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TÍTULO: Formación de formas de coalición de organización de entidades económicas.

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RESUMEN: El artículo propone un enfoque para estructurar el concepto de coalición / asociación, dentro del cual se proporciona una descripción formal de las condiciones para la formación de estructuras asociativas, que permiten aumentar la sostenibilidad económica de sus miembros y mantener la apertura del mercado.

PALABRAS CLAVES: coalición, estabilidad, equilibrio, efectividad de las decisiones de la coalición, seguro de responsabilidad civil.

TITLE: Formation of coalition forms of organization of economic entities.

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ABSTRACT: The article proposes a certain approach to structuring the concept of a coalition/association, within which a formalized description of the conditions for the formation of associative structures is given, which make it possible to increase the economic sustainability of its members while maintaining market openness.

KEY WORDS: coalition, stability, equilibrium, effectiveness of coalition decisions, liability insurance.

INTRODUCTION.

The consequence of the expansion of the multi-structured economic relations is not only the formation of many independent economic units of various forms of ownership, but also the emergence of coalition forms of organizing their joint activities, namely, associations.

An association is an association of independent economic subjects. The association does not absorb the entire firm, joint-stock company or individual. Associative type of connections is voluntary. The subject retains control over his actions, although at the same time he does not fully determine the actions of the association. He can simultaneously participate in several similar organizations.

At present, it is necessary to solve problems of increasing efficiency and sustainability in various sectors of the economy, taking into account the interests of many subjects - equal participants in market relations.

The creation of associations of economically independent market entities is relevant to ensure the cooperation of the latter in such specific areas as, for example, environmental management, scientific and technological progress, environmental protection, and the implementation of unique investment projects.

The problems of penalty function method and the Nash arbitration scheme are examined by Douligieris and Kumar (1992, 1995) regarding inter-networking and intra-networking contexts; by Mazumdar and Mason (1991) regarding network optimal flow control; by Feng, Niu, and Cheng (2018) regarding hydropower reservoirs operation; by Badufle (2007) regarding aircraft design.

The problems of penalty function method and the Shapley-value are examined by Setiono (2001) regarding neural network construction; by Wu, Ye, and Zhang (2005) regarding resource allocation; by Hartman and Dror (2005) regarding allocation of gains; by Zarghami, Safari, and Szidarovszky (2015) regarding water allocation.

DEVELOPMENT.

In order to increase productivity in resolving the issues outlined above and similar to them, a certain approach to structuring the concept of association is proposed, within which a formalized description of the conditions for the formation of associative structures is given, which make it possible to increase the economic sustainability of its members while maintaining market openness.

Two points are defining in the definition of the latter. First, the meaning of creating any organization, including an associative one, is to realize the possibilities of increasing the effectiveness of the functioning or development of the constituent entities themselves, and in the conditions of the existence of antimonopoly legislation, not due to the strengthening and exploitation of market power, but towards resources; the formation and use of systemic effects, in particular, by reducing transaction costs; reduce uncertainty and develop a coherent association policy. Secondly, the problem of the stability of an organization of an associative type, namely, its structural stability arises due to the criterion uncertainty (diversity of goals) among the members of this organization.

By structural stability, we will understand the ability of a certain system as a community of economic subjects to self-preservation and self-reproduction; to preserve its integrity, organizational unity in the presence of different (not completely coinciding) interests of the subjects included in the system. It implies the preservation of structural integrity, as a combination of some necessary subset of interrelationships of independent components that define the specified system.

So, suppose that some regional, industry, and so on, socio-economic system is formed by M independent subjects - participants of market relations ($i = 1, \dots, M$), each of which makes a choice of one or another variant (strategy) of its functioning development) $x^i = (x_1^i, x_2^i, \dots, x_{n_i}^i) \in X^i$ in accordance with the goal described by the criterion of optimality

$$V_i = f_i(x^1, x^2, \dots, x^{i-1}, x^i, x^{i+1}, \dots, x^M) \rightarrow \max.$$

At the same time, the values of the i -th objective function depend not only on the choice of the i -th participant, but also on the choice of other subjects.

This situation is a consequence of the existing economic and other relations between the latter, initiated by the relevant relations. These links, technological, resource and other constraints also form a multitude of sets of strategies for all participants X :

$$\begin{aligned} x &= (x^1, x^2, \dots, x^M) \in X = X^1 \times X^2 \times X^3 \dots \times X^M = \\ &= \{(x^1, x^2, \dots, x^M) / x^i \in X^i, i = 1, \dots, M\}. \end{aligned}$$

A point (variant, solution) $\tilde{x} = (\tilde{x}^1, \dots, \tilde{x}^M)$ is usually called a point of stable choice or a equilibrium situation or Nash optimal if for any i the condition (Germeyer, 1976) holds:

$$\max_{x^i \in X^i} f_i(\tilde{x}^1, \tilde{x}^2, \dots, \tilde{x}^{i-1}, x^i, \tilde{x}^{i+1}, \dots, \tilde{x}^M) = f_i(\tilde{x}^1, \dots, \tilde{x}^i, \dots, \tilde{x}^M)$$

$$x^i \in X^i \quad \text{или}$$

$$f_i(\tilde{x}^1, \tilde{x}^2, \dots, \tilde{x}^{i-1}, x^i, \tilde{x}^{i+1}, \dots, \tilde{x}^M) \leq f_i(\tilde{x}^1, \dots, \tilde{x}^i, \dots, \tilde{x}^M). \quad (1)$$

Denote the set of equilibrium points by \tilde{X} :

$$\tilde{x} \in \tilde{X} \subset X.$$

Let $X^* \subset X$ denote the set of effective (Pareto-optimal) solutions that exhaust the production, technical and resource capabilities of the considered economic system.

Notice, that $\tilde{X} = \tilde{X}(X, f)$, and $X^* = X^*(X, f)$, где $f(x) = (f_1(x), \dots, f_M(x))$, $x \in X$.

The condition for the existence of equilibrium points that are simultaneously points of the Pareto set, i.e.,

$$\tilde{X}^* = \tilde{X} \cap X^* \neq \emptyset, \quad (2)$$

we define as a necessary condition for the formation of associative-type organizations from M.

Indeed, the principle of efficiency allows us to expect that, making decisions independently of each other, partners (subjects) will make an equilibrium choice. Moreover, the implementation of this principle gives grounds for partners to implement certain agreements on the adoption of joint decisions within the framework of this aggregate of M participants. On the other hand, the principle of equilibrium, by virtue of (1), provides a well-known guarantee, stability against the violation of accepted agreements, in other words, the stability of collective decisions, which is a sign of the existence and preservation of the organizational unity (integrity) of the association.

Relations (1) fix the natural stability of the solution. By virtue of this, the fulfillment of condition (2) seems to be a very rare event, although certainly having great practical significance.

The natural sustainability of collective decisions can be strengthened by establishing some responsibility in relation to each participant for deviations in one direction or another from the original agreements in their implementation.

We introduce the function $f_i'(\bar{x}^b, x^i)$:

$$f_i'(\bar{x}^b, x^i) = \left\{ f_i(\bar{x}^1, \bar{x}^2, \dots, x^i, \dots, \bar{x}^M) - \Psi(\bar{x}^i, x^i) \right\}, \quad i = 1, \dots, M, \quad (3)$$

where $\Psi(\cdot)$ is a certain scalar “penalty” function that takes zero values, if $x^i = \bar{x}^i$, and positive numerical values are otherwise case; $\bar{x}^b = (\bar{x}^1, \bar{x}^2, \dots, \bar{x}^{i-1}, \bar{x}^{i+1}, \dots, \bar{x}^M)$.

In reality, “fines” can be implemented through liability insurance for violation of agreements. The danger of separative actions can also be reduced by creating a special advisory body that also has the right to monitor the implementation of decisions taken. We modify the definition of the equilibrium situation as follows: the variant \bar{x} ($\bar{x} \in X$) for $f_i'(\bar{x}^b, x^i)$, $i = 1, \dots, M$ will be called a consistent equilibrium solution, if:

$$\bar{x}^i = \arg \max_{x^i \in X^i} f_i'(\bar{x}^b, x^i) \text{ для всех } i = 1, \dots, M \quad (4)$$

Tightening penalties enhances the coherence of partners. Formally, this can be justified on the basis of the theory of optimization methods that exploit the idea of penalty functions. Consider the unconditional maximization task sequence:

$$\begin{aligned} x_k^i = \arg \max_{x^i \in X^i} f_k^i(\bar{x}^b, x^i), f_k^i(\bar{x}^b, x^i) = \\ = f^i(\bar{x}^1, \dots, x^i, \dots, \bar{x}^M) - L_k \|x_k^i - \bar{x}^i\|^2, \end{aligned} \quad (5)$$

$$L_k \rightarrow \infty \text{ при } k \rightarrow \infty, i=1, \dots, M$$

and problem with constraints (6) for any i :

$$\max_{x^i \in X^i} f^i(\bar{x}^1, \dots, x^i, \dots, \bar{x}^M), \quad (6)$$

$$x_j^i - \bar{x}_j^i = 0, \quad j = 1, \dots, n_i.$$

Under certain assumptions $x_k^i \rightarrow \bar{x}^i$ ($i = 1, \dots, M$) with L_k and $k \rightarrow \infty$. The latter is an expression of the ultimate transition to achieving a coherent solution.

Thus, for a sufficiently large L , any variant of $x \in X$ can be made consistent. On the other hand, “excessive” rigidity contradicts the essence of the associative form of organization, since the achievement of a coordinated equilibrium solution with “small” penalties means the presence of a substantial degree of consistency in the interests of the participants and vice versa.

The severity of penalties used to harmonize, and, consequently, the degree of preference (expediency) of uniting a number of subjects into an organization of associative type — its potential associativity — can be scaled by the values of the parameter L . The level of inconsistency of the actions of participants with a fixed L is determined by a subset of indices i , for which conditions (4) are not met, as well as the magnitude of the corresponding residuals.

Using the functions $f_L^i(\cdot)$, we can propose two problem statements related to the definition and formation of associative structures:

- at a given level of penalties, determining $\bar{x} \in X^*$, simultaneously satisfying conditions (4), or establishing the absence of such options;
- for options $\bar{x} \in X^*$, obtained using some principles of a “fair compromise”, minimization of the level of fines - the value of the parameter L , ensuring coordination of interests by \bar{x} .

Mutual exchange of information between subjects and even more so the implementation of “penalties” in relation to them for violation of accepted agreements transform the principle of balance into a collective, coalition (or cooperative) principle, and the corresponding situations of balance modify and turn into coalition (agreed) decisions.

Strengthening of coalition is also associated with the development of contractual relations between the parties in the area: jointly choosing the vector $x = (x^1, x^2, \dots, x^M)$; combining resources and then choosing an agreed way of action based on this association; increase the adaptability of the coalition to the disturbing influences of the external environment. Making decisions on a non-cooperative basis is possible, generally speaking, only when aggregate hypothetical conditions: the subjective descriptions of the circumstances of decision making coincide with the objective (the presence of an ideal independent ability of the subjects to obtain information); there is a point of natural sustainable choice and it is effective and unique.

One of the ways to formalize coalition rules of behavior or, which is the same, a formalized description of an association's behavior that corresponds to reality and is comparatively simple at the same time, is to introduce a common association goal — an associative performance criterion reflecting some compromise between the goals of its members.

CONCLUSIONS.

In this regard, let us reiterate some of the activities (some of them are widely used in organizing, for example, stock exchanges) that help reduce the danger of separative actions and allow us to retain the ability of an association to reproduce the balance of economic interests of its constituent entities:

- Liability insurance of participants.
- The introduction of partial a priori side payments (initial margin, collateral), based on the forecast of the future results of the association.
- The narrowing of the set of points from which to make a choice.
- Limiting the pooling of resources in order to ensure their own guaranteed results.
- The creation of a consultative arbitration body.

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BIBLIOGRAPHIC REFERENCES.

1. Badufle, Céline. (2007). Conceptual aircraft design: towards multiobjective, robust and uncertain optimisation. DOI: 10.1109/ICC.1992.268128
https://www.researchgate.net/publication/278633928_Conceptual_aircraft_design_towards_multiobjective_robust_and_uncertain_optimisation/citation/download
2. Douligeris C. and Kumar L. N. (1992). Access to a network channel: a survey into the unfairness problem, [Conference Record] SUPERCOMM/ICC '92 Discovering a New World of Communications, Chicago, IL, USA, 1992, pp. 1184-1189 vol.3.
3. Douligeris C. and Kumar L. N. (1995). Fairness issues in the networking environment, Computer Communications, 18, 4, 288-299.
4. Feng Z., Niu W., Cheng C. (2018). Optimization of hydropower reservoirs operation balancing generation benefit and ecological requirement with parallel multi-objective genetic algorithm, Energy, 153, 706-718, <https://doi.org/10.1016/j.energy.2018.04.075>.
5. Germeyer Yu.B. 1976. Games with opposing interests. Science, 327 p.
6. Hartman B.C. & Dror M. (2005). Allocation of gains from inventory centralization in newsvendor environments, IIE Transactions, 37:2, 93-107, DOI: 10.1080/07408170490278283.
7. Mazumdar R., Mason L. G. and Douligeris C. (1991) Fairness in network optimal flow control: optimality of product forms, IEEE Transactions on Communications, 39, 5, 775-782. doi: 10.1109/26.87140.

8. Setiono, R. (2001). Feedforward Neural Network Construction Using Cross Validation, Neural Computation, vol. 13, no. 12, pp. 2865-2877. doi: 10.1162/089976601317098565.
9. Wu T., Ye N. & Zhang D. (2005). Comparison of distributed methods for resource allocation, International Journal of Production Research, 43:3, 515-536, DOI: 10.1080/00207540512331311868.
10. Zarghami M., Safari N., Szidarovszky F. et al. (2015). Water Resour Manage 29: 4285. <https://doi.org/10.1007/s11269-015-1060-5>

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