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## THE MINING AND QUARRYING INDUSTRY IN ARMENIA: CHANGES IN FISCAL REGIME AND EXPECTED IMPACT ON TAX REVENUES IN THE SHORT RUN

### Introduction

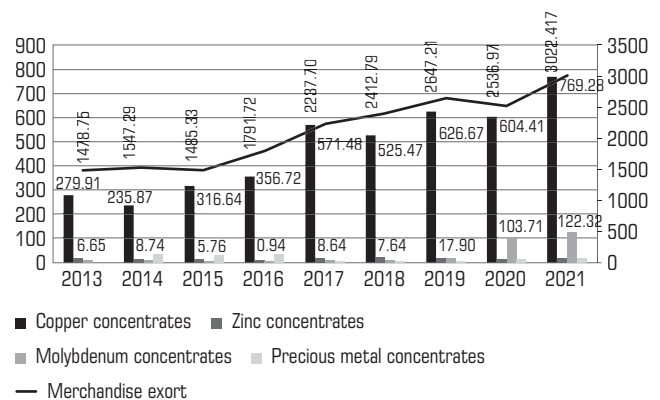
The entirely export-oriented mining and quarrying industry (Fig. 1) once was considered an industry with “much capacity” to boost the growth in Armenia [1, p. 15], causing a 4.418 p.p. increase (on average) if the share of the mining and quarrying industry-to-GDP ratio increases by 1 p.p. (based on marz-level panel data estimation technique covering the period 2004–2010). However, the industry is currently facing setbacks, with some of them hard and/or virtually impossible to address. S. V. Dokholyan and A. R. Makaryan [2] by estimating the role of metallic ores and concentrates in ensuring economic growth in Armenia, using quarterly data (2013:q1–2021:q3) find that the increase in the real exports of copper and molybdenum concentrates could have a negative impact on the real GDP (pp. 71–72). Among the factors affecting the industry’s real output growth were the “inability to extract and/or export”, strategies to increase supplies to fight price decline and to report the opposite when the prices hike [2], thus making the industry vulnerable to external shocks mainly due to the performance of the largest taxpayer of Armenia (in 2021) [3], Zangezur Copper Molybdenum Combine (ZCMC) [4].

In September 2018, Teghout (the second largest deposit of copper and molybdenum) was transferred to the VTB Bank by Vallex Group, since the Group failed to service the loan, and it resumed its operations only in 2019, and, in March 2022, the mine was again forced to suspend its operations, owing to either the renovation or the Western sanctions against VTB Bank, or the combination of thereof [2]. As of August 20, 2022, the company didn’t resume its operations. The ZCMC was forced to suspend its operations in 2021 resulting, in the inability to export and resumed its regular operations with the change of company ownership on September 30, when the Industrial Company, a subsidiary of GeoProMining (the owner of the Agarak Copper Molybdenum Combine (ACMC) as well) purchased the majority of its shares. By acquiring 60% of the ZCMC, the Industrial Company granted some of its shares to the Government of Armenia, thus making the Government the owner of 15% of the equity. This could also mean that the operations of the ZCMC would become more transparent, hence preventing the ZCMC from selling the metallic concentrates via an intermediary and charging lower prices [2], which caused a huge decline in real taxes paid by the mine in the period 2016–2017 (Table 1).

The government of Armenia introduced two major legislative changes in the period 2021–2022: state duties on exports then replacing thereof with a new royalty assessment method to levy additional taxes (including payments) and increase taxes paid by the mines-to-government tax revenue ratio. Therefore, we estimated the impact of real exports (as the only and/or major source of revenue) of copper and other metallic concentrates on the real taxes paid by the largest Armenian taxpayers in the short-run using quarterly data (2013q1–2021q2) and Least Squares (NLS and ARMA) estimation method, to determine how changes in mining fiscal regime had already affected and would affect the taxes to be paid by the mines from 2023 onward, and new investors’ attraction process. We find that an increase in the real exports of metallic concentrates lagged 1 period could cause a decline in the real taxes paid by major metallic concentrates’ exporters. We conclude that the proposed changes had already and would negatively affect companies, thus leading to much higher royalty-to-taxes paid by a company ratio exceeding 70% (on average) if prices hike, and this, in its turn, could negatively affect the decision of investors to invest in Armenia.

**Keywords:** mining, metallic concentrates, exports, copper, royalty, export duty, Armenia

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**Fig. 1. Armenia’s Metallic Concentrates and Merchandise Exports (million USD) [21]**

Hence, one of the priorities of the Government in ensuring higher tax revenues generated by mines-exporters is to make respective changes in mining fiscal legislation to increase the mining tax revenue-to-government tax revenue ratio and remove all barriers that could prevent companies from exporting. Overall, the increase in exports didn’t translate into much higher real tax revenues paid by mines (see Fig. 1, Table 1).

The Government of Armenia imposed state duties on exports of copper and molybdenum concentrates, ferromolybdenum, to be paid when

Table 1. Real Taxes paid by the Armenian Mining Companies (billion AMD)

Period	ZCMC Exporter of copper and molybdenum concentrates, ferromolybdenum	Teghout Exporter of copper and molybdenum concentrates	Chaarat Kapan Exporter of copper and zinc concentrates, gold concentrates containing precious metals	ACMC Exporter of copper and molybdenum concentrates	Akhtala Mining and Processing Enterprise Exporter of copper concentrates	Meghradzor Gold Exporter of concentrates containing gold	Total	Mining tax revenue-to- government tax revenue ratio
2013	41.9	1.8	5.9	3.9	0.5	1.0	54.9	5.0%
2014	21.4	3.5	5.6	3.4	0.9	0.5	35.3	3.1%
2015	28.5	4.8	3.5	3.0	0.8	0.2	40.9	3.7%
2016	9.6	14.0	3.4	1.5	0.3	0.3	29.1	2.6%
2017	19.4	12.0	6.7	0.7	0.6	0.5	39.9	3.3%
2018	55.1	4.7	8.3	3.3	1.1	0.3	72.7	5.7%
2019	53.6	3.4	5.7	4.1	1.0	0.4	68.3	4.7%
2020	42.5	7.0	4.7	2.6	1.0	0.4	58.1	4.3%
2021	45.0	14.1	5.9	3.4	1.1	0.8	70.3	4.8%
2020:4Q	9.6	1.8	1.0	0.7	0.3	0.1	13.4	3.7%
2021:1Q	9.3	1.5	1.1	0.6	0.2	0.1	12.8	4.0%
2021:2Q	15.9	7.7	2.8	1.1	0.2	0.5	28.1	7.2%
2021:3Q	10.4	2.3	1.2	0.8	0.2	0.1	15.1	4.3%
2021:4Q	9.5	2.7	0.8	0.9	0.3	0.1	14.4	3.6%
2022:1Q	31.5	3.4	1.6	3.2	0.5	-	40.2*	11.3%
2022:2Q	59.1	4.3	3.6	1.5	1.6	-	70.1*	15.6%

**Source:** [3, 18, 19, 24, 25]. Note: 2019=100. Since data for the first and second quarters of 2022 of Meghradzor Gold are not available, are not included in the real value. Taxes are paid by exporting the following HS Codes: 260300: Copper ores and concentrates; 260800: Zinc ores and concentrates; 261310: Molybdenum ores and concentrates; roasted; 261390: Molybdenum ores and concentrates; other than roasted; 261690: Precious metal ores and concentrates; (excluding silver); etc. Authors' calculations

exporting to third countries outside the Eurasian Economic Union under the granted license for the right to export the amounts for which the license is granted (the Changes and the amendments to the Law on State Duties adopted on July 15, 2021, by the parliament that became effective only on September 4, 2021). According to the introduced changes to the Law, the mine-exporter is required to pay 160,000 Armenian Drams (AMD) per metric ton of copper concentrates and 800,000 per metric ton of molybdenum concentrates (except the cases when the exporter sells less than 100 kg). On June 15, 2022, the parliament of Armenia by adopting the Changes and the amendments to the Law on State Duties eliminated the state duties on exports (becoming effective on January 1, 2023).

“Armenia’s fiscal regime puts heavy emphasis on the royalty, and the variable component of the combined royalty is likely to be the largest component of the royalty for many mines” [5, p. 28], with an average per company royalty-to-total taxes paid ratio ranging from 59.3% to 63.7% in the period 2020–2021 ([3, 6] Authors’ calculations). Instead of defining the combined rate of royalty (sum of fixed and variable rates to be computed based on the specified method) to be applied to determine the amounts of royalty payments, the Government introduced the new royalty assessment method via Changes and Amendments to the Tax Code adopted in June 2022 to be effective in 2023. The royalties to be paid (in AMDs) by the mines will be assessed as the following:

Royalty paid in AMDs = Royalty Base<sub>1</sub> \* Royalty Rate<sub>1</sub> (4%) + Royalty Base<sub>2</sub> \* Royalty Rate<sub>2</sub> (12.5%) + Royalty Base<sub>3</sub> \* Royalty Rate<sub>3</sub> (15%) = Sales Turnover \* 4% + EBIT \* 12.5% + (EBIT – Financial

Activity Costs – (Sales Turnover \* 4%) – (EBIT \* 12.5%) – (Sales Turnover \* 0.15) \* 15% (1)

Where: EBIT is the taxable profit before tax, which is calculated as a positive difference between Sales Turnover and all deductions allowed in the Tax Code (excluding financial activity losses, losses carried forward from previous years, and royalty; the Royalty Rate<sub>3</sub> of 15% will be applied only when the Royalty Base<sub>3</sub> is non-negative. The prices of metals quoted on the London Metal Exchange are taken into account (adjustment made) in assessing royalties.

### Aim of Investigation

To estimate the impact of real exports (as the major and/or only source of revenue) of copper and other metallic concentrates on the real taxes paid by the largest taxpayers of Armenia in the short run in order to determine how changes in the mining fiscal regime had already affected and would affect the taxes to be paid by the mines from 2023 onward, and new investors’ attraction process.

### Literature Review

The slowdown of the growth of the world economy in the late 1990s and the acceleration of the growth of thereof in the early 2000s prompted many governments in mineral exporting countries to start searching for options to maximize the contribution of the mining industry to national economies [7]. J. F. Consiglieri provides the following definition of royalty: “the charge incurred by companies for exploiting a resource that is property of the State” [8, p. 4]. Meanwhile, according to J. Otto et al. [9], the governments are inventive in considering

various revenue-capturing mechanisms as royalty; therefore, they provide a broad interpretation of the term “royalty” as the following:

“A royalty is any tax type that exhibits one or more of the following attributes:

- The law creating the tax calls that tax a royalty.
- The intent of the tax is to make a payment to the owner of the mineral as compensation for transferring to the taxpayer the ownership of that mineral or the right to sell that mineral.
- The intent of the tax is to charge the producer of the mineral for the right to mine the minerals produced.
- The tax is special to mines and is not imposed on other industries.” [9, p. 50].

Royalties are payable even though the project could be marginal or not without imposed royalty and could result in operating losses [10].

In the case of India, P. K. Jain (2008) proposed switching to ad valorem royalty and determining the values based on the prices quoted on international commodity exchanges such as the LME, while royalties need to “be calibrated as a combination of specific and ad valorem” [11, p. 125].

According to M. Genasci, ad valorem royalty rates could vary from 0% to 9% [5]. In the case of Armenia, South Africa, etc. variable rates of royalties are used that could increase in response to a rise in mineral prices or ratios of profitability [5]. Variable royalty in Armenia could reach or even exceed the given range [5]. While profit-measurement based variable royalties are rather complex to administer “Armenia’s royalty has a relatively high “floor”, which avoids the risk present in some variable royalty systems of extraction being effectively uncompensated” [5, p. 16]. M. Genasci proposed switching to upstream royalty schemes “at the first “measurable point”—rather than imposing the royalty on sales” [5, p. 17]. E. Lilford and P. Guj [12] provide several recommendations to governments concerning formulating various royalty schemes, namely, these payments need to take into account the value of non-renewable resources taken from the ground; and therefore, the rates need to be reduced if the mining company sells processed products, and remain unchanged if the mine sells ores or concentrates. Moreover, with ad valorem royalties being not so efficient they “can be improved by adopting progressive rates as a function of commodity prices” and would require more complex administration practices [12, p. 67].

By utilizing various econometric techniques and using data on 188 discovered gold mines in 24 developing nations (period: 1950–2018), M. T. Balde estimates the impact of mining fiscal regime on the time of developing a project in those countries and finds that the fiscal mining regime can boost the development of mining projects when the royalty payments are not exceeding 2% and negatively affect when the rate exceeds 5% [13]. M. Zhong et al. by taking into account the fact that copper was considered one of the mineral resources of strategic importance in China according to the National Mineral Resources Planning (2016–2020), constructed a dynamic CGE model to estimate the impact of “copper resource tax ad valorem reform on regional economies and the resource dilemma” [14, p. 304]. The authors determine that the reform negatively affects the copper mining sector of China, and propose to apply a differentiated tax rate [14]. W. Banda and E. Kabwe formulated a framework to evaluate copper mineral taxation reforms in Zambia by selecting five mineral taxation regimes for analysis (2009, 2012, 2015, Post-2015, and 2016 regimes) and conclude that the most robust regime in Zambia is the regime of 2016 [15]. Under this regime, the royalties varied from 4% to 6% for underground and open cast mining operations [15]. In 2011, Guinea introduced new mineral

royalty ranging from 2% to 3% for extracting copper, tin, nickel, zinc, titanium, and cobalt (concentrated/metal) assessed on “Gross value and Norm Value” (assessed based on prices quoted on LME per metric ton (average monthly) multiplied by the quantities sold, etc.) and previously not levied under the Mining Code of 1995 [16]. By performing a quantitative comparison of the tax rates imposed and levied by the resource-rich developing countries, Guinea, and developed nations, S. N. Moussa et al. conclude that “African countries have not performed well with regard to revenue mobilization and investment climate” [16, p. 121] and state that the new Mining Code of Guinea of 2011 somehow negatively affected foreign investments.

### Data and Research Methods

The original dataset included 37 observations spanning from the first quarter of 2013 to the first quarter of 2022. We deliberately excluded the 3<sup>rd</sup> and 4<sup>th</sup> quarters of 2021, and the 1<sup>st</sup> quarter of 2022 in our models. We primarily wanted to determine the expected changes in taxes paid by mines, which the government could have hoped for upon introducing state export duties on copper and molybdenum concentrates in July 2021 in addition to duties to be paid per ton exported. Our choice of the sample is explained by the fact that the Armenian government decided to replace state export duties with a new royalty assessment in 2022. If we had included the aforementioned quarters in our models, we could have had somehow distorted regression coefficients, since mines are required to pay export duties for a limited period and upon the elimination of thereof the selected sample would be valid to draw conclusions based on the estimated coefficients. We are primarily interested in estimating the impact of the major item that Armenia exports on tax revenues received from the largest taxpayers and accounted for about 25.5% of Armenia’s merchandise exports in 2021 (see Fig. 1), thus making Armenia’s exports earning vulnerable to volatility in copper prices.

The nominal values of all variables were converted into real ones (2019 = 100). The real quarterly values of exports of copper, molybdenum, zinc, and gold concentrates (source: UN Comtrade Database [17]) expressed in US dollars were calculated based on the methodology proposed by S. V. Dokholyan and A. R. Makaryan [2]. To calculate real exports of copper, zinc, and molybdenum concentrates, we summed up the real values of exports of the concentrates thereof (HS Codes: 260300; 260800; 261310; 261390), and in the case of exports of metallic concentrates (including gold), we additionally added exports of concentrates containing gold and/or gold concentrates (HS Code: 261690). Nominal quarterly data on taxes paid by the mines-exporters (6 companies) representing the mining and quarrying industry of Armenia (among the largest 1,000 taxpayers) were retrieved from the Tax Service of the Republic of Armenia [3] and converted into real values (expressed in drams) based on respective quarterly consumer price indices [18, 19]. We summed up the real taxes paid by the major mining companies (see Table 1), to calculate the real taxes paid by the major exporters of metallic concentrates, including gold concentrates; and excluded the data of Meghradzor Gold to compute the real taxes paid by mines exporting metallic concentrates, excluding concentrates containing gold and/or gold concentrates. The choice of these companies (see Table 1) is explained by the fact that the exports of molybdenum concentrate by ZCMC, Teghout, and ACMC amounted to 100% of total exports in 2021; only Chaarat Kapan exported 100% of zinc concentrates; Chaarat Kapan and Megradzor

**Table 2. Duties Accrued for Exporting to Third Countries paid by Mines (billion AMD)**

Period	Volumes exported, metric ton		Duties accrued (billion AMD)		Average monthly exchange rate of dram	Average price per metric ton (AMD)		Duty-to-Price per ton ratio	
	2603	2613	2603	2613	1 USD	2603	2613	2603	2613
Oct-21	24,381.1	104.1	3.90	0.08	479.25	840,372	7,370,470	19.0%	10.9%
Nov-21	32,168.5	600.5	5.15	0.48	477.66	973,739	6,762,120	16.4%	11.8%
Dec-21	40,553.2	224.3	6.49	0.18	485.14	882,240	7,368,017	18.1%	10.9%
Jan-22	19,036.1	879.7	3.05	0.70	481.99	918,552	6,910,993	17.4%	11.6%
Feb-22	24,571.6	409.2	3.93	0.33	480.24	861,543	6,700,601	18.6%	11.9%
Mar-22	28,056.3	573.7	4.49	0.46	496.96	914,872	7,304,904	17.5%	11.0%
Apr-22	34,471.3	408.3	5.52	0.33	470.99	886,759	6,747,489	18.0%	11.9%
May-22	43,737.1	756.3	7.00	0.61	456.54	794,497	7,293,766	20.1%	11.0%
Jun-22	40,805.5	1,527.9	6.53	1.22	422.69	727,710	6,312,805	22.0%	12.7%

**Source:** [18, 20, 25, 26]. Note: The authors' calculations are based on the assumption that exported quantities exceeded 100kg. Quantities exported to Russia were excluded, and respective calculations were made without Russian exports. Since data on Armenia's exports to Russia in May–June, 2022 were not available in the UN Comtrade Database as of August 20, 2022 (by destination), hence, the respective calculations are made on the available data that provide only total quantities exported, and the values thereof. However, with Russia not being classified as the major export destination, there might be only a slight difference, if the data were available, as was the case when we excluded Russia's export data to make respective calculations for previous periods, hence, our calculations can identify the major trend. Accrued means that duty could be paid during the next period

Gold exported 100% of concentrates containing gold and/or gold concentrates; about 90% of copper concentrates' exports were reported by major mines [20–22].

Then, all real values of variables to be included in regression equations were seasonally adjusted by using the moving average method, and the natural log of those variables was taken. By performing the Augmented Dickey-Fuller test on variables, we found evidence of non-stationarity; hence, we took the first difference of the variables of interest. Then we estimated the following equations by incorporating lagged variables (lagged one period by taking into account the requirements of the Armenian legislative acts) using the Least Squares (NLS and ARMA) method to determine the role of real exports of copper and other metallic concentrates in explaining the statistically significant changes in the real taxes (including royalties and duties) paid by the mines in the short-run:

$$Dlrtaxesfromconssa_t = \alpha_0 + \alpha_1 * dlrexports260300sa_{t-1} + \epsilon_t; \quad (2)$$

$$Dlrtaxesfromconssa_t = \beta_0 + \beta_1 * dlnweight260300sa_{t-1} + \upsilon_t; \quad (3)$$

$$Dlrtaxesfromconssa_t = \gamma_0 + \gamma_1 * dlrexportsmconssa_{t-1} + \tau_t; \quad (4)$$

$$Dlrtaxesfromconsinclgsa_t = \delta_0 + \delta_1 * dlrexportsmconsinclgsa_{t-1} + \eta_t. \quad (5)$$

Where:  $dlrtaxesfromconssa_t$  is the first difference of the log of the seasonally adjusted value of the real taxes (including royalties and payments, excluding export duties) paid by major taxpayers-mines exporting metallic concentrates (copper, zinc, and molybdenum) in period  $t$ ;  $dlrtaxesfromconsinclgsa_t$  is the first difference of the log of the seasonally adjusted value of the real taxes (including royalties and payments, excluding export duties) paid by major taxpayers-mines exporting metallic concentrates (copper, zinc, molybdenum, and gold) in period  $t$ ;  $dlrexports260300sa_{t-1}$  is the first difference of the log of the seasonally adjusted value of real exports of copper concentrates lagged one period;  $dlnweight260300sa_{t-1}$  is the first difference of the log of the seasonally adjusted value of net weight of exported copper concentrates lagged one period;  $dlrexportsmconssa_{t-1}$  is the first difference of the log of the seasonally adjusted value of real exports of metallic concentrates (HS codes: 260300; 260800; 261310; 261390) lagged one period;  $dlrexportsmconsinclgsa_{t-1}$  is the first difference of the log

of the seasonally adjusted value of real exports of metallic concentrates (HS codes: 260300; 260800; 261310; 261390; 261690) lagged one period;  $\alpha_0, \alpha_1, \beta_0, \beta_1, \gamma_0, \gamma_1, \delta_0, \delta_1$  are model unknown parameters;  $\epsilon_t, \upsilon_t, \tau_t, \eta_t$  are the error terms in period  $t$ .

Upon estimating the equations, all the required tests were performed. We tested for the evidence of autocorrelation and found evidence thereof, hence, we incorporated respective AR and MA order processes to deal with it. We found no evidence of heteroscedasticity, and found the evidence of normally distributed residuals as well. Specification errors weren't identified as well.

### Analysis, Results, and Discussions

With the introduction of duties on exports, Armenia managed to generate additional tax revenues (including royalties due to price hikes [23]) both in the 4<sup>th</sup> quarter of 2021, and the first half of 2022 (Table 1, 2), however, the physical volumes exported decreased in 2021 (y./y.) [2], and the exports of metallic concentrates reached 923.23 million USD in 2021, with metallic concentrates' exports-to-merchandise exports ratio surpassing 30% (see fig. 1). However, increased export concentration, especially in the period 2014–2020 (see fig. 1), didn't translate into much higher mine-exporters' taxes-to-government tax revenues ratios during the same period (see Table 1).

Moreover, the appreciation of the Armenian dram against the USD [22] put additional pressure on the exporters (see table 2), along with the decline in prices (starting from April 2022 [23]), hence, the duty-to-price per metric ton ratio reached 22.0% in June 2022 [21]; [22] (and it is expected to be much higher in the second half of 2022), while this ratio didn't exceed 19.0% from October 2021 to April 2022 (see table 2). Noteworthy to state, that increase in metallic concentrates' prices [23] resulted in higher real tax revenues generated in 2021 (compared to 2020) along with the decline in exported volumes, which is explained by the higher combined rates of royalty (due to variable rates), thus compensating the losses owing to the inability to export, since the ZCMC was forced to temporarily suspend operations, etc. [2]. Export duties and higher royalties paid (higher combined rates of royalty due to variable rates) caused the real taxes to report one of



**Table 3. Estimated Models (Method: ARMA Conditional Least Square); Adjusted Sample: 2013Q4 2021Q2)**

<i>Dependent variable: Dirtaxesfromconssa<sub>t</sub></i>	Estimation#1	Estimation#2	Estimation#3	<i>Dependent variable: Dirtaxesfromconsinclgsa<sub>t</sub></i>	Estimation#4
<i>Dlreexports260300sa<sub>t-1</sub></i>	-0.567 (-2.139)**			<i>dlreexportsmconsinclgsa<sub>t-1</sub></i>	-0.848 (-2.658)**
<i>dlnweight260300sa<sub>t-1</sub></i>		-0.567 (-2.138)**			
<i>dlreexportsmconssa<sub>t-1</sub></i>			-0.819 (-2.569)**		
<i>Constant</i>	0.049 (4.393)***	0.049 (4.393)***	0.061 (4.509)***	<i>Constant</i>	0.061 (4.591)***
<i>AR(1)</i>	-0.922 (-9.814)***	-0.922 (-9.825)***	-0.937 (-10.752)***	<i>AR(1)</i>	-0.937 (-10.776)***
<i>MA(2)</i>	-0.953 (-28.615)***	-0.953 (-28.624)***	-0.959 (-30.678)***	<i>MA(2)</i>	-0.958 (-30.665)***
<i>R-squared</i>	0.490	0.490	0.521	<i>R-squared</i>	0.527
<i>Adjusted R-squared</i>	0.433	0.433	0.468	<i>Adjusted R-squared</i>	0.474
<i>Included Observations</i>	31	31	31	<i>Included Observations</i>	31

**Note:** t statistics values in parentheses. \*\*\* denotes significant at 1 percent significance level; \*\* denotes significant at 5 percent significance level. Source: Authors' own calculations

the highest values of tax revenues in the first half of 2022 surpassing the highest value of 2018 in 2022 (see table 1). Meanwhile, taxes paid by the mines-to-government tax revenue ratio reached 15.6% in the second quarter of 2022.

Overall, the real changes in independent variables included in the four equations could explain 43.3–47.4% of variations in real taxes (including royalties, etc.) in the short run (**Table 3**). This could be explained by the fact that the ZCMC exports ferromolybdenum as well, exports of copper concentrates are not entirely covered by major taxpayers, the practices previously adopted by the ZCMC, etc.

*Copper concentrates:* An increase in the real exports of copper concentrates lagged one period (quarter) by 1% could cause a 0.567% decline in the real taxes paid by major copper concentrates' exporters in period  $t$  in the short-run, on average (see table 3, Estimation #1). The same statistically significant negative change could be expected if the net weight increases by 1% (see table 3, Estimation #2), explained by the fact that we deal with real exports (with 2019 prices taken as base year prices), and variation occurs only when the net weight changes. The negative impact on the real taxes paid by major taxpayers could be substantiated by the fact that, in general, the increase in physical volumes didn't reflect the increase in prices detailed discussed by S. V. Dokholyan and A. R. Makaryan [2]. When the government introduced export duties in July 2021, it could expect that increase in the exported net weight could cause a decline in real taxes paid by mines to be compensated by the imposed export duties, meanwhile, the decline in the net weight when the prices are rather high, the decline in export duties could be compensated by higher royalties paid (higher combined rates of royalty due to variable rates). Although the duty was considered a temporary burden for the exporters, the key factor not to make the burden on the exporters heavier was a rather stable exchange rate; however, a rather sharp appreciation of the Armenian dram against the US dollar, coupled with the decline in copper prices (severely experienced in June 2022) made the burden heavier than the government could have expected.

With a new royalty assessment method introduced in 2022 and

effective in 2023, the government, on average, could expect a decline in real taxes when the real exports increase in response to a price decline to prevent revenue losses, and much higher revenues than expected when the real exports could decline in response to price hikes (higher revenues by exporting less (in terms of physical volumes for whatever the reason could be)) due to the new method adopted and becoming effective in 2023. Transparent operations by the ZCMC could cause an increase in the exported net weights to be reported by the Company in response to price hikes, thus allowing the government to receive even higher tax revenues due to the royalty assessment method becoming effective in 2023.

*Metallic concentrates:* An increase in the real exports of metallic concentrates (copper, molybdenum, and zinc) lagged one period by 1% could cause a 0.819% decline in the real taxes paid by major metallic concentrates' exporters (excluding gold concentrates) in period  $t$  in the short-run, in general (see table 3, Estimation #3). Nearly the same statistically significant negative change of about 0.848% could be expected if the real exports of metallic concentrates (including gold) increase by 1% (see table 3, Estimation #4), majorly reflecting the changes in real exports of copper concentrates.

Our findings suggest that by replacing export duties with the new royalty assessment method, the price increase would be the key factor in determining how much the Government would generate tax revenues. Based on the previous strategies adopted by mines to fight price decline they could both report an increase in the net weight exported [2] and a decline in real taxes due to lower royalties paid, while price hikes coupled with a decline in the net weight (associated with the inability to extract and/or export) could cause higher real taxes. Meanwhile, if the mines can report higher exports (expressed in metric tons) when prices report a dramatic increase, they would pay much higher real taxes due to the new royalty assessment method adopted and becoming effective in 2023. This could lead to much higher royalty-to-taxes paid by a mine ratio exceeding 70% (on average) if prices hike from 2023 onward, thus negatively affecting the decision of investors to invest in Armenia (especially new investors).

The Government of Armenia was rather quick to replace export duties with the new royalty assessment method to generate more tax revenues, however, the adoption of the new royalty assessment method would negatively affect the decision of new investors and could possibly be considered a “deterrent to investment by increasing marginal cost” [26, p. 10]. Based on the empirical evidence E. Castillo [27] finds that, in the case of Chile, junior companies reported budget cuts for early-stage exploration, while the major companies increased their expenditures in response to changes in the mining fiscal regime (mineral royalty), which in its turn is associated with the stability agreements signed between major companies and the government of Chile, which excluded junior companies. E. Castillo [27] states that junior companies could be more sensitive to the changes in the mining fiscal regime than their major counterparts and stresses that “countries could take advantage of other instruments to generate an attractive investment climate to maintain the flow of discoveries and projects” (p. 12).

Although the investors in Armenia can be granted a 5-year period, allowing them to apply the fiscal regime at the moment of investment if the investor could wish so (Law of the Republic of Armenia on Foreign Investment, Article 7), however, the discovery and mine development period could exceed 5 years, and additional incentives would be required, enabling Armenia to compete for new investments in the mining and quarrying industry. Like in the case of Chile, the Armenian government could propose special stability agreements for the period of up to 10–15 years (depending on the projects) to be considered an attractive FDI destination for new investors, along with building favorable and attractive investment climate both for major companies and foreign investors.

Since the mining and quarrying industry in Armenia is dominated by a few major players (GeoProMining, VTB Bank, Chaarat), the companies would rather unlikely quit their operations in Armenia (although Teghout was forced to temporarily suspend operations) as a result of the expected additional tax burden associated with the introduction of the new royalty assessment method. However, under the worst-case scenario (possible imposing of western sanctions on GeoProMining) could seriously hit the industry in the short run and medium term, by taking into account the sanctions imposed on the VTB bank. Hence, the government needs to elaborate on options to respond to possible suspensions of operations by the ZCMC, and ACMC. S. V. Dokholyan and A. R. Makaryan [2] proposed 3 options with respect to Teghout (negotiations with the VTB Bank to initiate a merger and/or acquisition deal by a third party, etc.).

Therefore, the role of “inability to exploit and/or to export” will become the key factor that would determine how much additional tax revenues the Government of Armenian could generate, and how procyclical the fiscal policy of Armenia would be if the prices continue to report an upward trend for a prolonged period of time. If the mines manage to export more concentrates when prices rise drastically, Armenia would ensure higher tax revenues to be generated, thus making the Armenian economy vulnerable to external shocks (majorly to the sharp decline in commodity prices) through higher commodity export concentration. Therefore, the government needs to consider the option of having a sovereign welfare fund to smooth future losses owing to a sharp decline in commodity prices and address the volatility thereof. Based on the estimation results using the sample of 40 sub-Saharan African countries covering the period from 1995 to 2015, R. Ouedraogo and W. S. Sourouema [28] find that exports concentration could cause

an increase in the degree of fiscal policy pro-cyclicality, and the impact could be reduced if the country has a sovereign wealth fund. The authors state that their findings could support the idea of having “sovereign wealth funds in insulating the budget and economy from commodity price volatility” [28, p. 224].

### Conclusions

In general, a 1% increase in the real exports of copper concentrates lagged 1 period (quarter) could cause a 0.567% decline in the real taxes paid by major copper concentrates’ exporters in period  $t$  in the short-run. Meanwhile, a 1% increase in the real exports of metallic concentrates (copper, molybdenum, and zinc) lagged 1 period by 1% could cause a 0.819% decline in the real taxes paid by major metallic concentrates exporters. Hence, when export duties were introduced in 2021, it could be expected that an increase in the exported net weight would cause a decline in real taxes paid by mines to be compensated by the imposed export duties. Meanwhile, it could be expected that the decrease in the net weight when the prices hike could translate into higher royalties paid, thus compensating for the decline in export duties imposed per metric ton.

The appreciation of the Armenian dram against the USD that started in April 2022, put additional pressure on the exporters, along with the decline in prices, hence, the exports duty-to-price per metric ton ratio reached 22.0% in June 2022 (in the case of copper concentrates) and it is expected to increase with the price decline and further depreciation of the Armenian dram against the US dollar in the second half of 2022, thus compensating the decline in royalties paid.

When the new royalty assessment method was introduced in 2022, the price increase was the major factor affecting the taxes to be paid, since it could be expected that a price decline could cause an increase in the net weight exported (based on the strategies that the mining companies were adopting to fight price decrease [2] and a decline in real taxes due to lower royalties paid, while the price hikes coupled with the decline in the net weight (if reported) could cause higher real taxes.

Further possible sanctions to be imposed on Russian companies (namely imposing sanctions on GeoProMining) along with the current sanction imposed on VTB bank could seriously hit the industry in the short run and medium term. Hence, the government needs to consider specific steps to be in place (the possibility of merger and/or acquisition deals to be agreed upon with the owners and the prospective buyers, etc. [2] to meet future challenges ahead.

The introduction of a new royalty assessment method in June 2022 could lead to much higher royalty-to-taxes paid by a mine ratio that could exceed 70% (on average) if prices hike from 2023 onward. With this legislative initiative, the government attempted to ensure higher tax revenues when export duties would be eliminated in 2023, thus negatively affecting the decision of investors (especially new investors). With respect to attracting new FDI into the mining and quarrying industry of Armenia, the government could draft special stability agreements like Chile did [27], thus possibly allowing new investors to apply the fiscal regime at the moment of investment for about 10–15 years, along with designing specific instruments [27] to be offered and to make the investment climate of Armenia more competitive compared to other destinations for resource-seeking FDI and investors. The major players would unlikely quit the operations in Armenia in the short run and would continue investing in the medium term (if new sanctions are not imposed on GeoProMining).

Overall, the “inability to exploit and/or to export” could be the decisive factor that would determine how much additional tax revenues could be generated, especially when the prices hike and the new royalty assessment is effective, and how procyclical the fiscal policy of Armenia would be in the medium term. In order to absorb the negative impact of price volatility owing to the higher commodity export concentration, the government needs to consider the option of having a sovereign welfare fund to smooth future losses owing to a sharp decline in commodity prices.

#### References

- Grigoryan A. The impact of the mining sector on growth, inequality, and poverty: Evidence from Armenia, the AUA Acopian Center for the Environment. Yerevan, Armenia: American University of Armenia. 2013. Available at: [https://newsroom.aua.am/files/2013/04/mining\\_grigoryan.pdf](https://newsroom.aua.am/files/2013/04/mining_grigoryan.pdf) (accessed: 13.06.2023).
- Dokholyan S. V., Makaryan A. R. The role of exports of semi-manufactured gold, metallic ores and concentrates in ensuring economic growth in Armenia in the short run. *The contemporary issues of socioeconomic development in the Republic of Armenia*. 2022. Vol. 1. pp. 64–78.
- Tax Service of the Republic of Armenia (2022). The list of the first 1000 large taxpayers based on the amounts of taxes paid online quarterly databases for the period 2013–2022. Available at: <https://www.petekamutner.am/Content.aspx?itn=tsTILLists> (accessed: 10.01.2023).
- Swedish Geological AB, SLR Consultants Ltd, AVAG Solutions Ltd, AUA Centers for Responsible Mining & Turpanjian Center for Policy Analysis. Armenia: Strategic Mineral Sector Sustainability Assessment. Energy & Extractives, the World Bank. Washington, DC: World Bank. 2016. Available at: <https://openknowledge.worldbank.org/handle/10986/24756> (accessed: 13.06.2023).
- Genasci M. Analysis of Armenia's mining fiscal regime, Mining Legislation Reform Initiative, AUA Center for Responsible Mining, American University of Armenia Yerevan, Armenia: American University of Armenia. 2015. Available at: [https://mlri.org.am/media/pdfs/84\\_8278.pdf](https://mlri.org.am/media/pdfs/84_8278.pdf) (accessed: 13.06.2023).
- Tax Service of the Republic of Armenia (2022). List of taxes and duties paid for 2021 and 2022 by taxpayers-subsoil users that received permission to extract a useful metal mineral for online databases. Available at: <https://www.petekamutner.am/Content.aspx?itn=tsTILLists> (accessed: 10.01.2023).
- Tilton J. E. Determining the optimal tax on mining. *Natural Resources Forum*. 2004. Vol. 28, Iss. 2. pp. 144–149.
- Consiglieri J. F. Mining royalty as compensation not tax. Mining royalties. *Mining and Sustainable Development Series*. Uruguay, Montevideo : MPRI, IDRC, 2004. No. 2.
- Otto J., Andrews C., Cawood F., Doggett M., Guj P. et al. Mineral Royalty Instruments. In: *Mining Royalties – A Global Study of Their Impact on Investors, Government and Civil Society*. Directions in Development, Energy and Mining. Washington, DC: World Bank, 2006. Available at: <https://openknowledge.worldbank.org/handle/10986/7105> (accessed: 10.01.2023).
- Lilford E. V. Quantitative impacts of royalties on mineral projects. *Resources Policy*. 2017. Vol. 53. pp. 369–377.
- Jain P. K. Mineral Royalty in India and its Comparison with Selected Countries. *Minerals & Energy – Raw Materials Report*. 2008. Vol 23, Iss. 3. pp. 119–126.
- Lilford E., Guj P. Different Types of Mineral Royalties (eds. by Dilek Y., Pirajno F., Windley B.) *Mining Taxation. Modern Approaches in Solid Earth Sciences*. Cham, Switzerland : Springer, 2021. Vol. 18. pp. 43–69.
- Balde M. T. A brief history of time: Taxation and mineral production in developing countries. *Resources Policy*. 2020. Vol. 68. 101687.
- Zhong M., Liu Q., Zeng A., Huang J. An effects analysis of China's metal mineral resource tax reform: A heterogeneous dynamic multi-regional CGE appraisal. *Resources Policy*. 2018. Vol. 58. pp. 303–313.
- Banda W., Kabwe E. An integrated multiple criteria decision making framework for application in the evaluation of mineral taxation regimes. *Resources Policy*. 2019. Vol. 62. pp. 635–650.
- Moussa S. N., Deyi J., Lin L. Analysis of Guinean new mining fiscal regime: Considerations for improvement. *Resources Policy*. 2015. Vol. 46, Part 2. pp. 113–126.
- Trade Statistics Branch of the United Nations Statistics Division (2022). UN Comtrade Database. Available at: <https://comtrade.un.org/data/> (accessed: 10.01.2023).
- Statistical Committee of the Republic of Armenia (2022). Prices and Prices Indexes in the Republic of Armenia for the period 2014–2020. Available at: <https://www.armstat.am/> (accessed: 10.01.2023).
- Statistical Committee of the Republic of Armenia (2022). Food Security and Poverty, January - December 2021. Available at: [https://www.armstat.am/file/article/f\\_sec\\_4\\_2021\\_2.pdf](https://www.armstat.am/file/article/f_sec_4_2021_2.pdf) (accessed: 10.01.2023).
- Tax Service of the Republic of Armenia (2022). The list of items exported by taxpayers-subsoil users that received permission to extract a useful metal mineral for 2021 online database. Available at: <https://www.petekamutner.am/Content.aspx?itn=tsTILLists> (accessed: 10.01.2023).
- Statistical Committee of Armenia (2022). External trade database according to the Commodity Nomenclature at 4-digit level. Available at: <https://www.armstat.am/en/?nid=148> (accessed: 10.01.2023).
- Central Bank of Armenia (2022). Exchange rate of dram against several currencies online databases. Available at: <https://www.cba.am> (accessed: 10.01.2023).
- World Bank. Commodity Monthly Prices August 2022 Online Database (2022). Available at: <https://www.worldbank.org/en/research/commodity-markets#1> (accessed: 10.01.2023).
- Tax Service of the Republic of Armenia (2022). Information on revenues controlled by the State Revenue Committee of the Republic of Armenia for the period 2013-2022. Available at: <https://www.petekamutner.am/Content.aspx?itn=tsTITaxStatData> (accessed: 10.01.2023).
- Statistical Committee of the Republic of Armenia (2022). Consumer Price Index in the Republic of Armenia in January–June 2022. Available at: [https://www.armstat.am/file/article/cpi\\_06\\_2022-eng.pdf](https://www.armstat.am/file/article/cpi_06_2022-eng.pdf) (accessed: 10.01.2023).
- Baunsgaard T. *A primer on mineral taxation*. IMF Working Paper WP/01/139. Washington, DC : International Monetary Fund, 2001. 35 p.
- Castillo E. The impacts of profit-based royalties on early-stage mineral exploration. *Resources Policy*. 2021. Vol. 73. 102231.
- Quedraogo R., Sourouema W. S. Fiscal policy pro-cyclicality in Sub-Saharan African countries: The role of export concentration. *Economic Modelling*. 2018. Vol. 74. pp. 219–229. 