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The Impact of Kumtor Gold Mine on the Economic and Social Development of the Kyrgyz Republic

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Abstract

The Kumtor gold mine is the Kyrgyz Republic's largest enterprise. This paper provides details of the mine's operations and documents its current socio-economic contribution to the Kyrgyz economy including GDP, exports, investment, and the government budget and social development of the country. The paper also simulates the mine's future operations and its impact on the economy of the country for three scenarios: core (business as usual), pessimistic (abrupt closure of the mine), and optimistic (extended terms of its service). This analysis is implemented using computable general equilibrium model (MAMS) developed by the World Bank and adapted by the authors to the Kyrgyz economy. Results of the simulations confirm the large direct and indirect impact of Kumtor on the country's economy.

Keywords

Kumtor gold mine, CGE modeling, extractive industries, Kyrgyz Republic

JEL codes: Q32, Q38

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Abbreviations

Centerra	Centerra Gold Inc.
CGE	Computable General Equilibrium models
CJSC	Closed Joint Stock Company
EITI	Extractive Industries Transparency Initiative
FDI	Foreign Direct Investments
GDP	Gross Domestic Product
HS	Harmonised System
IKDF	Issyk-Kul Development Fund
IMF	International Monetary Fund
JSC	Joint Stock Company
KGC	Kumtor Gold Company
KGS	Kyrgyz Republic som
LHS	Left-hand side
MDG	Millennium Development Goal
NBKR	National Bank of the Kyrgyz Republic
NSC	National Statistical Committee of the Kyrgyz Republic
Oz	Ounce
RHS	Right-hand side
SF	Social Fund of the Kyrgyz Republic
UNDP	United Nations Development Programme
UN-DESA	United Nations Department for Economic and Social Affairs
US$	United States dollar
VAT	Value-added tax

1. Introduction

Kumtor gold mine is the largest enterprise, investor and taxpayer of the Kyrgyz Republic. Recently, Kumtor's current and future contribution to the country's social and economic development has become the subject of frequent discussions in the Kyrgyz Republic and beyond. These discussions frequently lack empirical evidence and comprehensive information. This paper aims at providing an impartial, evidence-based and rigorous assessment of Kumtor's impact on current and future economic and social development of the Kyrgyz Republic. The assessment was conducted to inform discussions on the country's onward development and the development of the mining sector in particular.

A comprehensive assessment of the impact of Kumtor on the economy of the Kyrgyz Republic requires accounting for not only the enterprise's direct contribution to gross domestic product (GDP) and the government budget, but also the multiple spillovers from its activities on other sectors of the economy. It is also important to consider this impact in the context of the country's long-term development. In applied economic research, computable general equilibrium (CGE) models are used to conduct comprehensive assessments. CGE models are designed to explicitly reflect inter-sectoral linkages and study the interdependence of different parts of the economy in the medium- and the long-term. This paper is based on an economy-wide single-country dynamic CGE model for the Kyrgyz Republic tailored to the needs of the study.[1] Specifically, the study relied on the Maquette for Millennium Development Goal Simulations (MAMS) model, which was developed by the World Bank for medium- to long-term policy analysis. The model traces the lasting impact of a variety of external and policy shocks on the performance of directly and indirectly affected sectors of the economy, household consumption, trade, government budget and other economic variables. Moreover, the model allows for the simulation of spillovers of economic shocks on the social sector, including education and health care. In this assessment, the model was used to conduct a quantitative evaluation of different scenarios related to future activities of the Kumtor mine, including a sudden shutdown of the enterprise, the gradual phasing out of its activities and more optimistic development options.

The model is not intended to simulate environmental issues, so this paper does not address the environmental aspects of Kumtor operations. As the model is macroeconomic in a sense that it considers the entire economy as a single entity, it does not provide information on the development of some of the country's regions or on the impact of the Kumtor enterprise on local development in the mine area. These topics are not covered by this paper and deserve in-depth research and analysis.

The model and analysis in the paper are based on statistical data produced by the country's National Statistical Committee (NSC), the National Bank of the Kyrgyz Republic (NBKR) and the Ministry of Finance of the Kyrgyz Republic, as well as official reporting of Kumtor Gold Company (KGC) and Centerra Gold Incorporated (Inc.) and government projections of mining sector development. Analysis of recent trends and the current situation in the paper

[1] The authors are grateful to Professor Martin Cicowiez, Deputy Director of the Center for Distributive, Labor and Social Studies at the National University of La Plata, for his valuable support in adjusting the model to the needs of this study and analysing different scenarios of economic and social development of the country using the model.

covers the period from 2009 to 2013, using 2011 as a base year for the model. Model simulations and projections are made for the period 2014 to 2035 to include the entire life cycle of the mine and trace the long-term implications of its closure.

2. Kumtor's Current Contribution to the Kyrgyz Economy

2.1. The Gold Mining Industry in the Kyrgyz Republic

Currently, gold mining is the only large extractive industry in the Kyrgyz Republic.[2] Apart from precious metals, there are some commercial deposits of coal, as well as iron, non-ferrous metals (copper, antimony, tin, tungsten etc.) and non-metal minerals (limestone, gypsum, clay and other materials for the construction industry). According to current estimates in the Government's draft mining industry strategy, gold comprises 87 percent of the total value of minerals in the country, with coal making up 10 percent and other minerals making up the balance. In 2013, precious metals production accounted for 93 percent of the total outputs of extractive industries, including mining and metallurgy.

There are a large number of gold and silver deposits in the Kyrgyz Republic (Table 1). Hard rock gold[3] is a key resource; the stock at placer gold deposits is relatively small. The largest hard rock gold deposit is Kumtor (see details in the next sections). As of September 2014, gold is also mined at three deposits (Makmal, Terekkan and Solton-Sary) by the state-owned company Kyrgyzaltyn JSC and at three deposits (Ishtamberdy, Jamgyr, Karakazyk) operated by Chinese and Kazakh companies. The latter companies only produce gold concentrate to be processed outside the Kyrgyz Republic. Several deposits, also operated by foreign companies, will begin gold production over the next one-two years or even few months.

Table 1. Precious Metal Deposits in the Kyrgyz Republic

Type of mineral	Number of deposits	Stock, ton
Deposits on the state balance of minerals,[4] as of 1 January 2012		
Hard rock gold	36	443.3
Placer gold	24	5.1
Silver	15	363.5
Perspective stock[4] and forecasted resources		
Hard rock gold	70	2 123.7
Placer gold	63	25.6
Silver	37	7 406.5

Source: Draft Medium-term and Long-term Development Strategy of the Mining Industry of the Kyrgyz Republic, 2014, www.mineconom.gov.kg/Docs/nedropolzovanie/mining_strategy.rar

2 This section is based on the government's draft mining industry strategy: Ministry of Economy of the Kyrgyz Republic, *Draft Medium-term and Long-term Development Strategy of the Mining Industry of the Kyrgyz Republic*, 2014, www.mineconom.gov.kg/Docs/nedropolzovanie/mining_strategy.rar (accessed 30 September 2014).

3 Placer deposits are composed of relatively loose material. Hard rock gold mining extracts gold encased in rock.

4 Deposits on state balance are those that have proven resources of gold; perspective deposits are still at exploration stage.

In the last ten years, total production of gold fluctuated in the range from 10.7 to 19.4 tons. Practically all gold produced in the country is directed to exports (Table 2).

Table 2. Exports of Precious Metals from the Kyrgyz Republic

	2009		2010		2011		2012		2013	
	Ton	Million US$	Ton	Million US$	Ton	Million US$	Ton	Million US$	Ton	Million US$
Gold (HS code 7108)	16.3	529.5	17.1	668.3	20.2	1 006.2	10.4	562.3	16.9	736.8
Silver (HS code 7106)	3.9	1.9	3.7	2.5	6.0	6.8	2.9	2.9	4.6	3.3
Precious metal ores and concentrate excluding silver ores and concentrates (HS code 261690)	4 587	2.5	334	0.6	41 057	17.2	85 643	55.5	62 155	18.3
Total		533.9		671.4		1030.2		620.7		758.4

Source: UN Comtrade Database

2.2. Organisation of the Enterprise and Production Activities

The Kumtor open pit mine is one of the largest gold mines in Central Asia. The mine is located in Issyk-Kul Oblast of Kyrgyzstan some 350 kilometres southeast of the capital, Bishkek and about 60 kilometres north of the international border with the People's Republic of China, in the Tien Shan Mountains, at $41^0$52' N and $78^0$11' E (Figure 1). The mill facility is situated at an elevation of 4,016 metres above sea level, while the highest mining activity occurs above 4,400 metres.

The Kumtor gold deposit was discovered in 1978. Implementation of the Kumtor gold project began in 1992 as a joint venture of the Kyrgyz Government and Canadian investors. Gold production started in 1997. Between then and by the end of 2013, 9.3 million ounces[5],[6] or 289 tons of gold have been produced by the enterprise. As of 31 December 2013, proven and probable reserves at the Kumtor mine were estimated at 85.2 million tons of ore containing 8.5 million ounces of gold. In addition, measured and indicated mineral resources[7] are estimated to be 34.4 million tons of ore and 2.6 million ounces of gold.

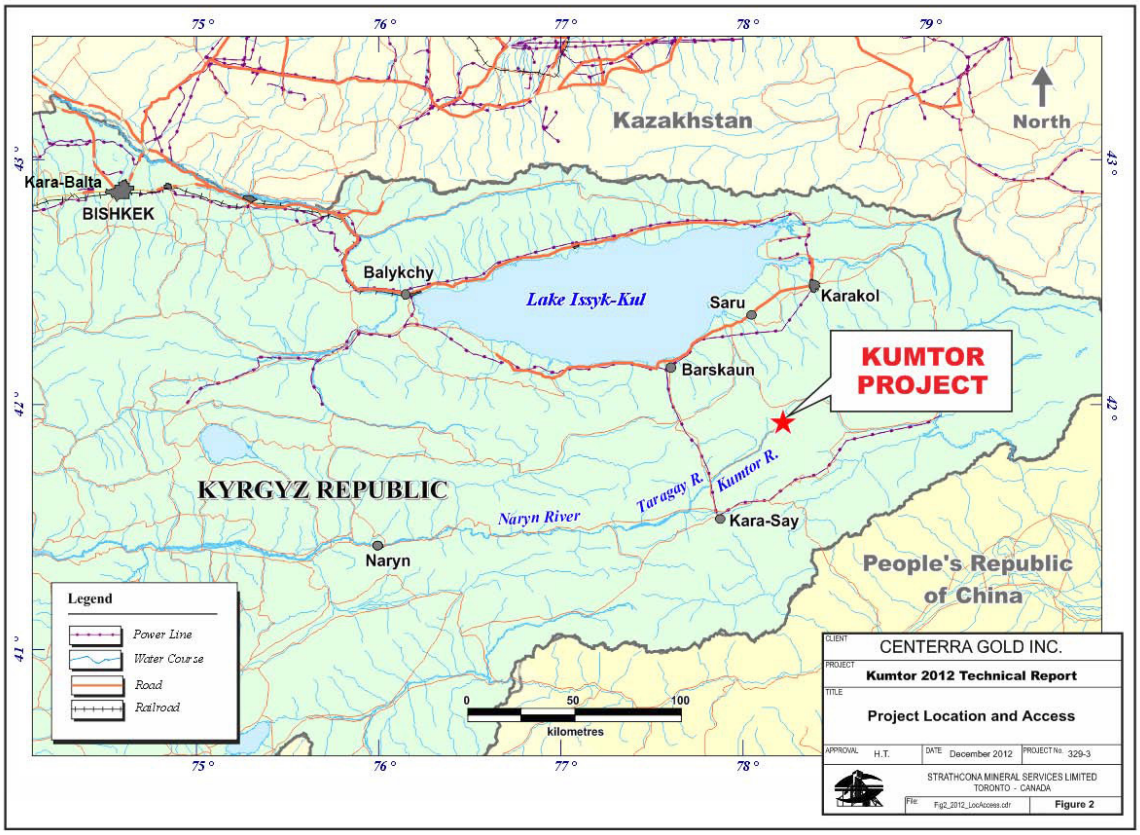
5 Here and below the sources of all Kumtor-related production and financial data are based on information on the websites of Kumtor Gold Company (KGC) www.kumtor.kg and parent company Centerra Gold Inc. www.centerragold.com.

6 1 (troy) ounce (oz) = 31.10348 gram or 1 ton = 32,151 oz.

7 Mineral resources do not have demonstrated economic viability at gold price of US$1,350/oz.

All gold doré bars[8] produced by the Kumtor project are purchased at the mine site by Kyrgyzaltyn for processing at its refinery in Kara-Balta in northern Kyrgyz Republic. Due to this arrangement, the value addition in the refining process takes place in the Kyrgyz Republic.[9]

Figure 1. Location of the Kumtor Gold Mine



Source: Centerra Gold Inc. website www.centerragold.com.

Centerra Gold Inc. (Centerra) holds a 100 percent interest in the Kumtor project through its wholly-owned subsidiary, Kumtor Gold Company (KGC) CJSC. Centerra focuses on acquisition, exploration, development and exploitation of gold deposits in the Kyrgyz Republic, Mongolia, Turkey, China and Russia. Centerra is headquartered in Toronto, Canada. The company shares are traded on the Toronto Stock Exchange. According to the latest[10] agreement between the Kyrgyz Republic and Centerra concluded in 2009, the Kyrgyz Government, via Kyrgyzaltyn, is Centerra's largest shareholder, owning 77,401,766 shares (about 33 percent of the total).

Key production indicators of the Kumtor project are provided in Figure 2. Production activities of KGC depend on various factors, including international gold prices, technical conditions and different shocks related to the situation around the enterprise. In the long-term, international gold prices are important factors determining the life cycle of the mine; the

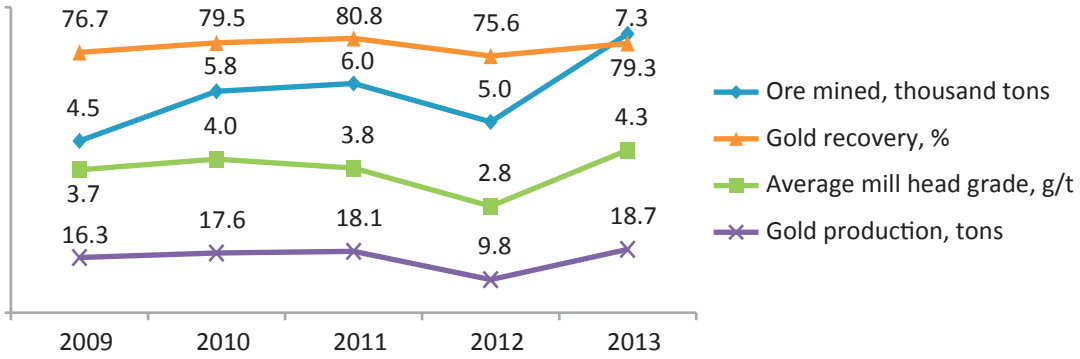
8 Doré bar is a semi-pure alloy of gold and silver.

9 This makes Kumtor different from some other foreign investment projects in gold mining in Kyrgyzstan. For example, in 2012, the Kyrgyz Republic exported ores and concentrates of precious metals other than silver (HS code 261690) worth US$55.4 million to China and Kazakhstan (UN Comtrade).

10 As of September 2014.

higher the prices, the more economical it becomes to develop some parts of the pit with relatively low contents of gold. Taking into account the increase in gold price and results of geological explorations, the Kumtor mine-life has been extended twice: in 2005 (until 2013) and then in 2012. At the level of gold prices of US$1,350 per ounce, mine operations are projected to continue until 2026.

Figure 2. Kumtor Production Indicators, 2009-2013



Source: Kumtor Gold Company website www.kumtor.kg

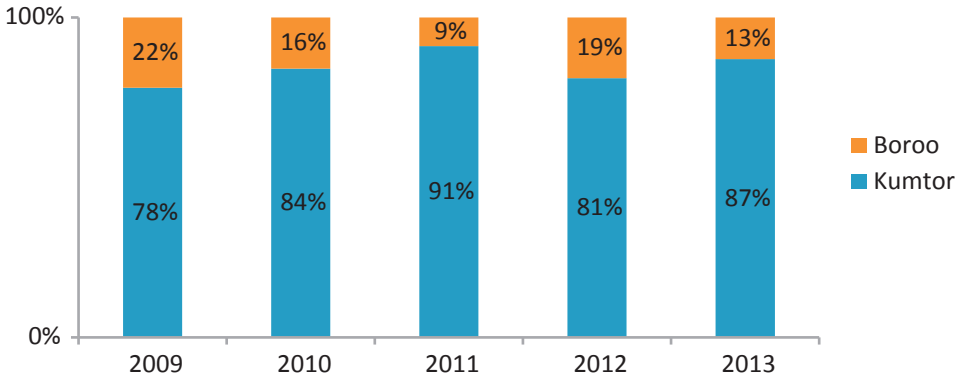
Technical factors, such as the stability of pit slopes, movement of waste and ice on the site and uneven contents of gold in ore, have resulted in some production fluctuations, especially in 2012. Some of the conflicts around the operations and ownership of the mine[11] also affected the enterprise's performance in 2012-2014.

2.3. Revenue, Costs and Profits Generated by Kumtor

The Government of the Kyrgyz Republic benefits from the Kumtor mine through several channels including its participation in the equity of Centerra. Kumtor is the main production asset of Centerra Gold Inc., which shapes its general economic and financial performance. As of September 2014, Centerra had two projects generating revenue from gold sales: Kumtor and Boroo (Mongolia). Boroo mine is much smaller than Kumtor; its contribution to Centerra's total gold production in recent years varied from nine to twenty two percent (Figure 3). It is worth noting that costs at Boroo are lower than at Kumtor; in 2013, all-in costs including taxes at Boroo were US$899 per ounce of gold sold compared to Kumtor's US$1,042 per ounce sold. Boroo costs are lower partially due to somewhat lighter taxation regime in Mongolia – in 2013, effective income tax rate was US$142/oz produced, while effective revenue-based tax rate in Kyrgyzstan was US$189/oz. Due to lower unit costs and, hence, higher profitability of gold production at Boroo in comparison to Kumtor, the Government of the Kyrgyz Republic receives more money from Centerra shareholding than it is implied by the share of Kumtor in total gold production of the company. In 2013, estimated dividends associated with Boroo activities were US$2.2 million or 19 percent of the total amount of dividends paid to Kyrgyzaltyn. This can be compared to 13 percent share of Boroo in total gold production of Centerra.

[11] See full coverage of these issues in English at www.eurasianet.org/search/node/kumtor and in Russian at russian.eurasianet.org/search/node/%D0%BA%D1%83%D0%BC%D1%82%D0%BE%D1%80 or www.knews.kg/tags/kumtor/ (accessed 30 September 2014).

Figure 3. Share of Kumtor in Gold Production of Centerra



Sources: www.centerragold.com and authors' calculations.

Financial results of Centerra's gold-mining activities are presented in consolidated form for all its projects, including Kumtor (Table 3). Due to the fluctuations in production described in section 2.2 and changes in gold prices, company revenue and costs have varied greatly in recent years. The main component of costs are production costs ('costs of sales') followed by revenue-based tax paid by Kumtor Gold Company (KGC) according to the terms of the agreement concluded in 2009. For the period 2009-2013 (except 2012) Centerra managed to keep net earnings positive with profitability[12] above 35 percent in 2010-2011. For the period 2009 to 2013, the average profitability rate was 18.4 percent.

Table 3. Financial Results of Centerra, 2009-2013, million US$

	2009	2010	2011	2012	2013	2009-2013
Revenue	685	850	1 020	661	944	4 160
Costs	625	528	649	805	786	3 393
Cost of sales	296	342	382	383	559	1 962
Revenue-based tax in Kyrgyz Republic	60	99	132	75	114	480
Administrative costs	56	73	66	48	54	297
Other costs	213	14	69	299[13]	59	654
Net earnings	60	322	371	-144	158	767

Source: www.centerragold.com

Net earnings together with money allocated for depreciation of fixed capital assets (*'Depreciation, depletion and amortisation'*) form the cash stream provided by company operations (Table 4). This cash is used mostly for production investments (*'Additions to property, plant and equipment'*, 73 percent of total cash inflow in 2009-2013), payment of dividends to shareholders (10 percent) and increase in cash balances (12 percent). Table 4 also reflects the amount of US$30 million transferred by KGC to the Government of the Kyrgyz Republic in 2012 as an advance revenue-based tax payment; two-thirds of this advance was recovered in 2013.

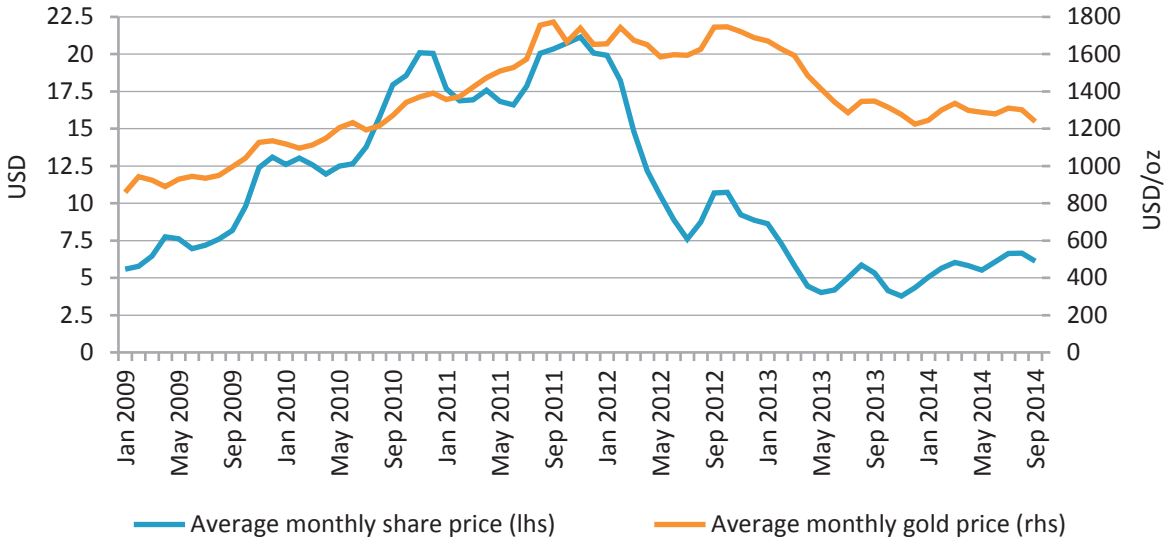
12 Measured here as a ratio of net earnings to the company's revenue.
13 Includes loss on de-recognition of underground assets – 181 million US$.

Table 4. Centerra Cash Flows, million US$

	2009	2010	2011	2012	2013	2009-2013
Net earnings	60	322	371	-144	158	767
Other cash provided by operations	186	-41	64	317	326	852
Depreciation, depletion and amortisation	104	76	99	153	309	741
Revenue-based taxes applied (advanced)				-30	20	-10
Other items	82	-117	-35	194	-3	121
Cash provided by operations	246	281	435	173	484	1 619
Investment activities	-220	-120	-474	-87	-441	-1 342
Additions to property, plant and equipment	-92	-208	-175	-405	-309	-1 189
Net redemption (+)/purchase (-) of short-term investments	-128	64	-290	325	-110	-139
Other investments	0	24	-9	-7	-22	-14
Financing activities	2	-8	-97	52	-34	-85
Dividends paid	0	-14	-99	-22	-31	-166
Other financing items	2	6	2	74	-3	81
Increase in cash during the year	27	154	-135	139	9	194

Source: www.centerragold.com

Figure 4. Dynamics of Centerra Share Prices



Sources: Yahoo Finance, www.finance.yahoo.com; OANDA Corporation www.oanda.com; and Kitco Metals Inc. www.kitco.com (accessed 30 September 2014)

The dynamics of net earnings is just one important factor affecting the market value of the company's shares (Figure 4). Centerra share prices steadily grew in the period 2009 to 2011, reflecting good performance of the company and a favourable outlook for the sector based on the increasing price of gold. In 2012, however, the share price of Centerra fell dramatically, despite only modest decline in international gold prices. Apparently, this was a direct consequence of the conflicts mentioned above. The average share price in September 2014 fell by 70 percent, compared to its value in November 2011. As a result, the market value of Centerra shares owned by

the Government of the Kyrgyz Republic fell from US$1,640 million in November 2011 to US$470 million in September 2014, with the value loss exceeding US$1,160 million (16 percent of the country's GDP in 2013). This share value loss made the government to delay/abandon its plans[14] to create a new state development bank, which was supposed to be capitalised by selling part of Centerra shares or using them as collateral for borrowing at international financial markets.

2.4. Macroeconomic Role of Kumtor

Kumtor's contribution to the Kyrgyz economy is easily traceable at the macro-level (Table 5 and Figure 5). Kumtor generates about half of the industrial output of the country and one third to one half of the country's exports. During the period 2009 to 2013, the share of Kumtor's value added in the GDP of the Kyrgyz Republic varied from 6.5 to 11.4 percent.

Table 5. Key Economic Indicators of Kumtor

	2009	2010	2011	2012	2013
Gross value added					
billion Kyrgyz Republic som (KGS)	13.6	19.9	32.5	20.2	32.4
% of the country's GDP	6.8	9.0	11.4	6.5	9.1
Industrial output					
billion KGS	45.6	62.6	88.0	50.7	80.2
% of the country's Gross Industrial Output	46.0	49.4	53.5	37.0	48.6
Gold exports from the Kyrgyz Republic					
million USD	529.5	668.3	1006.2	562.3	736.8
% of total exports of goods	36.7	44.9	50.8	33.6	41.2
Share of Kumtor in total gold production[15] of the Kyrgyz Republic, %	96.0	97.7	97.3	94.9	96.8
Capital expenditures[16], million US$					
old definition	73.4	186.5	180.7	399.8	-
new definition (sustaining + growth)	-	-	-	208.4	88.9

Sources: National Statistical Committee of the Kyrgyz Republic (NSC), National Bank of the Kyrgyz Republic (NBKR), www.kumtor.kg and Kyrgyzaltyn website, www.kyrgyzaltyn.kg

KGC is also one of the largest investors in the country. Its share in total capital investments of the country exceeded 5 percent in 2013; in 2012, the historically highest investment year for Kumtor, this share was 15.6 percent.[17] The share of KGC in foreign direct investment (FDI) inflow to the country is also high; Kumtor's 2011 share in total gross FDI inflow was 51 percent; in 2013 it was at 15 percent.

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14 See paragraph 76 of the Medium Term Development Program of the Kyrgyz Republic for 2012-2014 approved by the Government's Decree #239 from 12 April 2012.

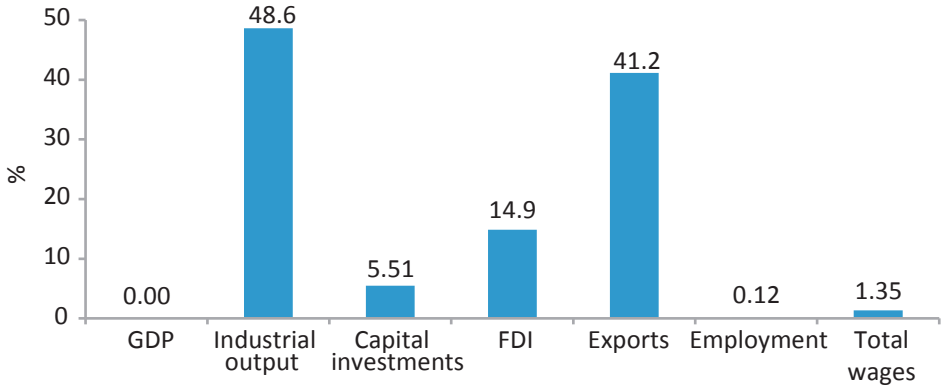
15 As of the end of 2013, only Kumtor and Kyrgyzaltyn's mines kept producing gold on permanent basis and their produce was included in this total. As mentioned in section 2.1, other mines either produce gold concentrate only, or have not yet established uninterrupted gold production.

16 Capital expenditures were restated in 2012 due to the adoption of new accounting rule, the so called IFRIC 20, which excludes capitalized stripping costs.

17 This value was estimated using a new definition of capital expenditures at KGC.

As of 1 January 2014, KGC provided employment for 2,617 workers from the Kyrgyz Republic, 103 expatriate staff and 470 local contractors working on the site. Wages at KGC are one of the highest among all enterprises in the country; in 2013, the average wage of KGC's local employees was 11 times higher than the average wage in the economy.

Figure 5. Share of Kumtor in Key Kyrgyz Economic Aggregates, 2013



Sources: NSC, www.kumtor.kg and authors' calculations

Production activities at Kumtor also have indirect macroeconomic effects such as the company's contribution to the government budget (see next section) and the balance of payment, and contribution to domestic demand through procurement of local goods and services. In 2013, KGC paid local contractors a total of US$74 million for services such as production inputs, electricity, food, roads outside the mine site etc. including US$4 million to Kyrgyzaltyn for refinery services. In the period 2009 to 2012, all these items made up from 0.5 to 0.9 percent of gross output of the country.

Providing up to one half of the Kyrgyz Republic's revenue from the export of goods, Kumtor is one of the main sources of foreign exchange for the country; it plays a critical role in maintaining the country's balance of payments. While the enterprise not only earns foreign currency, but also spends it on imports of equipment and production inputs, expatriate worker wages, and some other costs and different financial operations abroad, it generates positive inflow of foreign currency equivalent to US$300-400 million to Kyrgyzstan or 25-45 percent of annual turnover on the interbank currency market. This currency is exchanged into Kyrgyz som (KGS) to make payments to the government and local workers and contractors.

2.5. Kumtor's Contribution to the Government Budget

Kumtor is subject to a special regime of taxation established by the 2009 agreement. Key types of mandatory payments made by KGC/Centerra to the government budget[18] include:

[18] Government budget is understood as the general government budget, which includes all resources of the government including taxes and non-tax payments made directly or indirectly (e.g. through Kyrgyzaltyn) to the republican (national) budget, local budgets and extra-budgetary funds such as the Social Fund of the Kyrgyz Republic (SF) and Issyk-Kul Development Fund (IKDF). Payments of KGC and Centerra are spread across different parts of the general government budget.

- Revenue-based tax at the rate of 13 percent of gross income of the company;
- Contributions to the extra-budgetary Issyk-Kul Development Fund (IKDF) at the rate of one percent of gross income of the company;
- Dividends paid to the budget through Kyrgyzaltyn, as a major shareholder of Centerra; and
- An annual pollution fee in the amount of US$310 thousand per annum.

There are also few smaller taxes/payments by KGC including tax on the income of non-residents, customs administrative fee, license fee, and management fee paid to Kyrgyzaltyn. As any other legal entity in the country, KGC makes employer's mandatory contributions to the extra-budgetary Social Fund of the Kyrgyz Republic (SF); it also withholds from wages and transfers to the budget its employees' personal income tax and contributions to the SF. KGC is exempt from value added tax (VAT),[19] sales tax, excise tax and customs duties.

Each year, Kumtor provides between five and ten percent of the general government budget's revenue (see Figure 6). The share of Kumtor's payments in the government budget is therefore consistent with the company's contribution to the GDP of the Kyrgyz Republic. The largest contribution was made in 2011, when the company received its highest revenue from gold production in five years (see Table 3). Decline in payments in 2012 related to the lower volume of gold production due to technical reasons (see section 2.2). Further decline in 2013 was associated with the partial recovery of the advance payment of revenue-based tax made in 2012 (see section 2.3).

The effective tax rate[20] for Kumtor is considerably higher than for other FDI projects currently operating in the country. In 2012 (the latest year for which all necessary data are available), Kumtor's effective tax rate is estimated to be 24.0 percent, while the average effective tax rate for other active foreign-owned gold producers[21] is 10.8 percent. This difference is possibly due to the company-specific tax arrangements briefly described above, which resulted in higher taxation levels for Kumtor than the industry average.

The structure of Kumtor payments to the government budget by type of payment is presented in Figure 7. The largest payment made by Kumtor is revenue-based tax, which makes up over 60 percent of the total amount. This is the main channel through which the country benefits from the mine's operations. The second largest source of government revenue from the mine are employment-related payments of personal income tax and contributions to the SF, which make up over 20 percent of the government's total revenue from the mine.

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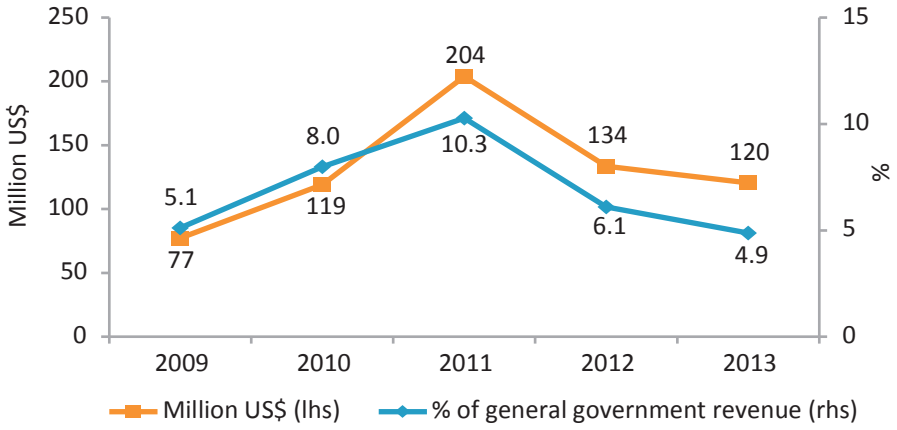
19 Gold and silver produced by Kumtor and other mines in Kyrgyzstan mostly go to exports. If gold producers stay in regular VAT regime, they become eligible for zero VAT rate on exports. This means that VAT liabilities of exporting companies would be negative, i.e. the government has to return VAT paid on inputs to these companies. The Tax Code of the Kyrgyz Republic (article 256) exempts gold supplies and exports from VAT thus releasing the government budget from the burden of VAT rebates to gold-producing companies.

20 Effective tax rate is estimated here as a ratio of total amount of taxes and other mandatory payments to the company's gold export revenue. Sources of data for the estimates include Kyrgyz Republic 2012 Extractive Industries Transparency Initiative (EITI) Report, eiti.org/report/kyrgyz-republic/2012 (accessed 30 September 2014), export statistics from the UN Comtrade Database (see Table 2) and the authors' calculations.

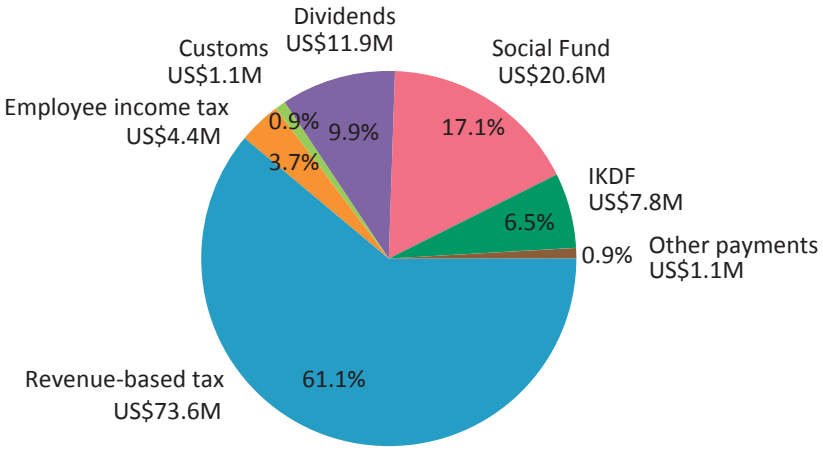
21 Operating Jamgyr, Ishtamberdy and Karakazyk mines.

Figure 6. Total Payments to the General Government Budget



Sources: www.kumtor.kg, Ministry of Finance of the Kyrgyz Republic, International Monetary Fund (IMF) and authors' calculations

Figure 7. Size and Structure of Payments to the Government Budget, 2013



Sources: www.kumtor.kg, Ministry of Finance of the Kyrgyz Republic, IMF and authors' calculations

The higher than average wage level at KGC implies high levels of labour-related payments to the government budget in this largest formal enterprise of the country. Dividend payments received by the government for shareholding in Centerra is only the third largest source of government revenue from the enterprise, making up less than 10 percent of the total. Contributions to the IKDF comprise 6.5 percent of the total amount. All other payments to the budget are relatively small, just 2 percent of the total.

2.6. Kumtor's Contribution to Social Development of the Country

Kumtor's contribution to the government budget is the key channel of its support to Kyrgyzstan's social development. About half of the government budget of Kyrgyzstan is spent on education, health care, social insurance and social protection and other so-

cial activities (Table 6).[22] The government's social commitments are large; according to the World Bank's World Development Indicators, the Kyrgyz Republic is one of the top transition countries by the share of public social expenditure in GDP. Money provided by Kumtor operations contributes to maintaining near universal basic secondary education, access to primary health care, reduction in child mortality and other social achievements of the country (see Figure 8). In the long-term, coverage and quality of social services for the population critically depend on the availability of the government budget resources.

Table 6. Public Social Expenditures in the Kyrgyz Republic

	Expenditures		Kumtor's contribution, % of total revenue
	Billion KGS[23]	% of total expenditure	
State budget,[24] 2013			4.4
Education	24.0	20.9	
Health care	12.3	10.7	
Social protection and social insurance	20.4	17.8	
Culture, recreation and religion	2.9	2.5	
Social Fund, 2013			6.0[25]
Social protection and social insurance	33.1	100	
Issyk-Kul Development Fund, 2011			100
Education infrastructure	0.19	44.0	
Health infrastructure	0.04	9.3	
Roads	0.03	8.0	

Sources: Central Treasury of the Ministry of Finance of the Kyrgyz Republic, IMF, IKDF and authors' calculations

In addition to the mandatory contribution to the social sector development through the government budget, KGC implements a broad and expensive voluntary social development programme at the local and national levels. According to a 2012 report of the Extractive Industries Transparency Initiative (EITI) in the Kyrgyz Republic, KGC spent KGS 1,224 million (about US$26 million) on this programme.[26] For every million Kyrgyz som of mandatory payments paid, KGC spent KGS 203,000 in voluntary contributions. In comparison, EITI reported that other companies in the mining sector covered by EITI voluntarily spent 40,000 som for each million som of mandatory payments, or five times less than KGC.

22 For a detailed discussion of public social expenditures in the country see, for example., Roman Mogilevsky "*Public Expenditures on Education and Health in the Kyrgyz Republic Before and During the Global Financial Crisis," Center for Social and Economic Research (CASE) Network Report* No. 97. (Warsaw: CASE, 2011).

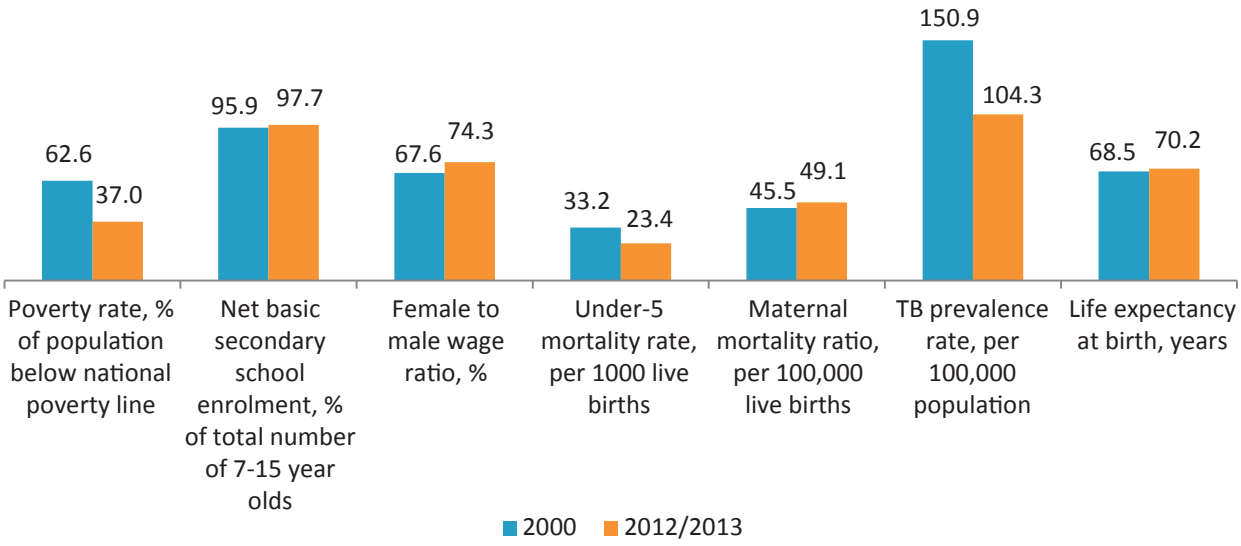
23 For reference: in 2013, the average annual exchange rate was 48.44 KGS per US$.

24 Combines republican and local budgets.

25 Total SF revenue here does not include contributions and transfers from the republican and local budgets to avoid double counting.

26 eiti.org/report/kyrgyz-republic/2012 (accessed 30 September 2014).

Figure 8. Key Indicators of Social Development in the Kyrgyz Republic



Source: NSC

Corporate social responsibility activities implemented by KGC in recent years include:

- Support to small businesses in the mine area to increase their sustainability and the diversity of their products and services. These activities are to help surrounding communities prepare for the eventual phasing out of mining activities and accompanying loss of employment income by the local population;
- Expanding the number of KGC's local suppliers. Apart from the direct economic benefits for these companies and their employees, this is to help these enterprises become knowledgeable about modern procurement standards in terms of quality requirements and timeliness of supplies and payments, etc.;
- Micro-financing and credit programme supporting local microcredit agencies. From 2006 to 2013, KGC invested more than US$26 million into this programme serving small businesses and farmers, with interest rates among the lowest in the country;
- A capacity building partnership with the European Bank for Reconstruction and Development to improve access of local entrepreneurs to business advisory services;
- Employee benefits, including fair compensation, safe work conditions and support for educational and professional development.
- Employee preferences for people from communities to fill available staff vacancies;
- Land rehabilitation and improved irrigation in local communities;
- A school reconstruction programme worth US$10 million;
- Support to citizen participation initiatives, e.g. through Youth Banks providing grants for projects addressing basic social and community infrastructure needs; and
- In-kind donations for local community groups or organisations.

3. Simulation of Kumtor's Future Development and Contribution to the Kyrgyz Economy

3.1. Simulation Methodology

A rigorous assessment of the contribution made by Kumtor to the current and future development of the Kyrgyz economy requires going beyond its direct impact in terms of value added and employment. Different types of spillovers generated by the enterprise should be taken into account. Specifically, one needs to consider the following:

- Kumtor's macro-level impact on its contractors and suppliers in other sectors of the economy;
- Kumtor's payments to the government budget, which influence government service delivery in the country;
- Kumtor's role in the economy's balance of payments; and
- Dynamic effects related to eventual closure of the mine.

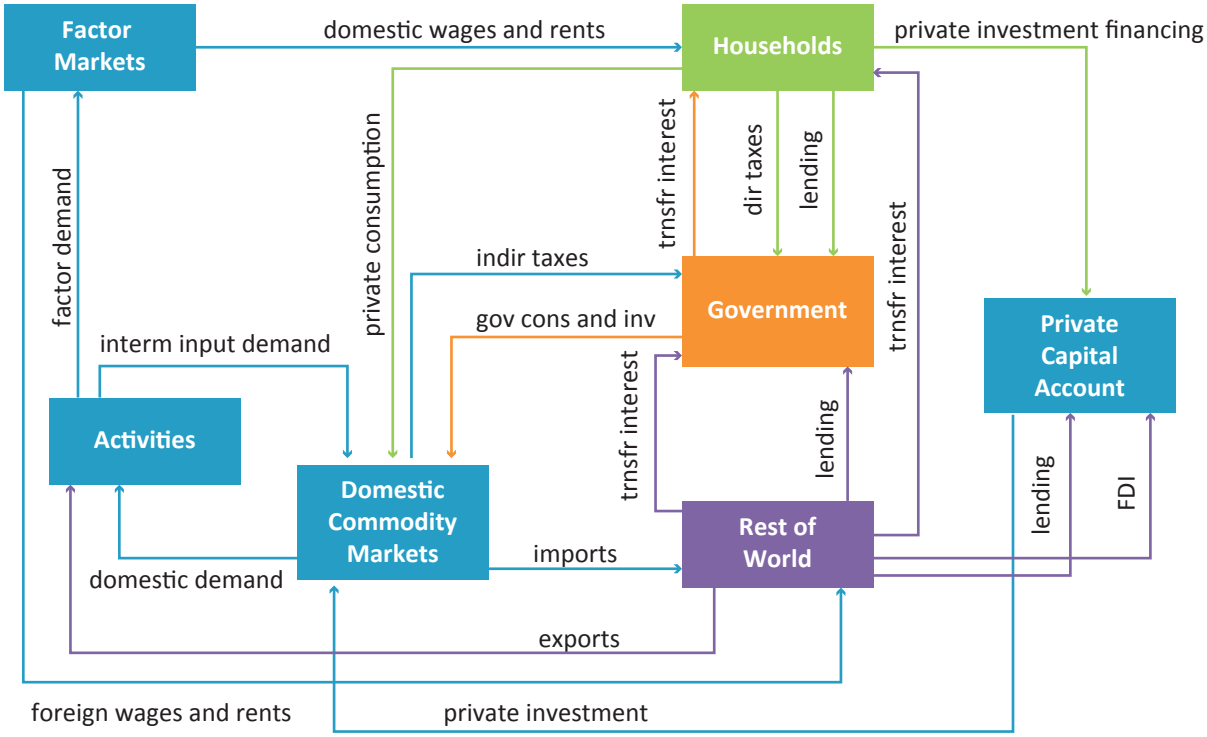
The MAMS simulation package is a suitable tool to address these various factors. MAMS is a recursive dynamic CGE model designed to analyse strategies for medium- and long-run economic and social development in low- and middle-income countries, initially with a focus on strategies for achieving the Millennium Development Goals (MDGs). Full descriptions of the model and its modification to the data and specifics of the Kyrgyz Republic are provided in United Nations publications,[27] which serve as a basis for the text below.

Key features/components of MAMS include the following:

- MAMS is a computable general equilibrium model. This means that it is economy-wide ("general"), in which economic agents (households and firms) maximise their utility/profits subject to budget constraints, supply is equal to demand on all commodity and production factors markets and macroeconomic balances (government budget, savings/investment, and balance of payments) are maintained ("equilibrium"). Mathematically, MAMS is a non-linear system of multiple algebraic equations solvable numerically ("computable"). The framework of relationships between firms representing different sectors of economy (activities), households, government and foreign agents (the rest of the world) is presented on Figure 9.

[27] Hans Lofgren, Martin Cicowiez and Carolina Diaz-Bonilla, "MAMS – A Computable General Equilibrium Model for Developing Country Strategy Analysis" in *Handbook of Computable General Equilibrium Modeling*, Volume 1, eds. Peter B. Dixon and Dale W. Jorgenson, 159-276. (Elsevier, 2013);
Roman Mogilevsky and Anara Omorova, "Kyrgyzstan" in *Financing Human Development in Africa, Asia and the Middle East*, eds. Rob Vos and Marco V. Sánchez , The United Nations Series on Development (New York: Bloomsbury Academic, 2013);
United Nations Department of Economic and Social Affairs (UN DESA), Presentations at *Assessing Development Strategies to Achieve the Millennium Development Goals (MDGs) in Asia and the Pacific* workshop (Bangkok, 2008).

Figure 9. Aggregate Payments in the Computable General Equilibrium Framework



Source: Hans Lofgren and Martin Cicowiez, "Analyzing Country Strategies for Structural Transformation, Poverty Eradication and Shared Prosperity: Method and Application to Sub-Saharan Africa," Paper prepared for 17th Annual Conference on Global Economic Analysis (Dakar, Senegal, 18-20 June 2014)

- The model's output (solution) at any given moment of time is a set of production volumes and prices; household and government consumption; investments, export and imports for each sector of the economy and each commodity; factor endowments (capital and labour stocks); transfers between households, government and rest of the world (including taxes, social assistance, remittances, FDI income); and some other economic variables.

- MAMS is a real model in the sense that only relative prices of goods/services/factors matter; there is no explicit modeling of inflation or the monetary sector in MAMS.

- MAMS is a dynamic model allowing simulating changes in the economy caused by production factor accumulation; technological and institutional transformation reflected in total factor productivity; and exogenous shocks. More specifically, it is a dynamic-recursive model, i.e. the solution in any time period depends on current and past periods, not the future. This dynamic-recursive procedure is repeated from the base year to the end year of simulation.

- The core module of MAMS is complemented by education and the MDG module, designed to simulate changes in key education, health and other social indicators related to economic dynamics. These changes are estimated using a set of elasticities linking social indicators to each other and to relevant economic variables (government spending, household incomes etc.). The social indicators of interest in the model are the poverty rate,

school enrolment and completion rates, child mortality rates and maternal mortality ratio, access to clean water and sanitation. The model also allows simulation of the impact of social changes (e.g. increase in education attainment levels) on the economy through the changing labour force skill composition.

- The model is easily adjustable to the data and economic structure of different countries. There are a number of parameters and exogenous variables that enable the model to simulate the impact of fiscal, trade, investment and social policies and external shocks on the selected country's economic and social development.

The MAMS database includes the economy's social accounting matrix (SAM) and few other types of data. SAM is a consistent and complete data system that captures the interdependence between different sectors of the economy, factors of production, households, government and the rest of the world and other linkages in the economy. It is based on the country's national accounts, input-output table, and fiscal and trade data. Other MAMS data include a detailed description of the education sector, employment and demographic data, and MDG indicators, etc. of the country under study. The model also operates with a number of elasticities mentioned above. All these data have to be available for the so-called base year, the initial year for the simulations. Calibration of MAMS is done in the way that ensures exact replication of the base year economic and social situation in the economy by the model.

The MAMS version for Kyrgyzstan was first developed in 2009 and 2010 and updated in 2013 and 2014. The current version of the model, used in this assessment, was calibrated for 2011, the year of the country's most recent available input-output table. SAM and other components of the model are based on official statistical data for 2011 and earlier years generated by the NSC, the NBKR and the Ministry of Finance of the Kyrgyz Republic. The model elasticities have been partially estimated based on the country's time series and partially reproduced the values recommended in the literature for developing countries.[28]

MAMS-based methodology of Kumtor's economic and social impact assessment applied in this paper includes:

- The development of different scenarios of production dynamics at Kumtor and other gold mines (see next section);
- Running simulations for each scenario;
- Comparison of the results for these scenarios, which allow the model to isolate the effects of Kumtor on long-term development of the country.

[28] The values of elasticities used in this model are available in the following paper: Roman Mogilevsky and Anara Omorova, "Assessing Financing Strategies to Achieve the MDGs in The Kyrgyz Republic. Final report prepared for the Project Realizing the Millennium Development Goals through socially-inclusive macroeconomic policies." New York: United Nations Department of Economic and Social Affairs, 2011 (www.un.org/en/development/desa/policy/capacity/output_studies/roa87_study_kgz.pdf, accessed 30 September 2014).

3.2. Scenarios

The scenarios analysed in this paper relate to the development of gold mining in the Kyrgyz Republic. For simplicity and clarity of the analysis, no other macroeconomic or exogenous sectoral changes are considered for the simulation period. In particular, the international gold price is assumed to stay at the level of US$1,350 per ounce.[29]

Developments at Kumtor have an impact not only on the mine and its partners/contractors/employees, but also on other gold mining enterprises. Foreign and domestic investors study the development of the situation around Kumtor and are prepared to adjust their investment strategies according to its outcomes.[30] Therefore, a strong correlation between the scale of gold mining activities at Kumtor and elsewhere is expected.

According to current projections,[31] operations at Kumtor are going to be completed by 2026. Taking this into account, the simulation period for this study has been selected from 2012 to 2035. For 2012-2014, actual or expected values of key macroeconomic variables have been reproduced in the simulations.

Three scenarios were considered in this study:

1. Core scenario: This is the most probable scenario when the currently negotiated restructuring of the enterprise is implemented to the full satisfaction of all participants;
2. Pessimistic scenario: In this scenario, production at Kumtor falls to zero rather quickly, in 2015-2017 and never re-starts due to lack of agreement between the government and Centerra on the future organisation of the enterprise; and
3. Optimistic scenario: In this scenario, the government's enabling policies and positive exogenous shocks allow for some extension of the gold mine's life.

Core Scenario: According to the technical projections cited above, Kumtor is expected to stay at its 2013 level and generate some 600,000 ounces of gold per annum till 2022 (Figure 10a). After that, the mine will gradually slow its activities and, over a few years, completely stop its operations. Other gold mines are expected to follow the so-called "inertial" scenario described in the draft mining industry strategy which anticipates no major improvement or deterioration of the investment climate in the gold mining industry. In this scenario, massive investments come to the sector starting from 2015, gold production output climbs to its peak in 2021 and 2022, and then it gradually declines to approximately 300,000 ounces per annum by 2035.

Pessimistic Scenario: In this scenario, no agreement about future of Kumtor is achieved and, as a result, the enterprise stops its operations in the period 2015 to 2017 (Figure 10b). Discouraged by Kumtor's experience, other investors would refrain from developing their respective

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29 As assumed in Henrik Thalenhorst, Dan Redmond, Tommaso Roberto Raponi, and Victor Vdovin, *Technical Report on the Kumtor Gold Project, Kyrgyz Republic for Centerra Gold Inc.* (2012).

30 See, for example, the letter of the Kyrgyz International Business Council at bit.ly/1sx7tb6 (in Russian, last accessed 30 September 2014).

31 Henrik Thalenhorst, Dan Redmond, Tommaso Roberto Raponi, and Victor Vdovin, *Technical Report on the Kumtor Gold Project, Kyrgyz Republic for Centerra Gold Inc.* (2012).

mines, so that gold production by Kyrgyzaltyn and other currently operating enterprises stays at the low level achieved in the period 2011 to 2013 for the entire period of the simulation from 2014 to 2035. A comparison of the core and pessimistic scenarios allows for an assessment of the economy's losses in the case of unfavourable development of the situation around Kumtor.

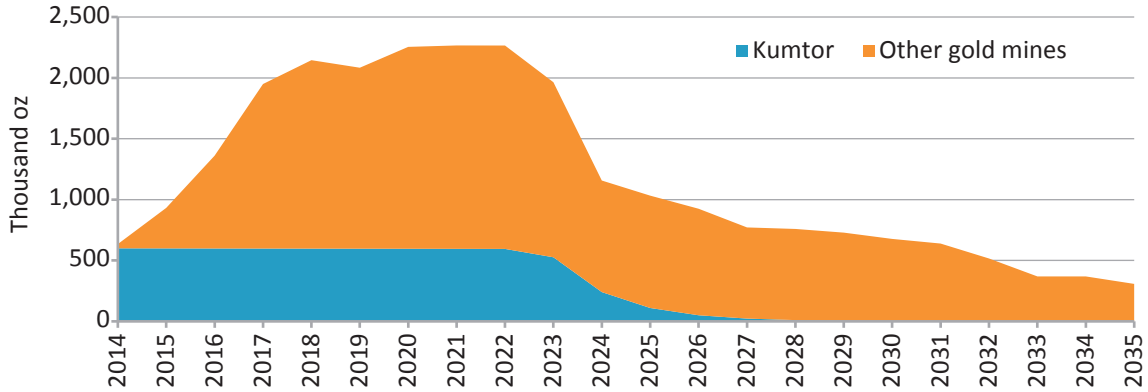
Optimistic Scenario: This scenario follows the "optimistic" scenario from the draft mining industry strategy, in which the government implements some effective reforms related to the sector and to the general business and investment climate in the country. These would reduce investment risks and allow for industrial development of additional gold deposits at the Kumtor site and elsewhere. In this scenario, the exploitation of the Kumtor mine at full capacity continues until 2027, followed by a gradual decline and the last ounces of gold produced in 2031 (Figure 10c). In this scenario, other mines would produce more than in the core scenario in both the production increase phase (2015-2022) and especially in the production slowdown phase (2023-2035), which will be much smoother than the slowdown phase under the core scenario.

Common features of all three scenarios include:

- An underlining 4 percent growth rate for the economy in the period 2014 to 2035,[32] based on average GDP growth rate in the period 2000 to 2013;
- Average population growth rate of 1.3 percent per annum;
- Government budget balance is achieved by proportional adjustment of government expenditures; so, in the case of a fall in budget revenue, a proportional budget cut is implemented;[33]
- Saving-investment balance is achieved by adjusting private investments;
- Balance of payments is cleared by changing real exchange rate;
- Demand and supply on the labour market are cleared by changing the unemployment rate or by wages, if the unemployment rate achieves a minimum level of 4 percent.

Figure 10. Gold Production Scenarios in the Kyrgyz Republic

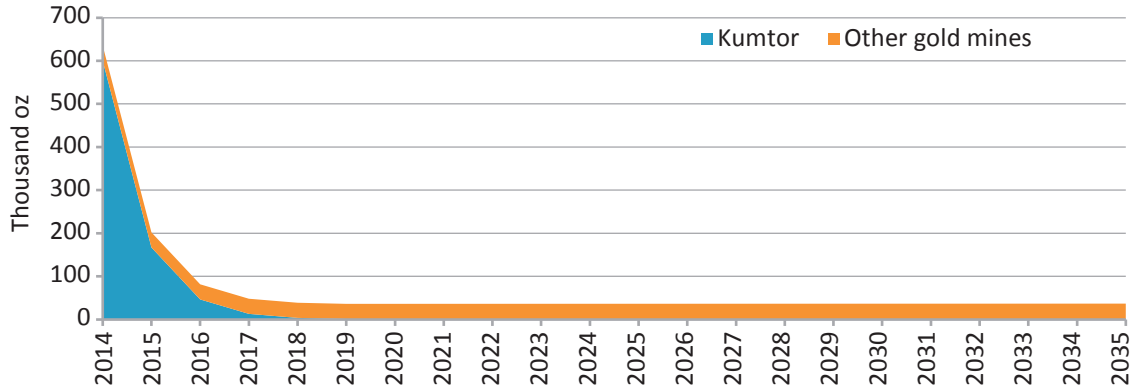
a. Core Scenario



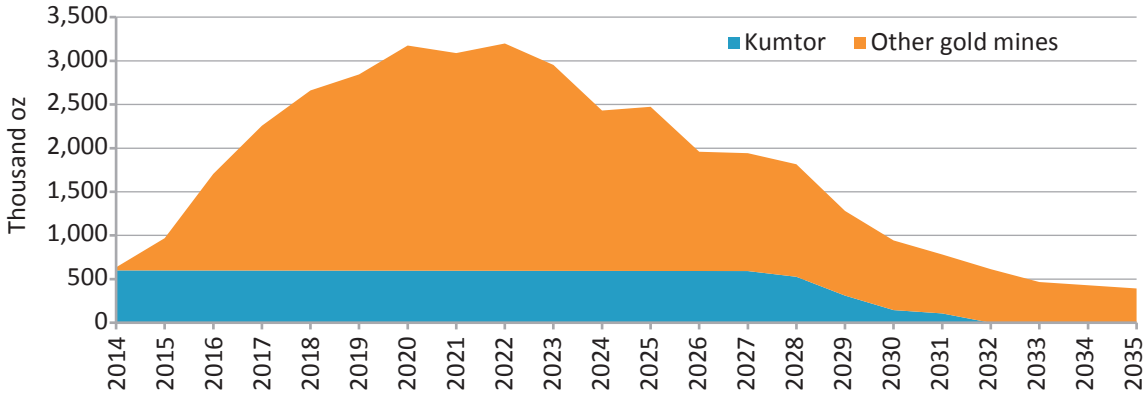
32 In other words, the growth rate of the economy without any shocks related to changes in the mining sector. In each scenario, GDP growth rate is endogenous and deviates from the underlining growth rate due to the level and sequence of changes in the gold production.

33 In practice, the government may choose to prioritise or protect some expenditure items. Technically, this is possible to simulate with MAMS, however, in this paper this policy change (as well as other types of policy interventions) is not considered for the sake of maximum simplicity and clarity of the scenarios.

b. Pessimistic Scenario



c. Optimistic Scenario



Sources: Authors' assumptions and estimates

3.3. Results of the Scenario Simulations

The main results of the scenario simulations are presented in Tables 7 to 9 and in Figure 11, and detailed information on the evolution of key model variables over time is provided in the Annex (Tables A1 to A5). As one could expect, the core scenario provides for good economic growth in the medium term (Table 7), with an average growth rate of 4.9 percent, higher than the historical average of 4 percent per annum, due to sustained production at Kumtor and an increase in gold production on other mines. Exports will grow at a higher rate as all increased gold output is supposed to be directed to exports based on past trends.

Table 7. Key Macroeconomic Variables in the Medium-Term

	Core scenario	Pessimistic scenario	Optimistic scenario
	Average annual growth rates in 2015-2019, %		
GDP at factor costs	4.9	-0.6	4.9
Household consumption	3.3	-1.5	3.3
Government consumption	3.3	-6.2	3.3
Gross fixed capital formation	3.8	-5.9	3.8
Exports	7.8	4.0	7.8
Imports	5.0	1.1	5.0

However, in the long-term (data for 2015-2035 and for 2035 in Table 8) the growth rate falls below the historical average of 4 percent per annum, due to the rapid decline in gold production after 2022. Government consumption is going to suffer the most (just 0.9 percent of the annual average growth rate in 2015-2035) as gold mining is an important source of revenue for the government budget. With a much weaker revenue stream after 2022, the government will not have resources to sustain expenditure increases (including social expenditure) at the previous pace. Investments (gross fixed capital formation) are going to become another important macroeconomic variable facing sluggish growth (at a period average annual growth rate of 1.8 percent), which is explained by the lower savings available in the economy after the Kumtor closure and the decline of other mines, which are built-in to the core scenario.

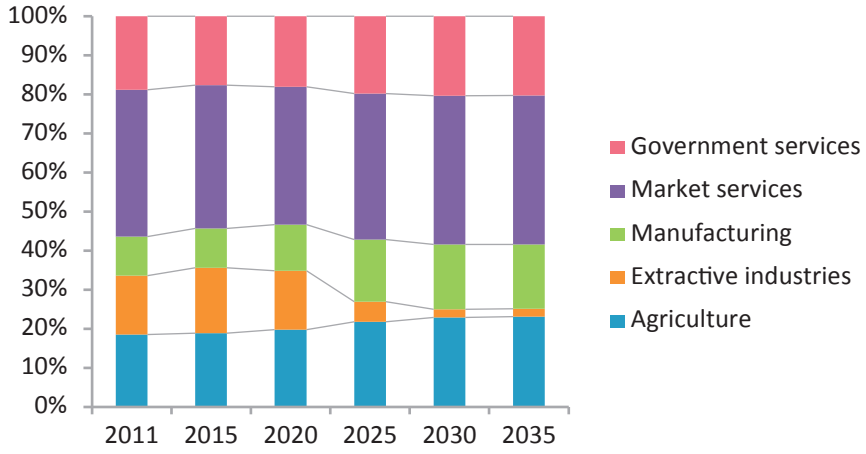
Table 8. Key Macroeconomic Variables in the Long-term

	Core Scenario	Pessimistic Scenario	Optimistic Scenario
Values in 2035, % of 2011 level			
GDP at factor costs	216	192	227
Household consumption	206	186	216
Government consumption	131	119	140
Gross fixed capital formation	166	143	173
Exports	317	279	338
Imports	271	238	288
Average annual growth rates in 2015-2035, %			
GDP at factor costs	3.1	2.5	3.3
Household consumption	2.5	2.0	2.7
Government consumption	0.9	0.4	1.2
Gross fixed capital formation	1.8	1.0	2.0
Exports	5.2	4.5	5.5
Imports	4.1	3.4	4.4

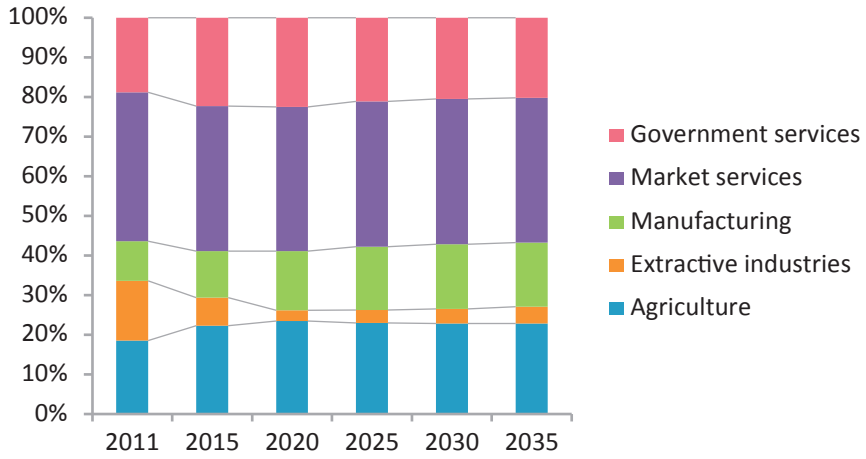
In the period 2015 to 2022, the core scenario implies a major expansion of gold production, so the share of extractive industries in GDP is going to expand at the expense of services (Figure 11a); the market and government services would still grow, but at a smaller rate than gold production. However, with gradual phasing out of gold production at Kumtor and other mines in the 2020s, the share of extractive industries in the GDP is going to decline to just 2 percent in 2035, with an accompanying increase in the shares of manufacturing and agriculture. Tradable parts of these sectors would respond positively to price incentives associated with some real exchange rate depreciation caused by the sharp reduction in gold exports.

Figure 11. Changes in the Industrial Structure of the Economy

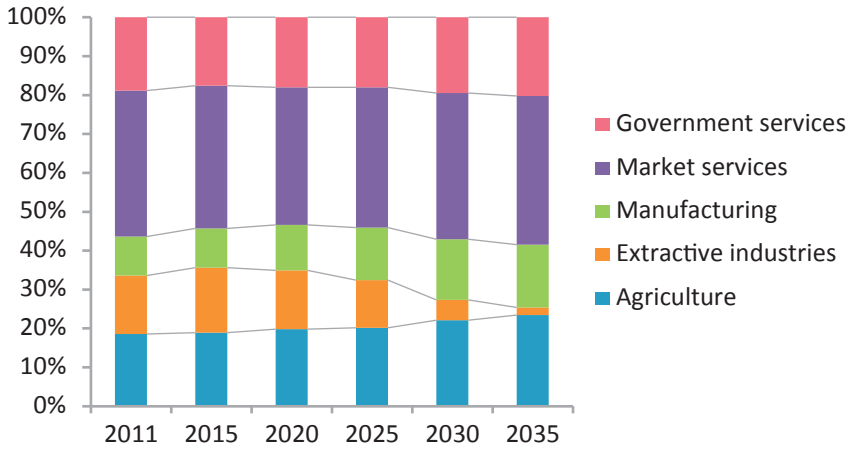
a. Core Scenario



b. Pessimistic Scenario



c. Optimistic Scenario



The unemployment rate will increase from the 2011 level of 8.5 percent to 9.9 percent in 2035 (see Table 9), due to the increase in the size of the unskilled labour force with basic secondary education, which cannot be absorbed by the economy. For the labour force with general secondary, professional secondary or tertiary education, the simulations indicate that

the 2035 unemployment rate will be at a minimum possible level of 4 percent (see the previous section) due to the shortage of workers with higher skills on the market. These changes in unemployment rates are related, not to the scenarios in the mining industry development, but to the general features of the country's current education system. Only basic secondary education is mandatory and provided near universally free of charge, so enrollment into non-mandatory higher cycles of education fall dramatically. In the long term, this results in an overproduction of unskilled labour and a shortage of workers with general/professional secondary or tertiary education (see Tables A3 and A4 in the Annex).

Table 9. Labour Market and Social Indicators in 2035

	2011	Core scenario	Pessimistic scenario	Optimistic scenario
Unemployment rate, %	8.5	9.9	11.4	9.3
Net basic secondary education completion rate, %	83.9	90.9	90.7	91.1
Under-five mortality rate, per 1,000 live births	24.5	16.8	17.5	16.5
Maternal mortality ratio, per 100,000 live births	54.8	31.6	33.9	30.7

As follows from Table 9, social indicators[34] in the core scenario in 2035 are going to improve in comparison to 2011, reflecting general growth in the economy for the 24 year period under consideration. However, under this scenario, by 2035, the country still is going to fall short of the 2015 MDG targets.[35]

The pessimistic scenario results in considerably lower economic and social growth rates, compared to the core scenario. In the medium-term of 2015 to 2019 (see Table 7), the average annual GDP growth rate is negative at -0.6 percent, and even deeper decline is expected with regard to household consumption and, especially, government consumption and investments. This indicates that other sectors of economy would not be able to replace Kumtor in the event of a premature cessation of operations. According to the simulation results, under this scenario, GDP value in 2019 is going to be just 77 percent of its level under the core scenario. In the same year, government consumption is going to be 38 percent lower than in the core scenario.

In the long-term, the difference between the pessimistic and core scenarios will decrease but remain very significant. In the pessimistic scenario, the 2015 to 2035 average annual GDP growth rate is estimated to be lower by 0.6 percentage points than in the core scenario. The GDP level in 2035 will be 89 percent of its level under the core scenario (Table 8). Extractive industries will begin to lose their share in GDP as early as 2015 (Figure 11b), with manufacturing and agriculture expanding due to the real exchange rate stimulus similar to that in the core scenario. The unemployment rate is estimated to increase to 11.4 percent or 1.5 percentage points higher than predicted in the core scenario (Table 9). This is the equivalent of 56,000 jobs lost in 2035, compared to core scenario. In the pessimistic scenario, social indi-

[34] Indicators for Millennium Development Goals (MDGs) 2, 4 and 5 provided in Table 9 are used in MAMS to measure the country's progress in social development.

[35] MDG target for the Kyrgyz Republic for the under-five mortality rate is 10.4/1,000 live births, and for maternal mortality ratio it is 15.7/100,000 live births. See United Nations Development Programme (UNDP), *Kyrgyz Republic. Third Millennium Development Goals Progress Report* (Bishkek: UNDP, 2013).

cators are expected to improve less than in the core scenario. This is a direct consequence of the fall in government revenue (and hence, expenditure) due to the non-payment of taxes by Kumtor and other gold mines. In these ways, the shock of an eventual abrupt Kumtor closure will be felt, even 20 years later.

The optimistic scenario differs very little from the core scenario in the medium term of 2015 to 2019 (Table 7). The main difference emerges after 2022, due to the higher gold production foreseen under this scenario. For the entire simulation period (2015-2035), the average annual GDP growth rate will be 0.2 percentage points higher than under the core scenario. Correspondingly, all other economic and social variables show modest improvement in comparison to the core scenario (Tables 8 and 9). The evolution of the industrial structure of the economy (Figure 11c) will be very similar to that in the core scenario, but the decline of extractive industries will take more time. The simulation results indicate that while better utilisation of existing gold mining potential (the main source of the difference between the optimistic and core scenarios) does produce positive macroeconomic and social outcomes, taken alone, it cannot compensate for the decline in growth rates associated with the depletion of gold resources expected in the 2020s and 2030s.

4. Conclusions and Policy Implications

4.1. Conclusions

As follows from the above discussion, Kumtor's contribution to the GDP (7 to 11 percent in 2009 to2013), industrial output (around 50 percent), exports (33 to 50 percent) and general government budget (5 to 10 percent) makes it the largest enterprise in the Kyrgyz Republic, directly or indirectly affecting virtually all aspects of economic and social development of the country.

Production at Kumtor is vulnerable to various natural, technical and commercial shocks and is sensitive to the political and social environment in the country. The last five years have been turbulent for the enterprise. However, it still demonstrated a reasonably good performance as reflected by the data on net earnings.

The Kyrgyz Republic benefits from the Kumtor mine through a number of channels including:

- **Taxes and other mandatory payments to the government budget**, in particular, the revenue-based tax which has resulted in Kumtor having a much higher effective tax rate than the sector-average;
- **Expenditures on local procurement of goods and services;** this includes full processing of gold at local refinery as opposed to production of gold concentrate only on some other mines;
- **Inflow of foreign exchange from Kumtor gold exports,** which is essential for maintenance of the country's balance of payment and stability of the national currency;
- **Kumtor's benchmarking role as one of the country's best employers,** based on its high local wage levels and, hence, as possibly the largest payer of labour-related taxes

and SF contributions in the country, despite its relatively small direct contribution to total employment in the country; and

- **Kumtor's contribution to social development of the country,** through mandatory payments to the government budget and extensive social corporate responsibility programmes implemented in the communities in the mine area and across the country.

Dividends associated with the government's participation in the enterprise equity have so far been much smaller than amounts received from Kumtor in the form of taxes and other mandatory payments. Dividends provide just around 10 percent of the government's revenue from the mine. The market value of Centerra shares owned by the government fell by 70 percent or more than one billion US dollars over the last three years cutting off the options to use the shares as a source for capitalisation of state development bank.

Simulations of different scenarios of economic and social development of the Kyrgyz Republic implemented using MAMS model indicate that in the case of the premature closure of the Kumtor mine (the pessimistic scenario), the economy will suffer very significant losses in the medium-term (loss of 23 percent in GDP in 2019 compared to the core scenario of business-as-usual at Kumtor). Losses will continue in the long-term, with a loss of 0.6 percentage points of average annual GDP growth rate in the period 2015 to 2035 or 11 percent of GDP in 2035, compared to the core scenario. Other macroeconomic variables, especially government consumption (including all public social expenditures) and investments into fixed capital, and key social development indicators would also be adversely affected by a premature mine closure to the same (or larger) extent as GDP.

More generally, under any of the three scenarios under consideration, average economic growth rates in the period 2015 to 2035 will be lower than historical averages. This is due to the depletion of currently known gold deposits by the middle/end of the 2020s, which, according to the government's draft mining industry strategy, are not going to be replaced by any comparable new deposits. Even optimistic projections in scenario of mining industry development as per this strategy do not allow for avoiding a decline in economic growth rates. This will be a serious challenge for the government budget and, hence, social development of the country.

4.2. Policy Implications

The analysis described in this paper on the impact of Kumtor on the economic and social development of the Kyrgyz Republic suggests the following policy implications.

1. Being a capital-intensive activity, mining is not going to provide directly a lot of working places, but is expected to make a substantial contribution to the government budget. From this perspective, government revenue is the main point of interest for the country with regards to mining. As the Kumtor experience shows, key sources of government revenue are the revenue-based (turnover) tax followed by labour-related taxes and mandatory contributions. Ownership-related revenue (dividends) is much smaller. The taxation scheme is therefore what is really important in mining. Discussions over the ownership structure of the Kumtor mine seem to somewhat miss the point; whatever is the own-

ership structure, it will only marginally affect the total amount of government revenue received from mine operations.

2. Arguably to receive substantial tax collections for the government and high wages for local employees it may be preferable to deal with large corporations, which usually are formal and then more transparent, have a longer-term approach, allow for establishing trade unions, and are more accountable due to their international presence. Large corporations are also associated with higher probability of implementing any significant corporate social responsibility programmes.

3. To maximise the spillover benefits of the mining industry to other sectors of the economy, it is important to maximise the utilisation of the local blue-collar and white-collar labour forces. But it is equally important to ensure maximum value addition inside the country, particularly related to existing domestic technical capacity for that as in the case of gold refinery. A mandatory requirement for all gold mining enterprises to establish production facilities and refine gold inside the country, when it is technically possible and economically viable, may be a practical step in this direction.

4. For mining to remain an important sector of the Kyrgyz economy, which keeps generating revenue for the government budget in the long-term, measures should be taken to: retain current investors by providing a favourable business climate based on the rule of law and indisputable property rights, and to attract new investors into geological exploration of new deposits before all currently known deposits are depleted in the next 10 to 15 years.

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Annex. Detailed Simulation Results

Table A1. Key Macroeconomic Variables

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Core Scenario																					
GDP growth rate, %	8.9	4.1	3.9	3.8	3.6	3.5	3.4	-0.5	5.5	-3.7	0.9	2.7	3.3	2.5	4.4	3.5	3.6	3.6	3.6	2.3	4.8
Private consumption, % GDP	89.1	88.4	87.9	87.6	87.3	87.2	87.0	87.0	86.8	86.3	85.9	85.6	85.6	85.4	85.7	85.7	85.8	85.8	85.8	85.5	85.9
Government consumption, % GDP	19.3	19.3	19.3	19.3	19.4	19.5	19.6	20.3	20.2	22.2	23.0	23.5	23.8	23.9	24.1	24.2	24.2	24.2	24.1	24.0	24.1
Private fixed capital investments, % GDP	21.3	21.4	21.4	21.4	21.4	21.4	21.4	21.3	21.3	21.1	21.0	20.9	20.8	20.7	20.7	20.7	20.7	20.7	20.6	20.6	20.6
Government fixed capital investments, % GDP	2.7	2.6	2.6	2.6	2.5	2.5	2.6	2.5	2.6	2.7	2.9	3.2	3.3	3.5	3.5	3.5	3.5	3.6	3.6	3.8	3.7
Exports, % GDP	46.2	47.9	49.3	50.5	51.7	52.7	53.7	53.3	55.7	58.8	61.9	64.9	67.1	69.2	69.7	70.4	70.9	71.2	71.4	73.0	71.9
Imports, % GDP	-78.9	-79.9	-80.8	-81.7	-82.6	-83.6	-84.5	-84.7	-86.9	-91.4	-95.1	-98.4	-101.1	-103.1	-104.1	-104.9	-105.4	-105.7	-106.0	-107.2	-106.4
General government expenditures, % GDP	37.6	37.6	37.7	37.8	38.0	38.2	38.5	39.8	39.8	43.5	45.5	46.8	47.8	48.4	48.8	49.1	49.3	49.4	49.5	49.8	49.8
Pessimistic Scenario																					
GDP growth rate, %	-5.2	-1.7	1.5	2.7	3.3	3.6	3.6	3.6	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.6	3.6	3.6	3.6	3.7	3.7
Private consumption, % GDP	89.8	88.6	87.7	87.0	86.5	86.2	86.0	85.8	85.7	85.5	85.3	85.1	85.0	84.9	84.8	84.7	84.6	84.5	84.5	84.5	84.4
Government consumption, % GDP	22.5	24.2	25.1	25.4	25.4	25.3	25.1	24.9	24.8	24.8	24.8	24.7	24.7	24.7	24.7	24.7	24.8	24.8	24.8	24.8	24.8

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Private fixed capital investments, % GDP	21.2	21.0	20.9	20.8	20.8	20.7	20.7	20.7	20.7	20.6	20.6	20.6	20.5	20.5	20.5	20.4	20.4	20.3	20.3	20.3	20.3
Government fixed capital investments, % GDP	3.0	3.1	3.3	3.6	3.7	3.7	3.8	3.8	3.8	3.8	3.8	3.8	3.9	3.9	3.9	4.0	4.0	4.0	4.1	4.1	4.1
Exports, % GDP	46.6	51.2	55.1	57.6	59.4	60.5	61.6	62.7	63.7	64.6	65.5	66.3	67.0	67.7	68.3	68.9	69.4	70.0	70.5	71.0	71.4
Imports, % GDP	-83.5	-88.6	-92.6	-95.0	-96.4	-97.1	-97.8	-98.5	-99.2	-99.8	-100.4	-101.0	-101.6	-102.1	-102.6	-103.1	-103.6	-104.1	-104.5	-104.9	-105.4
General government expenditures, % GDP	43.7	47.1	49.1	50.2	50.7	50.7	50.7	50.7	50.7	50.9	51.0	51.2	51.3	51.5	51.7	51.8	52.0	52.1	52.3	52.4	52.5
Optimistic Scenario																					
GDP growth rate, %	8.9	4.1	3.9	3.8	3.6	3.5	3.4	3.4	3.4	3.5	3.5	3.5	3.6	2.3	-0.2	1.1	3.2	2.6	3.5	3.5	3.5
Private consumption, % GDP	89.1	88.4	87.9	87.6	87.3	87.2	87.0	87.0	86.9	87.0	87.0	87.1	87.2	87.2	86.9	86.5	86.4	86.5	86.5	86.5	86.6
Government consumption, % GDP	19.3	19.3	19.3	19.3	19.4	19.5	19.6	19.7	19.8	19.9	19.9	20.0	20.1	20.5	21.5	22.4	22.6	23.8	23.7	23.7	23.7
Private fixed capital investments, % GDP	21.3	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.3	21.3	21.3	21.3	21.3	21.1	21.0	20.9	20.8	20.8	20.8	20.7
Government fixed capital investments, % GDP	2.7	2.6	2.6	2.6	2.5	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.7	2.9	3.1	3.4	3.4	3.5	3.5
Exports, % GDP	46.3	47.9	49.3	50.5	51.7	52.7	53.7	54.5	55.3	56.0	56.6	57.2	57.7	58.6	61.0	64.1	65.5	72.1	72.3	72.5	72.7
Imports, % GDP	-79.0	-79.9	-80.8	-81.7	-82.6	-83.6	-84.5	-85.4	-86.2	-87.0	-87.7	-88.4	-89.1	-90.4	-93.5	-97.1	-98.7	-106.9	-107.1	-107.4	-107.6
General government expenditures, % GDP	37.5	37.6	37.7	37.8	38.0	38.2	38.5	38.7	39.0	39.2	39.4	39.7	39.9	40.6	42.7	44.6	45.2	48.1	48.2	48.4	48.5

Table A2. Sector Structure of the Economy, % of total

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Core Scenario																					
Agriculture	18.9	19.2	19.4	19.6	19.7	19.8	19.9	20.2	20.2	21.3	21.8	22.2	22.5	22.8	22.8	22.9	23.0	23.0	23.1	23.2	23.1
Extractive industries	16.7	16.7	16.4	16.1	15.6	15.1	14.5	11.9	12.2	7.0	5.1	4.1	3.2	4.1	2.3	2.0	1.9	2.0	2.0	4.2	2.0
Manufacturing[8]	10.1	10.2	10.5	10.8	11.3	11.8	12.2	13.4	13.4	15.2	15.9	16.2	16.4	16.2	16.6	16.7	16.6	16.6	16.5	15.9	16.4
Market services	36.7	36.0	35.6	35.3	35.3	35.3	35.4	36.0	36.0	37.1	37.4	37.5	37.7	37.0	38.0	38.0	38.1	38.1	38.1	36.8	38.1
Government services	17.6	17.9	18.0	18.1	18.1	18.0	18.0	18.4	18.2	19.4	19.8	20.0	20.2	20.0	20.3	20.3	20.3	20.3	20.3	19.9	20.3
Pessimistic Scenario																					
Agriculture	22.3	23.2	23.6	23.6	23.6	23.5	23.4	23.3	23.2	23.1	23.0	23.0	22.9	22.9	22.9	22.8	22.8	22.8	22.8	22.9	22.9
Extractive industries	7.1	4.3	3.2	2.7	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2
Manufacturing	11.7	12.9	13.7	14.3	14.7	15.0	15.2	15.5	15.7	15.9	16.0	16.1	16.2	16.2	16.3	16.3	16.3	16.3	16.3	16.2	16.2
Market services	36.6	36.3	36.2	36.2	36.3	36.4	36.5	36.5	36.6	36.6	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.6	36.6	36.6	36.5
Government services	22.3	23.2	23.3	23.2	22.9	22.5	22.1	21.8	21.5	21.3	21.1	20.9	20.8	20.7	20.6	20.5	20.4	20.3	20.3	20.2	20.2
Optimistic Scenario																					
Agriculture	18.9	19.2	19.4	19.6	19.7	19.8	19.9	19.9	20.0	20.1	20.2	20.3	20.4	20.7	21.5	22.1	22.3	23.3	23.3	23.4	23.4
Extractive industries	16.7	16.7	16.4	16.1	15.6	15.1	14.5	13.9	13.3	12.8	12.2	11.7	11.3	9.9	7.0	5.2	4.8	1.9	1.9	1.9	2.0
Manufacturing	10.1	10.2	10.5	10.8	11.3	11.8	12.2	12.6	13.0	13.3	13.5	13.7	13.9	14.2	15.1	15.6	15.7	16.3	16.3	16.2	16.2
Market services	36.7	36.0	35.6	35.3	35.3	35.3	35.4	35.6	35.7	35.9	36.1	36.2	36.4	36.7	37.4	37.6	37.6	38.2	38.2	38.2	38.2
Government services	17.6	17.9	18.0	18.1	18.1	18.0	18.0	17.9	17.9	18.0	18.0	18.1	18.1	18.4	19.1	19.5	19.6	20.3	20.3	20.2	20.2

Table A3. Skill Composition of the Labour Force

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Core Scenario																					
Unskilled[9] labour	10.9	11.3	11.7	12.3	13.1	13.8	14.4	15.1	15.6	16.6	17.5	18.2	19.1	19.9	20.6	21.2	21.8	22.3	22.8	23.2	23.5
Semi-skilled labour	69.4	68.6	67.7	66.7	65.7	64.7	63.8	62.8	62.1	61.0	60.1	59.2	58.3	57.5	56.7	56.0	55.3	54.7	54.1	53.5	52.9
Skilled labour	19.7	20.1	20.6	21.0	21.2	21.5	21.8	22.0	22.3	22.4	22.4	22.5	22.6	22.6	22.7	22.8	22.9	23.0	23.2	23.3	23.5
Pessimistic Scenario																					
Unskilled labour	10.9	11.3	11.7	12.3	13.2	13.9	14.5	15.3	15.8	16.9	17.8	18.6	19.5	20.3	21.0	21.6	22.2	22.8	23.2	23.6	24.0
Semi-skilled labour	69.4	68.6	67.7	66.7	65.6	64.6	63.7	62.7	62.0	60.9	59.9	59.0	58.1	57.3	56.5	55.8	55.1	54.5	53.9	53.3	52.7
Skilled labour	19.7	20.1	20.6	21.0	21.2	21.5	21.8	22.0	22.2	22.3	22.3	22.4	22.4	22.5	22.5	22.6	22.6	22.8	22.9	23.1	23.3
Optimistic Scenario																					
Unskilled labour	10.9	11.3	11.7	12.3	13.1	13.8	14.4	15.1	15.6	16.6	17.5	18.2	19.0	19.8	20.5	21.1	21.7	22.2	22.6	23.0	23.3
Semi-skilled labour	69.4	68.6	67.7	66.7	65.7	64.7	63.8	62.8	62.1	61.0	60.1	59.2	58.4	57.5	56.8	56.0	55.4	54.8	54.1	53.6	53.0
Skilled labour	19.7	20.1	20.6	21.0	21.2	21.5	21.8	22.0	22.3	22.4	22.5	22.6	22.6	22.7	22.8	22.9	22.9	23.1	23.3	23.4	23.6

Table A4. Unemployment Rate

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Core Scenario																					
Total labour	6.0	6.0	6.0	6.1	6.2	6.2	6.2	6.1	6.2	6.2	6.4	6.8	7.3	7.9	8.2	8.6	9.0	9.3	9.5	9.9	9.9
Unskilled labour	18.0	18.2	18.2	18.7	19.8	19.8	19.4	18.0	18.3	17.0	18.0	19.4	21.4	23.6	24.7	25.9	26.9	27.7	28.3	29.6	29.1
Semi-skilled labour	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Skilled labour	6.5	6.0	5.8	5.3	4.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Pessimistic Scenario																					
Total labour	5.4	5.1	5.2	5.4	5.8	6.0	6.2	6.5	6.6	7.2	7.8	8.2	8.8	9.3	9.8	10.2	10.5	10.8	11.0	11.2	11.4
Unskilled labour	14.5	12.3	12.1	13.3	15.5	17.0	18.1	20.0	20.3	23.2	25.3	26.9	28.7	30.3	31.5	32.5	33.3	33.9	34.3	34.6	34.7
Semi-skilled labour	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Skilled labour	5.2	5.0	5.3	5.4	5.1	4.9	4.7	4.4	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Optimistic Scenario																					
Total labour	6.0	6.0	6.0	6.1	6.2	6.2	6.2	6.4	6.4	6.8	7.2	7.5	7.9	8.1	8.1	8.2	8.5	8.7	9.0	9.2	9.3
Unskilled labour	18.0	18.2	18.2	18.7	19.8	19.8	19.4	20.1	19.1	21.0	22.2	23.0	24.2	24.6	23.8	24.0	24.8	25.4	26.1	26.6	26.9
Semi-skilled labour	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Skilled labour	6.5	6.0	5.8	5.3	4.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0

Table A5. Social Indicators

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Core Scenario																					
Net basic secondary educa-tion completion rate, %	88.1	88.3	88.4	88.4	88.3	88.2	88.1	87.9	88.0	87.5	87.5	87.7	88.0	88.3	88.7	89.1	89.5	89.9	90.3	90.6	90.9
Under-five mortality rate, per 1,000 live births	22.7	22.4	22.1	21.8	21.4	21.1	20.8	20.8	20.3	20.5	20.4	20.1	19.8	19.5	19.1	18.7	18.3	17.9	17.5	17.3	16.8
Maternal mortality ratio, per 100,000 live births	47.7	46.8	45.9	44.9	44.0	43.0	42.1	42.1	40.6	41.4	41.2	40.5	39.7	39.0	37.7	36.7	35.7	34.7	33.6	33.0	31.6
Pessimistic Scenario																					
Net basic secondary educa-tion completion rate, %	87.3	87.1	87.0	87.0	86.8	86.7	86.6	86.6	86.7	86.7	86.9	87.2	87.6	88.0	88.4	88.8	89.2	89.6	90.0	90.3	90.7

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Under-five mortality rate, per 1,000 live births	23.7	24.0	23.9	23.8	23.5	23.2	22.9	22.5	22.2	21.8	21.4	21.1	20.7	20.3	19.9	19.5	19.1	18.7	18.3	17.9	17.5
Maternal mortality ratio, per 100,000 live births	51.4	52.2	52.0	51.4	50.6	49.7	48.7	47.7	46.7	45.7	44.6	43.6	42.5	41.5	40.4	39.3	38.2	37.2	36.1	35.0	33.9
Optimistic Scenario																					
Net basic secondary educa-tion completion rate, %	88.1	88.3	88.4	88.4	88.3	88.2	88.1	88.0	88.1	88.1	88.2	88.5	88.8	89.1	89.3	89.5	89.8	90.0	90.4	90.7	91.1
Under-five mortality rate, per 1,000 live births	22.7	22.4	22.1	21.8	21.4	21.1	20.8	20.5	20.1	19.8	19.4	19.1	18.7	18.4	18.3	18.1	17.8	17.6	17.2	16.8	16.5
Maternal mortality ratio, per 100,000 live births	47.7	46.8	45.9	44.9	44.0	43.0	42.1	41.1	40.2	39.2	38.1	37.1	36.1	35.3	35.2	34.8	34.0	33.6	32.6	31.6	30.7

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