TRANSACTIONS & INSTITUTIONS[1]

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Abstract

Theoretical positions which characterized self dependence of elements of system "transactions – costs – institutions" was elaborated. It was shown that the economical transactions may be divided into transactions for information search, market analysis, law defense, defense from opportunism and production promotion. The transactional costs classification is possible by the description as the nonproduction costs and on the base of the enterprise market potential structure. The transactional costs on the creation and development of the stable norm of interaction between economic agents may be determined as the cost estimation of the economic institutions. The empirical measured results of academic organizations mobility dependences from transaction costs were shown as the practice illustration for present research.

Key words: *transactions, transaction costs, institutions, transaction function.*

1. Introduction

The rapid development of institutional economics model approaches from the investigations of Nobel Prize winners R. Coase, D. Horth, O. Williamson and E. Ostrom quickly passed the development dynamics of institutional economics theoretical platform.

In spite of the fact that the institutional economics is based on such terms as "transactions', "transaction cost", "economic institutions" there is no correct dependence between this terms and isn't correct classifications of this terms up to the present time.

The elaboration of dependences between transactions, costs and institutions and possible classifications of these terms were the purpose of investigation. Also these terms, there definitions and types were the *objectives* of investigation. The results of the number of researchers and own results were the main *data* of investigation.

2. Transaction dimension of institutions

Despite the fact that the term 'transaction' traces its history back to over 80 years ago since the famous work of Commons J. *(Commons J., 1931),* the nature and kinds of transactions have not been shed enough light on yet. Obviously, the economic theoreticians find it much easier to handle the categories of higher rank such as 'transaction costs' and 'economic institutions' due to their quantative and qualitative certainty. However, transactions remain the initial element for the analysis of institutional economy, with the understanding of their nature and kinds forming a solid ground for modern economic models.

If by economic agents we imply the subjects of economic relations taking part in production, distribution, exchange and consumption of economic benefits, then the meta-production relations between them are determined by the processes of ownership transfer and activity restriction.

The most large-scale definition of transaction was offered by a Nobel prize-winner Williamson O. in 2009: 'transaction occurs when a good or service is transferred across a technologically separable interface; the end of one production stage and the beginning of another.' *(Williamson O., 1991)*
Giving a brief summary, by transaction we understand the process of ownership transfer or activity restriction between economic agents.

How we may put into order all the firm's transactions?

The answer on this question may be found on the base of the concept of the firm's market potential *(Popov E., 2004)* which illustrated various transactions on the firm level.
Due to the structure of the market potential all the nonproduction activity are the various transactions. So, the analytical activity includes the transactions of information search and transactions of market analysis. From other side the communication activity includes the transactions of product promotion, defense from opportunism and property rights defense.

Therefore, the firm's transactions may be divided on these main groups:

- transactions of information search;
- transactions of market analysis;
- transactions of defense from opportunism;
- transactions of property rights defense;
- transactions of product promotion.

The concept of transaction costs was first introduced by R. Coase in the 30s of the last century in his article 'The Nature of a Firm'. It was used to provide an insight on the existence of such a hierarchical structure as a firm, being oppositional to a market. R. Coase explained the emergence of these 'islands of consciousness' with their respective advantages in terms of transaction cost minimization. Specificity of a firm functioning he thought to be brought about by the suppression of a price mechanism and its substitution with the inner administrative control *(Coarse R., 1937)*.
In the framework of contemporary economic theory transaction costs have gained a variety of treatments.

Due to the various firm's transactions one may obtained the system of transaction costs (figure 1).

Figure 1: Types of product and transaction costs in the firm
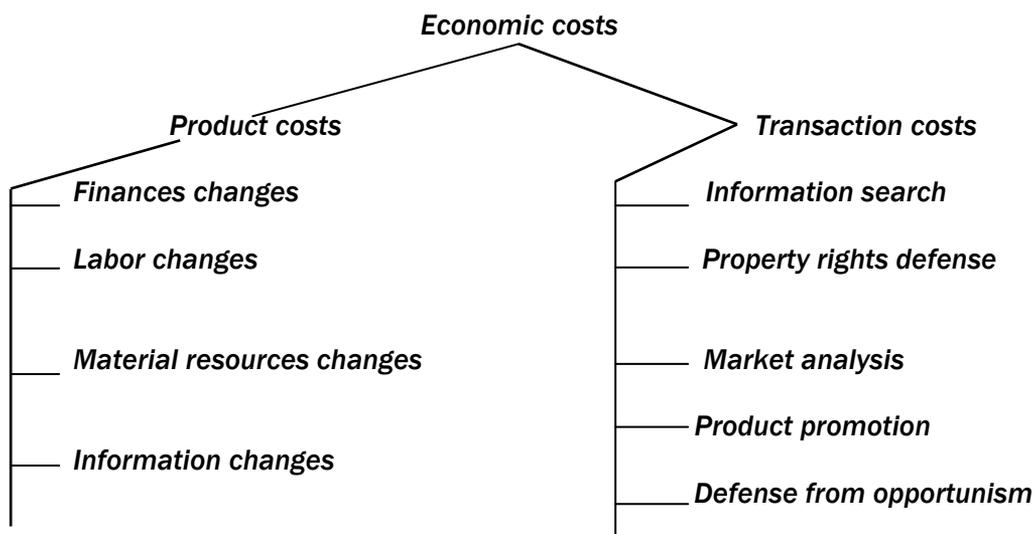
K. Arrow approaches transaction costs as the costs of economic system exploitation. He compared the influence of transaction costs on economy with the one of friction in physics. Such suggestions triggered conclusions that the closer the economy comes to the Walras's general equilibrium model the lower the level of transaction costs it demonstrates, with the opposite being as true *(Arrow K., 1994)*.

D. North determined transaction costs as consisting of 'the costs of assessment the useful properties of exchange goods and the costs of property rights security and enforcement on their execution' *(North D., 1981)*. These costs he believed to be the source of social, economic and political institutions.

Taking the notions of Arrow K. and North D. for granted, we take the value estimation of economic institution to be the transaction costs of establishing the norm of interaction between economic agents.

3. Theoretical results

The results as theoretical positions which characterized self dependence of elements of system "transactions – costs – institutions" were elaborated.

Firstly, it was shown that the economical transactions may be divided into transactions for information search, market analysis, law defense and protection from opportunism, production promotion. The correspondence to the nonproduction activity of firm is the criteria of systematization for such types of transactions. This classification of transactions is possible due to the firm's market potential structure. The theoretical significance of such dividing of economical transactions consists in the development of this terms essence from the investigations of J. Commons and K. Polanyi.

Secondly, the transaction costs classification is possible by the description as the nonproduction costs and on the base of the firm market potential structure. In this case it was correctly to divide the transaction costs for information search, market analysis, law defense, protection from opportunism and production promotion. The theoretical significance of such dividing of transaction costs consists in the development of transaction cost typology by T. Eggertsson.

Thirdly, the transaction costs on the creation and development of the stable norm of interaction between economic agents may be determined as the cost estimation of the economic institutions by K. Arrow and D. North. Such estimation of economic institutions allows to possible quality comparison and prognosis of the institutional structure progress in various economic systems.

To sum up, from the perspective of academic scientific activity the transaction costs include the nonproductive expenses of participating in scientific conferences, as well as of preparing the scientific papers for publication, with the costs of generating new knowledge by scientists being considered as the productive costs.

4. Procedure of empirical study

The choice of transaction costs estimation in terms of the research productivity analysis has been stipulated by the different nonproductive financing of scientific organizations along with their equal budgetary funding based on the staff number. In such a case, the assessment of transaction costs allows to comprehend the publication activity potential and the scientific mobility of academic organizations.

In the previous studies, the author singled out two patterns of academic institutions' transaction costs. In an academic sector of science, lion's share of transaction costs of knowledge gain proved to be of two kinds – the costs of information search and research publication, as well as those of negotiations *(Popov E., Vlasov M., 2011)*.

The costs of information search are the costs of information exchange with outer and inner environment of an organization, as well as the costs of information monitoring.

The costs of negotiations are the costs of preparing and signing the contract, including the costs of communication, strategic costs (such as entertainment expenses) for production firms. For

academic organizations the negotiation costs embrace the transport and travel costs, as well as the conference fees.

To obtain the compatible results, we have selected four organizations of the same science profile and one social science profile institution of the Ural Branch of the Russian Academy of Sciences as representative sampling.

Having received the agreement from the heads of these scientific institutions, we filed the accounting reports, the data on publication activity and scientific mobility in the period of 2005-2009. Treating this information yielded the empirical dependences of the change in the number of publications and conference research reports on the change in transaction costs. The preliminary discussion of the empirical study results made obvious some distinct correlations between the publication dynamics and conference reports and the change in transaction costs in every single organization under study.

Given the initial hypothesis of the significant impact the age structure in an organization has on the research productivity of academic institutions, we assigned the ordinal number to the peer science profile organizations due to the increase in the number of mature researchers' share (Table 1).

The analysis of the Table 1 revealed two interesting facts. First of all, the science profile organizations under study are characterized by a substantial age gap: the number of most active researchers in the age of 40 to 49 is no more than 13%. It seems to be most likely due to some researchers having moved to the real economy sector in the 90s of the last century. Secondly, this generation gap is a little less critical in the institutions of social science profile: the share of 40 year old researchers is over 16%. We can predict an increase in the share of researchers for the humanity and social discipline organizations in the 2000s.

Table 1: Distribution of academic organizations under study due to the share of mature (over 50 year-old) and young (up to 39 year-old) researchers

Conventional name of organization	Share of mature researchers, %	Share of young researchers, %
First organization	0.35	0.54
First organization	0.59	0.28
Third organization	0.63	0.29
Forth organization	0.73	0.14
Social science organization	0.50	0.33

The results obtained facilitate the understanding of how transaction costs affect research productivity. It is of great interest to compare the dynamics of publication activity with that of the similar academic organizations.

It is worth mentioning that these econometric dependencies were obtained not only for the overall number of publications and conference reports, but for the same values according to the Russian and world magazines and conferences, respectively.

5. Publication activity

Let us turn to the dynamics of publication activity in the academic organizations under consideration. By publication activity we mean the empirically determined exponential dependences of the change in the published article volume (measured in printer's sheet) on the change in organization's transaction costs.

Table 2 illustrates the indicators of exponents for the empirical dependences obtained. The exponent indicators of the total publication activity dynamics on the transaction costs are seen to be in inverse proportion to mature researchers' shares in the given research organizations. Undoubtedly, the increase in the share of young researchers in the RAS institutions cannot but stimulates creativity which is reflected in the publication of scientific papers.

Table 2. Exponent indicators of publication activity dynamics (in printer's sheets)
on the change in transaction costs

Conventional name of organization	Exponent indicators		
	Total number of articles	Articles in Russian papers	Articles in foreign papers
First organization	0.36	0.46	0.13
Second organization	0.17	0.08	0.29
Third organization	0.12	-0.06	0.52
Forth organization	0.01	-0.06	0.17
Social science organization	0.47	0.46	0.01

The results of empirical study demonstrate the increase in 1% of young researchers' share to bring about the 1% growth of the publication activity, with the comparison between the first and the forth organizations being done through rounding up to the first significant digit. This, in turn, means the growth of the exponent in 7 %, being proportional to the number of research publications. To put it in other words, the 1% increase in young researchers' share allows the 7% ($e^{0,01}$) increase of publication activity, with the transaction costs rising by 1% only.

For the sake of comparison, the table gives the results obtained for the social science profile organization. As it was expected, the dynamics of article publication dependent on the transaction costs bears here high indices. The matter of the fact is that the number of articles published is the major indicator of productivity for the researchers in social sciences and humanities. These researchers can not report on their achievements with patents and discoveries as scientists do. Another specific feature for the organizations of social science profile is the predominance of having the papers published in Russian magazines.

The overall result of young researchers' effect on the research productivity is also proved when the publication activity is measured in the number of articles published instead of assessing it in publication volume.

Another significant issue deemed important for the analysis is comparing the publication activity separately for Russian and foreign scientific journals. Here, the situation seems ambiguous. Even in this case, the share of young researchers in the organizations studied is directly proportional to the research activity dynamics when the articles are published in Russian journals. However, as far as publications in foreign journals are concerned, this dynamics correlates with the share of mature researchers in the organizations.

Addressing the dependencies obtained, we believe that trying to gain scientific expertise the young researchers tend to aim at the easier accessible Russian journals. Nonetheless, submitting the articles in foreign papers takes expertise of mature researchers. That is why the increase in the share of mature researchers in an organization results in greater dynamics of extra transaction costs return on publication activity in foreign papers. However, this result is only a part of overall publication activity, with the driving force being young researchers.

Moreover, the dependence of the outside right column in the Table 2 can be explained by introducing the rating system of assessing the research productivity in the course of reforming the RAS in 2007-2009 (this period covers the database of the present study). According to the rating estimates suggested, publications in foreign papers have higher rank than publications in the Russian ones. Hence, there is a tendency for mature researchers to have their articles published in foreign papers and, as a result, to get higher grade.

To draw an intermediate line at the analysis of the publication activity for peer science organizations, the increase in the share of young researchers in an organization is proved to be a solid ground for a distinct growth in the dynamics of academic organizations' publication activity.

6. Academic mobility
We carried out the similar analysis of academic mobility. By this phenomenon we understand the empirically determined exponential dependences of the change in the conference

reports on the change in organization's transaction costs. Table 3 gives the indicators of exponents for the empirical dependences obtained.

The dependences involved do not have a pronounced correlation between the young researchers' share and academic mobility. Nevertheless, we succeeded in acquiring some tendencies. Table 3 demonstrates that along with the decrease in the share of young researchers from the second to the forth organization, there is a decrease in the academic mobility dynamics dependent on the change in organization's transaction costs. Eventually, the 1% increase in the share of young researchers may bring about the 5% growth in academic mobility, with the comparison between the second and the forth organizations being done through rounding up to the first significant digit. This, in turn, means the growth of the exponent in about 31% ($e^{0,05}$), being proportional to the rise in the conference report number.

**Table 3. Exponent indicators of academic mobility dynamics
(in the number of conference reports) on the change in transaction costs**

Conventional name of organization	Exponent indicators		
	Total number of conference reports	Reports in Russian papers	Reports in foreign papers
First organization	0.56	0.31	2.67
Second organization	0.92	0.95	0.57
Third organization	0.40	1.12	-0.07
Forth organization	0.28	0.26	0.30
Social science organization	0.43	-	-

Thus, the 1% increase in the share of young researchers with the 1% increase in the transaction costs may raise the academic mobility by 36%. This is certainly the maximum estimate taken from the comparison between the second and the forth organization, however, it allows to assess the effect of young researchers on the conference participation.

In other words, the increase in young researchers' share makes a solid ground for boosting the academic mobility with a rise in transactional costs related, first of all, to travel expenses and conference fees.

A relatively low rate for the social science profile organization proves the fact that the academic mobility dynamics supported by transaction costs has fairly similar conditions independently on the organization profile.

Nevertheless, Table 3 shows the rate of academic mobility in Russian conferences to rise with the increase in the share of mature researchers (from the first to the third organization). We are bound to explain this by the traditions and experience of mature researchers to participate in conferences. It also shows a broad range of possibilities of such participation for Academy's mature researchers.

It is our pleasure to note that along with the increase in young researchers from the third to the first organizations, academic mobility rises sharply, with it being quite large quantitatively. We believe this is due to young researchers' eagerness to 'conquer the scientific Olympus', as well as their better abilities to speak foreign languages.

Therefore, an increase in the number of young researchers along with the related low rise in the transaction costs involves abrupt growth in the participation of Russian researchers in foreign scientific conferences. In other words, the dynamics of overseas scientific mobility is largely determined by the participation of young researchers in symposiums, setting and conferences.

However, both the publication activity and, even in greater extend, academic mobility are determined by transaction costs. Given the under-financing of the RAS, there is an issue of transaction cost minimization. To approach the problem of how to save transaction costs and transfer the surplus on bolstering publication activity and scientific mobility we need to consider the transactional function.

7. Transaction function notion

Most studies on transaction costs refer to their functional dependence on various factors in a qualitative or mediated way. Thus, J. Benassy, investigating competitive market mechanisms, suggested that market equilibrium between the supply of commodities and the customers' ability to buy these commodities should result from the strategic function of conformity between the price announcements from different market players. However the author did not go further but gave a general description of functional transaction dependences, supporting market signals concerned (*Benassy J., 1986*)

E. Heinesen considered the possibility of simulating the transaction function of macroeconomic institutional dimensions (*Heinesen E., 1995*). The works of Ch. Koldstad and M. Turnovsky were concerned with the transactions assumed for the information alignment of prices of goods of different quality, with the need for the transaction function to describe the market asymmetry dynamics being put forward (*Kolstad Ch. D., Turnovsky M.H.L., 1998*).

It is of particular significance to introduce the function of transactions in the labor market, because it is where there is a need for information search, as well as where negotiations over optimal salary between an employer and an employee take place. F. Alvarez and M. Veracierto were confident that modeling the functional transaction dependences on various endogenous factors will assist in designing a sensible policy of labor regulation (*Alvarez F. and Veracierto M., 1999*)

Comparing the firms in the US and Japan in terms of transaction costs on maintaining partnership, S. Globerman, Th.Roehl and S. Standifird faced the problem of transactional function design. Nevertheless, the authors only managed to list the expenses capable of functional dependence of transactions on the inter-firm interaction parameters (*Globerman S., Roehl Th. W., Standifird S., 2001*)

The transaction function of money has been demonstrated by J. Vuchelen and L. Hove. They have showed that the introduction of the euro as a common payment unit of the EU required the significant transaction costs which can be described in terms of a model (*Vuchelen J. and Hove L.V., 2002*).

E. Rachardjo, D. Mirchandany and K. Joshi focused on the transaction costs of search and verification of the Internet websites in Indonesia. The authors pointed out that assessment of cost dynamics can be performed via introduction of the transactional function *(Rahardjo E., Mirchandani D., Joshi K., 2007)*.The similar simulation of transactions for managing the flow of goods with the help of taxes has been suggested in the recent study of A. Cunha *(Cunha A.B., 2007)*, but here again the explicit form of transactional function has not been discussed.

The analysis of the bulk research done into the introduction of transaction function has shown that the explicit representation of transactional function is likely on the basis of classic definitions given for the nature of transaction costs followed by the verification of the correlation developed.

The classic definition of transaction costs was coined by T. Eggertsson *(Eggertsson T., 1998)* implying that 'transaction costs are costs arising when individuals exchange the property rights on economic assets and secure their own exclusive rights'. However, he points out that there is no clear definition of transaction costs due to the absence of the adequate definition of production costs in the neo-classical economic theory. R. Matthews offers the following definition (*Matthews R.C.O., 1986*): 'fundamental idea of transaction costs is that they consist of the costs for drawing and negotiating the contract, as well as the costs of policing and enforcing the contract execution, which are opposite to the production costs, being by nature the expenses of contract execution'.

The latter definitions let set apart three key dependences of the transaction costs on the economic system parameters. According to T. Eggertsson, the transaction costs are directly proportional to the number of economic agents, negotiating between one another. And the transaction costs from the R. Matthews's standpoint are inversely proportional to the number of contracts signed and norms established to guarantee the contracts considered.

If by the contracts signed we understand formal institutions (i.e. established norms of interaction between economic agents), and by the norms that guarantee the contract execution – non-formal institutions, than it is possible to simulate quantitatively the dependence of the transaction costs on the major institutional parameters of economic systems.

In such a case, the transactional function will have the following form (*Popov E., 2008*):

$$TC = B \, N^\lambda \, / \, (F^\mu + I^\nu), \qquad\qquad (1)$$

where TC – transaction costs of the firm (economic agent in a general case); *B* – coefficient of proportionality, measured in cost terms; *N* – the number of economically active agents (actors), having signed institutional agreements with the firm (or a certain agent); *F* – the number of formal institutions (contracts); *I* – the number of non-formal institutions; *λ, µ, v* - the coefficients of elasticity of actors' use, formal and non-formal institutions to form the institutional environment.

In the equation (1) the formal and non-formal institutions are presented as additive items, because they compliment, but do not overlap the economic activity with their norms. In other words, in every single situation the particular contract relations might be determined as the formalized (classical or neo-classical) norms, or as the form of non-formalized (implicit) agreements between economic agents.

Analytical presentation of the transaction function allows the prediction of institutional environment development for economic actors, and as a consequence, to ensure sensible management in a particular economy sector.

Studying the ratio (1) in terms of transaction costs minimization brings us to the fact that the more formalized and non-formalized economic institutions are created, the less costs it will take to perform the agreements achieved.

In other words, the analytical representation of the transactional function proves transaction costs minimization under forming the settled norms of economic activity.

The transaction costs minimization will also take place when there are a settled list of academic journals and publication requirements. In such a case, the expenses of a researcher on information search will be brought to a minimum.

Building a settled schedule for the scientific conferences and the conference requirements may as well cause a reduction in the transaction costs of scientific mobility. Here, the travel costs and the arrangement fees will be minimized by means of early booking the tickets and accommodations, as well as by earlier, and more optimal, arrangement of fee payments.

Consequently, forming a stable institutional structure for the academic journals and conferences allows the transaction cost minimization, which in turn may bolster the publication activity and the scientific mobility of academic institutions when spent to ensure scientific publications and participation of young researchers in conferences.

8. Conclusion

The present empirical study carried out with the purpose of assessment for the dependences of the academic productivity institutions measured numerically on the transaction costs on scientific activity allowed the following theoretical and practical results.

Firstly, an increase in young researchers' number along with a little rise in the transaction costs of information search results in the jump in publication activity of scientific organizations, with the share of young researchers in the organizations studied being directly related to the scientific activity dynamics when the articles are published in Russian academic journals (institution of publishing). When the research results are published in foreign papers, the number of articles published is directly proportional to the number of mature researchers in these academic institutions.

Secondly, an increase in the number of young researchers, though making up a solid basis for the scientific mobility enhancement (institution of academic mobility), entails the extra transaction

costs related both to the travel expenses and the conference fees. However, the dynamics of scientific mobility in Russian conferences rises with an increase in the share of mature researchers.

Thirdly, an increase in the number of young researchers along with the related low rise in the transaction costs involves abrupt growth in the participation of Russian researchers in foreign scientific conferences. In other words, the dynamics of overseas scientific mobility is largely determined by the participation of young researchers in symposiums, setting and conferences.

Fourthly, according to the author's model of transaction function, a decrease in the transaction costs of publication activity is likely to take place if a list of academic journals, as well as the stable submission requirements, are settled.

Fifthly, building a settled schedule for the scientific conferences and the conference requirements may as well cause a reduction in the transaction costs of scientific mobility. Consequently, forming a stable institutional structure for the academic journals and conferences allows the transaction costs minimization, which in turn may bolster the publication activity and the scientific mobility of academic institutions when spent to ensure scientific publications and participation of young researchers in conferences.

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