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DETERMINING THE LOSS OF MINING SECTOR TAX REVENUE: EVIDENCE FROM MONGOLIA

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ABSTRACT

In recent years, due to significant tax revenue losses, transfer pricing has become an issue of concern for tax authorities, policymakers, and academics. In this study, the authors aim to analyze transfer pricing and its impact on fiscal revenue in the case of Mongolia, a developing country with a mining-dominated economy. In our research, we used the arm's length principle to determine transfer pricing and estimate the loss of corporate income tax due to transferring pricing; moreover, we compared the operating profit margin of Mongolia's mining companies with the Far East and Central Asia Oceania countries. We found that Mongolia has lost about 44.4 billion MNT in corporate income tax revenue from the mining sector over the past seven years, estimated by adjusting the total operating revenue by an average of 10.5% for coal companies and 16.4% for copper companies. This result shows that mining companies are avoiding taxes by mispricing, which negatively affects the budget revenue in Mongolia. This research will contribute to the implementation of the common principles of transfer pricing and reduce tax evasion in Mongolia and similar countries with a mining-dominated economy.

Keywords: transfer pricing; tax evasion; loss of tax revenue; mining sector; budget revenue; arm's length principle (ALP); operating profit margin (OPM)

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INTRODUCTION

In countries that pay little or no attention to transfer pricing issues, abusive transfer pricing (Sebele-Mpofu, 2021) is more common, leading to irretrievable losses of tax revenue. Different tax rules across countries and a lack of administrative coordination between tax jurisdictions lead to capital outflows and loss of tax revenue (Marcuta, 2021). The studies of the World Bank (Cooper, 2017) and "Christian Aid" a British organization that aims to fight world poverty (Christian Aid, 2009) noted how much tax revenue is lost due to the lack of regulation or poor implementation of transfer pricing, and estimated that between 2005 and 2007 a total of £119.5 billion in tax revenue was lost from developing countries to developed countries. It is estimated that China lost £20.2 billion, Mexico £10.5 billion, India £3.6 billion, and the world's forty-nine poorest countries £1.8 billion, respectively.

By the middle of the 20th century, transfer pricing issues had been discussed among researchers and policymakers. Transfer pricing is defined as a price of a product or service that is exchanged between autonomous profit-center divisions within the firm (Hirshleifer, 1957). Patel (1981) defined it as the price paid for a good transferred between related parties located in different countries belonging to the same transnational enterprise.

During the last two decades, because of globalization, transfer pricing has become more intense and complex in global production, and multinational enterprises (MNEs) or transnational firms have been more prevalent in transfer pricing issues (Mashiri, 2021). Klassen et al. (2017) described transfer pricing as a strategic tool used by MNEs for shifting profits from one company to another or from one tax jurisdiction to another to exploit tax advantages. If transfer pricing has been motivated by tax avoidance, it often results in *base erosion and profit shifting* (BEPS), which is a misallocation of income and expenses that aims to reduce taxable income. BEPS can be defined as tax planning strategies that use loopholes and inconsistencies in tax regulations to "disappear" profits or shift profits to low-tax countries or jurisdictions with no real or little activity, resulting in less tax being paid (OECD, 2014). Mongolia became the 100th member of the "Multilateral Convention on the Use of BEPS instruments related to tax treaties" in 2022. By joining the convention, the Double Tax Agreement (DTA)-signed countries follow the same modern anti-tax avoidance rules to eliminate DTA's loopholes, and it is important to protect the domestic tax base with the opportunity to improve negotiation activities.

In the existing transfer pricing literature, researchers have been addressing both policy and theoretical aspects such as regulation and policy, strategies, and theories. Choi et al. (2018) developed a new theory of vertical collateral as an equilibrium outcome of strategic transfer pricing, while Darsani & Sukartha (2021), Gracia-Bernardo et al. (2021), and Gillman (2021) introduced and measured effective tax rate values to mitigate tax avoidance. In terms of case studies, several underdeveloped and developing countries of the Asia-Pacific, Africa, South America, and Central Asia have been discussed (Waris, 2017; Readhead, 2016). However, there is a lack of studies and research related to transfer pricing, tax evasion, and avoidance in the case of Mongolia, especially in terms of the estimation of the impact of transfer pricing on budget revenue.

In this study, the authors conducted comparative case studies by selecting Mongolia as a representative of developing countries with a mining-dominated economy and compared it with Far East Central Asian Ocean (FECAO) countries. Mongolia is a small, open economy that is dependent on natural resources, and it is highly vulnerable to commodity price fluctuations and external factors. The mining sector accounts for the largest share of Mongolia's budget revenue, and it accounted for 16% of tax revenue in 2016 and 48% by 2022, which means about 35% of tax revenue was collected from the mining sector over the past seven years (Ministry of Finance of Mongolia, 2022). More than 80% of Mongolia's total exports are made up of mining and mineral products. We chose FECAO countries to compare the results of our analysis because 86.3% of total exports are made to Asian countries, with 13.3% going to European countries and the remaining 0.4% to Australia, the United States, and African countries (Authority of Mongolian Customs, 2022).

This study has the following objectives: 1) to analyze the taxation and transfer pricing of the mining sector for tax purposes and to determine the loss of corporate income tax (CIT); 2) to

determine indicators such as the operating profit margin (OPM) and median of the mining sector in Mongolia; 3) to determine the amount of the loss of CIT using the transfer pricing adjustments of OPM median with loss-making companies for four or more years; 4) to determine the influencing factors on the tax revenue mining sector. Achievement of these objectives is important in creating opportunities to reduce tax avoidance and tax-motivated transfer pricing by domestic and MNEs, increasing budget revenues, disclosing the shadow economy, and implementing the common principles of transfer pricing in Mongolia. In this study, we chose the companies that have been operating at a loss for four years or more based on the assumption that longer periods of operating loss may relate to transfer pricing issues (Della Rovere, 2019; Romancov, 2020).

As a result of the analysis of the amount of tax income loss through CIT due to transfer pricing and tax evasion issues of copper and coal companies in Mongolia, it was found that during the last seven years, Mongolia has lost about 43.4 billion MNT in CIT revenue, which is 10% of the 433.7 billion MNT of the CIT taxable income of coal companies, and 761.6 million MNT CIT revenue of the 7.6 billion CIT taxable income of copper companies.

The remainder of this paper is structured as follows. The literature review section presents the theoretical background of the transfer pricing concept and reviews the related literature; the Methodology section describes the methodologies used in this study; the Results and Discussion follows; and, finally, is the Conclusion and Recommendation section.

LITERATURE REVIEW

In the existing transfer pricing literature, researchers have discussed both policy and theoretical aspects such as regulation and policy, strategies, and theories (Sebele-Mpofu, 2021; Oats, 2019; Asongu, 2016; Rogers, 2021; Waris, 2017). Within the literature, transfer pricing issues are mostly discussed related to MNEs, as MNEs seek to maximize their profits by minimizing their tax obligations as much as possible (Walton, 2019). Since MNEs set transaction prices between affiliated companies, they manipulate these prices to reduce profits in high-tax countries and vice versa to increase profits in low-tax countries. Klassen & Kenneth (2017) described transfer pricing as a tool used by multinational enterprises for profit shifting between related parties or from one tax jurisdiction to another to benefit from tax advantages. Researchers, however, have stated that they cannot clearly estimate the level of MNE transfer pricing manipulation but use several strategies as tools for determining profit shifting or tax reduction. Sebele-Mpofu et al. (2021) explored MNEs' strategies to reduce tax burdens in developing countries using the case of Zimbabwe. The results of that study found that the most compelling key role in transfer pricing strategies is the setting of high management or service fees. Waris (2017) analyzed transfer pricing laws, regulations, and policies in Kenya, stating that Kenya introduced transfer pricing laws, regulations, and policies to audit transfer pricing transactions as effectively. The study provided examples of developing countries' transfer pricing issues arising in the mining sector. It also examines transfer pricing practices and challenges in implementing transfer pricing rules in developing and middle-income countries. Bird et al. (2018) pointed out that tax avoidance and profit-shifting issues can be better understood and mitigated by defining them as a sustainability problem, providing a broader and more comprehensive understanding of the organization and social implications of tax avoidance behavior.

The study suggested that the integration of sustainability principles with corporate taxation and social responsibility can support the achievement of the goals of reducing tax avoidance and its occurrence. Rogers et al. (2021) conducted qualitative research and focused on the views of senior transfer pricing professionals relating to the UK and the US. In a longitudinal study, the researchers found that the Arm's Length Principle (ALP) was more commonly used among senior transfer pricing professionals. The ALP is used to determine transfer pricing by the price of the same transaction assumed by unrelated third parties (Challoumis, 2019). Mukunoki & Okoshi (2021) discussed the rules of origin related to transfer pricing to avoid a high corporate tax by MNEs. Rules of origin under FTAs require exporters to identify the origin of their exports to receive preferential tariff rates. The authors argued that the value-added criteria of the rules of origin limit the transfer prices of MNEs.

In addition to academic works on policy and regulation, several theoretical and quantitative

studies have been conducted. Choi et al. (2018) developed a new theory of vertical collateral as an equilibrium outcome of strategic transfer pricing, analyzing the tax incentives for MNEs to manipulate internal transfer pricing by exploiting corporate tax differences between countries. Several researchers, Darsani (2021), Garcia-Bernardo (2021), and Gillman (2021) introduced and measured the effective tax rate value to mitigate tax avoidance, while Odintsov (2020) determined the impact of taxes on economic development in the case of Ukrainian agricultural enterprises using the Cobb-Douglas production function.

In this study, we aim to determine the loss of CIT and the factors influencing the tax revenue of the mining sector in Mongolia. This research, which estimates the amount of the loss of CIT and determines the factors influencing tax revenue in the mining sector, is being conducted for the first time in Mongolia. The results of this research will contribute to making recommendations to budget and tax policymakers and decision-makers to elaborate policy documents aimed at combating tax evasion and collecting taxes as fully as possible, thereby increasing budget formation and having policy implications. Thus, this research will indirectly contribute to reducing tax evasion and tax-motivated transfer pricing by domestic firms and MNEs, increasing budget revenues, uncovering the shadow economy, and further creating opportunities to implement the minimum standards of international taxation in Mongolia.

DATA AND METHODOLOGY

Mongolian enterprises just started to report only the amount of transactions between related parties in 2015. Therefore, in this study, we used data from transfer pricing documentation and tax returns for 2016-2022. We collected data from the financial and tax reports of 10,462 companies operating in Mongolia's mining industry from 2016 to 2022 (excluding companies with exploitation licenses and exploration licenses) as well as the annual and monthly mineral resource statistics of Mongolia. (Mongolian Tax Office, 2023). From these datasets, we conducted our analysis using the seven years of financial and tax reports of a total of 1478 companies (by duplicated number) in the coal sector and 158 (by duplicated number) companies in the copper sector. Moreover, we collected data from other sources such as annual mineral resources statistics, foreign trade statistics, as well as FECAO countries' companies' data, which is extracted from the ORBIS database, which contains data of more than six million large and medium-sized companies operating worldwide.

In our research, we used the arm's length principle (ALT), which is a common principle of determining transfer pricing, as the main methodology. Five different methods of the ALP compare the profit level of a related company with the profit level of unrelated companies operating in the same industry and the same type of activity and monitor whether the tax base has been reduced or not. These methods are the *Comparable uncontrolled price method, Resale price method, Cost plus method, Profit split method,* and *Transactional net margin method.* We used the Cost Plus method (Marcuta, 2021) in this study and conducted the following analyses and estimations: 1) classified the unrelated mining companies by type of products and determined the average OPM for copper and coal of the product; 2) from the mining industry, we selected the coal and copper sectors and then divided the average OMP of these sectors and determined the median(Q_2); 3) the companies then were classified into three segments based on their operating revenue or turnover - Large (over 20 billion MNT), Medium (from 6 billion MNT to 20 billion MNT), and Small (below 6 billion MNT). The loss of CIT revenue was calculated by making the transfer pricing adjustments by the OPM median or Q_2 on the companies that have operated with a loss for four or more years, and 4) determining the influencing factors on the total tax revenue of the mining industry of Mongolia using multi-factor regression analysis using the Cobb-Douglas production function.

We determined the influencing factors on the total tax revenue of the mining industry of Mongolia based on six variables such as the number of mining sector taxpayers, mining sector sales revenue, US exchange rate, copper concentrate exports, the average price of copper on the world market in US$/ton, coal production exports and the average price of raw coal (coking) on the world market in US$/ton. The relationship was found as non-linear by analyzing the distribution of variables. Therefore,

the function was written as a Cobb-Douglas function, converted to a linear equation by logarithmization, and the shape of the function was determined by regression.

Additionally, we conducted a comparative analysis between Mongolia and FECAO countries in the first three analyses.

RESULTS AND DISCUSSION

The analysis of coal companies

We can see from Table 1 that two-thirds of the Mongolian coal companies, or about 68%, have operated with a loss every year. For the last seven years, the average OPM of Mongolian coal companies has been between 10.8% and 21.0%. Among them, we selected the profitable companies and determined the average OPM.

Table 1: The average OPM of Mongolian coal companies

	2016	2017	2018	2019	2020	2021	2022
Total number of companies	158	173	200	220	206	236	285
Operated profitably	39	59	63	72	62	78	106
Operated at a loss	119	114	137	148	144	158	179
Average OPM	**13.9%**	**14.2%**	**10.8%**	**11.2%**	**20.9%**	**19.8%**	**21.0%**

Source: Authors' findings are based on data from the mining company's 2016-2022 financial statement reports and tax filings.

Based on the average OPM of the coal mining sector, the OPM range is determined the results are shown in Table 2. From the results, we can see that the OPM range of Mongolian coal companies significantly fluctuated between 2019 and 2020. This fluctuation may have depended on the difficulties related to foreign trade, customs, transportation and logistics, exchange rates, and demand and supply of mineral products in the global market during COVID-19. Also, the range of OPM median or Q_2 of coal companies is between 5.46% and 14.76% (Table 2).

Table 2: OPM range of Mongolian coal companies

Quartile	2016	2017	2018	2019	2020	2021	2022
Min	0.1%	0.1%	0.0%	0.2%	0.0%	0.1%	0.1%
Max	45.7%	57.1%	47.8%	50.3%	89.5%	76.9%	85.0%
Q_1	1.5%	2.5%	1.2%	1.8%	2.9%	2.0%	2.3%
Q_2	**7.6%**	**8.4%**	**5.5%**	**6.0%**	**14.8%**	**10.6%**	**14.4%**
Q_3	23.8%	21.7%	13.8%	17.6%	30.5%	34.4%	32.6%

Source: Authors' findings are based on data from the mining company's 2016-2022 financial statement reports and tax filings.

Therefore, we selected coal companies with sales revenue but have incurred losses for more than four years and analyzed their CIT avoidance through transfer pricing based on their financial statements and tax returns. (Table 3).

Table 3 shows that in the last seven years, the loss (opportunity cost of taxation) of CIT revenue from coal companies was about 43.4 billion MNT, which is 10% of the 433.7 billion MNT of the CIT taxable income in Mongolia. This adjusted taxable income has been estimated by adjusting the total operating revenue by an average of 10.5% for the years 2016-2022 for coal companies.

Table 3: The opportunity cost of CIT revenue from Mongolian coal companies

	2016	2017	2018	2019	2020	2021	2022	Total	CIT
OPM, median (Q_2)	7.6%	8.4%	5.5%	6.0%	14.8%	10.6%	14.4%		
Adjusted taxable income (bln. MNT)	18.6	51.1	40.8	58.2	112.5	58.3	94.2	**433.7**	**43.4**
Total operating revenue (bln. MNT)	245.0	609.0	747.5	971.7	762.0	548.1	655.9	4,539.4	453.9

Source: Authors' findings are based on data from the mining company's 2016-2022 financial statement reports and tax filings.

We classified the mining companies into three segments based on the amount of operating revenue or turnovers - Large, Medium, and Small - and then calculated the unit cost of coal per ton by operating cost and gross expenses for each large, medium, and small company.

The cost of coal per ton varies depending on the size of the coal company. For example, the cost of a small profitable company is 2-3 times higher than that of a large company. It is interesting, however, that the cost of coal per ton of loss-making companies is 1.4-1.6 times higher than that of profitable companies. Loss-making companies may avoid income tax by reducing income and increasing expenses (Sebele-Mpofu, 2021), and as a result, we selected and analyzed the companies that have incurred losses for four or more years.

Table 4 shows the results from the comparative analysis of data from the coal companies of Mongolia and FECAO countries. FECAO countries' data is extracted from the ORBIS database, commercially offered by Bureau van Dijk (BvD).

Table 4: The average OPM of coal companies of FECAO countries

	2016	2017	2018	2019	2020	2021	2022
Number of the companies with operating revenue	140	144	139	141	142	142	137
Of which:							
Number of profitable companies	109	120	113	118	112	114	122
Number of companies at a loss	31	24	26	23	30	28	15
Number of companies have not reported operating revenue	14	10	15	13	12	6	17
Total number of companies	154	154	154	154	154	148	154
Average OPM	**9.48%**	**13.26%**	**12.98%**	**13.78%**	**13.07%**	**14.27%**	**19.07%**

Source: Author's calculation based on ORBIS data.

From Table 4 we can see that on average, 71-80% of coal companies operating in FECAO countries are profitable. However, in Mongolia, only about 30% of companies operate profitably. It can be observed that the coal companies of both Mongolia and FECAO countries have similar levels of average OPM. Table 4 shows the average OPM of FECAO countries is about 9.5%-19.1%, while that of Mongolia is 10.8%-21.0% (Table 1).

The OPM range of coal companies in FECAO countries is relatively stable, between 3.9% and 6.6% in 2016-2022. For Mongolian coal companies, though, the OPM median, or the range in Q_2, was between 5.46-14.76% for the period, and it has increased approximately three times in recent years.

Table 5: The OPM range of coal companies of FECAO countries

Quartile	2016	2017	2018	2019	2020	2021	2022
Min	0.2%	0.0%	0.1%	0.0%	0.1%	0.1%	0.1%
Max	98.5%	194.2%	186.5%	188.9%	140.5%	228.1%	411.6%
Q_1	1.4%	1.9%	2.1%	2.0%	1.5%	2.4%	2.6%
Q_2	**4.4%**	**5.5%**	**5.0%**	**5.4%**	**3.9%**	**4.4%**	**6.6%**
Q_3	9.0%	15.8%	10.6%	15.4%	14.3%	12.5%	17.8%

Source: Authors' findings based on ORBIS data.

On average, about 80% of the coal companies in the FECAO countries belong to the category of "large companies" according to the Mongolian classification, so the operations of the coal companies in the FECAO countries can be considered relatively stable and normal compared to the coal companies that operate in Mongolia.

The analysis of copper companies

By the end of 2022, there were twenty-five mining license-holding companies in the copper sector in Mongolia, but only three to four of them have been operating with profits. These companies are more stable, and some of them have been operating in copper mining for more than ten years, including a large state-owned company that has been in operation for more than forty years. On the other hand, large companies such as foreign-invested MNEs, including “Oyu Tolgoi” LLC (33.4% of which is owned by the Mongolian government and 66.4% by the Rio Tinto group) and 100% state-owned Erdenet, are also operating in this sector. “Oyu Tolgoi” LLC is the biggest copper-gold mine MNE in Mongolia, holding one of the largest high-grade copper deposits in the world.

Table 6: Average OPM of Mongolian copper companies

	2016	2017	2018	2019	2020	2021	2022
Total number of companies	21	24	26	25	19	18	25
Of which: Operated profitably	2	6	3	3	3	4	5
Operated at a loss	19	18	23	22	16	14	20
Percentage of companies that operated at a loss	90%	75%	88%	88%	84%	78%	80%
Average OPM	**20.1%**	**18.6%**	**18.4%**	**42.5%**	**22.1%**	**31.5%**	**16.7%**

Source: Authors’ findings are based on data from the mining company's 2016-2022 financial statement reports and tax filings.

The average OPM of copper companies ranges from 16.7% to 42.5% between 2019 and 2022, which is higher than the coal sector (Table 6). The economy of Mongolia, i.e. budget revenue, is directly dependent on the price and export volume of copper and coal, the main mineral products. On the other hand, the operations and financial performance of copper companies are directly dependent on the global market price of the product.

Table 7: OPM range of Mongolian copper companies

Quartile	2016	2017	2018	2019	2020	2021	2022
Min	5.4%	8.1%	8.5%	22.3%	13.0%	13.4%	0.5%
Max	34.8%	26.9%	29.6%	81.3%	33.9%	40.6%	35.4%
Q_1	-	11.9%	-	-	-	-	4.0%
Q_2	**-**	**21.0%**	**16.9%**	**23.7%**	**19.3%**	**36.0%**	**11.8%**
Q_3	-	24.5%	-	-	-	-	31.9%

Source: Authors' findings are based on data from the mining company's 2016-2022 financial statement reports and tax filings.

In 2016-2022, the OPM range (Q_2) of copper companies was between 12-36% (Table 7). The number of companies influences the profitability and OPM of the sector (there are a few) operating in the sector, the difference in their operational period and performance, company size (annual turnover), and the stability of their operations. Since more than 80% of the copper companies of Mongolia incurred losses, we analyzed their loss and estimated tax evasion through transfer pricing for tax purposes (Table 10).

Table 8: The amount of opportunity cost of CIT revenue of Mongolian copper companies

	2016	2017	2018	2019	2020	2021	2022	Total revenue	CIT
OPM, median (Q_2)	0	21%	16.90%	23.70%	19.30%	36%	11.80%		
Total operating revenue (mln. MNT)	7,893.2	17,011.7	14,679.0	5,174.0	7.7	540.8	1,187.7	46,494.1	4,649.4
Adjusted taxable income (mln. MNT)	-	3,572.5	2,480.7	1,226.2	1.5	194.7	140.1	7,615.8	761.6

Source: Authors' findings based on the data from the mining company's 2016-2022 financial statement reports and tax filings

This adjusted taxable income has been estimated by adjusting total operating revenue by an average of 16.4% for the years 2016-2022 for copper companies.

According to Table 8, the related parties have been reducing their tax base, shifting their profits (base erosion and profit shifting), reducing their income, and increasing their expenses. Therefore, when we analyzed the losses of companies that had too-low OPM compared to the average of the industry and had losses for more than four years, the result shows that between 2016-2022, Mongolia lost about 761.6 million MNT CIT revenue out of the 7.6 billion CIT taxable income of copper companies. (Oyu Tolgoi LLC is not included in this calculation.)

When we estimated the cost of copper concentrate by each segment, its cost per ton for large loss-making companies was twice as high as the profitable companies. The higher cost of copper concentrate is due to tax avoidance by reducing income and increasing expenses, but on the other hand, it also depends on the operational period or the age of the company. It is challenging to analyze the cost and expenses of the products produced by the company because the financial reporting of legal entities operating not only in the mining sector but also in all sectors is very poor, and cost accounting is not maintained in Mongolia.

Table 9: Copper companies' average OPM of FECAO countries

	2016	2017	2018	2019	2020	2021	2022
Number of the companies with operating revenue	163	182	198	191	257	124	67
Of which:							
Number of profitable companies	108	139	156	135	124	101	66
The number of companies at a loss	55	43	42	56	133	23	1
Number of companies have not reported operating revenue	3	4	8	6	8	7	5
Number of companies marked with N/A	694	674	654	663	595	729	788
Total number of companies	860	860	860	860	860	860	860
Average OPM	**15.2%**	**15.5%**	**17.1%**	**14.7%**	**17.9%**	**18.6%**	**34.3%**

Source: Authors' findings based on ORBIS data

We selected 860 actively operating and profitable copper companies located in the Far East and Central Asia, Oceania region in 2016-2022 from the Orbis database. The reason there are many companies marked with N/A in Table 9 is that most companies did not fully report operating income due to the limited privileges of data access for private companies.

The average OPM of copper companies in FECAO countries is around 15%, which is more stable compared to Mongolia (Table 9). When we extracted data from the ORBIS database, 78% of companies' information was marked as N/A or unavailable and showed that only 15% of all companies operated profitably.

Table 10: OPM range of copper companies of FECAO countries

Quartile	2016	2017	2018	2019	2020	2021	2022
min	0.1%	0.2%	0.2%	0.2%	0.1%	0.4%	0.1%
max	100.0%	104.3%	105.1%	101.5%	106.6%	110.1%	100.0%
Q_1	3.2%	7.3%	3.8%	3.6%	2.5%	3.7%	11.6%
Q_2	**7.7%**	**21.2%**	**7.8%**	**7.0%**	**7.5%**	**7.4%**	**23.2%**
Q_3	16.8%	21.2%	22.1%	19.6%	25.1%	29.6%	49.4%

Source: Authors' findings based on ORBIS data.

Except for 2017 and 2022, the Q_2 indicator of copper companies in the FECAO region is relatively stable, averaging around 7%. In Mongolia, this indicator is 12-36%, which is higher than the average of the EFCAO region and has high fluctuation.

When we classify the companies of the FECAO countries based on their annual turnover by our classification, on average, more than 40% of profitable companies belong to the small and medium segments. This shows that in addition to MNEs and state-owned companies, small and medium-sized private companies are also heavily involved in the copper industry.

Analysis of the influencing factors on the mining tax revenue

We mentioned earlier that the mining sector plays an important role in tax revenue in Mongolia, and mining companies pay CIT, VAT, Royalty, PIT, and other taxes. As of 2022, the mining companies have paid 1.0 trillion MNT of CIT, 2.7 trillion MNT of Royalty, 167 billion MNT of VAT, 186 billion MNT of PIT, and 296 billion MNT in other taxes, a total of 6.9 trillion MNT,

which accounted for 45% of state total tax revenue (Statistic of Mongolian Tax, 2023).

Table 11: Summary statistics of impact factors on the mining sector tax revenue

	2016	2017	2018	2019	2020	2021	2022
Y	792,671	1,681,880	2,223,122	4,063,895	3,548,401	5,465,490	6,932,610
x_1	1536	1604	1715	1846	1622	1747	2008
x_2	9,409,590	13,342,802	16,711,948	19,270,625	18,204,999	21,895,985	27,936,362
x_3	2148	2441	2473	2664	2814	2849	3145
x_4	1562	1447	1437	1404	1395	1283	1453
x_5	4851	6179	6508	6003	6169	9354	8915
x_6	25,811	33,400	36,265	36,604	28,677	16,138	31,814
x_7	121	143	139	138	119	324	200

Source: Mining Division, MRPAM (Mineral Resources and Petroleum Authority of Mongolia) and http://iltod.mof.gov.mn

In our study, we analyzed the impact of factors influencing the total tax revenue paid by Mongolian mining companies. Total tax revenue of the mining sector was taken as a dependent variable (Y), and the number of mining sector taxpayers (x_1), mining sector sales revenue (turnover) (million MNT) (x_2), US exchange rate (x_3), copper concentrate export (thousand tons) (x_4), average price of copper on the world market in US$/tons ($x_5$), coal production export (x_6), and the average price of raw coal (coking) on the world market in US$/tons ($x_7$) were taken as independent variables. Multi-factor regression analysis and Cobb-Douglas production function were used to conduct this analysis.

Through our comprehensive analysis, we have identified a nonlinear relationship between the variables x_i and Y, as detailed in Annex-1. Our hypothesis that the production function follows the Cobb-Douglas type has been confirmed.

Thus,

$$Y = A_0 x_1^{\alpha_1} x_2^{\alpha_2} x_3^{\alpha_3} x_4^{\alpha_4} x_5^{\alpha_5} x_6^{\alpha_6} x_7^{\alpha_7} \quad (1)$$

To facilitate further investigation, we applied a logarithmic transformation to both sides of Equation (1), leading to the following linear form:

$$lnY = \ln(A_0) + \alpha_1 \cdot lnx_1 + \alpha_2 \cdot lnx_2 + \alpha_3 \cdot lnx_3 + \alpha_4 \cdot lnx_1 + \alpha_5 \cdot lnx_5 + \alpha_6 \cdot lnx_6 + \alpha_7 \cdot lnx_7$$

Through the application of regression analysis to this transformed equation, we derived significant results for the investigation. Our analysis has revealed that the dependent variable Y can be represented as a function of the independent variables x_1, x_2, x_3, x_4, x_5, x_6, and x_7 as expressed by Equation (2):

$$Y = x_1^{19.31} x_2^{4.60} x_3^{2.45} x_4^{1.51} x_5^{0.13} x_6^{1.29} x_7^{3.39} \quad (2)$$

In Equation (2), the coefficients α_1 = 19.31, α_2= 4.60, α_3= 2.45, α_4 = 1.51, α_5 = 0.13, α_6= 1.29, and α_7= 3.39 denote the respective influences of each independent variable on the dependent variable Y.

These coefficients serve as quantitative indicators of the contributions made by the independent variables of the Cobb-Douglas production function.

The derived Equation (2) enhances our understanding of the intricate relationships between the variables, providing valuable insights into the specific effects of each factor. These findings contribute to the body of scientific knowledge, expanding our understanding of the underlying production process. Additionally, they offer practical implications for decision-making and policy formulation in fields related to the phenomenon under investigation.

This result shows that factors such as the number of tax-paying enterprises, sales revenue, the volume of mining production, the average world market price, and the exchange rate of the US dollar affect the total tax revenue of the mining industry.

CONCLUSION AND RECOMMENDATION

In this study, we aimed to estimate the impact of tax evasion and transfer pricing on budget revenue in the case of Mongolian domestic companies and MNEs operating in the coal and

copper sectors. Mongolia was selected as a representative of developing countries with a mining-dominated economy. Moreover, the authors conducted comparative case studies between Mongolia and Far East Central Asian Ocean (FECAO) countries. This study fulfilled its objectives by analyzing the transfer pricing issues of the coal and copper mining sector and determining the loss of tax income. As a result, Mongolia has lost about 44.4 billion MNT in income tax revenue over the past seven years, which is an average of 10.5% and 16.4% of corporate tax income from copper and coal companies, respectively.

While conducting the analysis, the authors encountered difficulties due to Mongolian companies' poor accounting and reporting, and insufficient bookkeeping and reporting of the cost of goods sold.

The authors suggest the following recommendations. First, it is necessary to improve accounting and financial and tax reporting, not only for the mining industry but also for all enterprises in Mongolia. For example, out of 479 coal companies used in our study, 127 companies, or 27%, did not report or maintain a bookkeeping of the cost of goods sold. Second, although the legal environment for documenting transfer pricing and monitoring it is in place, the implementation is insufficient and only at the initial stage in Mongolia. And third, the fact that Mongolia's economy is based only on the mining sector and depends on the price and production volume of a few types of mineral products indicates that the budget revenue composition is dependent on one sector and therefore is risky.

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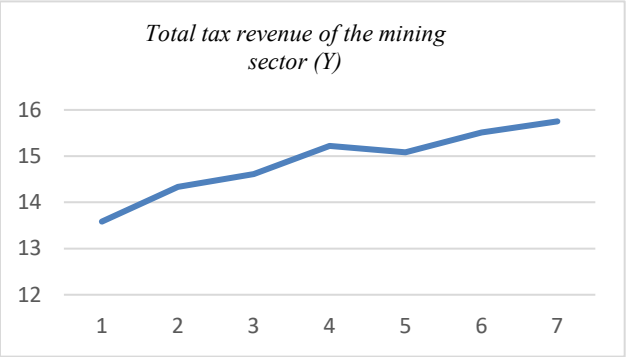
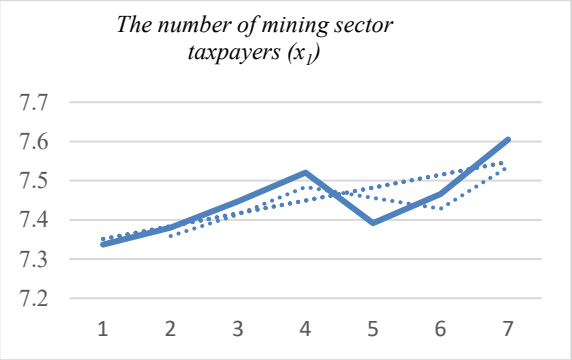
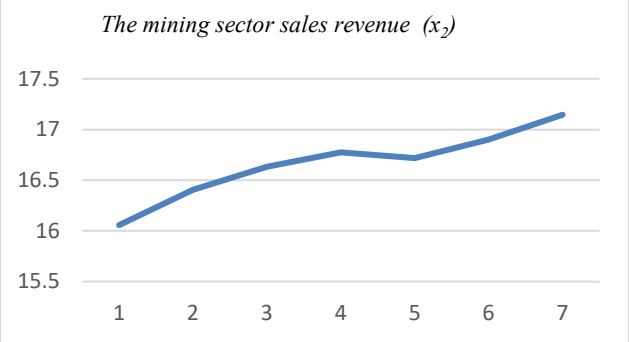
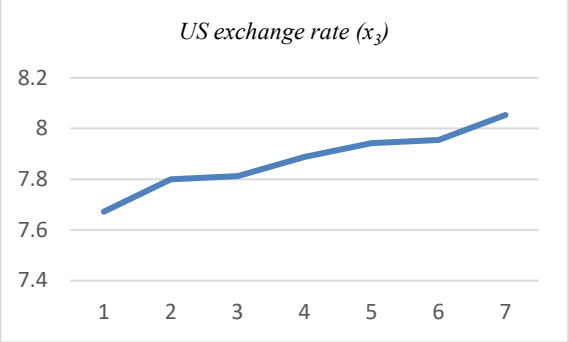
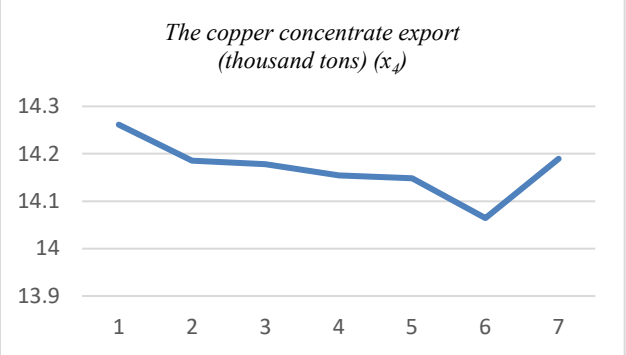
Annex-1

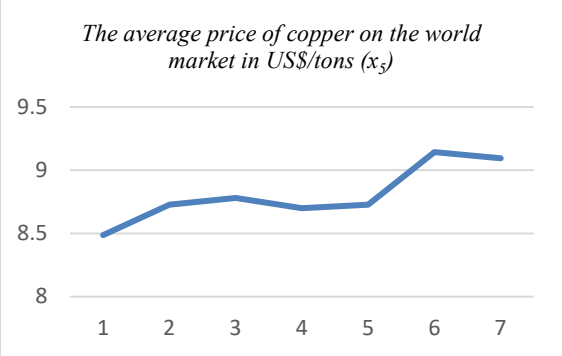


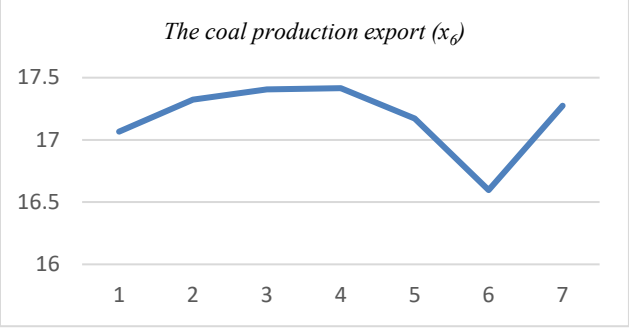


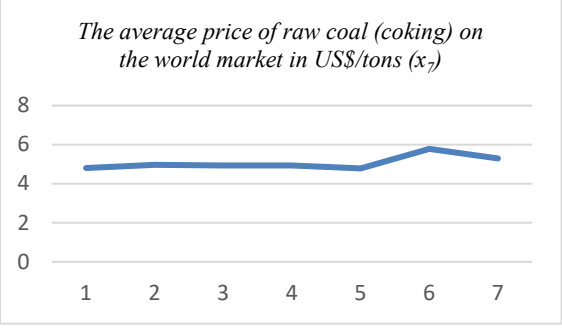












Graphs of the results of the regression analysis of the total tax revenue of the mining sector and the factors influencing it.