LOOK ACADEMIC PUBLISHERS
OPEN ACCESS

IEJME— MATHEMATICS EDUCATION
2016, VOL. 11, NO. 7, 2732-2744

Nash Equilibrium Design in the Interaction Model of Entities in the Customs Service System

Roman V. Fedorenko[a], Nadezhda A. Zaychikova[a], Dmitiy V. Abramov[a] and Olga I. Vlasova[b]

[a]Samara State University of Economics, RUSSIA; [b]Russian state vocational pedagogical University, RUSSIA

ABSTRACT

The urgency of the analyzed issue is due to the importance of the use of economic-mathematical tools in the course of modeling the interaction of the entities in the customs service system that is necessary for the development of foreign economic activity (FEA) of any state. The purpose of the article is to identify effective strategies for the interaction between the participants of foreign trade activities with customs brokers. The leading method to the study of this issue is economic-mathematical modeling, allowing studying the process of making decisions while choosing the strategy of cooperation between the customs broker and his client. Results: the article suggests the mathematical model to optimize the management mechanisms of interaction between enterprises, engaged in foreign trade, and customs dealers. The data of this article may be useful in modeling interaction of the entities in the customs service system using the methods of game theory. The model of "customer - customs broker" is implemented as a bimatrix game. Assuming the noncooperativegame the authors solve the problem of finding Nash equilibrium in mixed strategies.

KEYWORDS
Nash equilibrium; the customs service system; international economic activity; the game approach to economic modeling.

ARTICLE HISTORY
Received 16 April 2016
Revised 26 June 2016
Accepted 26 June 2016

Introduction

Establishing a context

In the face of the growing international trade turnover a special attention is paid to the issue of the effective customs service system of foreign trade, designed to provide a reduction in the total cost of moving goods. Both the potential market success of the import or export of goods and the competitiveness of the

CORRESPONDENCE Roman V. Fedorenko ✉ fedorenko083@yandex.ru

participants of foreign trade activities at the national and international market depend on the implementation of customs support.

Despite the active reforms of the entire customs system, a participant of foreign economic activity is still faced with a sufficiently large number of problems that require significant time and cost. These problems include a need to meet all established requirements by customs legislation, and the solution of certain economic issues, such as the organization of movement and storage of goods.

A common approach in solving these problems for a foreign trade operator becomes a transfer of functions of customs support to professional dealers on the basis of outsourcing. Providing services in the field of customs aims to expedite and simplify all necessary customs procedures in foreign trade activity, and it will minimize the financial and time costs of foreign trade operators and, consequently, increase the efficiency of their work.

The problem of the effective interaction between the participants of foreign trade activities with professional customs dealers is also very important. The worsening competitive environment is forcing companies to expand the management tools to optimize the use of all available opportunities in today's market.

The modern trend of determining the optimal interaction strategy is the economic and mathematical modeling, in particular, the use of tools of game theory.

Literature review

The literature on strategic management tends to borrow ideas from related sciences, for example, from the field of military strategy (Ghyczy et al., 2002; McNeilly, 2014), from the field of game theory (Dixit &Nalebuff, 2010). Game theory in this case is particularly interesting because it tends to formulate general principles of strategic thinking, applicable to the different areas of activity. So, T. Schelling (1981) identifies three types of games: combinatorial, gambling and strategic.

According to T. Schelling (1981), a strategic game - a “behavioral situation in which the best selection of each player’s actions depends on actions that, as he supposes, will be taken by another one. In this case the player knows that his actions, in turn, depend on the expectation of another player concerning his actions.” In real life, players’ interests overlap and partly they diverge. This means that players have to coordinate their actions in terms of latent conflict. The result is the need to find an equilibrium position, ensuring the highest possible level of satisfaction of the interests of all involved parties.

P.F. Drucker (2001), one of America's leading theorists of modern management, said: “Every organization operates on the basis of its own theory of business, in other words, on the basis of a number of ideas about this business, its goals, determined results, its consumers and what these consumers value and what they pay for. The strategy is a way to implement the business theory in practice. The purpose of practice - to give the organization the ability to achieve the desired results in an uncontrolled environment.”

Establishing a research gap

Currently, while studying the customs service system in the domestic scientific literature most researchers focus on issues of services by the customs authorities, while they neglect the activity of professional customs dealers.

The article represents the issue of interface of divergent interests of foreign trade operators and service providers in the field of customs services of export-import cargoes. The nature of interaction between foreign trade operators with professional customs dealers is largely due to their needs. Independent decisions of all foreign trade transaction issues for many companies-participants of foreign economic activity is too complex task requiring a significant investment of time and financial resources, as a result the employment of specialists for these companies becomes almost inevitable. So, the analysis of mechanisms of interaction between the individual elements and the subjects of the simulated system is becoming increasingly important .

An effective method of studying the various types of interactions is the game theory - a branch of applied mathematics, exploring models of decision making under conditions of divergence of interests of the parties (players), where each party seeks to influence the development of the situation in its own interests. The game is interaction between the parties, whose interests do not coincide.

Aim of the study

The purpose of the study is to simulate the interaction system between a foreign trade operator and a customs dealer, determining the optimal strategy for each of them and building Nash equilibrium in the bimatrix game.

Methodological Framework

Research methods

In the course of research the following methods were used: the theoretical (formalization, modeling, hypotheses methods, induction and deduction); diagnostic (causal, situation); empirical (observation, experiment); methods of mathematical statistics and graphic results.

Experimental research base

ExperimentalresearchbasewereSamaraCustomsandentitiesofnear-customsinfrastructureoftheSamararegion.

Research stages

The study was conducted in two stages:

At the first information retrieval stage the authors analyze scientific approaches to the use of economic-mathematical tools in management, generalize Russian and foreign experience of mathematical modeling of the interaction system of independent entities in the economic system, develop a model of the customs service. The empirical study at the first stage was aimed at revealing the contradictions goals, objectives and basic strategies for work of foreign trade operators and customs dealers.

At the second formative stage, the authors develop a model of a bimatrix game, which parties are a customs dealer and a foreign trade operator. In order to find the optimal strategy of interaction between players, the authors design

Nash equilibrium, and define possibilities for maximizing the payoff of each party.

Results

Identification of possible strategies of players

As a unit of analysis will be taken a foreign trade operator and a customs dealer, that has the greatest value in the subsystem services in the field of customs. Let's consider a bimatrix game in which each player has two strategies, conventionally designated by the term "trick" and "cooperation."

The player A – a customs dealer - implements two strategies:

A1 – to use the simplest form of declaration ("deceive the customer");

A2 - to use the most favorable declaration form for the customer ("cooperation").

This division is based on the low interest of the customs dealer in the use of modern forms and methods of customs clearance and customs control. Using low customer qualification in matters of customs clearance, the customs dealer fills a declaration by a pattern, spending minimum time on it, without offering the customer more complex possibilities of modern customs tools – a preliminary declaration, the submission of periodic declarations, the use of technology of remote release.

In turn, player B – a client - implements two strategies:

B1 – to continue to carry out customs clearance via the same customs dealer ("cooperation");

B2 - to leave the customs dealer and fill a declaration on his own ("trick").

Let us introduce the following notation: parameters in the matrix A, -

i - income from the supply unit registration by filling a simple declaration;

I - income from the supply unit registration by filling one of the types of complex declarations;

n - number of filled simple declarations;

-t – lost profits, determined by lack of time available between the client calls for a constant filing of simple declarations;

T - profit resulting from the lead time between the client calls, which the customs dealer gets using one of the types of complex declarations;

-s - lost profits.

When using the simple declaration the customs dealer receives a relatively small income from each declaration that is compensated in the case of large volumes of foreign trade turnover and rapid supply at low labour cost. Then, the constant use of only simple technologies turns the customs dealer in a mechanical worker, which leads to loss of time to perform template operations, does not allow obtaining the necessary experience in the application of modern forms of customs clearance and promotes the shortfall of potentially higher profits (-t).

In turn, the constant search for new opportunities to reduce the time and financial costs for the client through the application of modern customs tools leads to an increase in the professional level of the customs dealer, increasing

his appeal and demand in the customs market, that is expressed in the proposed model by T parameter.

We should take into account the lost profit (s), arising from the unnecessary effort of the customs dealer in cases where, despite the use of all declaration opportunities, the customer leaves.

To design a matrix of the payoff of the customs dealer it is necessary to look at the various combinations of possible moves of the parties (Table 1).

Table 1. A matrix of the payoff of the customs dealer

Player A	B_1	B_2
A_1	$a_{11}=in-t$	$a_{12}=i$
A_2	$a_{21}= I+T$	$a_{22}= -T+I-s$

Source:It is made by authors

The combination of A_1B_1 – the customs dealer fills only a simple declaration, as the customer uses his services for quite a long time. In case of repeated imports the customs dealer fills declarations by a single pattern, without spending considerable effort on filling them. Player A receives regular income from filling a simple declaration, multiplied by the number of declarations, but spends time on the performance of mechanical operations and loses the possible profits, as a result his payoff is $a_{11}=in-t$.

The combination of A_1B_2 – the customs dealer fills only a simple declaration, and the client goes away, hoping in the future to fill declarations himself. The customer leave can be caused by a decrease in profitability of foreign trade and the loss of confidence in the dealer and the desire to fill declarations by a pattern. The customs dealer receives regular income by filling a simple declaration, but the client does not return, as a result the payoff of player A is $a_{12}=i$.

Combination A_2B_1 – the customs dealer uses various types of complex declaration, and the client continues to use his services. Player A receives income from the use of complex forms of declarations, more than when filling a simple declaration, and extra time T. The payoff of player A is $a_{21}= I+T$. Extra time can be formed as a result of the periodic declaration, as well as using the pre-declaration. As a result, the customs dealer can get more revenue for the filling of a separate declaration, and extra time he can spend on filling simple declarations for the same or another client.

The combination of A_2B_2 – the customs dealer uses various types of complex declarations, and the client goes away, hoping in the future to fill declarations himself. Player A gets increased revenue from filling complex declarations, but the customer leaves, so the time spent on complex declaration can be considered inefficient, as the customs dealer lost profits, refused other options, and his payoff is $a_{22}= -T+I-s$.

Let us design the similar matrix of the customer's payoff with the following parameters:

-p - costs on the customs dealer when filling a simple declaration;

n - number of filled simple declarations;

-P - costs on the customs dealer in case of filling one of the types of complex declarations;

U – customer's profit in case when he leaves the customs dealer and will fill a simple declaration himself;

u - customer's profit in case when he leaves the customs dealer and will fill complex types of declarations himself;

W – customer's profit, if the customs dealer fills a complex declaration, and the client continues to cooperate.

-p and -P parameters characterize the client's costs and determine the cost of the services of the customs dealer, and filling of complex declarations leads to increased costs.

The matrix of the customer's payoff for different combinations of strategies for players A and B are shown in Table 2.

Table 2. The matrix of the payoff of the customer

Player B	B_1	B_2
A_1	b_{11}= -pn	b_{12}= U-p
A_2	b_{21}= W-P	b_{22}= u-P

Source: It is made by authors

The combination of A_1B_1 – the customs dealer fills only a simple declaration, as the customer uses his services for quite a long time. The player B pays the standard dealer services repeatedly, and the playoff of B is b_{11}= -pn. If there are large volumes of foreign trade and a significant number of delivered goods, the charges of the foreign trade operator on the customs dealer fees can be very high. In a limited range of goods such high costs, a low complexity of filling the declaration and the absence of significant changes in its content can encourage the client to abandon the customs dealer services and to continue to declare himself.

The combination of A_1B_2 – the customs dealer fills only a simple declaration, and the client goes away, hoping in the future to fill declarations himself. The player B pays the dealer services, and, in the case of leaving, he has the opportunity to benefit in self filling the declaration. In typical supply of unchanged range of goods, the filling of declarations by a pattern obtained from the customs dealer, it is a simple task to perform which you need only one specialist in customs clearance, as a foreign trade operator in the company structure. As a result, choosing such a strategy in this model the payoff of the player B can be b_{12}= U-p.

The combination A_2B_1 – the customs dealer uses various types of complex declarations, and the client continues to use his services. The player B pays for services on filling a complex declaration and benefits, expressed as a maximum reduction of time and costs for customs supply of foreign trade. At the same time, the constant cooperation with the same dealer allows the client to receive the most efficient service including delivery under varying conditions. The payoff of the player B in the case of continued cooperation is b_{21}= W-P.

The combination of A_2B_2 – the customs dealer uses various types of complex declarations, and the client leaves him, hoping in the future to fill declarations himself. The player B pays for the dealer services to fill a complex declaration, and as he leaves, it is possible to obtain benefits u in case of independent use of modern methods of customs clearance. In this case, the payoff of the player B is b_{22}= u-P.

Determination of the effects implementing the chosen strategy

Differences of payoffs depending on the combinations of strategies put the problem of searching for strategies for each player that can bring the greatest benefit and the smallest possible loss. Let us calculate the possible payoffs of the parties on the basis of the payment matrix from the table 1 and 2, wherein all variables are considered positive, besides $n>1$, $U>u$, $T>t$, $I>i$, $P>p$.

Table 3. Possible payoffs of the parties

	min min	max min	min max	max max
For the player *A*	*-T+I-s*	*i*	*I+T*	*In-t*
For the player *B*	*-pn*	*u-P*	*U-p*	*W-P*

Source: It is made by authors

If this game is performed once, the players would choose only cautious strategies, but when the game is replayed the situation is changing.

Indeed, let us suppose that the player A chooses the strategy A_1, and sticks to it as long as the player B continues to use his service. In this case, there is the combination of A_1 B_1, in which the long-term cooperation with the same client provides the maximum payoff of the customs dealer and the client's payoff is minimal.

High costs for customs clearance may lead to the fact that the customer decides to abandon the customs dealer and to fill declarations himself, which will result in the combination of A_1B_2. This corresponds to a situation in which the customs dealer always fills a simple declaration, and the client leaves him. The client can fill declarations himself without much effort, saving money on the dealer services. Then, after a few of these moves A understands it and decides to deviate from this condition choosing the strategy A_2, as a sole deviation will allow him to increase his payoff in filling a complex declaration, which will increase the one-payoff . In this case there is a situation A_2B_2 in which the payoff of the customs dealer is minimal, so the dealer will be forced to choose thestrategy A_2 - either by direct request of the client, or as a result of a significant reduction in demand for services on registration of simple declarations.

If we apply modern methods of declaration, it will reduce the total costs of the foreign trade operator, as well as improve his efficiency. The customer, realizing that he is not deceived, and is served with the help of modern tools, decides to stay as a leave and self-filling of declarations will be more difficult than copying a simple declaration. Thus, there is the situation A_1B_1.

However, in the absence of proper motivation and the control of the customer, the player A is more likely to decide to reduce his own costs and go back to the simple filling of declarations that is unnoticed at a low level of the customer qualification. As a result, there is the situation A_1B_1, corresponding to the initial position.

Thus, when the game is replayed many times the players can alternate strategies using not only one “pure” strategy but “mixed” strategies, combining “friendly” strategies at a certain frequency.

Nash equilibrium design

In terms of variability of possible cooperation strategies the issue is not just to find the optimal strategies giving a maximum payoff but to find those strategies that provide it when games are replayed. According to Nash theorem, the search should be carried out among the states in which the sole deviation of any of the players on the chosen strategy does not increase his payoff when others do not change their strategies (the players do not have incentive to deviation). Nash equilibrium in mixed strategies exists in every finite game, and is achieved by finding pairs of such strategies (x^*, y^*), for which the following conditions are fulfilled:

$$\begin{cases} \begin{cases} M_A(x^*, y^*) \geq M_A(1, y^*), \\ M_A(x^*, y^*) \geq M_A(0, y^*), \end{cases} \\ \begin{cases} M_B(x^*, y^*) \geq M_B(x^*, 1), \\ M_B(x^*, y^*) \geq M_B(x^*, 0), \end{cases} \end{cases} \qquad (1)$$

where x^* – the frequency of use ofthe strategy A_1 by the player A in equilibrium $(0 < x^* < 1)$, y^* – the frequency of the use of the strategy B_1 by the player B in equilibrium $(0 < y^* < 1)$, $M_A(x^*, y^*)$ – the statistical expectation of the payoff (the best average payoff) of the player A when using the strategy A_1 with the frequency x^* and the player B when using the strategy B_1 with the frequency y^*, $M_B(x^*, y^*)$ - the statistical expectation of the payoff (the best average payoff) of the player B when the player A uses the strategy A_1 with the frequency x^* and the player B uses the strategy B_1 with the frequency y^*, $M_A(1, y^*)$ and $M_A(0, y^*)$ - the statistical expectation of the payoff (the best average payoff) of the player A when using the strategy A_1 with the frequency 1 and 0, respectively, and the player B uses the strategy B_1 with the frequency y^*, $M_B(x^*, y^*)$ and $M_B(x^*, 0)$ - the statistical expectation of the payoff (the best average payoff) of the player B when the player A uses the strategy A_1 with the frequency x^*, and the player B uses the strategy B_1 with the frequency 1 and 0, respectively.

Searching for solutions of the given inequality systems by substituting the values of the payoffs we get a lot of decisions. For the subsystem (1), it is:

1) all cases of the form (0, y^*), where $0 \leq y^* \leq \dfrac{T + s + i - I}{t + 2T + s - i(n-1)}$;

2) all cases of the form $(x^*, \dfrac{T + s + i - I}{t + 2T + s - i(n-1)})$, where $0 < x^* < 1$;

3) all cases of the form (1, y^*), where $\dfrac{T + s + i - I}{t + 2T + s - i(n-1)} \leq y^* \leq 1$.

Many subsystem solutions (2) include:

1) all cases of the form $(x^*, 0)$, where $\frac{W-u}{W-u+U+p(n-1)} \le x^* \le 1$;

2) all cases of the form $(\frac{W-u}{W-u+U+p(n-1)}, y^*)$, where $0< y^*<1$;

3) all cases of the form $(x^*, 1)$, where $0 \le x^* \le \frac{W-u}{W-u+U+p(n-1)}$.

The decision of the game is the vector (x^*, y^*), composed of x^*, y^* common for the considered sets. The image of sets in graphs (Figure 1, for the sub-system (1) – a bold line, for the subsystem (2) – a dashed line) shows that there is one common point *C*, the result of the intersection of the broken lines, Nash equilibrium in the analyzed game.

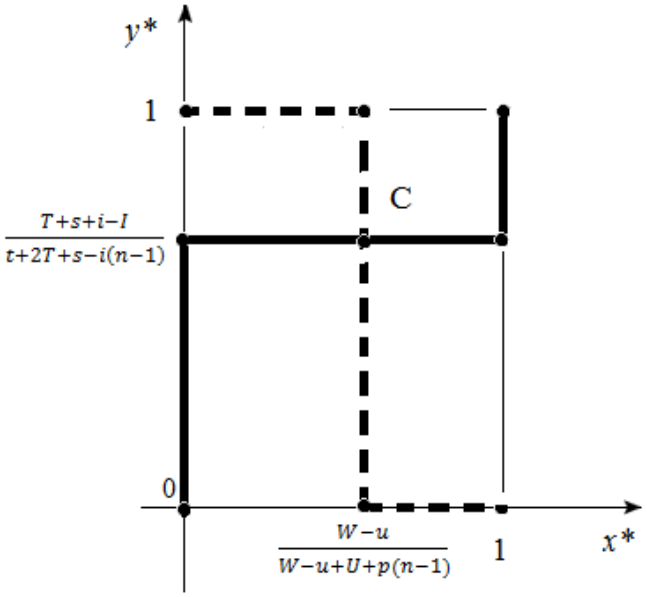

Figure 1. Graphical presentation of the game solution
Source: It is made by authors using the Mathcad program

Thus, when the game is replayed many times:

- for the player *A* it is optimal to use the strategy A_1 (filling simple forms of declarations) with the frequency $x^* = \frac{W-u}{W-u+U+p(n-1)}$ and to use the strategy A_2 (filling complex forms of declarations) with the frequency $1-x^* = \frac{U+p(n-1)}{W-u+U+p(n-1)}$, the average payoff is $M_A(x^*, y^*) = \frac{(W-u)(in-t)+(U+p(n-1))(I+T)}{W-u+U+p(n-1)}$;

- for the player B it is optimal to use the strategy B_1 (to stay) with the frequency $y^* = \frac{T+s+i-I}{t+2T+s-i(n-1)}$ and to use the strategy B_2 (to leave) with the frequency $1-y^* = \frac{t+T+I-inI}{t+2T+s-i(n-1)}$, the average payoff is $M_B(x^*, y^*) = \frac{-p(T(n+1)-I(n-1)+ns+t)+U(t+T+I-in)}{t+2T+s-i(n-1)}$.

.

It is easy to check that the equilibrium payoff of the players A and B exceeds their payoffs at maximum strategies.

On the basis of formulas for x^* and y^* for certain values of the parameters the authors obtain the optimal values of the application frequency of the strategy of the first and second players. Analyzing the optimal strategy of the customs dealer, which is determined by the frequency $x^* = \frac{W-u}{W-u+U+p(n-1)}$ of filling simple forms of declarations, we see that the higher the cost of a simple declaration to the client is, it is more useful to move to complex forms of declarations, and it is more likely that the customer will not leave the customs dealer. The higher the benefit of the client is, when he fills simple forms of declarations himself, the faster the customs dealer should go from these simple forms, as in the case of a complex declaration there are less chances for the customer to leave.

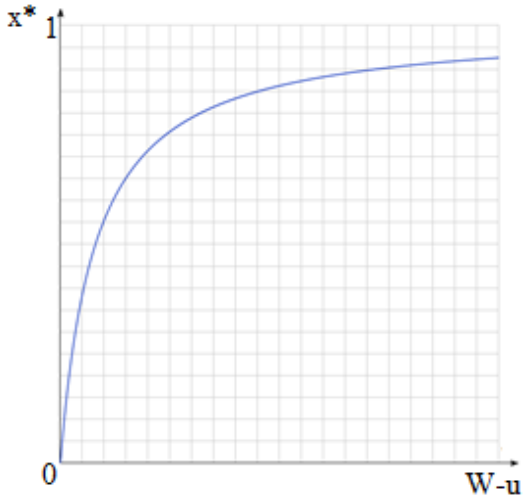

Figure 2. The graph of x^* (W-u)
Source: It is made by authors using the Mathcad program

The greater the difference between the payoff of the complex forms of declarations made by the customs dealer, and independent filling of complex forms of declarations is, the more the customs dealer uses simple forms of declarations (Figure 2), the risk of losing the customer is less because the

cooperation on the basis of complex forms indicates a greater benefit of the cooperation with the customs dealer.

Thus, constantly filling the simple declaration, the customs dealer can get a maximum income, if the client continues to cooperate with him. If there is a high demand for services in customs clearance it is advantageous for the customs dealer to use a simple form of declaration, giving him the maximum income. In addition, for customers filling of a large number of simple declarations will be economically inefficient. The consequence of this strategy of the customs dealer becomes a gradual loss of customers as a result of which the income from a small number of simple declarations is less than the potential income gained while filling the complex declaration. However, the use of complex forms of declarations may be disadvantageous to the customs dealer, if there is a high possibility that the customer can leave, so the optimal is the mixed strategy.

Discussions

The issues of FEA management were studied in detail in the scientific works of different authors, and the customs services (Gupanova, 2011), provided by foreign economic operators of customs authorities, and the services of the customs dealers were analyzed separately (Fedorenko, 2014). The evaluation of the role of customs dealers in the development of the foreign economic activity is also studied by foreign authors. For example, in the work of Customs Brokerage Services and Trade Facilitation: A Review of Regulatory Coherence is stressed the importance of customs dealers for the state and for the business environment (Llanto et al., 2013).

However, economic and mathematical tools and the analysis of interaction processes of the entities involved in the foreign trade are not fully used in recent studies.

Game approach to solving economic problems was first considered by J. Neuman & D. Morgenstern (2007). The founder of the Russian school of games theory N.N. Vorobyov (1984) highlights the nature of mathematical game theory as a key feature: “Game theory - a theory of mathematical models of optimal decision making in conflict situations.” At the moment, if we talk about the economic context, it is not only the use of game-theoretic methods to fairly traditional problems of industrial organization, and, in fact, to all the variety of economic issues (Pecherskii &Belyaev, 2001).

Nash equilibrium design as a mathematical framework for the analysis of the strategy efficiency of the foreign trade operator was used in the work of T. Do et al. (2015), dedicated to the problem of determining the strategy for the effective development of a major international port. In the course of the study T. Do et al. (2015) designed mathematical modeling of interaction between two competing entities of the near-customs infrastructure.

With regard to the organization of the customs service in the Russian Federation, game theory is almost not used by modern researchers. N.V. Babichev (2010) used game theory to model the process of cooperation between the customs authorities and foreign trade operators avoiding payment of customs duties.

As part of this article game theory is applied to model the process of interaction between foreign trade operators and customs dealers.

Conclusion

The conducted economic and mathematical modeling led to the conclusion that the use of tools of game theory makes it possible to justify the selection of mathematical relations strategy in the customs service. This emphasizes the importance of the behavior of the other party. For example, the customs dealer may receive the maximum income by constantly filling simple declarations, but only in condition if the client continues to cooperate with him. If there is a high demand for services in customs clearance the customs dealer advantageously uses such a strategy that gives him the maximum profit. However, registration of a large number of simple declarations is often economically inefficient for the customers, which will lead to a change in their behavior. The consequence of this strategy is that the customs dealer looses his customers as a result of which the income from the filling of a small number of simple declarations is less than the potential income from the filling of complex declarations. However, the use of only complex forms of declarations may be disadvantageous to the customs dealer, as there is a possibility that the customer can leave. Thus, we can conclude that the optimal strategy would be the mixed one. The use of economic and mathematical tools of game theory, analyzed in this article, allows finding the optimal strategy of interaction between participants of the customs service system among themselves.

Recommendations

The results of this research can be used in the practice of managing a complex of services in the field of customs in the modern stage of the development of the foreign trade activity at Russian enterprises, requiring revising established solutions and minimizing the financial costs of customs support. In addition, the research results can be used in the development and implementation of training programs for professionals in the field of management of foreign trade activity at enterprises.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Roman V. Fedorenko isAssociate Professor of Samara State University of Economics, Samara, Russia.

Nadezhda A. Zaychikova isAssociate Professor of Samara State University of Economics, Samara, Russia.

Dmitiy V. Abramov isAssociate Professor of Samara State University of Economics, Samara, Russia.

Olga I. VlasovaisPhD, associate professor of Russian State Vocational Pedagogical University, Ekaterinburg, Russia.

References

Babichev, N.V. (2010) Modelling of the interaction between customs authorities and traders, evading of customs duties.*Vestnik of Astrakhan state technical university, series: economics, 2*, 113-117.

Dixit, A. & Nalebuff, B. (2010) The Art of Strategy: A Game Theorist's Guide to Success in Business and Life. New York: W. W. Norton & Company. 512p.

Do, M.H., Park, G., Choi, K, Kang, K. & Baik, O. (2015) Application of Game Theory in Port Competition between Hong Kong Port and Shenzhen Port. *International Journal of e-Navigation and Maritime Economy, 2*, 12-23.

Drucker, P.F. (2001) Management Challenges for the 21st Century. Harper: Business. 224p.

Fedorenko, R. V. (2014) Development of Outsourcing in the Customs Sphere. Asian Social Science; *10(20),* 202-209.

Ghyczy, T., Bolko von Oetinger, B. & Bassford, C. (2002) Clausewitz on Strategy. Moscow: Alpina Publisher. 218p.

Gupanova, Y. E. (2011) Actual Problems of Customs Services' Quality Management Poblems. *Journal of the Russian Customs Academy, 1*, 5-12.

Llanto, G, Navarro, A., Detros, K. & Ortiz, K. (2013) Customs Brokerage Services and Trade Facilitation: *A Review of Regulatory Coherence*. Retrieved from https://docs.google.com-/viewer? url=http://dirp4.pids.gov.ph/webportal/CDN/PUBLICATIONS/pidsdps1348.pdf

McNeilly, M. (2014) Sun Tzu and the Art of Modern Warfare: Updated Edition. Oxford University Press. 328p.

Neuman, J. & Morgenstern, O. (2007) Theory of Games and Economic Behavior.Princeton: Princeton University Press. 776p.

Pecherskii, L. A. & Belyaev, A. A. (2001) Game theory for economists. St. Petersburg: Publishing house of the European University. 342p.

Schelling, T. (1981) The Strategy of Conflict. Harvard: Harvard University Press. 328p.

Vorobyov, N. N. (1984) Fundamentals of the theory of games. Noncooperative games. Moscow: Science. 497p.