

## Economic situation of hard coal mining industry in Upper Silesian Coal Basin.

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**Abstract:** Article aims at investigating the economic situation of hard coal mines localized in Upper Silesian Coal Basin in Central Europe. It is interesting to compare financial situation of four chosen entities that do business in two neighboring countries: the Czech Republic and in Poland. Special focus was paid to legal status of mining companies, scope of their activities, profits gained, employment level, and effectiveness of coal sale. In conclusion authors state that although hard coal mining is important so as to provide uninterrupted supplies of coal for state energy sector, it shall meet a free market requirements regarding economic effectiveness. As two out of four entities encompassed in the study have been privatized and are competitive coal producers, authors suggest using their experience in order to improve unfavorable financial situation of two remaining entities. Nationality distinction of entities seems to be less important than ownership classification of hard coal mining enterprises operating in Upper Silesian Coal Basin.

**Key words:** hard coal mining industry, The Czech Republic, Poland, economic analysis, hard coal mining

### Introduction

For centuries coal production in Central Europe has been considered a strategic energy resource as the countries of the region seek to secure their energy future and independence. The largest mining fields are stationed in Upper Silesian Coal Basin (called also Moravian-Silesian Region) that is located on the boarder of two states: Poland and the Czech Republic.

Upper Silesian Coal Basin (USCB, Polish: Górnośląskie Zagłębie Węglowe; Czech: Hornoslezské uhelné pánve) is triangle shaped with concave base. It can be appointed by the city of Frenštát pod Radhoštěm in Czech, while in Poland by Myslenice and Sucha Beskidzka on the south, and Tarnowskie Góry on the north. This way USCB encompasses Cracow region together with the territory of Upper Silesia and Ostravsko-Karvinsky land in the Czech Republic [17, 22, 27].

The area of USCB is 7490 km<sup>2</sup>. Polish part amounts 5760 km<sup>2</sup>. The territory occupied by productive works is about 5 400 km<sup>2</sup>, of which 4 450 km<sup>2</sup> belongs to Poland. About 300 km<sup>2</sup> of productive area lies on the territory of the Czech Republic, which is approximately 6% of southern part of Upper Silesian Basin [1, 3, 4].

Due to geological conditions mining industry has developed in two neighboring countries. It gave rise to two metropolitan areas: Upper Silesian Industrial District with capital in Katowice (in Poland) and agglomeration around Ostrava (in the Czech Republic). Both agglomerations are important industrial areas since XIX century. Nowadays Poland and the Czech Republic are leading coal producers in the European Union with a combined yearly production of coal reaching half of Australia's coal production.

The average sufficiency of the Polish operational reserves deposited in working horizons and horizons under construction, in conditions of the output level planned by Polish coal companies is about 20 years [25]. Czechs also continuously document their coal reserves so as to ensure continuous mining also in the upcoming years. Mineable reserves of Czech as of 31 December 2013 amounted 66 241 thousand tones, while reserves in Poland amount to almost 16,9 billion tones [10].

Tab. 1. Hard coal operational reserves in Upper Silesian Coal Basin [kt].

	JSW	KHW	KW	OKD
<b>Name</b>	Jastrzębska Spółka Węglowa S.A.	Katowicki Holding Węglowy S.A.	Kompania Węglowa S.A.	OKD a.s.
<b>Country of operation</b>	The Republic of Poland	The Republic of Poland	The Republic of Poland	The Czech Republic
<b>Hard coal operational reserves [t]</b>	285 838	708 027	1 979 493	228 119
<b>Reserves by the country</b>	2 973 358			228 119

Source: [1, 6, 27, 28, 23, 25]

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Article aims at investigating the economic situation of hard coal mines localized in Moravian-Silesian Region in Central Europe. It is interesting to compare financial situation of four chosen entities that do business in the Czech Republic and in Poland. Special focus was paid to legal status of mining companies, scope of their activities, profits, employment, and effectiveness of coal sale. Literature analysis together with analysis of financial reports and official governmental documents were basis of methodology of the paper.

### Changes in coal prices

The study of the price levels for steam coal in the European Union reveals that since 1991 there has been a long term declining trend due to oversupply of coal in global markets. Furthermore, since 1999 the price change cycles have been shortened. The macroeconomic uncertainty that continued in Europe with a slowdown of major global economies have influenced financial results significantly. A lower demand for coal in the steel and energy sectors, together with increased supplies mainly from Russia, and the subsequent huge surplus of coal on the market pushed coal prices down during 2013. On a year-on-year basis, the sale price of OKD dropped by 19 %, while Polish prices decreased by 13 % [1]. It is worth mentioning that coal prices in 2013, in spite of the decrease, are higher than 10 years ago (Fig. 1).



Fig. 1. Average monthly coal rating index [USD/t].  
Source: [12]

Low prices, failing to cover production costs of coal (especially exploited from deep underground mines) influenced the decisions to reduce European coal production capacity recently. Decisions, consequently, lead to make the European countries dependent on the suppliers from other continents. According to most of the experts, the decline in coal prices will continue in the long-term perspective [28]. Due to low prices of coal, at present the price of electricity generated from coal is one of the lowest compared to electricity generated from other sources. According to experts, taking into account the global situation in the oil and natural gas markets, in medium-term prospect the price of electricity generated from coal, compared to the price of electricity generated from other sources will still be one of the lowest. Similar situation is in the case of price of heat generated from coal. Its price is lower than the price of heat produced from other sources [25]. Forecasts for short-term global coal market are divergent: Morgan Stanley, Macquaries and Citi predict an increase in prices due to a decrease in exports from China, Australia and the United States, and the increased demand for energy from China. Analyst from Bank of America, Merrill Lynch, and Fitch agency believe that prices will continue to decline due to oversupply of coal [5, 7, 12, 25, 27].

### Situation on European coal market in 2013

In the beginning of year 2013, European coal market was characterized by a small activity. Demand for coal was limited due to the increased supply of coal from Columbia and the south Africa, and high winter temperatures in many parts of Europe. The continuing oversupply of coal and small demand from buyers were another reasons for coal price decline in Europe. The inventories of unsold coal in the ports of Rotterdam and Amsterdam reached the level typical for winter months. According to forecasts, import to Germany was enormous while exploitation in three active German mines was 30 % (7,5 million tonnes) less than in 2012 although coal consumption increased by 4 % (that is by 60,7 million tonnes). High levels of coal import were also

observed in Great Britain. The main reason for the increase of supply of imported coal was a reduction of coal production in Great Britain that amounted by 4 millions tons. The decline in production was due to the closure of two deep mines, difficult geological conditions in other mines and the collapse of Scottish Coal Company. In France, high temperatures and increased usage of renewable sources of energy affected the decrease in coal consumption. Reduced imports altogether with reduced demand from the French allowed to rebuild coal inventories in power plants, which at the end of October 2013 exceeded 5 million tons. In Russia coal extraction diminished by 1 % as a result of difficulties with transportation of coal to the ports of the Baltic Sea and the Far East and lack of additional supply from other countries. In spite of decrease in exploitation of coal, export of Russian coal amounted to 142.9 million tons, which constitutes an increase of 12.6 % [5, 12].

Year 2013 in Colombia remained with tensions regarding unexplained situation of coal loading at the port of Drummond due to the strike of loading company, which resulted in a slight increase in coal prices. Supplies from Colombia to Europe decreased by 10.1 % to 52.7 million tons. The biggest recipient of Colombian coal was the Netherlands (19.4 million tons), Turkey (7.7 million tons), Chile (6.6 million tons), United Kingdom (6 million tons) and the USA (5.9 million tons). At the beginning of 2013 suppliers of coal from the South Africa showed high activity and a customers have benefited from decline in the coal prices and attractive freight rates. Strong Colombian coal competition that was observed on Asian markets (especially in China), and fall in demand for coal in India has contributed to the reduction in coal prices. Increased interest in coal from South Africa arose mainly due to the uncertainty of consumers as to the availability of coal from Colombia. Limitations in Colombian coal supply have also resulted in securing supplies form the South Africa. Export from South Africa to European countries has reached 38 % of all international sales from the South Africa [5, 6, 7, 9, 10].

Limitation of production in many Australian mines led to a shortage of coal with higher calorific value and contributed to the increase of coal prices in 2013. According to the latest forecasts, in 2014 in India the demand for coal import will increase. Greater demand for coal in the Indian power sector (with an expected decrease in domestic production) is likely to contribute to an increase in purchases of imported coal. In 2013 China imported a total of 327 million tons of all types and kinds of coal, which is 13,4 % more than in 2012 [5, 12, 18].

### Methodology of survey and analysis of data

Analysis encompassed 4 enterprises: three Polish entities and one Czech company, all exploiting hard coal in mines located in Moravian-Silesian Region. Depending on data available overall time-scope of analysis comprises the period of 2003-2013. Authors have surveyed tens of financial reports, two prospectus and more than twenty other documents regarding national strategy for hard coal mining, as well as other reports prepared by governmental agencies dated back to year 2003.

Number of mines, coal reserves, level of employment, and owners' structure of chosen companies are presented in the table 2.

Tab. 2. Main characteristics of hard coal enterprises in Upper Silesian Coal Basin..

	JSW	KHW	KW	OKD
Country of business operations	The Republic of Poland	The Republic of Poland	The Republic of Poland	The Czech Republic
Owners' structure [31.12.2013]	Publicly traded on Warsaw Stock Exchange; 55% of shares belong to the State Treasury of the Republic of Poland	The State Treasury of the Republic of Poland	The State Treasury of the Republic of Poland	The sole shareholder is New World Resources N.V. registered in Amsterdam, the Kingdom of Netherlands. New World Resources is publicly traded in Warsaw, London, and Prague.
Number of mines [31.12.2013]	5	9	23	4
Employment [2013]	106 693			12 369
Reserves of coal [Mt]	5 000			66,2
<b>Production [Mt]</b>				
2013	74,9			8,8
2012	78,1			11,2
2009	72,0			11,0
2006	94,4			13,0
2003	100,4			14,7

Source: [1, 6, 9, 12, 14,23, 24, 25]

JSW is regarded as one of the top mining companies in Poland with reserves of good quality coking coal and a well - established customer base of steel producers. JSW is also the largest coke producer in the European Union, possessing substantial coking facilities of about 3 - 4 million tons annual capacity. Two other coal producing companies remain under state ownership: KW, the European Union's largest coal mining group with a production capacity of nearly 40 million tons of coal, and KHW with a production capacity of 12 million tons of thermal coal [12].

In the Czech Republic coal is currently extracted by OKD a.s. at four deep mines: Karvin., ČSM, Darkov and Paskov with coal reserves until 2055. OKD has been privatized in 1999 and since 2005 it is a part of New World Resources, an international group. In 2012, saleable output was 11,4 million tons, with a workforce of 12 866 own employees and 16 432 contractors. In 2013 in order to prevent a market situation impact on the Company, OKD adopted a so-called savings package - a range of cost-cutting measures – worth almost CZK 2.3 billion [1, 11, 12, 26].

Employment and production capacity comparison of Czech and Polish mining enterprises shows that Polish hard coal mining industry is much bigger than Czech (Fig. 2).

Employment in OKD amounted 12 369 employees in 2013, that is 11,6% of employment in Polish hard coal mines. Figure 4 reveals that, although mining industry in both neighboring countries diminishes its employment, still the number of employees exceeds 115 thousand people. Comparing the cut down of employees and reduction in hard coal exploitation it can be observed that employment has decreased less than production since 2008. Czech OKD presents bigger fall in employee efficiency as their employment dropped by 18 % while production by 31 % in the period from 2008 to 2013. But efficiency cannot serve as an explicit criteria for economic evaluation, especially in deep underground mining where safety of employees shall be the most important element of business doing.

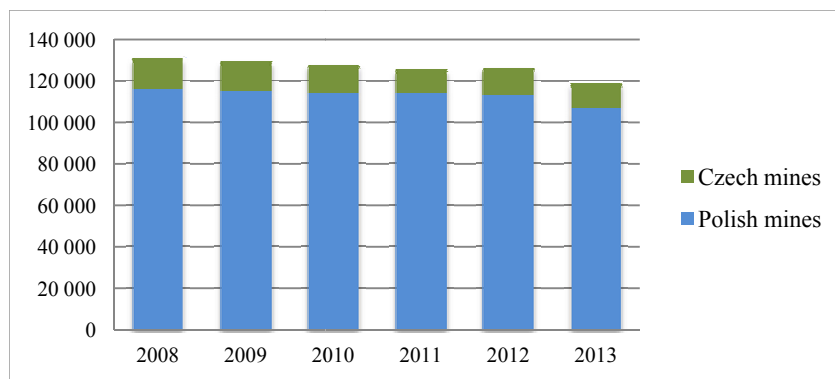


Fig. 2: Employment in hard coal mines located on the territory of Upper Silesian Coal Basin in the period from 2008 to 2013 [in persons]  
Source: [1, 12, 21, 25]

A comparison of production and sales of hard coal shows (Fig. 3) that Polish mines have increasing inventories of unsold goods. In 2003 inventories of hard coal amounted for 2,9 M tons, while at the end of 2013 they reached 6,45 M tons. Analysis of production and sale volume dated back to year 2008 reveals that Polish mines overexploited 17 M tons of hard coal.

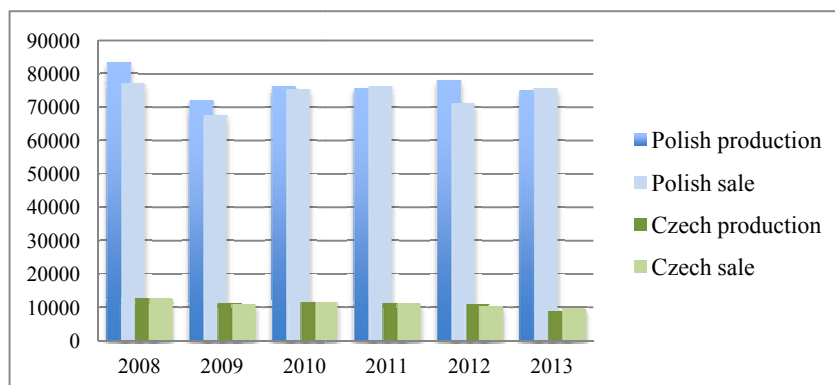


Fig. 3. A comparison of production and sales volumes [k tones].  
Source:[1, 2, 6, 12, 13, 14, 22, 28, 32]

Contrary to Polish production-sales relations, a positive trend can be observed in Czech mines, as sales exceeded production in most years. The biggest overproduction in Czech mines occurred in 2012, but most of that stock was sold out in 2013. Unsold finished goods in Polish mines decreased by 5 % in 2013 when compared to 2012. As a result, in 2013 Polish mines did not manage to sell overproduction from year 2012, while Czech sale in 2013 exceeded 2013 production consuming excess of 2012. Among Polish mines, JSW sale exceeded coal production by 0,8 M tones selling overproduction from 2012 year. In case of KW, the owner of 23 hard coal mines, selling out overexploited hard coal is not possible as coal inventories are pledged as collateral for issued bonds and other liabilities [12]. Constant overproduction of Polish mines exposes inability to adjust supply to the market demand. Combining the lack of flexibility in production volume with legal constraints arising from past agreements, the situation of Polish hard coal mining industry looks much worse than Czech.

Another interesting finding regards an average sale price of Polish and Czech companies (Fig. 4).

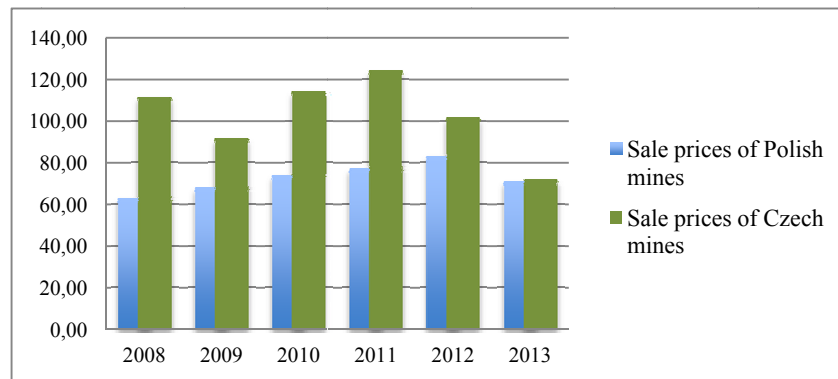


Fig. 4. A comparison of average sale prices [EUR/t].  
Source: [1, 12, 22]

Sale price of Czech hard coal was higher in every year since 2008. The biggest difference was observed in 2008 and it amounted for almost €50 per ton of hard coal. The market on which the coal is being sold might have influenced the level of average sale price. In 2013 almost 90 % of revenues of Polish mining came from domestic sale [12], while 48 % of Czech coal was delivered abroad [8]. Germany is the biggest coal importer of Polish coal as it imported 3,3 M tons in 2013. The Czech Republic is on the second place with 1,6 M tons imported from Poland in 2013, although a decreasing trend can be observed. Czech hard coal is being delivered to international group Dalkia, Verbund AG and SW Munchen in Germany.

In European Union, as well as in both neighboring countries, the market is pushing coal prices down (figure 5).

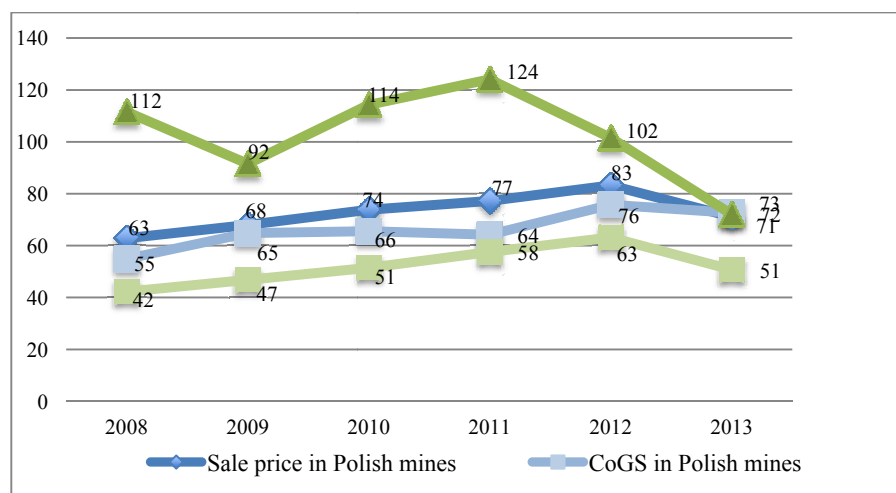


Fig. 5. Unit gross margin regarding hard coal [EUR/t].  
Source: [1, 2, 12, 24]

The sale price of OKD coal dropped by 19 % in 2013, while average prices in Poland dropped by 14 % in the same period. It is worth mentioning, that despite of the decrease, average prices in 2013 are higher than ten years ago. Polish coal prices were at a level of €30,35 in 2003 and €71,12 in 2013. Comparing Czech OKD to

Polish JSW, it can be stated that these two companies are competitors on European hard coal market, among other things because selling price of JSW is much higher than average Polish selling price and it amounted €93 in 2013 while OKD's €72. Average prices of all Polish mining companies and prices of JSW shows that the latter is a leader among Polish hard coal enterprises. JSW has also experienced a decrease in average sale price in 2013. The average sale price dropped by 23 % in 2013 when compared to year 2012.

As stated above, selling prices has lowered recently in both neighboring countries. The cost of production has increased in the same period of time mainly due to environmental requirements, safety restrictions and hard geological conditions of coal seams. Analyzing the period of 2003-2013 revenues increased by 58 % while cost of goods sold by almost 63 % in Polish mining industry. Comparing year 2006 and 2013, revenues of OKD decreased by 29 % while cost of goods sold increased by 19 %.

Figure 6 shows that difference between selling prices and cost of goods sold is much bigger in the Czech hard coal mining. There are two reasons for higher gross margin value. The first reason is the selling price of Czech coal, which is much higher than the Polish one. The second reason regards cost of coal production. Czech hard coal not only is more expensive on the market, but also its production process is cheaper. Figure 6 reveals that average Czech hard coal cost of production amounts for 42-63 EUR per ton, while Polish mines extract coal at a minimum cost of 55 EUR per ton (in 2008). Data reported on charts support unfavorable situation of Polish hard coal mining industry detecting that they might have problems with competitiveness on European coal market. In 2013 the cost of production exceeded the selling price generating loss on coal sale in Polish coal industry. Czech OKD also reported a loss on operational activities, although sale price exceeded cost of goods sold. Operational costs of 2013 rose above revenues by more than 20 % in OKD. By comparison, Polish JSW generated 15 % gross profit in 2013.

Assuming similar geological conditions in Upper Silesian Coal Basin, a question arises why there is such a difference in selling prices and cost of production between Polish and Czech mines? One must bear in mind that two out of three Polish enterprises included in the analysis (KW, KHW) are state owned entities operating 32 mines out of 37 mines covered by the study. Entities are under organizational and financial restructuring process governed by the Ministry of Industry in Poland. Market competitiveness in terms of price and adjustment of production capacity to meet market needs are among primary tasks for restructuring programme [21]. On the other hand, miners' social privileges and energy policy stressing independence limit reduction of hard coal production and maintain high fixed costs of mining industry in Poland.

Organizational change, including lowering of employment, is an important element of restructuring process in Polish hard coal industry, as payroll cost constitutes the largest part of the operational costs. Although employment in Polish hard coal industry has diminished by 56 % since 1998, salaries still exceed 50 % of total operational costs (Fig. 6).

Polish miners' social benefits that arise from the rights acquired decades ago are still largely respected increasing the cost of labor. By comparison labor cost in Czech mines accounts for 31 % of total costs only. A large share of payroll draws attention in the context of discussed inability to adjust Polish production volume to existing market demands. Other cost items of Czech mines present a larger share than their counterparts in Polish mines. Both depreciation and consumption of materials and energy are 6 points higher than in Polish industry. It is worth mentioning that the structure of operational costs of JSW is more similar to OKD, than to summarized Polish mines, as Polish hard coal industry is mostly influenced by the biggest mining company KW operating 23 hard coal mines [8, 12].

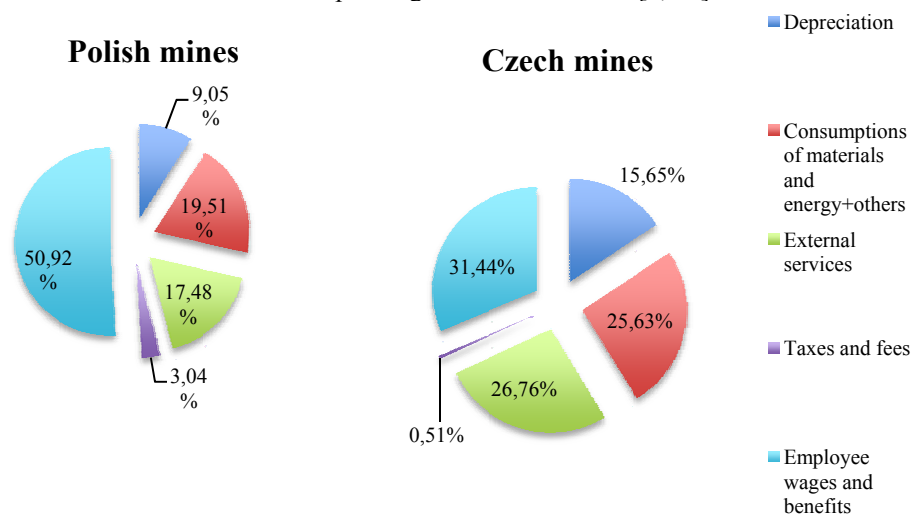


Fig. 6. Composition of operational costs (by nature) in 2013 [%].

Source: [1, 12]

Analysis of operational costs leads to the level of return on coal sale achieved by two neighboring hard coal mining industries. Figure 7 informs about higher return on coal sale in the Czech Republic than in Poland in the period from 2008 to 2011.

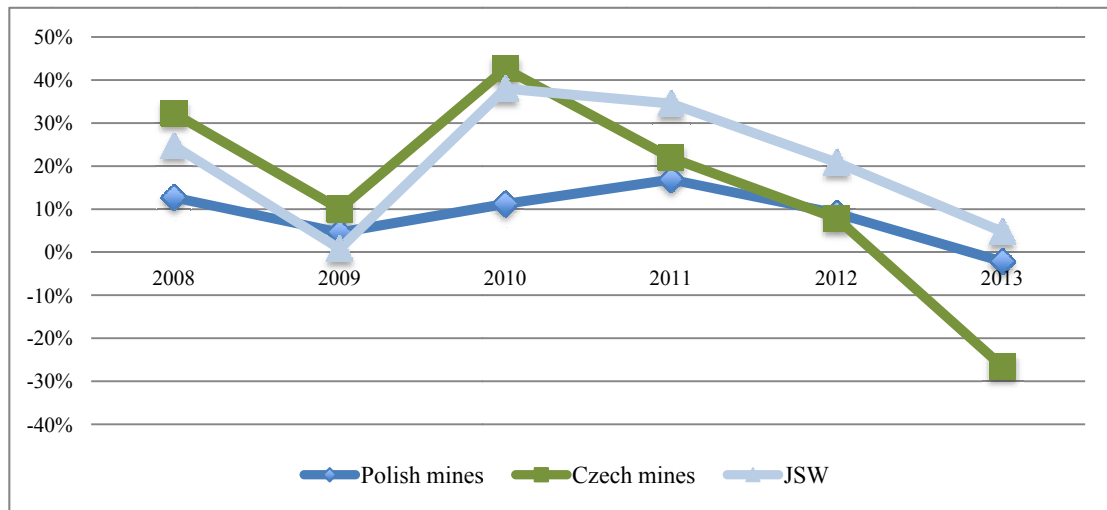


Fig. 7. Return on hard coal sale [ROS; %].  
Source: [1, 12, 15]

Since 2010 profitability of coal sale is decreasing with deep loss of both Polish and Czech entities in 2013. Polish and Czech mines recorded negative profitability in 2013 as costs of production exceeded revenues. Negative profitability makes coal mining economically ineffective and questions future business activities. The above statement does not apply to JSW, as the company reported a positive gross profit in 2013.

As seen on figure 8, negative profitability is not a long-lasting trend among analyzed mining companies. It shows that 2013 was a difficult period for all companies extracting in USCB, and the biggest coal producer KW suffered the biggest loss that amounted for almost €163 M. Despite of the fact that other Polish coal producers made a profit in 2013, Polish hard coal mining industry ended up with a loss of almost €66 M. Year 2013 was also hard for OKD as the financial results presented a loss of €0,7 M.



Fig. 8. Net profit/loss of USCB hard coal companies in the period of 2010 - 2013 [€M].  
Source: [1, 6, 15, 23, 24]

It is worth mentioning that Czech OKD, although operates 4 mines only, is the leader when judging by the value of net profit compared to assets' value in the analyzed period. The value of equity that equals net assets value is very high although the entity operates only 4 out of 41 mines included in the research. The above findings show that Czech hard coal mining represents much better economic standing when compared to neighboring enterprises located in Poland. On the other hand, OKD is not free from market impact, and it also faces some challenges nowadays. Last year overproduction and decrease in sales has generated unsold growing

stock, liquidity problems and liability increase in all USCB entities extracting hard coal. In Poland, some companies even faced lowering creditworthiness to the level threatening the continuation of external funds.

### Conclusions

Summarizing the analysis of four mining enterprises extracting hard coal in Upper Silesian Coal Basin, it can be concluded that state-owned entities (KW, KHW) are doing much worse when compared to entities owned by private investors (JSW, OKD). Capital strength measured by the amount of equity and profitability reveals that JSW and OKD's financial results are higher than their state-owned counterparts. JSW and OKD are also more flexible in the volume of production responding to market demand and coal prices. Operational activities are more effective as cost of goods produced are competitive on European hard coal market. In authors' opinion, nationality distinction is of no importance when analyzing economic situation of USCB mines. Classification based on the ownership reveals that economic standing of publicly traded companies (JSW, OKD) is much better when judging by profitability, economic effectiveness, and competitiveness. The above findings lead to the conclusion that business activities of hard coal mining entities should be based on economic calculations taking efficiency and effectiveness of non-renewable resources into calculations. Even state-owned entities that operate in order to meet domestic demand for hard coal shall obey free market economy requirements, and be economically effective. The study shows that state-owned enterprises seem to respect that, but still have problems to reach the goal, as employment level and costs of production process are not adapted to market needs and still require finance assistance from the state. Actions are required in order to improve and rationalize the structure of operation (production) costs, and reduce them in all business segments.

The example of JSW and OKD, which were privatized, proves that economic effectiveness and competitive advantage on free market is possible even in difficult times with lowered consumption of hard coal. Although 2013 was a hard time in the mining industry, JSW and OKD proved that it is possible to secure satisfactory level of financial liquidity and creditworthiness in order to ensure sustained operation and development. Balancing of funds so as to enable current payment of liabilities and positive gross margin on hard coal sale were possible (among others) due to introduction of innovative management practices and optimization of companies' organization structures, along with pursuing of a rational employment policy.

Polish and Czech hard coal industry has significant identified and available hard coal resources, skilled and experienced staff in mines, and strong domestic researchers' base. These strengths should be used in order to create the basis for profitable business activity, especially if two out of four companies show that hard coal mining can operate in a free market economy.

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