

Foreign Mining, Labor Welfare and Local Trust: Evidence from Kyrgyzstan Gold Mine

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Abstract

The impact of foreign investment in natural resources on worker welfare and host country politics is controversial. This paper explores this issue by analyzing Kyrgyzstan's dominant foreign-invested gold mine, which in 2020 accounted for 12.5% of Kyrgyzstan's GDP. A key finding is that mines with foreign ownership isolate local communities from the benefits of the mining industry. Using geolocation data from Kyrgyzstan household panel surveys from 2010 to 2016, the study shows Kumtor, the country's largest foreign mine, offers only mine-related workers better social benefits. Mining industry wealth is associated with economic grievances of the non-mining sector and social division. Kumtor's higher corporate earnings result in higher levels of inequality and less trust in local leaders by mine workers.

Keywords:

JEL Codes:

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1 Introduction

The Kyrgyz Republic has large gold reserves, which make a significant contribution to the national economy and bring investment from foreign mining companies. About 10% of the nation's employment is in extractive industries. Prior to 2017, eight of the ten largest mining companies had foreign owners, with headquarters in Canada, China, Russia, and Kazakhstan.¹ The largest gold mine, Kumtor, is owned by Canadian company Centerra Gold and accounts for 90% of the country's gold production. In 2020, Kumtor's mining operations constituted 12.5% of Kyrgyzstan's GDP. Until 2021, Kyrgyzaltyn, the Kyrgyz state-owned enterprise (SOE), held a 32.7% equity interest in Centerra. The Kyrgyz government is able to collect revenue from Kumtor through multiple sources: dividends from Kyrgyzaltyn, gross taxes, and other payments.

The pros and cons of foreign investment have long been debated. Particularly debated are the linkages between natural resource investment and weak political and economic institutions (Sachs and Warner, 2001). This paper contributes to the debate by examining the local impact of a large foreign-invested gold mine and the linkages between foreign ownership, worker welfare, and local trust. This paper suggests that Kyrgyzstan's large foreign mining company, Kumtor, offers its employees better social welfare but has also contributed to high inequality and local division. This division plays an essential role in furthering political instability and local dissent. The conundrum here is how foreign companies pay higher wages and contribute to social welfare while still causing such dissent. This paper suggests that foreign-invested mines only benefit some workers in the mining industry and undermine workers in other sectors, exacerbating social divisions.

Large foreign companies are profitable and create higher labor demand, which allows them to offer better labor benefits than local companies. Luong and Weinthal (2010) argue that the distribution of these benefits by foreign-invested companies causes political contention. If the national government can draw dividends by holding a majority stake in the company, this limits the taxes (and thus total revenue) that can be collected by local governments. Company revenue will also be unevenly distributed between the mining and non-mining sectors. Mining sectors are paid better because they can claim mineral wealth directly from company profit. However, local non-mining communities benefit from mineral wealth only through partial taxes and payments from regional aid funds.

Workers who benefit from mining companies have little trust in local leaders because they are less connected to them; non-mining workers have higher levels of trust in local leaders and the local

¹2017 Extractive Industries Transparency Initiative (EITI) Report

community because they receive mining wealth through local taxation. The increase in mining activity has weakened ties between local leaders and mining workers in local communities and strengthened ties with those leaders and non-mining workers. As a result, foreign investment produces alliances between local communities and non-miners and isolates mining workers from their local communities. Mining workers receive better benefits and rely less on local leaders if mining profit is higher. This effect will be reversed for non-mining workers.

My empirical analysis focuses on how the presence of Kumtor affects workers' socioeconomic well-being and trust in local communities by considering households that are exposed to mining activities and their distance to the Kumtor mining pit. The study uses mining companies' annual reports and the 2010 to 2016 Life in Kyrgyzstan (LiK) household survey (Kotsadam and Tolonen, 2016) . The empirical results show that the social dissent caused by foreign mining companies is not due to the mistreatment of mining workers. Mining workers, especially those who live close to Kumtor, have higher incomes, social security, and more stable contracts.

I use travel time and distance between the household and the mine location to measure the magnitude of mining impacts. In addition to geographic variations, I assess variations in mining activity by considering measures such as company revenue, production, taxes, gold price, and regional aid funding. Foreign mining companies have also crowded out non-mining families, and those who live in the Kumtor area will have lower welfare. As compared to non-miners, miner families living near Kumtor have less trust in local leaders. Non-mining households, especially manufacturing workers living near Kumtor, have a higher level of trust in local leaders than their mining counterparts. Mining has no significantly different impact on unskilled and skilled workers.

I use a dummy variable to identify households within a 4-hour drive of Kumtor as the treatment group and have consistent results. The effects decline monotonically with distance to the pit and become insignificant beyond a 4-hour drive. More extensive mining activity and closer proximity to mines weaken the mining workers' trust in local leaders and strengthen the trust of non-mining households. Higher gold prices and revenue generate further disparity between workers in the mining community and non-mining workers. The dataset also shows that migration is not the main reason for the welfare divergence; only around 10% of mining workers in the sample are migrants. By controlling for income, I show that the channel through which mining affects trust is partly related to income, but this is not the only reason for the disparity. In the robustness checks, I applied propensity score matching (PSM), and the results for the matched sample were consistent with those for the full sample.

Scholars have studied the downstream effects of foreign direct investment. Much of the research is based on cross-country analyses and multiple mine sites. Due to the importance of Kumtor and data limitations, my research focuses on only one site. Harrison and Scorse (2010) summarize the literature and note that foreign firms will pay higher wages (Allcott and Keniston, 2018), hire more unemployed workers (Marchand and Weber, 2018), and spend more on employee training because higher productivity levels and increased labor demand (Agerton et al., 2017; Jacobsen and Parker, 2016).

However, Robertson (2010); Robertson and Teitelbaum (2011) argue that foreign direct investment (FDI) produces social tension and the climate for protest because of the resultant political competition. The downsides of FDI or foreign natural resource investment include conflict (Collier and Hoeffler, 2005) because of the possibility of foreigners funding dissident political groups (Berman et al., 2017; Paine, 2016; Parker and Vadheim, 2017; Shim, 2020). It alters the distribution of income and the poverty rate (Agerton et al., 2017; Wegenast et al., 2019) and creates corruption (Alexeev and Zakharov, 2021; Fields, 1980; Ross, 2012; Van der Ploeg, 2011). FDI impacts educational attainment (Weber, 2014), public goods provision (Aragón and Rud, 2013; Dell, 2010; Loayza et al., 2013), employment structure (Wegenast et al., 2019), and gender inequality (Kotsadam and Tolonen, 2016; Ross, 2008), and these impacts are felt in the long term (Hirschman, 1958; Sachs and Warner, 2001). Others argue that the quality of FDI development outcomes depends on the interaction with local institutions (Alexeev and Zakharov, 2021; Dell, 2010,?; Ross, 2008; Van der Ploeg, 2011), and state capacity (Acemoglu, 2005; Besley and Persson, 2009; Mann, 2012). Shenk (2021) argues that in Colombia, the relative power imbalance between private companies and anti-extractive expert allies has a considerable impact on the ability of local communities to organize.

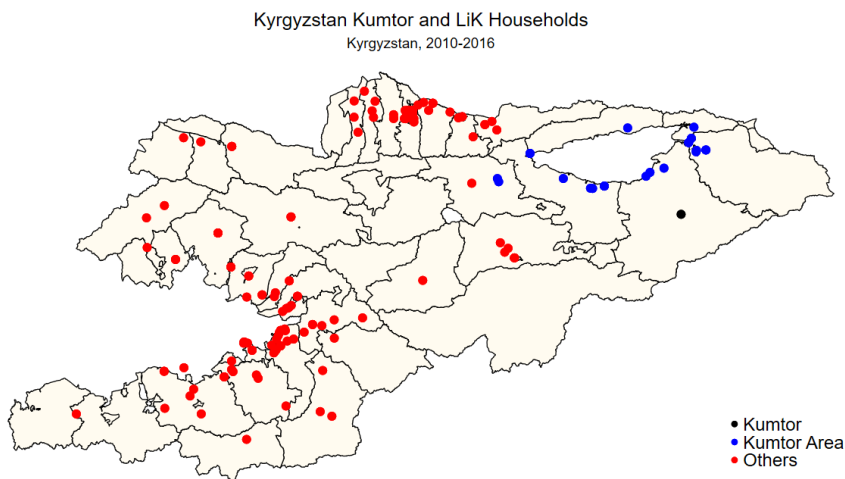
The analysis in this paper is organized as follows. First, I introduce Kumtor, the large foreign mining company mentioned above. The link between Kumtor's ownership structure and social division, and political participation is then discussed. I then introduce the data and the dependent variables drawn from the household surveys representing the socioeconomic status of respondents and, from this, generate descriptive questions. Fifth, I use an empirical strategy to compare socioeconomic welfare between miners and non-miners. In the main regression table, I assess the welfare effects of mining projects by measuring the distance between households and deposits. I then analyze the groups that benefit and those who are victims of the mining industry, and the trust in local leaders of workers in different industries far from and close to Kumtor.

2 Kumtor - The Canadian Gold Company

Kumtor is the largest operational mine in Kyrgyzstan, located in Issyk-Kul province. It is one of the largest gold mines in Central Asia owned by a Western-based company, having produced more than 13.2 million ounces of gold between 1997 and the end of 2020. The Kumtor mine is the largest private sector employer and taxpayer in the Kyrgyz Republic and represents its largest foreign investment. Mine operations at Kumtor contributed 12.5% of Kyrgyz GDP in 2020, and some 99% of KGC's 2,750 employees are Kyrgyz citizens. Kyrgyzaltyn, a joint stock company wholly owned by the Kyrgyz Republic, and the largest mining SOE, has shares in Kumtor. Before the government temporarily confiscated Kumtor in May 2021, Kyrgyzaltyn held about one-third of the shares of Centerra (a Canadian mining company listed on the Toronto Stock Exchange), which holds a 100% interest in the Kumtor mine. Centerra's new release in May 2021 shows that Kyrgyzaltyn held a 32.7% equity interest in Centerra.

The map of Kyrgyzstan below shows the exact location of Kumtor, with the towns covered in the household survey sample represented by dots. The blue dots are towns that are affected and covered by mining activity. In the empirical section, I adjust the scale of this area to test variations of impact. The black dot is the location of Kumtor mine. The red dots are the unaffected towns.

Figure 1: Kumtor Location and Sampled Towns



There have been multiple protests around Kumtor over the years in support of nationalizing the mine and raising environmental concerns and allegations of corruption. Over 30 years, Kumtor has been involved in two nationwide uprisings that alleged the mine and the country's president at the time were involved in corruption and which resulted in the amendment of three Kumtor profit-sharing agreements². Several fieldwork studies have considered the mechanism of mining protests and linkages

²<https://www.centerragold.com/investor/news-releases>

between institutional trust and conflicts, but few have followed a systematic empirical quantitative methodology. Ethnographic studies, documentation, and interviews with gold mining companies, government officials, and local residents show that mining conflict is driven by deep structural factors such as weak governance, lack of institutional trust, and limited cooperation among groups of actors Ocaklı et al. (2021, 2020), as well as constant violations of environmental regulations Wooden (2013). The low capacity of the state has made mining revenue a source of rent for officials, but the state has been unable to stop the uprisings and has even acted as a mediator between foreign investors and local residents Doolot and Heathershaw (2015).

Because of the limited availability of transparent protest-participation data, I do not discuss the protest mechanism in great detail. The study only measures institutional trust as an indicator of local dissatisfaction. Usually, protests are more likely to happen if workers are underpaid, unemployed, or without social security. However, the study shows that because mining workers are well treated by foreign mining companies, the conflict is mainly the result of a lack of trust between those in the mining sector and the non-mining sector. The foreign investment company separates the beneficiaries of the mining industry from their local communities.

3 Fiscal System and Revenue Sharing

The Kumtor project is governed by an investment agreement and related agreements dated June 6, 2009 (collectively the “Kumtor Project Agreements”), which provide for a fixed tax regime and revenue-sharing. The 2009 Restated Kumtor Project Agreements, approved by the Kyrgyz Republic Parliament and the country’s Constitutional Court, were reaffirmed by the government in 2017³. According to the agreement, in 2009, the Kyrgyz Government could own up to 33.0% of Centerra, Kumtor’s Canadian parent company.

The distribution of foreign investment revenue in Kyrgyzstan is idiosyncratic – the central government collects wealth from both taxation and ownership dividends. Sales revenues are distributed among the mine and stakeholders other than the taxing government entity. The SOEs controlled by the central government are the major shareholders of dominant foreign companies.

Under a centralized fiscal system, most revenues will be paid to and distributed by the ruler. Primary taxes are usually set by the central government, and secondary taxes are set by local governments, within limits. To simplify this mechanism, the central government manages the revenue-sharing process in a

³<https://www.centerragold.com/investor/news-releases>

less transparent way. Under the set tax regime, gross revenue will be taxed at a rate of 14%, which includes a 1% monthly contribution to the Issyk-Kul Oblast Development Fund. The main purpose of the fund is the region's socioeconomic development. This suggests that only a small fraction of profits benefit the mine localities, and most of the revenue goes to the central government and the firm. The structure of ownership over mineral resources determines who owns and controls the development of these resources.

By contrast, domestic companies have different revenue-sharing mechanisms. Luong and Weinthal (2010) argue that domestically owned mining companies pay less to mining workers and more to local communities. This creates a group of players with a common interest in establishing formal guarantees to increase fiscal predictability and reduce transaction and monitoring costs. The relative power between national elites and domestic owners is symmetric; each has an independent source of authority. Domestic owners have rights to mineral extraction revenue and are, therefore, an important source of state tax revenue. State elites have the power to revoke property rights and reduce revenue streams by demanding excessive taxation.

4 Analytical Framework

This study takes the case of Kumtor gold mine, a dominant foreign-owned natural resource company with an SOE as its largest shareholder and a state without strong capacity. Large foreign-invested companies often produce “enclave” economies that have a controversial local impact (Hirschman 1958). In this context, it is necessary to understand under what circumstances enclaves like Kumtor can be a booster of regional revenue. The answer is that revenue-sharing systems create various alliances between beneficiaries. This revenue-sharing system has a particularly serious impact when the company has foreign ownership and the SOE becomes a shareholder. Therefore, the activity of the mine can be seen as an exogenous shock to Kumtor's mineral wealth. Worker welfare in Kumtor and surrounding areas is analyzed using treatment groups and comparing the direct and indirect impacts of mining activities on different sectors. Thus, the shock in the form of mining wealth causes wage increases in the mining sector and Kumtor's surrounding areas.

Luong and Weinthal (2010) argue that mineral-rich countries are cursed not by their mineral wealth but by the ownership structures used to manage that mineral wealth. Where there is state ownership without control, the state and foreign investors are the main direct claimants of mineral wealth. At the same time, the state, local elites, and the country's population are indirect claimants through taxation.

Miners, who receive the benefits of mineral wealth, are beneficiaries of corporate profits and taxes. Compared to taxation revenue, dividend revenue collected by SOEs is less transparent. Shenk (2021) argues that domestic companies can incentivize local politicians to act in favor of corporate interests. By contrast, domestically owned companies can promote a strong fiscal system, because they usually have a stronger connection with local government. Furthermore, if the shareholders are domestic, the beneficiary local investors have greater connections with the local community. Domestic-owned mining companies pay less to mining workers and more to local communities.

Specifically, Centerra, the Canadian company listed on the Toronto Stock Exchange, owns Kumtor mining deposits. In the 2010s, Kyrgyzaltyn, the largest mining SOE in Kyrgyzstan, owned about 30% of Centerra's stock. In addition to receiving dividends, in such arrangements, major taxes are commonly set by the central government and minor taxes by the local government, within carefully crafted constraints. The state is a shareholder in Kumtor's parent company, and the central government can directly claim mineral rents. The detailed items and actual taxes and payments made by Centerra to Kyrgyzstan are noted in Centerra's financial reports. Under this ownership structure, state elites and SOE bureaucrats legitimize their privileged access to mineral rents by deliberately concealing taxes on the population.

This study shows that higher mining revenue causes more divergences. If mining revenue and gold prices increase, mining workers are alienated from local communities because of their stronger ties with the company. Mining communities are wealthier when mining revenue is high, but local non-mining communities remain poor. The more profitable mining companies are, the more miners earn (Harrison and Scorse, 2010) and the lower their trust in local leaders. The revenue share enjoyed by the mining community far outweighs that enjoyed by the non-mining community, exacerbating social divisions due to high income disparities.

The discussion sets up a null hypothesis and a set of alternatives. In the empirical part, I test the following hypothesis: Hypotheses 3 and Hypotheses 4 are tested in appendix

Hypotheses 1:

- *Mining workers who live closer to Kumtor mining pit have higher income and better social security.*
- *Non-mining working family who lives closer to Kumtor mining pit don't have higher income and better social security.*

Hypotheses 2:

- *Mining workers who live closer to Kumtor mining pit have lower trust to local authority.*

- *Non-mining working family who lives closer to Kumtor mining pit have higher trust to local authority.*

Hypotheses 3:

- *If mining income or gold prices rise, the income and social welfare of mining workers will increase, and the impact will be prominent for those living near the Kumtor mine.*
- *If mining income or gold prices rise, the income and social welfare of non-mining family workers will not increase.*

Hypotheses 4:

- *If mining income or gold prices rise, the trust in local authority of mining workers will decrease, and the impact will be prominent for those living near the Kumtor mine.*
- *If mining income or gold prices rise, the trust in local authority of non-mining workers will increase, and the impact will be prominent for those living near the Kumtor mine.*

5 Data

This study evaluates the socioeconomic effects of a foreign mining company in a small country and combines household data with information about Kumtor mining company’s activities between 2007 and 2016. The LiK survey Brück et al. (2014) is a country-wide general household survey that includes demographic information and socioeconomic questions. I used the “coate” code to identify the location of all households. This “State Classification of Administrative and Territorial Units” was used as a post-soviet administrative identification code. The distance between households and mining deposits is scrapped using Python from Google API Services. The survey respondents were then matched with the foreign mining company Kumtor, allowing me to identify which respondents lived around the mining town and which did not. To quantify exposure to Kumtor, the center of mining activity, I constructed measures of distance and driving time from the household to the pit and differentiated Kumtor from non-Kumtor areas using a radius of 4 hours of driving time. The dataset also includes respondents’ occupations and the major economic activities in each community. I determined whether the respondent was a miner, whether the household had at least one miner, and whether the worker was in manufacturing. I have included descriptive statistics on mining families and miners.

To measure mine activity, I collected Kuntor data from the annual report of its parent company, Centerra Gold Inc, including data on revenue, average annual gold price, and total production, and the Issyk Fund, a regional aid fund for local residents. The data is annual and covers the period from 2006 to 2016. The Issyk Fund receives only around 1% of total revenue.

5.1 Household Survey - Life in Kyrgyzstan

5.1.1 Basic information

My dependent variables were drawn from socioeconomic questions in the LiK survey. The survey generates comprehensive public attitude survey data and is geo-coded at the village level, allowing me to link mining companies with individuals. The dataset included 3,000 households and 8,000 individuals in five waves: 2010, 2011, 2012, 2013, and 2016. It included seven Kyrgyz regions (oblasts), the two cities of Bishkek and Osh, 136 towns (villages), and 33 mining towns. The questions concerned household demographics, assets, expenditure, migration, employment, agricultural markets, shocks, social networks, subjective well-being, and many other topics. In my analysis, I included address, occupation, basic demographics, and information from questions concerning well-being, income, trust, and employment.

5.1.2 List of Variables

The descriptive table below summarizes the descriptive statistics of variables in my analysis concerning well-being, income, trust, and employment, including the number of observations, mean value, and standard deviation for each survey question. I used dummy variables, with “0” indicating a “no” response and “1” indicating a “yes” response to yes/no questions. The survey also used a scale of 0 to 10 to rate the respondent’s level of health satisfaction.

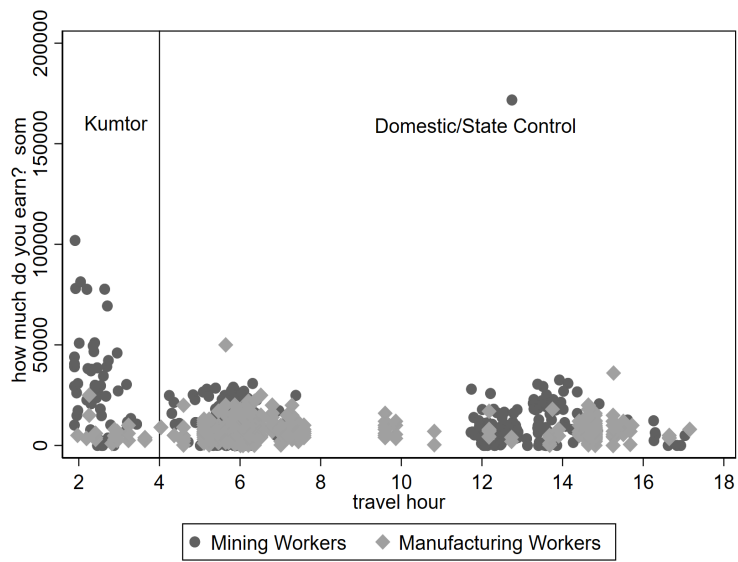
Descriptive statistics					
	(1)	(2)	(3)	(4)	(5)
	N	mean	sd	min	max
written contract	14,263	0.476	0.499	0	1
working training	14,263	0.564	0.496	0	1
social security	13,475	0.564	0.800	0	1
income	11,869	7,741	6,180	0	170,000
health satisfaction	42,067	7.044	2.460	0	10
distance	41,654	554,121	226,845	9,979	1.089e+06
travel time	41,654	34,665	16,859	995	64,341
president trust	40,278	2.628	0.960	1	4
local leader trust	40,167	2.650	0.943	1	4
business leader trust	39,238	2.412	0.906	1	4
miner	46,174	0.00790	0.0886	0	1
miner family	46,174	0.0482	0.214	0	1

6 Empirical Strategy

6.1 Distance and Welfare

Figure 3 below provides a simple overview of miners living closer to the Kumtor mine than manufacturing workers. Miners living near the Kumtor mine have higher overall incomes, especially in the area immediately around Kumtor. However, there are also many low-income miners, suggesting a higher level of inequality around Kumtor. Additionally, the Kumtor mining operations have crowded out manufacturing workers. There are fewer manufacturing workers around Kumtor, and their incomes are lower.

Figure 2: Income of Mining Workers and Manufacturing Workers



6.2 Empirical Specification

Despite the fact that miners have better income and social welfare overall, my preliminary empirical analysis shows that mining workers who live closer to Kumtor have higher income and better social welfare than those living further away. I use two methods to measure the various effects. I measure distance effects in terms of travel distance and time between households and Kumtor. Using Python from Google API Services, I scrapped the distance between households and the pit. I then collected data for firm revenue, gold production, and gold prices to measure the various effects of mining activity; I also used 1- and 2-year lag effects.

First, to evaluate the effect of the mine exposure on living standards, I assume that the impact of Kumtor decreases with distance, and I estimate the following regression:

$$Y_{idt} = \beta_0 + \beta_1 \text{LnDistance}_{idt} + \beta_2 \text{Miner}_{idt} + \beta_3 \text{LnDistance}_{idt} \times \text{Miner}_{idt} + \theta_d + \gamma t + \epsilon_{idt}$$

where Y_{idt} is the outcome variable for person i in district d at year t . The outcome variable is the logarithm of income or a measure of social welfare; that is, a dummy variable is used to identify if the individual had a written contract, formal job training, and social security. Another outcome variable is trust to local authority, which is ranked on a scale from 1 to 4. LnDistance_{idt} is the logarithm of the distance (meters) between the household and the Kumtor Gold Mine. Miner_{idt} is the identifier for mining workers. $\text{LnDistance}_{idt} \times \text{Miner}_{idt}$ is the interaction term of occupation and distance.

All regressions are controlled for year and region fixed effects. I use logit regression if the outcome variable is a dummy variable. I also switch job identifiers from the mining to the non-mining sector to see if that impacts other groupings. I swap the dummy variable nonminer_{idt} with Miner_{idt} if no one in the household works in mining. Gold mining should have a greater impact on miners than non-miners, and this impact decreases with increasing distance from the mine. For non-miners, the effect will be reversed. I also empirically test the effects on other outcome variables, such as written contracts, job training, social security, and health satisfaction.

Second, I maintain the household distance from the Kumtor as a source of heterogeneity in response to the gold shock from the mine. However, the heterogeneity arises in two ways. I divide distances into those ranging from a 0 to 4-hour drive and those more than a 4-hour drive and designate these as the Kumtor and non-Kumtor areas, respectively. In the main specification, the area is divided into two dummy categories, far pit and near the pit, with 4.5 hours as the threshold. The Kumtor mining activity is used as the treatment, and those households beyond the 4-hour drive mark comprise the untreated group. Then I utilize several measures of mining activity, including the annual production

of gold, the annual income from gold, the annual average price of gold, and the Issyk-Kul Region Development Fund. As previously mentioned, the increase in gold mining has increased employment opportunities and improved local income and welfare for residents of the Kumtor area. At the same time, residents further from the Kumtor area are not treated. To assess the impact of mines by this method, I estimated the following regression (Results are in Appendix):

$$Y_{idt} = \beta_0 + \beta_1 Kumtor_{id} + \beta_1 Miner_{idt} + \beta_3 Kumtor_{id} * Miner_{idt} + \beta_4 \ln M_t * Kumtor_{id} + \beta_5 \ln M_t * Kumtor_{id} * Miner_{idt} + \theta_d + \gamma t + \epsilon_{idt}$$

where Y_{idt} is the outcome variable for individual i in region d at year t . Outcome variables can be logarithms of income and measures of living standards. M_t is a measure of mine activity, lagged by one or two years to allow the market to adjust. M_t I replace between annual gold production, annual gold income, the annual average price of gold, and the Issyk-Kul Region Development Fund. $Kumtor_{id}$ is a dummy variable if the individual lives in the Kumtor area approximately 4 hours from the pit. $Miner$ is the job identifier if the individual is working in the mining industry. All regressions controlled for year and region fixed effects. Then the estimation would be the impact of Kumtor on the trust in local communities and the state. The dependent variables are Y_{idt} trust in the central government or president and trust in local leaders, ranging from 1 to 4. I also switch job identifiers from miners to non-mining sectors to see if that makes a difference to other groups. $nonminer_{idt}$ is a dummy variable that I replace with $Miner_{idt}$ in the empirical equation if no one in the individual household is engaged in mining. mfg_{idt} is a dummy variable that takes the value of 1 if the individual works in manufacturing. I also used quantile regression to show the effect of Kumtor on miner income for each quantile. I only evaluate the 25, 50, and 75 quantiles for mining workers, including ordinary least squares (OLS) regressions and year/region dummy controls. However, there may be other unobserved time-varying factors associated with mines and affecting different regions closer and further to the mine, which would invalidate my identification. I will address these more.

Table 1: Welfare effect of Kumtor

	(1)	(2)	(3)	(4)	(5)	(6)
	income	income	contract	training	social security	health
ln_dis×miner	-0.766*** (-4.61)		-1.209*** (-4.12)	-4.232*** (-8.28)	-1.408*** (-4.99)	-0.435** (-2.67)
ln_distance	0.132** (2.93)	-0.330* (-1.89)	0.179*** (2.91)	0.568*** (9.13)	0.820*** (10.73)	0.173 (0.71)
miner	10.481*** (4.90)		16.577*** (4.34)	56.818*** (8.42)	18.196*** (4.98)	6.133** (2.96)
non-miner		-6.261** (-3.10)				
ln_dis×nonming		0.462** (2.99)				
Year FE	Y	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y	Y
Observations	11,748	11,748	14,198	14,198	13,426	41,013
R-squared	0.176	0.167				0.025

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 3: coefficient plot of Kumtor's effect on income, interaction term

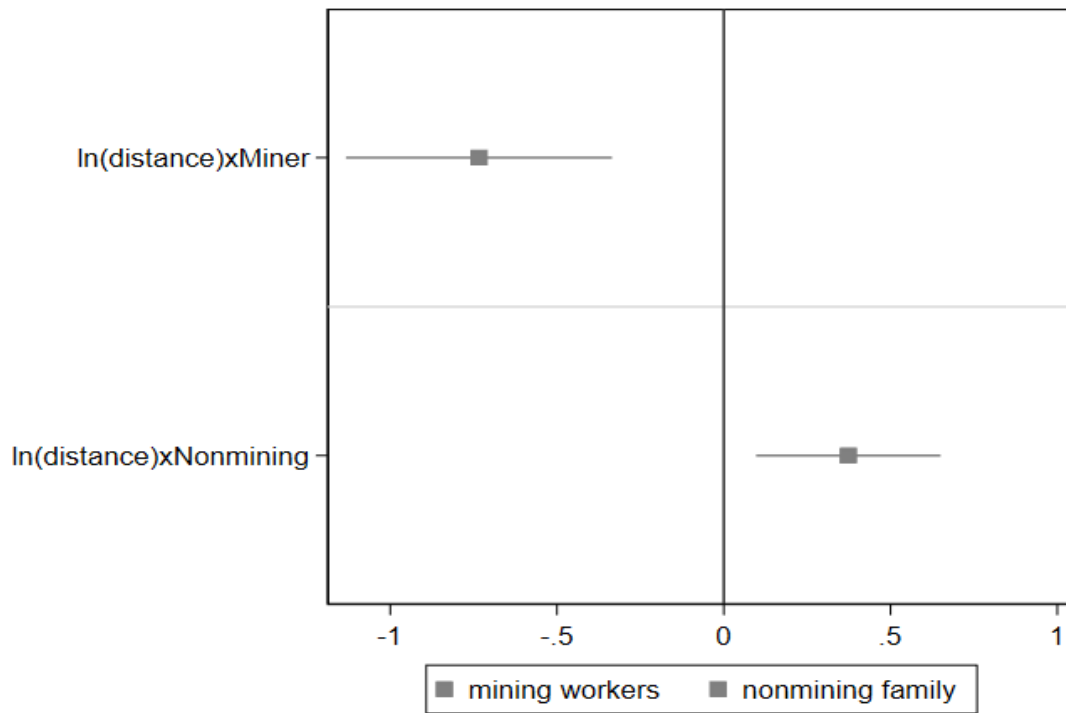


Figure 4: coefficient plot of Kumtor's effect on trust in local, interaction term

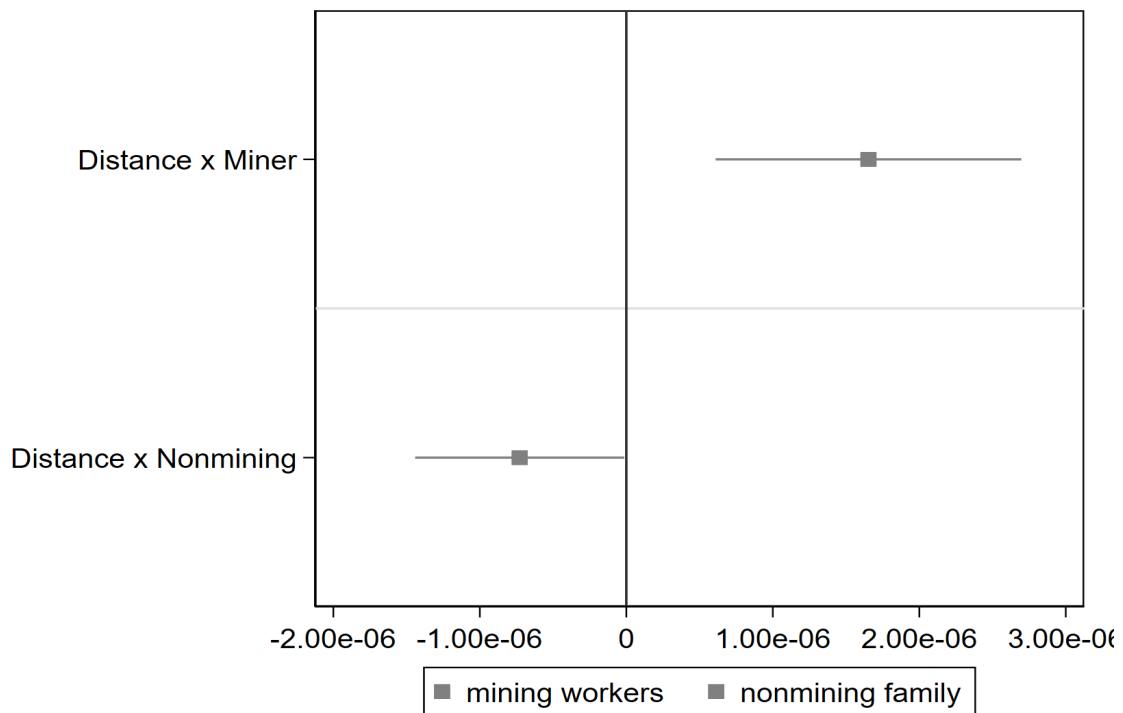
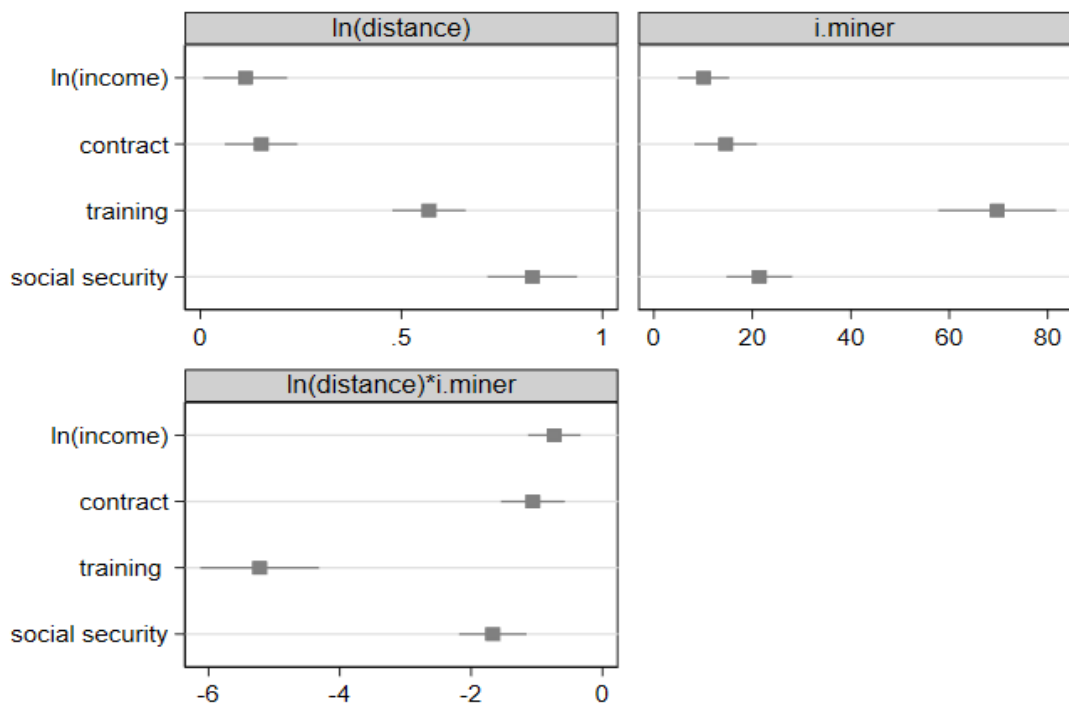


Figure 5: coefficient plot of Kumtor's effect on miners' welfare



6.3 Marginal Effects Plot

The marginal effects plots in Figures below graphically show how a mine increases the income of mining workers. The impact of mining is heterogeneous and varies according to the distance from the mine and the gold price. The effect of mining is stronger for individuals living close to the mine. In addition, if the gold price fluctuates greatly, workers around the mine will be more sensitive to those fluctuations than workers further away. In the marginal effects plots, I control for the year and region fixed effects as well as important demographic control variables.

Figure 6-9 shows the marginal income and trust effect of Kumtor at a distance. The closer a miner lives to the mine, the greater the effect on their income, and the greater negative effect on their trust to local authorities. The opposite is effect for non-mining households. Figure in appendix is the marginal revenue effect of Kumtor as the gold price varies. In Kumtor, the impact on the average marginal income of mining workers is higher than in the Kumtor area. The income of miners around the Kumtor mine is more sensitive to changes in the gold price than those living outside. At the same time, when the price of gold rises, the income gap between miners inside and outside Kumtor widens.

Figure in appendix compare miners and non-miners inside and outside the area of the Kumtor mine. Mining workers' trust in local leaders is negatively affected by gold-price volatility. Conversely, gold prices have a positive impact on trust in local leaders among non-mining company workers. For all types of workers, the impact in the Kumtor area of changes in the gold price is greater but less pronounced than for outsiders. Meanwhile, miners who live near the mine are more affected by mining activity when gold prices are higher. Those not working in mines are not affected by fluctuations in the gold price. I controlled for all marginal effects regressions with year and region fixed effects. Figure 8 is the marginal trust effect of Kumtor by the number of travel hours to the mine. The closer miners are to the mine, the less trust they have in local authorities. In terms of travel time, the impact is not very significant, but we can see this trend that the mine undermines trust in local authorities,

Figure 6: Marginal income effect of Kumtor at distance

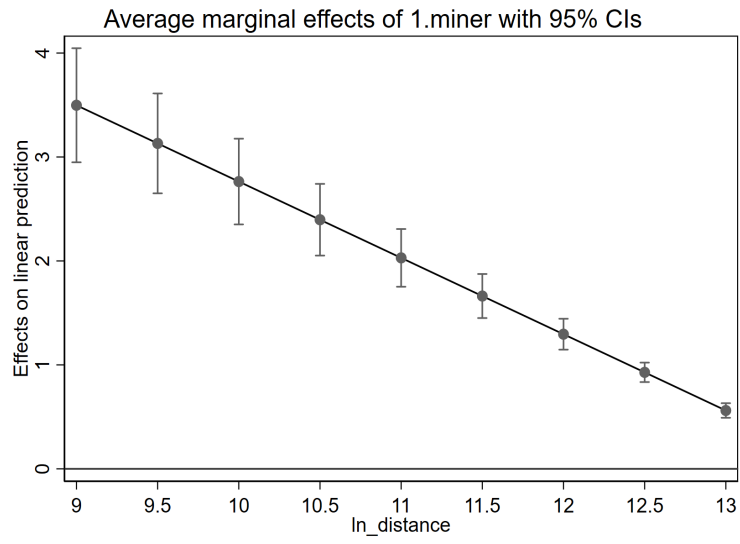


Figure 7: Marginal income effect of Kumtor at distance

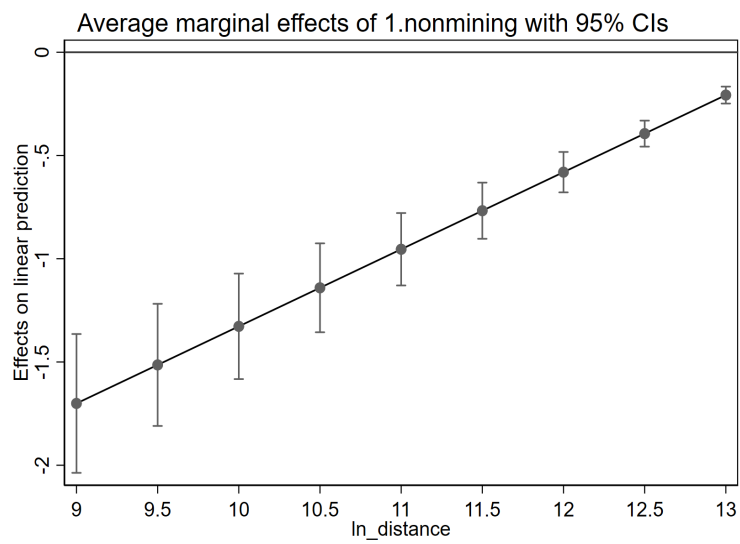


Figure 8: Marginal trust effect of Kumtor at distance

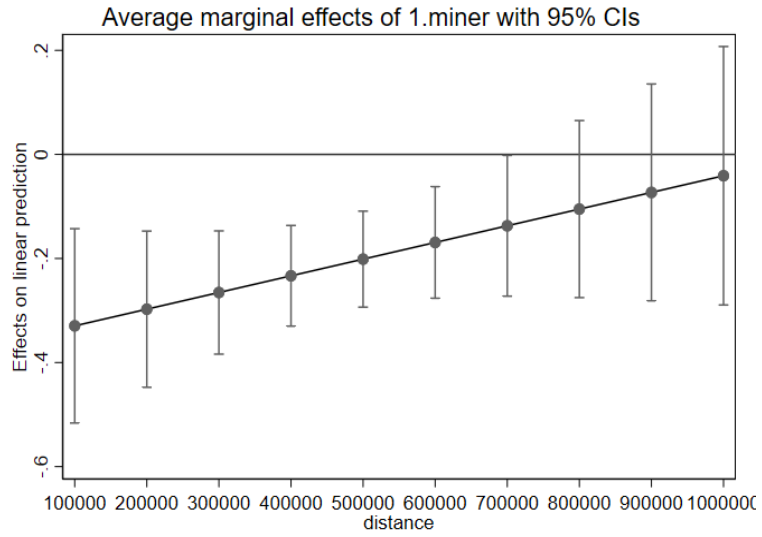
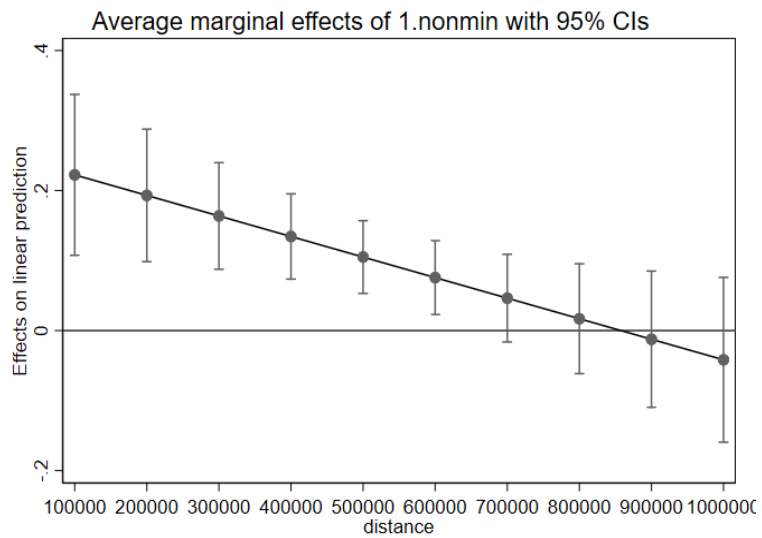


Figure 9: Marginal trust effect of Kumtor at distance



6.4 Propensity Score Matching

Individuals of certain ages, genders, levels of education, distance from mines, and migration status are more likely to be miners and are more likely to earn higher incomes. To remove selection bias, I also used PSM to match miners with non-miners by these characteristics. The first table below is the result of using “teffects psmatch” and the second table is the result of using ”psmatch2”. The column with 11,274 observations is PSM matched by age, sex, and education. The column with 11,226 observations is PSM matched by age, gender, education, and migration status. The 10,826 observation column is PSM matched by age, gender, education, migration status, and distance to mining. In all tables, the results are consistent with my conclusions. In the next table, I removed the unmatched samples in the PSM and repeated my previous OLS fixed effects regression; PSM gave me consistent results. When matched with the same propensity scores for “age, gender, education, distance from mine, and migration status,” miners living near mines had better welfare than non-miners.

Table 2: Income effect of Kumtor mining- PSM weighted sample

	(1)	(2)	(3)
	ln_income	ln_income	ln_income
travel hour	0.0132*** (3.90)	0.0197 (1.58)	-0.00449 (-0.44)
miner	1.009*** (8.03)	1.222*** (7.41)	0.701*** (8.17)
miner×c.travel hour	-0.0643*** (-4.57)	-0.0865*** (-4.87)	-0.0344*** (-3.55)
demographic control	Y	Y	Y
district/year control	Y	Y	Y
sample	full	matched	iweight
<i>N</i>	10826	880	10680

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.5 Results

The results of the regressions are set out in the table and include year and region fixed effects. The regression tables are the following: Kumtor's income effect; Kumtor's income effect of mining activities on mining and non-mining households; quantile impact on income from Kumtor; Kumtor's trust effect; Kumtor's trust effect of mining activities.

Generally, Kumtor only offers higher income for those in the mining sector. Miners who live closer to Kumtor are paid much higher than those further afield. Income variance is much higher near Kumtor, and workers in the other sector who live closer to Kumtor are even lower paid. The explanation may be that manufacturing workers switch to Kumtor. Miners living closer to Kumtor are more likely to have formal contracts, working training, social security, and health satisfaction. If the individual is in a household where no one works in the mining industry, their income will be lower when living closer to Kumtor.

Miners in the Kumtor area (within a 4-hour drive) earn a higher income. At the same time, if the gold price or revenue of Kumtor increases, the income of miners will also increase, with a 2-year lag effect. The wage effect of Kumtor also applies to miners across the country. However, the effect of mining activity does not apply to gold production and Issyk funds, meaning that production and local aid funds have little effect on mining-worker welfare.

Non-miners at the Kumtor mine (within a 4-hour drive) earn less because they are crowded out by the mining industry. At the same time, if Kumtor's gold price or revenue increases, non-miners will also receive less income; the income of those living near Kumtor will be even lower. At the same time, the 2-year lag effect is significant. Interestingly, local and regional funds have only a small impact. Gold production has little impact

Mining development only benefits miners, especially those in higher income quantiles. Quantile regression shows that high-income miners (above the 0.5 quantile) have a stronger impact on Kumtor's wealth than low-income miners. These results show that mining not only increases income but also creates inequality. High-income workers benefit from mining wealth, but low-income workers remain poor. Mining distance has a heterogeneous effect on different income levels of mining workers.

My analysis shows that foreign mining companies face local community dissatisfaction as their arrival erodes trust between the mining industry and local leaders. In general, all households living near Kumtor have higher levels of trust in the central government and the president than other households. Miners living in the Kumtor region have low levels of trust in local leaders. However, households around

Kumtor without a member who works in mining have more trust in local leaders. Manufacturing workers, thought to be displaced by the mining industry, show higher levels of trust in local leaders. Mining development will only improve the lives of high-income miners and creates an alliance between local leaders and manufacturing workers against the mining industry and the state.

With a 2-years lag, mining activity had a heterogeneous impact on mining and manufacturing workers. In this table, I only focus on the trust in local leaders because the impact in respect of trust in state government and the president is not significant. As mining activity increases, as seen in higher mining revenue and higher gold prices, miners' trust in local leaders weakens, while trust on the part of manufacturing workers becomes stronger. In this case, mining activities will create more social divisions and isolate mining workers from their local communities. I also controlled for the interaction between the Kumtor dummy, sector dummy, and mining activity.

Migrants from outside of Kumtor are also likely to migrate to the Kumtor area, as mining has brought higher incomes. It would be interesting to examine whether the change in trust comes from locals or from migrants, as this issue is a major concern. However, household surveys found very few people migrated to Kumtor from other areas.

7 Conclusion

This study investigates the impact of foreign natural resource investment on the well-being of workers in Kyrgyzstan. It focuses on mining workers and local communities associated with Kumtor, the country's largest mining company. In general, Kyrgyz miners living near foreign-owned mines have high wages and good benefits. Foreign companies offer them safer jobs, higher wages, and higher health satisfaction than domestic companies. Conflict is also associated with mining towns, as mining deposits alter trust between mining workers and local communities in different sectors. Foreign mines only benefit some miners, not all residents. As mining wealth increases, the beneficiaries of the mining industry are isolated from the local community. My analysis shows that miners living near the Kumtor deposit have higher incomes and better social welfare, and a greater impact is felt by those who live within a 4.5-hour drive. Due to the unequal flow of large amounts of gold wealth into the state and the mining industry, very little benefits local communities. It creates alliances between non-mining workers and local authorities in opposition to mining workers and the state. Local conflict is more likely to occur around mining towns with high levels of mistrust.

The main contribution of this paper is to improve understanding of the conditions under which

foreign companies promote local development. Extractive industries, in particular, lead to positive development for mining workers, but the unequal distribution of wealth does not satisfy everyone. A major limitation of this study is that I only observed mine operations for a short period and without conducting an adequate pre-trend analysis. The other limitation arises because I only used the National Household Survey, which is objective but with a small sample of mining workers and without the ability to track individuals. A special feature is that this study uses only one very important case and thus differs from other cross-country, multi-site studies.

The policy implication of this study is that under weak government, policies that promote local procurement and employment may be more beneficial to local residents than increased public spending. Furthermore, more transparent aid to local residents and higher levels of engagement between the mining industry and local communities would help ease the conflict. The natural resources of developing countries are often seen as obstacles to economic development. In most cases, institutional failures such as conflict or corruption are the main reasons underlying the inability of states to translate natural wealth into better living standards. This paper argues that the key issue may not be mining in itself, but the way ownership is structured and how wealth is distributed. Domestic control or greater involvement of local communities may lead to mining benefiting more of the population.

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Appendix A Additional Figures

Figure 10: Production and Gold Price

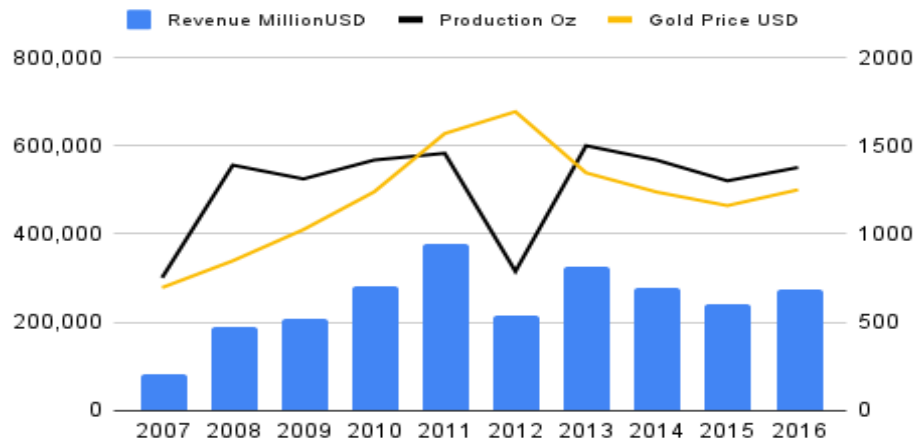


Table 3: Protests from Kumtor Company Release

Date	Description
October 6, 2020	Kumtor Mine continue uninterrupted following the recent political unrest in the Kyrgyz Republic.
May 30, 2013	National grid power supply to the Kumtor mine has been disrupted by local protesters. The road leading to the mine also continues to be blocked.
February 14, 2012	Unionized employees at its Kumtor operation in the Kyrgyz Republic remain on strike. operation is currently suspended.
December 5, 2011	The transfer of diesel fuel and other supplies from the Kumtor yard to the mine has been interrupted due to roadblock.
April 8, 2010	Kumtor mine continue uninterrupted and are currently unaffected by the unrest in the country.
October 1, 2010	Unionized employees of its Kumtor Mine in the Kyrgyz Republic commenced strike action.
May 7, 2007	A small group of villagers (50-70 people) is blocking the road to the Kumtor mine demanding the Government and the Company make further compensation payments in relation to the May 1998 cyanide spill.
December 19, 2006	Mine department and some support services personnel have begun work stoppage
February 23, 2005	Kumtor mine has been unable to move employees and supplies to and from the mine site due to roadblocks on public highways.
November 14, 2005	Kumtor mine is currently being restricted by illegal roadblocks. The action is related to the 1998 cyanide incident

Figure 11: Marginal income effect of Kumtor at gold price

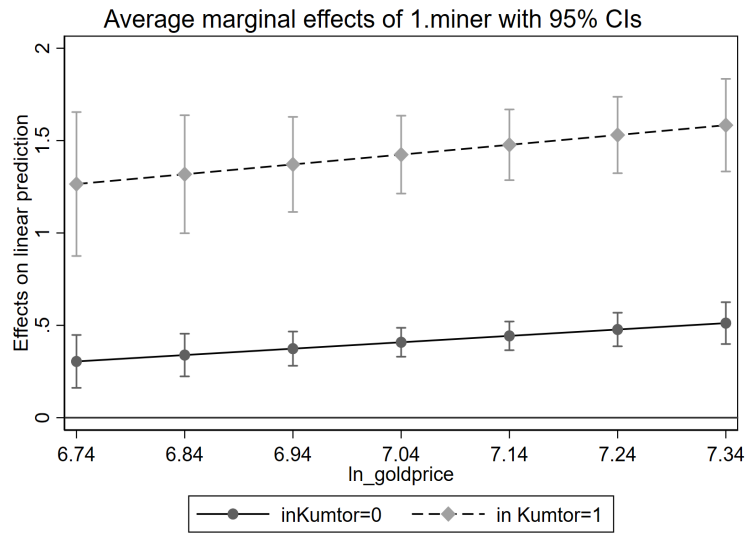


Figure 12: Marginal trust effect of Kumtor at gold price for miners

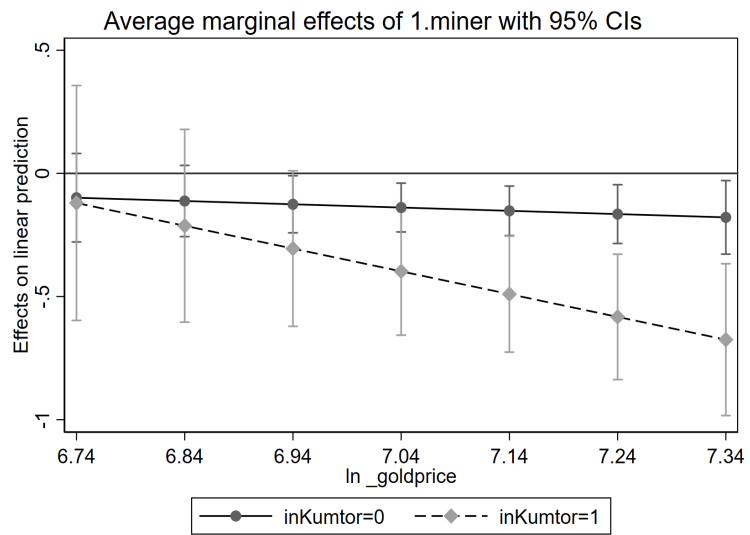
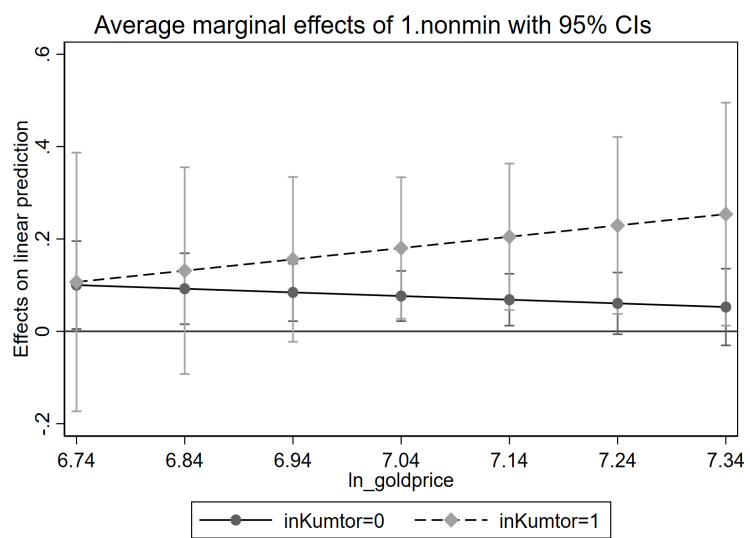


Figure 13: Marginal trust effect of Kumtor at gold price for non mining family



Appendix B Additional Tables

Table 4: Trust Effect of Kumtor

	(1)	(2)	(3)	(4)	(5)	(6)
	pres.	local leader	pres.	local leader	pres.	local leader
Kumtor	0.227*** (5.35)	-0.034 (-0.26)	0.163 (1.70)	-0.239 (-1.46)	0.226*** (5.42)	-0.049 (-0.37)
miner	-0.052 (-0.56)	0.007 (0.07)				
Kumtor × miner	-0.119 (-1.38)	-0.478*** (-4.14)				
nonminer			-0.021 (-0.23)	-0.057 (-0.70)		
Kumtor × nonm.			0.065 (0.79)	0.209* (2.28)		
mfg.					-0.036 (-0.56)	-0.284*** (-4.52)
Kumtor × mfg.					-0.131 (-1.03)	0.288** (2.41)
Year FE	Y	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y	Y
Observations	39,279	39,164	39,279	39,164	39,279	39,164
R-squared	0.078	0.005	0.078	0.005	0.078	0.008

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Income effect of Kumtor Mining Activity

VARIABLES	(1) income	(2) income	(3) income	(4) income	(5) income	(6) income
miner×ln_M×Kum	-0.153 (-0.74)	-0.351* (-1.88)	1.139 (1.55)	0.864*** (4.48)	0.641*** (3.93)	0.025 (0.38)
ln_M×Kum	0.210 (1.14)	0.152 (0.84)	-1.576 (-1.62)	-0.288 (-1.35)	-0.250 (-1.53)	-0.123 (-1.28)
Kumtor	-2.935 (-1.17)	-2.164 (-0.93)	20.684 (1.60)	1.870 (1.36)	1.457 (1.36)	0.041 (0.18)
miner	0.390*** (5.22)	0.390*** (5.21)	0.390*** (5.22)	0.390*** (5.22)	0.390*** (5.22)	0.376*** (5.53)
year_lagged	0	1	2	2	2	2
miner×Kumtor	controlled	controlled	controlled	controlled	controlled	controlled
ln_M	controlled	controlled	controlled	controlled	controlled	controlled
ln_M	production	production	production	goldprice	revenue	IssykFund
Year FE	Y	Y	Y	Y	Y	Y
District FE	Y	Y	Y	Y	Y	Y
Observations	11,749	11,749	11,749	11,749	11,749	9,648
R-squared	0.176	0.176	0.176	0.176	0.177	0.142

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Income effect of Kumtor Mining Activity, non-mining households

VARIABLES	(1) income	(2) income	(3) income	(4) income
nonminer×ln_M×Kum	-2.631 (-1.77)	-1.060*** (-4.17)	-1.362*** (-4.71)	-0.287* (-2.21)
ln_M×Kum	1.155 (1.10)	0.807*** (4.80)	1.065*** (5.44)	0.178** (2.89)
Kumtor	-14.812 (-1.07)	-4.755*** (-4.78)	-7.048*** (-5.49)	0.247 (1.26)
nonminer	-0.141** (-2.99)	-0.141** (-2.99)	-0.141** (-2.99)	-0.124** (-2.53)
year_lagged	2	2	2	2
nonminer×Kumtor	controlled	controlled	controlled	controlled
ln_M	controlled	controlled	controlled	controlled
ln_M	production	revenue	goldprice	IssykFund
Year FE	Y	Y	Y	Y
District FE	Y	Y	Y	Y
Observations	11,749	11,749	11,749	9,648
R-squared	0.166	0.166	0.166	0.131

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Trust Effect of Kumtor Mining Activity

VARIABLES	(1) local leader	(2) local leader	(3) local leader	(4) local leader
Kumtor×miner×c.ln_M	-0.759*** (-7.46)		-0.956*** (-8.25)	
Kumtor×mfg.×c.ln_M		0.256** (2.98)		0.385*** (3.47)
miner	1.657 (0.95)		2.192 (0.97)	
mfg.		-0.568 (-0.54)		-0.761 (-0.57)
year_lagged	2	2	2	2
1.Kumtor×c.ln_M	controlled	controlled	controlled	controlled
1.sector×c.ln_M	controlled	controlled	controlled	controlled
Kumtor×1.sector	controlled	controlled	controlled	controlled
ln_M	controlled	controlled	controlled	controlled
ln_M	revenue	revenue	goldprice	goldprice
Year FE	Y	Y	Y	Y
District FE	Y	Y	Y	Y
Observations	39,164	39,164	39,164	39,164
R-squared	0.006	0.008	0.006	0.008

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8: PSM Miners vs Non-Miners "teffects psmatch"

	(1)	(2)	(3)
	ln_income	ln_income	ln_income
ATET			
r1vs0.miner	0.359*** (6.46)	0.380*** (5.42)	0.388*** (5.95)
<i>N</i>	11336	10826	11274

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: PSM Miners vs Non-Miners "psmatch2"

	(1)	(2)	(3)
	ln_income	ln_income	ln_income
._treated	0.390*** (7.16)	0.393*** (7.21)	0.353*** (6.23)
._cons	8.499*** (1072.91)	8.496*** (1068.52)	8.478*** (1041.82)
<i>N</i>	11336	11274	10826

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$