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INCENTIVE REGULATION OF NATURAL MONOPOLIES

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The article presents the improved by the author classification of the methods of natural monopolies incentive regulation. The article deals with the main goals, essence and formulas of each method.

Incentive regulation of natural monopolies has the goal to create certain financial incentives to cost cutting and quality improvement of the services provided, at the same time the companies are prevented from establishing excessively high tariffs.

Incentive regulation includes the following methods:

1) slide scale regulation.

This method suggests that the regulator defines the target rate of return of the regulated company:

$$R_a = R_t + h \times (R^* - R_t),$$ (1),

where R^* – the target rate of return; R_t – return at the original prices; R_a – the actual rate of return; h is in interval [0, 1], 0<h<1 involves risk sharing [2].

If the rate of return of the regulated company is higher than the target one, then the sum of excess needs to be shared with the consumers. If the regulated company hasn't reached the target rate of return, then the received losses also have to be shared with the consumers. Profits and losses sharing is usually made by correction of necessary gross revenue in the next period of regulation. The main goal of this method is fair division of profits and risks between the regulated company and its consumers.

2) efficiency based regulation:

2a) yardstick regulation or yardstick competition.

In implementation of this method benchmarking is used, that is the indicators of the regulated company activity are compared to the reference level or to the indicators of the comparable companies activities:

$$AC_i = \sum (AC_j)/(n - 1),$$ (2),

where AC_i – average costs of company i, AC_j – average costs of company j, n – number of all companies in the market [3].

Thus, tariffs or gross revenue become linked to some industry indicators, for example, to the indicator of the industry average long-term incremental expenses, the average level of expenses in the industry/group of companies or to the average prices which are applied by the group of comparable industry companies, etc. When using this method the performance of the company can be estimated in three main aspects: productivity, efficiency and quality [4]. At the same time the production efficiency and, in particular, cost efficiency are the most commonly used measures in the yardstick regulation of the electricity sector.

In yardstick regulation the following methods of performance efficiency assessment of the regulated companies are used:

– the regression method COLS - corrected ordinary least squares. This method is used for assessment of the average productivity or expenses in a selection of the enterprises, but differs from a usual method of the ordinary least squares method in that it corrects the regression line by subtraction of the greatest negative residuals. It shifts the regression line to the most effective result. This method measures efficiency of the companies according to the line which passes through the greatest negative result (the most effective company). However, the usage of this method requires the large volume of data, also the results of the regression are very sensitive to a functional form;

– DEA – Data Envelopment Analysis. DEA is the method which is based on linear programming to determine the relative efficiency by means of various products sold by the enterprise. The corresponding approach carries the name of assessment of technical efficiency when the actual indicator of production output is compared with greatest possible one at this quantity of resources. And the enterprises providing the

maximum production   output per unit of resources is undertaken as a "yardstick" to which all other enterprises are compared according to the extent of resources usage . At the same time the production function on the basis of these best enterprises is created, or in other words, the effective enterprises form the so-called "limit of production efficiency". Thus, the measurement of efficiency consists of distance determination between the studied enterprises and the limit of efficiency. The results of DEA are sensitive to random errors, mistakes in measurements. Results of the analysis depend on selection of resources;

− TFP − Total Factor Productivity method. The most widespread approach in creation of the total productivity indicator is the use of linear functions of cumulative value of "inputs" and "outputs" of the company, i.e. a measure of the efficiency of company j, j = 1..., n is calculated in the following way:

$$TFP_j = \frac{\sum_{i=1}^{m} u_i y_i^{(j)}}{\sum_{v=1}^{k} w_v x_v^{(j)}},$$
(3),

where the vectors $y^{(j)} = \left(y_1^{(j)}, ..., y_m^{(j)} \right)$ and $x^{(j)} = \left(x_1^{(j)}, ... , x_k^{(j)} \right)$ describe the "output" and the "input" of company j, the components of the vector $u = (u_1, ..., u_m)$ – the non-negative weight coefficients characterizing the value of the corresponding types of the products created by the companies, and the components of the vector $w = (w_1, ..., w_k)$ – the non-negative weight coefficients reflecting the value of the resources involved by the company. Thus, for comparison of the considered n companies by efficiency of their activity it is required to establish values of vectors of the weight coefficients $u = (u_1, ..., u_m)$ and $w = (w_1, ..., w_k)$. The prices of the created products and services and the prices of the used resources or a share in revenue and a share in the amount of expenses are often applied as weights. However, comparing of the efficiency of the company on the total productivity calculated on the basis of the fixed weight factors for variables of "output" and "input" puts the compared units in "unequal" conditions as in situations when due to peculiarities of their activities the companies have no opportunity to vary the structure of their "output" or "input", the optimum structure of "output" and "input" set by weights is favorable for some companies and is unfavorable for the others.

− other methods (SFA – stochastic frontier analyses, FDH – free disposal hull, etc.);

2b) performance based regulation.

This method is considered as implementation of rules, including financial incentives which induce the regulated company to reach certain target indicators, at the same time the company has considerable freedom of action in the choice of means to achieve the results. Target indicators can belong to various aspects of the company's activity, but non-financial indicators, for example, the volume of losses of the electric power in networks, quality indicators of the regulated services, indicators of operational availability, etc. are most often used [4]. This method of regulation is characterized by two aspects:

− the own expenses of the regulated company are not linked to the cap prices or revenue for this company;

− the cap prices or revenue for the regulated company are linked to the prices of other comparable companies.

3) cap regulation:

The cap on the revenue or the prices usually is calculated by the regulator on the basis of expenses of the regulated company at the beginning of the regulation period and is fixed for the entire period. During the regulation period the cap on the revenue or the prices can be corrected according to inflation and the factor of increase in productivity of the regulated company (X-factor). The regulated company sets tariffs for its services freely provided that its revenue/price won't exceed the cap established by the regulator. If this condition isn't met, then the sum of excess has to be returned to consumers in the next period of regulation. If during the regulation period the company is able to reduce the expenses, then the financial benefit received by it will be its income.

3a) price-cap-regulation;

This method is generally used when the share of fixed expenses of the regulated company which don't depend on sales volumes is rather small, otherwise the use of this method would create either risk of receiving a considerable excess profit by the company, or, on the contrary, risk of incomplete covering of its actual full expenses. At the same time the cap is calculated as a result of division of the necessary gross revenue of the regulated company into the predicted sales volumes. During the regulation period (usually not less than 3 — 5 years) when the set cap works, the price (tariff) for services changes every year on a formula:

$$P_t = (1 + \frac{RPI_t - X}{100}) \times P_{t-1} - Z, \tag{4}$$

where P_t – the price in year t, RPI_t – the percentage change of the index of various prices which isn't connected with change of expenses in the regulated company (the index of consumer prices growth), X – the size of increase in efficiency expected by the regulator in the industry (or for the company), P_{t-1} – the price in the previous year, Z – the factor considering the influence on the company's expenses of the external events which are out of the sphere of its control [1].

The factor of Z can be absent in the formula. Periodically, but with an interval bigger, than the period of regulation the revision of the basic level of the prices is made on the ground of the detailed analysis of the necessary gross revenue. Determination of the new level of the base price with which RPI -X indexation coefficient is used subsequently is the result of this analysis;

3b) revenue-cap-regulation.

This method is offered for the companies with a big share of fixed expenses. The maximum size of the gross revenue for the regulated company is set for the corresponding year. If the actual gross revenue for the previous year is lower or higher than its expected size, the received deviation is taken into account when calculating of the allowed gross revenue for the next years of the period of regulation with the use of the following formula:

$$R_t = (R_{t-1} + CGA \times N_{cust}) \times (1 + \frac{RPI_t - X}{100}) - Z, \tag{5},$$

where R_t – the allowed gross revenue in year t, R_{t-1} – the allowed gross revenue in the previous year, CGA – correction coefficient on the growth of the consumer base (dollars/consumer), N_{cust} – the change in the number of consumers [1].

The factor of Z can be absent in the formula.

3c) hybrid-use-of-revenue-and-price-cap;

The aim of this method is to minimize the shortcomings of two methods considered above applied respectively to the companies with a small and big share of fixed expenses.

With this method in case of deviation of the gross revenue of the regulated company because of divergence of the predicted and actual sales volumes additional profit isn't left completely at the disposal of the company (that occurs when using the price-cap-regulation method), and the half-received gross revenue isn't subject to a full recovery during the subsequent periods of the company's activity (that occurs when using the revenue-cap-regulation method). An example of the formula for the hybrid method of regulation is the following:

$$R_t = P_t \times Q_t = \left[(1 + \frac{RPI_t - X}{100}) \times P_{t-1}\right] \times Q_{t-1} \times \left[W_p \times \left[\frac{Q_t}{Q_{t-1}}\right] + W_r\right] \tag{6},$$

where P_t – the supply price, Q_t – the volume of supply, W_p – the weight of the price factor, W_r – the weight of the gross revenue factor [1].

Selecting various W_p and W_r values, it is possible to gain various stimulating effects and to redistribute the risks connected with a deviation from the forecast in different ways between the regulated company and its consumers. At the same time if to accept $W_r = 0$, and $W_p = 1$, the formula for the price-cap-regulation method will be received. Otherwise ($W_r = 1$, a $W_p = 0$), it is a formula for the revenue-cap-regulation method.

Conclusions. Establishment of excessively high or excessively low rates for natural monopolies services causes negative consequences at the micro-level and a macro-level of the national economy therefore the choice of the most suitable method of tariff regulation in these economic conditions is of particular importance. In each case it is necessary to proceed from the purposes of regulation, their priority, merits and demerits of certain methods of regulation, opportunities of their administration and information support. It is also necessary to mark that methods of tariff regulation evolve, the new elements, for example, considering efficiency and quality of services are added to already existing formulas. In practice the combination of several methods often takes place. Therefore when forming a tariff policy on services of natural monopolies it is necessary to consider

not only the existing methods, but also possibilities of their correct combination and also adaptation under specific economic conditions and purposes.

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