181)	0.502 (p=0.478)	0.166 (p=0.684)	0.063 (p=0.802)	0.275 (p=0.600)	0.356 (p=0.551)

Note: "Dependent variable:" spans the REER, REER CIS, and REER non-CIS column groups.

Source: own estimations using the Two Stage Least Squares (2SLS) Estimator. Remittances are instrumented by Russian GDP and own 1st and 2nd lags. *,**,*** indicates statistical significance at 0.1, 0.05 and 0.01 confidence levels respectively. Robust standard errors are in parentheses.

Table 6.3: Real Bilateral Exchange Rate between som and rouble and remittances

Independent variables:	Dependent variable:							
	Real Bilateral Exchange Rate for Russian rouble							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Remittances, % of GDP	-1.478*** (0.371)		-1.897*** (0.366)	-1.895*** (0.364)	-1.778*** (0.351)	-1.784*** (0.359)	-1.847*** (0.387)	-1.632*** (0.381)
Remittances, % of GDP (t-1)		-1.251*** (0.326)						
Real GDP growth rate, %	0.051 (0.046)	0.039 (0.048)	0.099** (0.047)	0.103** (0.044)	0.090** (0.045)	0.074 (0.046)	0.094* (0.049)	0.074 (0.046)
M2, % of GDP	-0.009 (0.081)	-0.303*** (0.110)	0.013 (0.093)	0.009 (0.096)	-0.019 (0.087)	0.048 (0.088)	0.014 (0.094)	-0.016 (0.092)
Terms of trade	-0.223 (0.279)	-0.219 (0.331)	-0.368 (0.286)	-0.329 (0.303)	-0.301 (0.286)	-0.362 (0.279)	-0.363 (0.288)	-0.289 (0.283)
Trade openness	0.305** (0.117)	0.364*** (0.139)	0.417*** (0.119)	0.440*** (0.124)	0.405*** (0.116)	0.338*** (0.114)	0.401*** (0.123)	0.362*** (0.103)
Foreign Direct Investment, % of GDP	-0.078 (0.158)	-0.211 (0.168)		-0.136 (0.187)				
Non-FDI inflows, % of GDP	0.128 (0.092)	-0.008 (0.092)			0.197** (0.085)			
Government expenditure growth rate, %	0.044* (0.024)	0.019 (0.026)				0.051** (0.025)		
Foreign aid, mln. US$	-0.003 (0.018)	-0.015 (0.022)					0.013 (0.023)	
Crisis/political instability	-2.791 (2.027)	-4.624** (2.111)						-3.136 (2.106)
Time trend	0.142 (0.202)	0.386 (0.261)	0.305* (0.181)	0.301* (0.181)	0.245 (0.181)	0.252 (0.185)	0.269 (0.201)	0.218 (0.192)
Constant	91.273*** (28.204)	96.605*** (31.113)	96.106*** (31.120)	90.821*** (33.460)	91.821*** (30.423)	99.591*** (29.723)	96.814*** (31.237)	94.182*** (28.483)
No. of observations	59	58	59	59	59	59	59	59
Wald chi2	347.84***	357.09***	215.21***	234.15***	229.46***	255.26***	223.28***	261.46***
R-squared	0.781	0.723	0.735	0.739	0.756	0.755	0.738	0.755
Test of overidentifying restrictions	0.436 (p=0.509)	0.003 (p=0.957)	1.167 (p=0.280)	1.034 (p=0.309)	1.127 (p=0.288)	1.566 (p=0.211)	1.317 (0.251)	0.258 (p=0.612)

Source: own estimations using the Two Stage Least Squares (2SLS) Estimator. Real Bilateral Exchange Rate is calculated using the GDP deflator for the Kyrgyz Republic and Russian Federation. Remittances are instrumented by Russian GDP and own [1st] and [2nd] lags. *,**,*** indicate statistical significance at 0.1, 0.05 and 0.01 confidence levels respectively. Robust standard errors are in parentheses.

The impact of **Foreign Direct Investment** on both **RBER for Russian rouble** and **RBER for US dollar** is statistically insignificant. However, the Real Effective Exchange Rate index, including the index for CIS and non-CIS regions, depreciates when FDI increases (Table 6.2). The interpretation of this finding is not straightforward. An immediate implication would be that FDI was invested into productive activities which improve the competitiveness of exports in the KR. At the same time, this effect is not anymore significant when an alternative measurement of the real exchange is considered in Tables 6.3 and 6.4. One potential explanation is that **REER** (as well as **REER CIS** and **REER non-CIS**) is calculated using the CPI, which includes imported goods, whereas calculations of the **RBER for Russian rouble** and the **RBER for US dollar** using the GDP deflator takes into account only domestically produced goods. The latter might be more reliable when it concerns relative competitiveness of Kyrgyz exports and we conclude that FDI had rather no substantial effect on the real exchange rate.

In many specifications, money supply, **M2**, has a significantly negative impact on the real exchange rate, i.e. real exchange rate depreciates when money supply increases. Since expansionary monetary policies are accompanied with lower interest rates, the local currency might lose attractiveness for investors and devaluate. Nominal depreciation can also occur if the cuts in interest rates boost aggregate demand which increases inflation. Given sluggish price adjustment or price rigidity, this nominal depreciation can be transferred into a real depreciation (Lartey *et al.* 2008). An increase in government expenditure leads to an appreciation of the real exchange rate (Tables 6.3 and 6.4). Because government expenditure is likely to be biased towards the consumption of nontradables, this finding seems plausible. An increased demand for nontradables due to larger government expenditure leads their price to rise and results in the appreciation of the real exchange rate.

The effect of **Foreign aid** on the real exchange is insignificant in all models. An important variable to explain the real exchange rate in the Kyrgyz Republic seems to be **Crisis/political instability.** The coefficient estimate for this variable indicates that during the times of political and economic instability, the real exchange rate depreciated significantly. Political instability between 2005 and 2010 and related border closures have likely had an impact on Kyrgyz exports. Moreover, the fuel and food prices increased sharply during the economic crisis in 2008.

Table 6.4: Real Bilateral Exchange Rate between som and US dollar and remittances

Independent variables:	Dependent variable: Real Bilateral Exchange Rate for US$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Remittances, % of GDP	1.972** (0.819)		0.756 (0.829)	0.779 (0.833)	0.690 (0.786)	0.881 (0.838)	0.946 (0.852)	1.779** (0.906)
Remittances, % of GDP (t-1)		1.625** (0.745)						
Real GDP growth rate, %	-0.020 (0.076)	-0.002 (0.091)	0.107 (0.074)	0.102 (0.073)	0.112 (0.072)	0.083 (0.073)	0.087 (0.074)	0.008 (0.083)
M2, % of GDP	-0.171 (0.197)	0.222 (0.172)	-0.102 (0.219)	-0.104 (0.219)	-0.087 (0.206)	-0.077 (0.234)	-0.099 (0.220)	-0.216 (0.207)
Terms of trade	0.195** (0.533)	1.178** (0.512)	0.909* (0.469)	0.892* (0.501)	0.879* (0.465)	0.922** (0.468)	0.931** (0.459)	1.213** (0.529)
Trade openness	0.249 (0.194)	0.176 (0.311)	0.555*** (0.176)	0.538*** (0.185)	0.564*** (0.176)	0.484*** (0.180)	0.495*** (0.179)	0.342* (0.183)
Foreign Direct Investment, % of GDP	-0.048 (0.330)	0.127 (0.311)		0.083 (0.328)				
Non-FDI inflows, % of GDP	-0.279 (0.215)	-0.099 (0.194)			-0.068 (0.199)			
Government expenditure growth rate, %	0.025 (0.048)	0.058 (0.042)				0.043 (0.051)		
Foreign aid, mln. US$	0.039 (0.041)	0.054 (0.047)					0.047 (0.032)	
Crisis/political instability	-13.03*** (4.549)	-10.49*** (3.776)						-11.84*** (4.627)
Time trend	1.327*** (0.308)	1.032** (0.464)	1.768*** (0.309)	1.762*** (0.311)	1.797*** (0.297)	1.712*** (0.312)	1.633*** (0.323)	1.432*** (0.333)
Constant	-45.520 (54.803)	-53.011 (52.971)	-46.094 (47.844)	-43.046 (52.539)	-44.433 (47.943)	-43.387 (47.802)	-43.432 (47.928)	-53.524 (51.185)
No. of observations	59	58	59	59	59	59	59	59
Wald chi2	1571.2***	1424.6***	1115.4***	1234.1***	1125.4***	1239.3***	1778.6***	1290.0***
R-squared	0.936	0.934	0.928	0.928	0.928	0.929	0.929	0.934
Test of overidentifying restrictions	2.534 (p=0.111)	4.742 (p=0.029)	6.154 (p=0.013)	6.156 (p=0.013)	6.043 (p=0.014)	6.737 (p=0.009)	7.089 (p=0.008)	2.176 (p=0.140)

Source: own estimations using the Two Stage Least Squares (2SLS) Estimator. Real Bilateral Exchange Rate is calculated using the GDP deflator for the Kyrgyz Republic and the United States. Remittances are instrumented by Russian GDP and own 1st and 2nd lags. *,**,*** indicates statistical significance at 0.1, 0.05 and 0.01 confidence levels respectively. Robust standard errors are in parentheses.

All these events left the National Bank of the Kyrgyz Republic undertaking policies which

allowed the Kyrgyz som to depreciate (IMF 2011).

According to predictions within the Dutch disease framework, the impact of remittances on the real exchange rate is expected to be positive, i.e., a positive shock to remittances is expected to appreciate the real exchange rate. Since remittances increase the real disposable income in the receiving economy, the demand for nontradables rises, too. Due to an excess demand for nontradables, the real exchange rate has to appreciate (see Section 6.2.2).

This is not always the case in our estimations. If we look at the aggregate index of the real exchange rate, the **REER** (Table 6.2), remittances seem to have led to a depreciation of the real exchange rate. When only the **RBER for US dollar** is considered, the coefficient for remittances becomes positive and significant, and the other way round when the **RBER for Russian rouble** is considered. All models from Table 6.3 show that due to the large inflow of remittances, Kyrgyz som depreciated against the Russian rouble in real terms during 2000-2014, whereas the model estimations from Table 6.4 indicate that Kyrgyz som appreciated against the US dollar because of workers' remittances.

Which measure should be more relevant for considerations about Kyrgyz exports' competitiveness? Based on the same arguments as in the case of terms of trade effects on the real exchange rate, it would be rather the **RBER for US dollar** that is critical for Kyrgyz exports than the **REER**. Thus our estimates show that because of workers' remittances, the Kyrgyz som appreciated to a significant effect against the US dollar in real terms (Table 6.4). In terms of US dollars, exports from the Kyrgyz Republic have become more expensive than before and this happened because of the large inflow of remittances. The increased demand for nontradables as shown in Figure 6.10 seems to be the major cause for the real appreciation of the Kyrgyz som. The spending effect of remittances is thus confirmed by our estimates for the case of the Kyrgyz Republic.

As noted earlier, because of sluggish price adjustments in the economy, changes in the nominal exchange rates can be transferred into a real depreciation or appreciation (Lartey *et al.* 2008). Therefore, developments on the market for foreign exchange can be also useful in understanding the results in Tables 6.2 to 6.4. For instance, the depreciation of the Kyrgyz som against the

Russian rouble in real terms can potentially be a result of an increasing trade deficit between the Kyrgyz Republic and the Russian Federation. In 2014, imports from Russia to the KR comprised US$ 1851,9 million, whereas exports from the KR to Russia constituted less than one tenth of that amount: US$ 122.7 million. Apparently, workers' remittances were used to cover the trade balance deficit of the KR. Yet what if remittances have contributed to the growth of the trade deficit in the first place? Given the fact that the KR is a small open economy and that remittances have a positive income effect, it is logical to expect that remittances do not only raise the demand for nontradables, but they also lead to an increased import demand. This should be especially true if the domestic production is rather weak. All other things equal, an increase in the inflow of remittances in roubles would lead to an appreciation of the Kyrgyz som against the rouble: the larger supply of roubles on the market for foreign exchange would lead to a fall of its price against the domestic currency. On the other hand, the growing import demand would decrease the supply of roubles and thus the Kyrgyz som depreciates against the rouble. According to the results in Table 6.3, the latter effect seems to be more significant and remittances lead to a real depreciation of the Kyrgyz som against the Russian rouble. Given the enormous trade deficit with Russia mentioned earlier, this result seems plausible. Moreover, the large part of remittances might be transferred not in Russian roubles but in US dollars considering the inflation and instability of the rouble within the last decade.

Another possible channel through which remittances may influence the real exchange rate is via adding to an upward inflationary pressure in the remittance-receiving economy. For instance, Narayan *et al*. (2011) found that for the case of 54 developing countries included in their study, remittances had a positive significant effect on inflation, which became even stronger in the long run. A similar result was confirmed empirically for the case of Pakistan (Nisar and Tufail 2013) and Mexico (Ulyses Balderas and Nath 2008). If we go back to Figure 6.9, we can see that during the same period when the KR experienced a boom in the inflow of remittances (2000-2014), inflation rates in the country increased rapidly, too. It is very likely that remittances have contributed to increased inflation in the Kyrgyz Republic. If that was the case, then through this channel, remittances led to a real appreciation of the domestic currency with respect to any other foreign currency. According to regression results in Tables 6.2 to 6.4, this would mean that due to remittances, the Kyrgyz som appreciated in real terms with respect to the US dollar possibly also

because of the inflation channel, whereas the depreciation of the Kyrgyz som against the Russian rouble could have been even stronger if it were not for remittances inflow.

The resource movement effect, if present, should be reflected in the model estimates for the **Tradable-to-Nontradable ratio** and sectoral outputs (Tables 6.5 and 6.6). The effect of remittances on TNT is negative and significant. It implies that when the remittances-to-GDP ratio increases by one percentage point, the TNT ratio decreases on average by four percentage points. This is a substantial number which indicates at a large shift of resources from the tradable to nontradable sectors in the KR as a result of an increasing inflow of remittances. The results in Table 6.5 suggest that the nontradable sector has benefited strongly from remittances, whereas the tradable sectors in total have experienced much slower growth due to the resource movement effect. When we look at the sectoral outputs, it becomes clearer which sectors have grown or shrunk in response to a larger inflow of remittances (Table 6.6). The entire economy is disaggregated into three sectors only: agriculture, manufacturing and services, where agriculture and manufacturing are traditional tradable sectors and services are nontradables. Since manufacturing and agriculture are more likely to need a time lag to respond to remittances inflow, a first of lag of remittances is used as an explanatory variable here.

The effect of remittances from the current period on the output of both agriculture and manufacturing was not significant. On the contrary, the service sector responds significantly to remittances in the current period and is not influenced by the lags of remittances.

The results presented in Table 6.6 present the specification of the system where the lag of remittances is used for the two tradable sectors and remittances in the current period are used in the equation for services output. The results suggest that when the ratio of remittances to GDP increases by one percentage point in the previous period, the share of agricultural output in GDP declines by 1.1 percentage points. Looking back at the descriptive statistics, one can see that both agriculture and manufacturing have lost their share in GDP over the last decade: agriculture from 30.1% in 2000 down to 14.1% in 2014, whereas manufacturing output as the share of GDP decreased from 24.4% in 2000 to 12.9% in 2014. At the same time, ratio of services to GDP has experienced a strong growth from 41.9% to 63.2% during 2000-2014.

Table 6.5: Results from the Two Stage Least Squares estimation for the Tradable-to-Nontradable ratio

Independent variables:	Dependent variable: Tradable-to-Nontradable ratio					
	(1)	(2)	(3)	(4)	(5)	(6)
Remittances, % of GDP	-3.769*** (1.096)		-4.300*** (1.291)	-4.323*** (1.322)	-4.144*** (1.332)	-4.473*** (1.395)
Remittances, % of GDP (t-1)		-0.564 (0.962)				
Real GDP growth rate, %	1.590*** (0.182)	1.461*** (0.157)	1.509*** (0.182)	1.500*** (0.178)	1.558*** (0.172)	1.506*** (0.179)
M2, % of GDP	1.249*** (0.442)	0.180 (0.201)	1.371 (0.496)	1.345*** (0.502)	1.318*** (0.499)	1.371*** (0.520)
Terms of trade	-1.084 (0.800)	-0.438 (0.699)	-1.275 (0.806)	-1.152 (0.827)	-1.089 (0.852)	-1.208 (0.845)
Trade openness	0.129 (0.242)	-0.443 (0.407)	0.221 (0.297)	0.304 (0.304)	0.285 (0.283)	0.328 (0.319)
Foreign Direct Investment, % of GDP	0.539 (0.347)	0.249 (0.254)	0.334 (0.377)			
Non-FDI inflows, % of GDP	0.329 (0.309)	0.082 (0.240)		0.146 (0.294)		
Government expenditure growth rate, %	-0.223* (0.126)	-0.126 (0.096)			-0.193 (0.123)	
Foreign aid, mln. US$	-0.016 (0.066)	0.023 (0.055)				-0.021 (0.055)
1st quarter (dummy)	-19.449 (17.326)	17.103 (12.104)	-7.798 (16.723)	-7.727 (17.139)	-19.019 (18.873)	-8.444 (17.654)
2nd quarter (dummy)	-72.002*** (10.348)	-63.394*** (7.938)	-68.812*** (11.252)	-67.852*** (11.337)	-68.969*** (10.050)	-67.480*** (11.272)
3rd quarter (dummy)	-33.338** (13.369)	-43.873*** (15.851)	-14.213 (15.252)	-11.486 (14.354)	-24.531* (14.077)	-11.354 (14.815)
Time trend	-0.790** (0.362)	-1.092** (0.438)	-0.617 (0.375)	-0.637 (0.384)	-0.689** (0.337)	-0.544 (0.412)
Constant	204.29*** (77.037)	209.47*** (65.969)	202.33*** (78.659)	184.82** (80.569)	188.46** (82.194)	187.24** (82.469)
No. of observations	59	58	59	59	59	59
Wald chi2	510.44***	509.88***	496.72***	515.47***	500.27***	494.56***
R-squared	0.909	0.931	0.895	0.893	0.899	0.890
Test of overidentifying restrictions	0.401 (p=0.527)	2.559 (p=0.110)	0.622 (p=0.430)	0.342 (p=0.559)	0.305 (p=0.581)	0.367 (p=0.545)

Source: own estimations using Two Stage Least Squares (2SLS) Estimator. Remittances are instrumented by Russian GDP and own 1st and 2nd lags. *,**,*** indicates statistical significance at 0.1, 0.05 and 0.01 confidence levels respectively. Robust standard errors are in parentheses.

Table 6.6: Results from the GMM estimation of the system of equations

Independent variables:	Dependent variable:		
	Agricultural Output, % of GDP	Manufacture Output % of GDP	Services Output% of GDP
Remittances, % of GDP			0.858***
			(0.312)
Remittances, % of GDP (t-1)	-1.096***	0.423**	
	(0.267)	(0.179)	
Real GDP growth rate, %	0.241***	-0.054*	-0.222***
	(0.056)	(0.032)	(0.038)
M2, % of GDP	0.194**	-0.317***	-0.071
	(0.090)	(0.064)	(0.117)
Terms of Trade	-0.578***	0.323***	0.035
	(0.177)	(0.118)	(0.118)
Trade Openness	0.262***	-0.070	-0.152**
	(0.101)	(0.064)	(0.077)
1st quarter (dummy)	-10.299**	10.382***	0.702
	(4.578)	(2.885)	(3.734)
2nd quarter (dummy)	-13.348***	4.883**	8.894***
	(3.662)	(2.169)	(1.957)
3rd quarter (dummy)	18.143***	-9.443	-3.759
	(4.487)	(3.138)	(2.878)
Constant	65.504***	1.527	54.876***
	(16.866)	(12.909)	(13.849)
No. of observations	57		
Test of overidentifying restrictions	3.591 (p=0.309)		

Source: own estimations using Simultaneous System of Equations and the General Method of Moments Estimator. Remittances are instrumented by the 2nd and 3rd lags of Russian GDP. *,**,*** indicates statistical significance at 0.1, 0.05 and 0.01 confidence levels respectively. Robust standard errors are in parentheses.

The negative and large effect of remittances on agriculture can also be explained by the fact that the out-migrated labour was mostly coming from the rural areas where they previously were occupied in agriculture. The positive impact of remittances on the manufacturing sector is somewhat counterintuitive. The appreciation of the real exchange rate and the out-migration of labour, as well as the likely shift of labour into nontradables would be expected to result in the contraction of the sector due to remittances. A possible explanation might lie in the structure of the manufacturing sector and the destination of exports from this sector. A large part of the manufacturing sector is occupied by the textile industry, producing mostly for exports to Russia (NBKR 2015). The distribution of Kyrgyz textile products in Russia is partly undertaken by the

Kyrgyz migrants themselves. This might explain why the inflow of remittances is associated with the growth of the manufacturing sector in the Kyrgyz Republic.

6.6 Discussion and conclusion

When discussing the impact of remittances on the economic growth of recipient countries, we need to keep in mind various ways through which this process can take place, whereby the Dutch disease aspects are only one of them. The more long run effects of remittances can include their effect on investment, human capital, economic inequality and domestic labour supply, including future migration and occupational decisions - all having implications for the long-term economic growth (Rapoport and Docquier 2005). The goal of this paper was to investigate whether the Kyrgyz Republic, one of the largest recipients of remittances worldwide in relation to its economy, is affected by possible Dutch disease effects expected from such a large capital inflow.

In the Kyrgyz Republic, as in many other states of the former Soviet Union, absolute de-industrialization was a natural part of the transition process. Breakdown of former supply chains and cuts of financial support from Moscow led to a shutdown of many plants and factories. Considerable urban-to-rural migration took place to undertake subsistence agriculture, whereas others found jobs in shuttle trade, and hundreds of thousand left to work abroad. Whether remittances have exacerbated this de-industrialization process is one of the important questions asked in this paper.

Theoretical expectations with regard to DD effects are based on rather strict assumptions. One of them is that the country's trade is balanced. In case of the Kyrgyz Republic, trade deficit has increased over the last decade, and remittances became an important source of foreign exchange to balance that deficit out. This might be a reason why the aggregate real exchange rate index depreciates because of remittances. Remittances might have played a stabilizing effect on the Kyrgyz economy, responding to domestic economic and political instability and balancing out income shocks. Even though the service sector seems to have benefited much stronger from remittances than the manufacturing sector, the latter was positively influenced due to the inflow of remittances. Yet whether this took place because of the investment of remittances into that sector or due to the depreciation of the Kyrgyz som with respect to the Russian rouble is not clear. The resource movement effect seems to have taken place from agriculture possibly into out-migration and the services sector. Agricultural exports must have also deteriorated because of some serious structural problems in the sector, including underinvestment, lack of machinery and

other inputs, low productivity and underdeveloped value chains.

Overall, the results indicate that Kyrgyz exports lost in international competitiveness due to remittances if the exchange rate with the US dollar is considered. The real appreciation of the Kyrgyz som against the US dollar was associated with an increase in the remittances inflow. Moreover, the more remittances the Kyrgyz economy received, the smaller its Tradable-to-Nontradable output ratio became. However, this does not seem to be a result of the de-industrialization process caused by remittances: the manufacturing sector's output was positively associated with remittances.

On the other hand, remittances seem to have contributed to a real depreciation of the Kyrgyz som against the Russian rouble. The positive link between the remittances and the manufacturing sector could be explained by this depreciation such that Kyrgyz exports become cheaper in Russian roubles and thus more competitive. The depreciation of the Kyrgyz som against the rouble because of remittances can be a result of increasing imports and a corresponding trade deficit with the Russian Federation. Remittances could have caused not only an increase in the demand for nontradables, but also an increase in the import demand. If import bills grew due to remittances, this can explain why remittances led to a real depreciation of the Kyrgyz som with respect to the Russian rouble.

In sum, the spending and the resource movement effects from remittances seem to be only partially present in the Kyrgyz Republic. Our findings show at the disaggregated level which sectors have improved and which deteriorated due to the dramatic increase in remittances. The effects of Dutch disease could be controlled if the foreign exchange coming from remittances is invested in productive activities, including human and physical capital, and by creating a favourable policy environment for such investments (Tuaño-Amador *et al.* 2007).

Several aspects have to be kept in mind when implementing policies to deal with the Dutch disease effects. First, it is important to know whether the foreign exchange shock is permanent or temporary. If it is a permanent shock, intervention policies on the foreign exchange market will be costly and slow down macroeconomic adjustment. Second, if the inflow of remittances can be redirected to investment in productive activities, the Dutch disease effects could be outweighed by benefits from these inflows (Magud and Sosa 2010). The best way to encourage the

productive use of remittances is to improve the quality of institutions to induce these investments (Catrinescu *et al*. 2009). In fact, poor-quality institutions and weak domestic industries apparently are the reason why remittances are rather spent on conspicuous consumption, including imports, instead of being invested.

This study is not exempt from limitations. Shortages in data continue to be one of the major problems of research in the Central Asian region, especially when it concerns time series data. The same reason makes it difficult for many studies on developing countries to choose appropriate instruments for macroeconomic variables used in the models. This study could serve as a basis for the future research on the Kyrgyz Republic or on other Central Asian countries, where an additional Dutch disease channel could be elaborated, namely, the changes in real wages. Remittances are likely to affect real wages in the home country of migrants and lead to a real exchange rate appreciation. Another important aspect, which could be considered given more disaggregated data, is the contribution of remittances to the volatility of the real exchange rate that could potentially create growth-hampering effects on the recipient economy.

7   SUMMARY AND CONCLUSIONS

The development of the agricultural sector in the Kyrgyz Republic since its independence has been strongly affected not only by government policies in this sector, but also by a number of significant changes in the macroeconomic environment, including the disruption of supply chains within the former Soviet Union, newly established borders with the neighbouring countries, rapid liberalization policies, deteriorating infrastructure, political instability, and a massive outmigration of labour abroad among others.

The goal of this PhD thesis is to elaborate on government policies in the agricultural sector, as well as on some important macroeconomic trends in order to obtain a clearer idea on how these policies and economy-wide trends affected agricultural development in the KR. Following this goal, an analysis of the impact of both direct agricultural policies and economy-wide developments on agricultural incentives, an analysis of WTO impacts on agricultural trade, and analyses of the international migration impacts on the household and on the macroeconomic level have been conducted within this PhD project.

Looking at the implications of WTO accession for agricultural trade development in the Kyrgyz Republic, one can see that the structural changes in agricultural trade have been substantial since the time of accession. During this time, agricultural and food imports have developed much quicker than Kyrgyz agricultural exports widening the agricultural trade deficit. Agricultural exports became concentrated rather on raw materials and fresh products, whereas imports consisted more on higher value processed food products. The WTO accession does not seem to have improved access to new export markets neither, as mostly the CIS member-countries, especially Russia and Kazakhstan, remained the largest trade partners for the KR in agricultural trade. Moreover, the diversification of exports of agricultural and food products' trade was substantially smaller than for imports. The main reason behind is the low competitiveness of the agro-processing industry due to the lack of technology. Prohibitively high trade costs due to underdeveloped infrastructure, landlockedness, corruption and the smallness of scale impose a serious barrier to Kyrgyz exports, including agricultural exports.

The findings on government support to agriculture over the years since independence show that the assistance to farmers has been concentrated mostly on input-related support, yet was not

based on a continuous medium-run policy of market price support. There were many individual policy actions for individual years or a few years which were then revised again. Despite this discontinuous policy approach, apparently due to political instability, food crops seem to be favoured compared to tradable agricultural products based on the sum of agricultural policy measures and a lack of market integration of the exportables. Regression results demonstrate that a significant part of the increase in the prices in the importable sector is shifted on to the exportable sector as an implicit tax. When non-agricultural and agricultural exportables are distinguished in the regression model, the results show that agricultural exports are implicitly taxed with protection in the manufacturing sector or if an exogenous import price boom occurs. Strong intersectoral linkages between the prices in the nontradable and tradable sectors have straightforward implications for designing future policies, as they indicate the extent by which each sector would be affected by a certain commercial policy or a general macroeconomic development that affects prices in the importables sector.

One important example of a general macroeconomic development likely to affect the agricultural sector as well is international migration. The study on the impact of international migration on crop production and rural income provides new results that should be relevant for both agricultural and rural development policies. The data show that most Kyrgyz migrants leave to Russia and the remittances sent back comprise a substantial part of migrant households' income. Yet only few migrant households spend remittances for investing in a productive activity. The GMM-3SLS results showed that it was important to differentiate between crop income and total crop production when discussing the effects of migration on crop output for the case of smallholder farmers. Even if not directly invested, remittances were positively linked to crop income. Overall, own empirical findings do not confirm the view that outmigration of labour significantly reduces crop output. The concern for policy-makers thus should not be that outmigration negatively affects crop production, but rather that remittances are not used for generating more income that would sustain the positive effect of remittances for the remaining residents and possibly create multiplier effects. On the other hand, the implication of empirical results for rural poverty is that international migration helped to significantly improve the total household income for migrant households. If the policy goal is to improve the domestic production of food crops in order to secure food self-sufficiency and food security goals, then

general policies facilitating an increased investment of remittances in agricultural production by smallholder farmers could be useful. In this regard, additional support might be needed to help smallholder farmers with marketing of their produce, which could include, e.g. efforts to reduce transaction costs related to transport costs and the smallness of output size.

The goal of the next part of this thesis was to investigate whether the Kyrgyz Republic, one of the largest recipients of remittances worldwide in relation to its economy, is affected by possible Dutch disease effects from remittances. The empirical results indicate that Kyrgyz exports lost in international competitiveness due to remittances if the exchange rate with the US dollar is considered. The real appreciation of the Kyrgyz Som against the US Dollar was significantly associated with an increase in the remittances inflow. Moreover, the more remittances the Kyrgyz economy received, the smaller its Tradable-to-Nontradable ratio became. However, this does not seem to be a result of the de-industrialization process caused by remittances: the manufacturing sector's output was positively associated with remittances. The effect of remittances on the agricultural output at the aggregate level was negative as expected, which can be explained partly by the removal of labour and partly by the positive effect of remittances on the services sector.

An important policy implication from both studies on international migration is that the government should create a favourable environment for and promote an investing the workers' remittances in productive enterprises, including crop and livestock activities. The Dutch disease effects can be reversed if remittances are used to strengthen the losing sectors, but such an investment has to be economically attractive for migrants and their families. Agricultural sector does not lead in this contest. Agricultural prices are distorted, but mainly by non-policy barriers. Discontinuous agricultural policies may have little effect on agricultural prices, but do add to a general confusion of farmers with regard to the overall policy and macroeconomic environment. Much has been said on the numerous constraints that farmers in the Kyrgyz Republic face today. The main challenge seems to be in providing a coherent policy framework crucial for the sustainable development of not only the agricultural sector, but the entire Kyrgyz economy as well.

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APPENDICES

Table A1: GMM-3SLS results: a joint estimation of crop income, remittances and migration

Independent variables:	Dependent variables:		
	Crop income, Soms	Remittances amount, Soms	Number of migrants
Constant	100 591.9**	-44 673.6**	-2.82***
	(47 071.8)	(21 561.3)	(0.35)
Number of migrants	-43 079.1	36 881.8***	
	(28 749.6)	(8 314.6)	
Remittances amount, Soms	1.19*		
	(0.69)		
Input use:			
Land under crops, log value	16 085.2***	-717.4	0.01
	(2 845.9)	(1 591.5)	(0.03)
Irrigation (1=Yes)	12 896.5		
	(12 938.2)		
Fertilizer use (1=Yes)	-639.3		
	(6 497.5)		
Machinery use (1=Yes)	-4 388.3		
	(5 431.2)		
Socio-demographics			
Household size	1 976.0	87.3	0.10***
	(1 231.3)	(780.9)	(0.02)
Age of household head	-1 456.3	-1 747.7**	0.07***
	(1 540.8)	(704.3)	(0.01)
Age of household head sqrd.	11.34	-15.53**	-0.0006***
	(13.51)	(6.28)	(0.0001)
University degree (1=Yes)	-7 619.9	2 048.6	-0.01
	(5 498.1)	(3 279.6)	(0.05)
Kyrgyz ethnicity (1=Yes)	-11 206.9	-7 381.6*	0.12**
	(7 200.5)	(3 816.3)	(0.06)
Value of physical assets, thous. Soms	26.48	-12.37	0.0004**
	(18.29)	(11.83)	(0.0001)
Value of livestock, thous. Soms	10.48	2.86	-0.0001
	(11.97)	(5.65)	(0.0001)
Infrastructure			
Distance to the nearest road, m	-0.39	0.20	-0.0001
	(1.17)	(0.73)	(0.0001)
Distance to the nearest market, m	-0.77***	0.38**	0.0001
	(0.29)	(0.16)	(0.0001)
Distance from the plot to the dwelling, m	-0.20	-0.01	0.0001
	(0.62)	(0.33)	(0.0001)
Shocks			
Weather and climate shocks (number)	-2 288.6	-1 900.1	0.04***
	(2 519.4)	(1 287.1)	(0.02)
Family shocks (number)	-10 372.9**	-1 182.4	-0.09**
	(4 144.0)	(2 425.7)	(0.04)
Shocks related to socio-economic and political situation (number)	-2 560.3	1 989.3	0.03
	(2 664.3)	(1 444.9)	(0.02)

Independent variables:	Crop Income, Soms	Remittances amount, Soms	Number of Migrants
Regional fixed effects			
Osh	-9 739.1	6 384.0*	0.35***
	(9 949.5)	(3 477.2)	(0.06)
Batken	-1 254.5	15 897.8***	0.31***
	(16 335.8)	(5 229.8)	(0.09)
Jalalabad	-22 228.1	19 960.7***	0.51***
	(17 154.3)	(7 013.7)	(0.09)
Naryn	-54 912.4***	2 566.5	0.09
	(10 173.7)	(4 740.2)	(0.08)
Talas	63 564.7***	3 712.2	0.17**
	(11 094.1)	(5 515.7)	(0.09)
Issykkul	-35 583.2***	3 972.6	0.06
	(9 323.7)	(3 242.4)	(0.06)
Instruments			
Subjective well-being of the household		3 205.8***	
		(1 014.5)	
Activeness of participation in financial groups		-1 924.1**	
		(982.8)	
Activeness in social or political organizations			0.04*
			(0.02)
Reliance on family and friends as main source of information			-0.27***
			(0.04)
Test of overidentifying restriction: Hansen's J chi2 (3) J test= 5.57; p-value=0.13			

Table A1 continued

Source: Own estimates based on the LiK Survey. *,**,*** significant at 0.1, 0.05 and 0.01 confidence levels respectively. Robust standard errors in parentheses.

Table A2: Probit model results used for estimating propensity scores; dependent variable is *Migration Dummy* (1=a household has at least one migrant abroad; 0 otherwise)

Independent variables	Coefficient	Standard Error
Age of Household Head	0.237***	0.038
Age of Household Head sqrd.	-0.002***	0.0003
Land under crops, log value	-0.038	0.064
Household size	0.156***	0.028
University degree (1=Yes)	-0.173	0.137
Kyrgyz Ethnicity (1=Yes)	0.221	0.149
Value of physical assets, thous. Soms	0.0004*	0.0002
Value of livestock, thous. Soms	-0.0003	0.0004
Distance to the nearest road, m	-0.0001	0.0001
Distance to the nearest market, m	0.0001	0.0001
Distance from the plot to the dwelling, m	0.0001	0.0001
Weather and climate shocks (number)	0.101**	0.045
Family shocks (number)	-0.044	0.109
Shocks related to socio-economic and political situation (number)	0.062	0.048
Osh	1.286***	0.323
Batken	1.287***	0.355
Jalalabad	1.775***	0.342
Naryn	0.364	0.476
Talas	1.13***	0.36
Issykkul	0.499	0.367
Activeness in social or political organizations	0.063	0.049
Reliance on family and friends as main source of information	-0.439	0.071
Number of observations: 1006		
LR chi2 (22) =215.45, p-value=0.000		

Source: Own estimates based on the LiK Survey. *,**,*** significant at 0.1, 0.05 and 0.01 confidence levels respectively.

Table A3: Testing the matching quality with the Standardized Bias (pstest in Stata)

Variables	Mean after matching		% bias	t-test (p-value)
	Treated	Control		
Land under crops, log value	-0.71	-0.61	-10.0	-0.96 (0.34)
Household size	6.36	6.41	-2.0	-0.18 (0.86)
Age of Household Head	55.3	54.8	3.6	0.38 (0.71)
Age of Household Head sqrd.	3173.7	3134.5	2.7	0.28 (0.78)
University degree (1=Yes)	0.16	0.17	-1.5	-0.14 (0.89)
Kyrgyz Ethnicity (1=Yes)	0.83	0.87	-8.6	-0.9 (0.37)
Value of physical assets, thous. Soms	128.5	143.1	-5.4	-0.5 (0.61)
Value of livestock, thous. Soms	145.4	176.9	-17.1	-1.7 (0.097)
Distance to the nearest road, m	994.6	1071	-4.1	-0.39 (0.69)
Distance to the nearest market, m	8978	8829.5	1.2	0.11 (0.91)
Distance from the plot to the dwelling, m	1161.1	1122.4	1.1	0.14 (0.89)
Weather and climate shocks (number)	1.93	1.83	7.6	0.71 (0.48)
Family shocks (number)	0.24	0.28	-9.5	-0.76 (0.45)
Shocks related to socio-economic and political situation (number)	1.05	1.10	-4.5	-0.40 (0.69)
Osh	0.34	0.26	16.0	1.52 (0.13)
Batken	0.21	0.19	3.2	0.27 (0.79)
Jalalabad	0.31	0.32	-2.8	-0.23 (0.82)
Naryn	0.01	0.01	-2.8	-0.45 (0.65)
Talas	0.07	0.09	-8.6	-0.76 (0.45)
Issykkul	0.05	0.09	-15.6	-1.69 (0.09)
Activeness in social or political organizations	0.06	0.06	0.3	0.06 (0.95)
Reliance on family and friends as main source of information	-0.06	-0.09	3.9	0.39 (0.70)
Mean bias			6.0	
Median bias			4.0	

Source: Own estimates based on the LiK survey.

Erklärung gemäß der Promotionsordnung des Fachbereichs 09 vom 07. Juli 2004 § 17 (2)

„Ich erkläre: Ich habe die vorgelegte Dissertation selbständig und ohne unerlaubte fremde Hilfe und nur mit den Hilfen angefertigt, die ich in der Dissertation angegeben habe.

Alle Textstellen, die wörtlich oder sinngemäß aus veröffentlichten Schriften entnommen sind, und alle Angaben, die auf mündlichen Auskünften beruhen, sind als solche kenntlich gemacht.

Bei den von mir durchgeführten und in der Dissertation erwähnten Untersuchungen habe ich die Grundsätze guter wissenschaftlicher Praxis, wie sie in der „Satzung der Justus-Liebig-Universität Gießen zur Sicherung guter wissenschaftlicher Praxis" niedergelegt sind, eingehalten."

[I declare: this dissertation submitted is a work of my own, written without any illegitimate help by any third party and only with materials indicated in the dissertation. I have indicated in the text where I have used texts from already published sources, either word for word or in substance, and where I have made statements based on oral information given to me. At any time during the investigations carried out by me and described in the dissertation, I followed the principles of good scientific practice as defined in the "Statutes of the Justus Liebig University Giessen for the Safeguarding of Good Scientific Practice".]

Eliza Zhunusova

Giessen, 26. Oktober 2017