IMPACT OF ELECTRIC POWER PRICES ON TOTAL COSTS OF FOUNDRY CASTING PRODUCTION WITH THE SIDE EFFECT ON GLOBAL COMPETITIVENESS

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Abstract

Presented paper deals with the composition of total costs of foundry casting production with special accent on electrical energy ratio participating. Typical calculation of costs is introduced with the help of industrial partner. There was analyzed how changes in variable costs especially electricity prices affect final foundry production price. Timeline charts characterizing correlation of energy prices and basic metal production prices are presented. We discuss change in fixed costs contribution with potential negative effects. Possible influence of competitiveness in global range is considered too. Results are presented and conclusions are proposed.

Keywords: electrical energy, foundry, basic metals, production, costs, competitiveness

1.   INTRODUCTION

Electricity prices are continuously rising for many years in Czech Republic. Besides negative impact on households, due this phenomenon struggle mostly enterprises using high power consuming technology. Among such technologies belong especially processes using energy for heating. In contrast with power draining buildings which can be insulated and energy consumption minimized, technologies as melting of metals (or other use of furnaces), which need energy to chemo-physical change, do not save so easily. Electrical energy usually creates important item in costs calculation of such companies and rise of electricity prices causes need to save on other stack. Relevant energy efficiency measurement systems for benchmarking, budgeting and targeting purposes are under progress [1]. Competitiveness with abroad (European or worldwide) enterprises is than at the stake. The question is how much electricity really influences basic metallic production prices and. Why is it so and to whom servers such trends? We have to realize, that Czech Republic is clear electricity exporter (see **Table 1**). If national demand is lower than production (Approx. 25 % excess of production over consumption) and CR is energetically independent, why isn't national industry international competitiveness supported better by lower regulated electricity prices?

Table 1 Energetics in CR - basic data (ERÚ [2])

	1.-12.2013	1.-12.2012
Installed Power (MW)	21 079.1	20 519.5
Production (GWh)	87 064.9	87 573.7
Consumption (GWh)	70 177.4	70 453.3
Electricity Import (GWh)	10 571.0	11 587.0
Electricity Export (GWh)	27 458.1	28 707.1

1.1 Paper Goals and Methodology

Primary goal of the contribution is to consider and discuss the effect of energy and especially electricity prices continual increase on total costs and final price of foundry production and generally basic metallic production.

Methodology used in presented paper is based on research of secondary statistical data [2], [3], [4] and comparison with practical experiences and expert estimation of industrial partner (primary data). Basic statistic methods as linear regression were utilized.

Hypothesis H1 was set: Rise of energy prices in the Czech Republic has over average influence on rise of variable costs, reducing the contribution to fixed costs, margin and stimulates grow of final customer price.

2. RESULTS AND DISCUSSION

Following paragraphs bring most important findings and considerations concerning composition of energy prices (with special focus on electricity) and foundry casting production prices, their time changes in range 2005-2013 and possible consequences on competitiveness on Czech companies producing basic metals.

2.1 Composition of electric energy price

The price of electricity is currently in CR composed of regulated and unregulated part (see **Table 2**). Both two parts are then consisting of a fixed charge, which is derived from the size of the main breaker and payments for supplied electricity. Regulated items linked to the amount of electricity supplied are more numerous. The final price is constituted also from the electricity tax and value added tax. Among the suppliers of electricity, there exist two exceptions: one alternative supplier does not charge a fixed permanent for supply of electricity and other alternative contractor does not charge electricity tax because all his supplied electricity comes from renewable sources (RES) [5].

Price declaration of regulated price components can be found in Energetically Regulation Bulletin published by Energetically Regulation Office (ERÚ).

Table 2 Composition of electricity prices in CR with difference index (I_D) 2005-2013 with government subsidy. OTE - market operator, CHP - combined heat and power sources, DZ - secondary energetic resources ([1], ERÚ [2], TZB-info [5])

Regulation	Component	Item	I_D 2005-2013
Regulated components	Electricity distribution ČEPS	Charge for power reservation	1.22
		Price for the distributed amount of electricity	1.92
	Related services	System services	0.78
		Clearing activity OTE	1.82
		Charge of electricity from RES, CHP and DZ	**15.56**
Unregulated components	Supply of electricity	Fixed charge	
		Payment for electricity supply	
Taxes		The electricity tax	
		Value added tax	

In **Table 2** is well visible, that one regulated component has increased during observed period very heavily. Difference index of Charge of electricity from RES, CHP and DZ has multiplied 15.56 times. Major factor of this phenomenon is frequently discussed e.g. [6] support of RES especially photovoltaic power plants.

2.2   Composition of foundry casting production price

Price calculation (ex-ante or ex-post) of foundry production or generally basic metals and metallic production is composed from two usual parts:

- Variable Costs (VC) - composition of this part including price indexes can be seen it **Table 3**.

  Highest percentage item is Charge which creates approximately 2/3 of total VC, but has grown only 7.3 % in observed period. The most growing item however are Energies which creates less than 1/5 of total costs, but has grown 53.1% what does indicate quite unhealthy evolution. Electric energy cerates major part (83%) of this item. Empirical observations show, that according to the produced iron (grey iron, modular iron) and size of the castings, the total variable costs oscillate between 56% and 71% of total costs.

- Contribution to Cover (Fixed Costs) - this part covers especially salaries, repair & maintenance, R&D costs, general overheads and margin.

Cost of electricity makes then between 8% and 11% from total costs of foundry casting production. According [7] energy represents around 20% of the total cost of producing steel.

The market price of metals and metallic production is given by customers' demand and producers' offer and its index has grown much slower (7.3%) than index of energy suppliers (53.1%). Whereas VC can be regarded as inevitable costs, than the range for the contribution to cover fixed costs and margin shrinks. We can simply calculate the percentage of diminishing the contribution in years 2005-2013: (1.187 - 1.073 = 0.114) 11.4% of the final price in 2005. If contribution oscillates between 29% and 44% of total costs and their range is diminished of 11% on final prices, it makes than fall 25 % to 38% of original cover contribution in 2005, which is certainly not negligible amount.

Table 3 Typical VC calculation of foundry production with difference index (I_D) 2005-2013 (ArcelorMittal Engineering Products Ostrava s.r.o., CSÚ [3])

Variable Cost Item	Percentage (%) of Variable Costs	I_D 2005-2013
Electricity	15	1.531
Other energy (gas, technological water)	3	1.531
Charge (solid iron, liquid iron, scrap, additives)	67	1.073
Other Variable Costs	15	1.286
Total VC/ Average I_D	**100**	**1.187**

We have to admit, that most recent trends in 2014 bring decrease in energy prices, so the situation can improve.

2.3   Timelines and trends in prices

Following comparative (see **Fig. 1**) chart depicts energy price trends and basic metals and metallic product price trends in years 2005-2014. Data are interposed by linear trend lines. There is well apparent that energy prices have grown much more (circa 50%) than prices of metallic products (circa 10%).
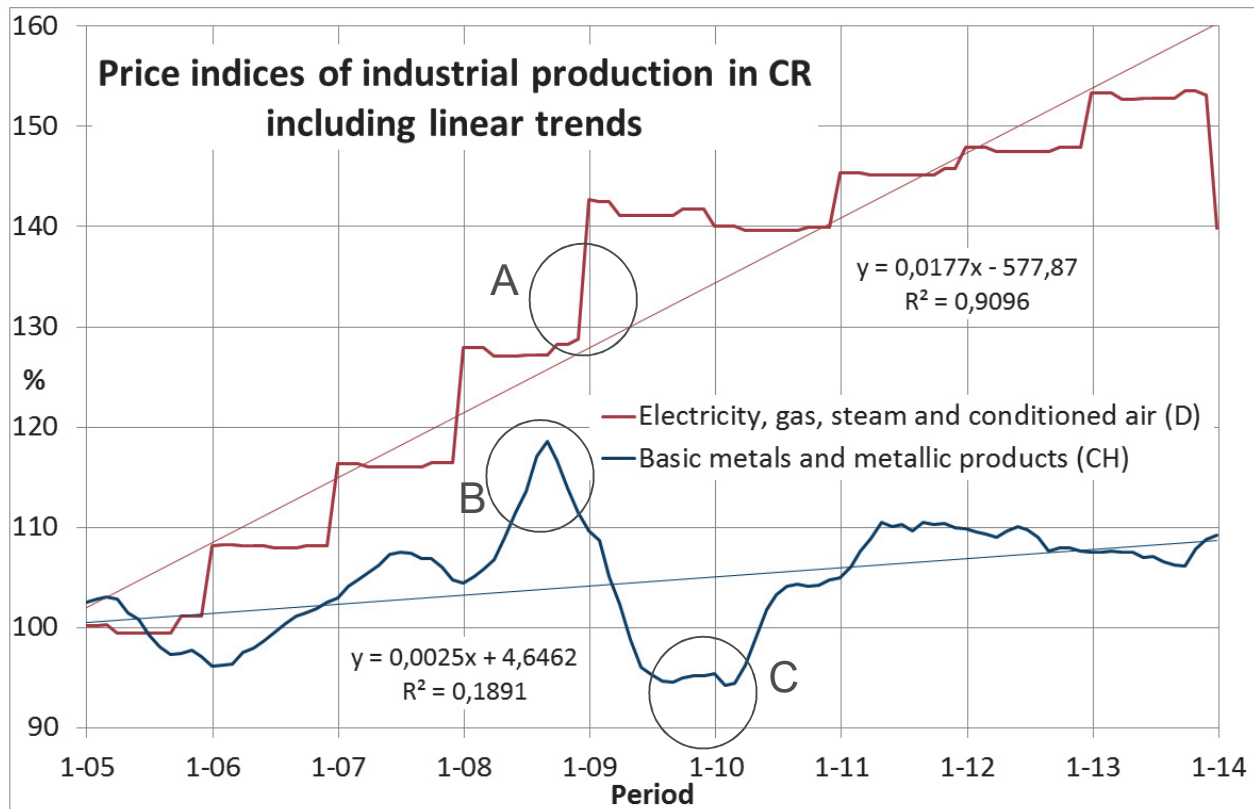
Fig. 1 Price indices of industrial production in the Czech Republic including linear trends - upper line characterizes energy prices; lower line characterizes prices of basic metals and metallic products (ČSÚ [3])

As electric power is important input of metallurgy production it is probably the major cause of metallurgical production prices increase and factor limiting the contribution to cover fixed costs and margin. We can observe, that energy prices has grown in bigger and bigger jumps till 2009 (phenomenon A), later the prices stabilized for two years and then again grow progressed especially supported by Charge of electricity from RES, CHP and DZ. The prices of basic metals and metallic production indicate one strong maximum and one strong minimum (phenomena B and C) reacting on world market behavior.

From presented point of view (see **Table 3**) we can accept hypothesis H1: Rise of energy prices in the Czech Republic has over average influence on rise of variable costs, reducing the contribution to fixed costs, margin and stimulates grow of final customer price.

2.4   Competitiveness consequences

Regarding information in previous paragraphs there is worthy to consider possible influence on competitiveness of Czech basic metals producers in global context. Due to increased globalization, industries are facing greater competition that is pressing companies into decreasing their expenses in order to increase their profits - compare [8], [9], [10]. Shrinking of contribution to cover fixed costs and margin has negative influence especially on following attributes closely interconnected with effect of competitive advantage:

- Investments into innovations and new technologies
- R&D expenses
- HR satisfaction, motivation and productivity

If space for contribution and margin shrinks than global competitiveness of Czech foundries decreases. Potentially restructuring and cost reduction may be needed with negative CSR effect - fallout on employees

(wage reduction or dismissing). Moreover there exists several further cost factors influencing negatively final prices as e.g. central bank interventions against CZK or rise of taxes [11].

Increase of energy price in years 2010-2014 app. 25% makes app. 2.5% increase of final cost price or more likely decrease profit margin in this business. Foundry production is regional business and European market is very sensitive on price changes.

Change in price of energy was not caused only by price evolution on European energetic market but also by legislation steps of Czech authorities in charges for distribution, renewable resources etc. It worsened competitiveness of Czech heavy industry in comparison with foreign producers where foreign authorities look for different sources of financing their legislative actions.

Any unsystematic cost increase causes drop in orders received and sales and subsequently profitability. This leads to savings and reorganization. Impact can be positive and negative as well. Company can start working more efficiently, on the other hand must reduce fixed costs among other employee costs and maintenance.

CONCLUSION

In the end of presented article we should ask, why is it so? To whom emerged situation serves? Who earns? Industrial producers (and other e.g. households) have to repay investments in photovoltaic (PV) power plants. Regardless who is major PV investor; resulting economic effect could probably be quite negative.

Is energy market democratic and apolitical enough? We can doubt on CR and EU level too. Why do Czech companies have to pay contribution to RES and Germans not? Again we encounter unauthorized state support and dumping prices [12].

Presented paper brought data and reflections concerning composition of final prices of foundry casting production with special accent on electrical energy ratio participating. Despite of simplifications there was deduced that rapidly growing cost items indices (especially Charge of electricity from RES, CHP and DZ) can cause decreased competitive advantage in comparison with producers from other countries e.g. Germany. Future research will go deeper and expand presented findings focusing other items with strong rise-the-price effect and trends in time.

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