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EFFECTS OF MORAL HAZARD ON COOPERATION ARRANGEMENTS – SOME EXPERIENCES FROM HUNGARY¹

*EFEKTY NADUŻYĆ W POROZUMIENIACH O WSPÓŁPRACY
– WYBRANE DOŚWIADCZENIA Z WĘGIER*

Key words: cooperation, Hungary, moral hazard, trust

Słowa kluczowe: współpraca, Węgry, nadużycia, zaufanie

Abstract. The paper examines the effect of moral hazard on the machinery sharing cooperation arrangements of Hungarian fieldcrops farms. The results of empirical research confirm that the moral hazard is present – although not significant – in the relations between farmers. Statistical examinations prove that the moral hazard has negative impact on cooperation activity. This impact can be divided into two parts: direct and indirect impact, which means that the moral hazard can reduce the cooperation willingness of farmers by the destruction of trust. Our results also demonstrate that the low cooperation activity we can see these days can be but partly explained by the moral hazard within the surveyed group of farmers.

Introduction

The positive economic impacts of cooperation between farmers in many areas of agricultural production – with special regard to machinery use – have been examined by researchers both in Europe [Larsen 2008] and in the United States [Long, Kenkel 2007]. The above researchers point out that the partnership of farmers might have a major role in improving the profitability of farms and reducing the costs of production. In this sense, the cooperation of farmers in the agricultural economies of countries with structural and efficiency problems [Takács-György, Sadowski 2005] can be especially important in the achievement of goals of sustainable agriculture.

In the 1990s, there were some trials in Hungary (too) to introduce the capital-efficient machine operation arrangements and partnerships (e.g. machinery ring), but these were not as successful as it was hoped by the professionals at that time [Nagy, Takács 2001]. The empirical research on the subject points out that the reason for failure is the low cooperation willingness of farmers [Takács et al. 2006, Baranyai 2010]. The negative experiences have also motivated the present research. The main objective is to identify those factors which may explain the low cooperation willingness of farmers regarding joint machinery use. On the basis of an explanatory model of new institutional economics, our study analyzes the effect of moral hazard on machinery sharing arrangements.

Theoretical background

In agriculture – like in other sectors – the farmers work together within several groups and they make oral or written agreements (contracts) for their economic activities. The analysis of these contracts and the organizational arrangements set up this way is one of the most researched fields of New Institutional Economics (NIE).

Some of the theoretical approaches of NIE focus on different aspects of contracts on cooperation: the agency theory typically deals with the area of asymmetric information; the transaction costs theory concentrates on areas related with the costs of concluding the contracts; while the issues of residual control rights are covered by the theory of property rights. These theories, of course, overlap each other in many aspects, while the different theoretical approaches are extremely useful in the differentiated examination of contracts. The present paper describes the examinations made on the basis of principal-agent theory.

The agent theory – especially its normative direction, the principal-agent theory – stresses the asymmetric information and the consequent opportunistic behavior. The asymmetric information is always present – although differently – if cooperation is set up between two or more parties. Within the frames of principal-agent theory the authors distinguishes two types of problems due to information asymmetry between cooperating partners: moral hazard and adverse selection. The issues of adverse selection are not discussed by the present paper.

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Moral hazard sets in when at least one input is not observable in the cooperation process and the quantity of this input cannot be determined in the contract [Royer 1999]. Following the suggestion of the problem many authors tried to develop an optimization scheme within the question. The special references dealing with the question offer a lot of special models within principal-agent theory. These are (according to Larsen [2008]): multiple tasks model [Holmstrom, Milgrom 1991]; double moral-hazard model [Agrawal 2002]; and, team production model [Alchian, Demsetz 1972]. This latter model is relevant in regards to our subject, because the team production model discusses the situation – as a basic case – when production is performed together with more farmers. In general, the cooperation between farmers can much rather be regarded as the network of farmers (agents) than in principal-agent relation. Nevertheless, it often happens in machinery sharing that the farmer temporarily acts as a principal or as an agent and these roles are changed from time to time.

In the literature of team production, the concept of moral hazard was introduced by Holmstrom [1982]. The main point is the following: when the partners in the team are rewarded on the basis of joint efforts and at least one input cannot be observed by the others, it will encourage the individual agents to withdraw from the joint efforts (deadhead behavior). This type of moral hazard is referred to as “effort moral hazard”. Another type of moral hazard is discussed by Hart [1995]. When inputs (e.g. machinery, tools, equipment, etc.) are divided among agents in the production process, it will drive them to excess use or misuse of the assets, because the user of the asset does not see the full value of the asset since he does not own it, or only partly. This risk is the so-called „asset moral hazard”. In this case the information asymmetry comes from the imperfect controlling rights above assets because they are in joint use or lease with other farmers. The limited ability of control may cause damage to the assets because the necessary repair and maintenance is not made.

The moral hazard emerging in the economic relations between farmers results the reduction of trust level [Larsen 2008], and owing to this our research has been extended in this direction, too.

Trust is very important in human relations, thus it is very significant in the cooperation among farmers, too. Questions of trust – as research topic – have become into the focus of interest in many scientific fields during the recent decades.

Trust as a subject of study in (agricultural) economics is a relatively new phenomenon in spite of the fact that it has been used widely in sociology, anthropology and other “soft” disciplines. However, in the last 25 years the number of publications on trust in the economics literature has grown vastly [McAllister 1995, Sholtes 1998, Szabó 2010].

We used Sholtes’s trust model in our research (based on earlier research experiences – Takács et al. 2006). Sholtes [1998] placed trust in the matrix of loyalty and capability. We can speak about trust if the faith in loyalty as well as in capability has high values among the partners.

Materials and methods

Our examinations are based on primary databases. In order to explore the effect of moral hazard on machinery sharing arrangements we have performed questionnaire survey in the South-Eastern part of Hungary, in the Southern Great Plain region, in Békés county. The research involved private farmers of three statistical micro regions (NUTS-4 level), namely Orosháza, Békéscsaba and Mezőkovácsháza. We collected information about 132 private farms (n= 132) during the survey².

A questionnaire was constructed in the frames of the empirical research, the questions of which covered the following topics: moral risk, trust, faith in loyalty and capabilities, cooperation activity [Baranyai 2010]:

1. Moral hazard³ (MOR):

² It is important to note that in statistical terms we do not regard the sample representative either at national or county level, but on the basis of local-level representativeness of the sample we presume that the results collected from the examined region can be generalized because the region is not much different from the key agricultural areas of the country in regards to economy and society.

³ As it was discussed in Theoretical background, the references describe two types of moral hazard, under the titles of “effort moral hazard” and “asset moral hazard”. Upon designing the research and drafting the questionnaire we did not aim to cover the issues of “effort moral hazard”, we rather concentrated on the aspects of “asset moral hazard”. The questions were set up accordingly. The survey, however, proved that our presumptions were wrong: the dimensions of moral hazard cannot be clearly separated, or rather the questions we asked were not suitable for defining the categories. In many cases we found that the responses to our questions asked for measuring typically the “asset moral hazard” belonged to the concept of “effort moral hazard”. For example, the negative experiences of farmers from lending the machinery were due not to the failure or breakdown of assets, but rather because they considered the cooperation one-sided. They thought that they gave more in the partnership and made less benefit. In this approach the responses to the negative experiences could not be limited merely to the “asset moral hazard”, but rather to the questions of “effort asset hazard”. Considering this, the further examinations in present paper are generally discussed under the question of moral hazard.

- Q1. Have you had any negative experiences during machinery services based on mutuality?
- Q2. Have you had any negative experiences in case of providing machinery or assets for use?
- Q3. Have you had any negative experiences in case of joint ownership and use of machinery and assets?
 - If yes, please evaluate their degree on a scale 1 to 7 (0 – no; 1 – nothing, no big damage to me; 7 – big problem, I suffered great losses)
- 2. Trust (TR):
 - Q4. How much do you trust your fellow farmers in general? (scale from 1 to 7).
- 3. Faith in loyalty (LOY):
 - Q5. I think my fellow farmers definitely keep their words (scale from 1 to 7),
 - Q6. I think my fellows would never do any harm to me even if the conditions of farming changed (scale from 1 to 7).
- 4. Faith in capability (CAP):
 - Q7. I trust that if any of my fellow farmers provides any machine work to me, the quality of his work will be the best possible under the given conditions (scale from 1 to 7),
 - Q8. I trust that if any of my fellow farmers provides any machine work to me, it will be done at the most appropriate time, under the given conditions (scale from 1 to 7),
 - Q9. I trust that if I lend a machine or tool to any of my fellow farmers, he will use it with the due precautions (scale from 1 to 7).
- 5. Cooperation activity (COOP):
 - Q10. Please evaluate the individual machinery operations from the aspect of the assets on your farm, how typical is the machinery labor based on mutuality (0 – never; 1 – rare: 1-2 occasion/year; 2 – median: 3-4 occasions/year; 3 – frequent: more than 5 occasions per year),
 - Q11. Please evaluate the machinery of your farm, how many times they are lent to others for use! (0 – never; 1 – rarely: 1-2 times/year; 2 – median: 3-4 times/year; 3 – frequent: more than 5 times a year),
 - Q12. Please classify each machine of your farm, whether it is in joint ownership with other farmers! (0 – no; 1 – yes).

Out of the 11 items in table 1 we have formed aggregated indices by each group of question ((MOR, LOY, CAP and COOP). The weights for the indices formed by weighting process were generated with PCA method.

The impact of moral hazard on the cooperation activity was examined with the so-called „way-model” which is the series of regression models built on each other. The logical interrelations of our model is drawn up in figure 1.

The model was used for examining the impact of moral hazard (MOR), as an exogenous variable, on the cooperation activity (COOP). Besides the direct impact (λ_1) of moral hazard we can also analyze its indirect effect manifesting through the changes of trust: by using the Sholtes model we take into account that the moral hazard directly (γ_1) and through changing the trust-determinants (LOY and CAP) (σ_1 and π_1) indirectly influences the level of trust which in turn also affects the cooperation activity (λ_2). Four regression models can be described on the basis of figure 1:

Model I.: $COOP = \lambda_1 * MOR + \lambda_2 * TR + RESID_1$ (1)

Model II.: $TR = \gamma_1 * MOR + \gamma_2 * LOY + \gamma_3 * CAP + RESID_2$ (2)

Model III.: $LOY = \sigma_1 * MOR + RESID_3$ (3)

Model IV.: $CAP = \pi_1 * MOR + RESID_4$ (4)

Where: λ_j ; γ_j ; σ_j ; π_j : partial standardized coefficients (beta); $RESID_j$: residuals.

By drawing the equations together, the following formula can be drawn up, where the beta products express the strength of each „way”:

$$COOP = \lambda_1 * MOR + \gamma_1 * \lambda_2 * MOR + \sigma_1 * \gamma_2 * \lambda_2 * MOR + \pi_1 * \gamma_3 * \lambda_2 * MOR + \sum_{i=1}^4 RESID_i \quad (5)$$

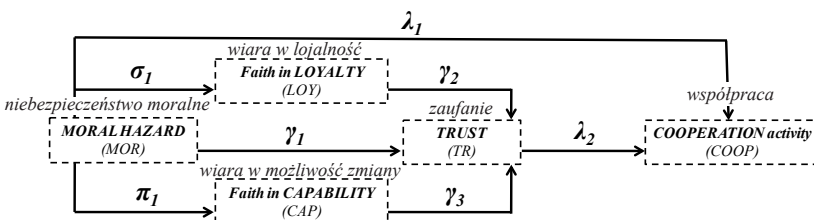


Figure 1. The logic of way-model structure
 Rysunek 1. Struktura logiczna modelu drogi
 Source: own study
 Źródło: opracowanie własne

Results

The descriptive statistics of variable set in the regression models are listed in table 1. The experiences of the empirical research prove that the moral hazard is obvious among the surveyed farmers but its average level (2.42) cannot be regarded significant (the theoretical maximum is 7.00).

Sholtes [1998] led back the trust to two determinants: the faith in the loyalty and the capabilities of fellow farmers. According to the results, the respondents believe a bit more in the capabilities (CAP) of fellow farmers that they fulfill the undertaken tasks in appropriate quality, than in their loyalty (LOY) that they always fully keep their promises.

The general level of trust (TR) is 3.77, which is weaker than median. As it is well-known, the respondents used a scale from 1 to 7 to evaluate their own level of trust towards fellow farmers. The replies were distributed as follows: 21% of the sample categorically declared, that: „today you can trust nobody in the world...!”, they indicated the trust level 1. Another 19% chose level 2, thus indicating that they do not really trust their fellows. The weight of those with intermediate trust levels (scale 3-5) was 30%, while the upper end (scale 6 and 7) of trust scale was marked by 17% and 13%.

The average level of cooperation activity (COOP) is 1.47, which means a really modest activity. Examining it by the fields of cooperation the most typical is providing services on mutual basis, almost 50% of farmers participate in cooperation like this, while this ratio is less than 40% regarding the cooperation based on lending machinery to each other. These cooperation arrangements are occasional and cover only one or two work phases or machines. The joint ownership of machines, as form of cooperation, is very rare.

In the next part of research we ran four regression models of the way model and the main results are summarized in table 2. In model I, we estimated the impact of moral hazard (MOR) and trust (TR) on cooperation activity (COOP). The results have statistically proven that the moral hazard and faith in the economic relations affect the cooperation activity: as it could be expected, the moral risk has negative, while the trust has positive determination. Beta values demonstrate that the partial impact of moral risk is stronger, it affects the cooperation activity to a greater extent than trust.

In model II, the impact of MOR, LOY and CAP independent variables is also statistically proven in respect to the trust level (TR). It can be seen that the moral risk reduces – although very weakly – the level of trust between partners. Another interesting experience that there is significant difference between the „strength” of

Table 1. Descriptive statistics of the variable set
Tabela 1. Zmienne statystyki opisowej

Descriptors/ Charakterystyki		MOR	LOY	CAP	TR	COOP
Mean/Średnia		2.42	3.59	3.94	3.77	1.47
CI 95%	lower bound/ przedział górný	2.11	3.26	3.72	3.41	1.28
	upper bound/ przedział dolny	2.73	3.92	4.16	4.14	1.66
St. Dev./Odchylenie standardowe		1.61	1.92	1.27	2.13	1.03
Min/Max		0.00/5.82	1.00/7.00	1.33/7.00	1.00/7.00	0.00/3.01

Source: own study

Źródło: opracowanie własne

Table 2. Summary of results of regression models

Tabela 2. Wyniki modeli regresji

Models/ Modele	Standardized Coefficients (Beta)/Współczynnik standardowy (beta)		R ²	F-sig.	
I.	MOR: $\lambda_1 = -0.328^{**}$ (CI95%: -0.240 – -0.416)	TR: $\lambda_2 = 0.214^*$ (CI95%: 0.126 – 0.302)	0.260	0.000	
II.	MOR: $\gamma_1 = -0.115^*$ (CI95%: -0.009 – -0.221)	LOY: $\gamma_2 = 0.675^{**}$ (CI95%: 0.559 – 0.791)	CAP: $\gamma_3 = 0.336^{**}$ (CI95%: 0.206 – 0.466)	0.776	0.000
III.	MOR: $\sigma_1 = -0.293^*$ (CI95%: -0.113 – -0.473)			0.089	0.002
IV.	MOR: $\pi_1 = -0.527^{**}$ (CI95%: -0.367 – -0.687)			0.278	0.000

* significant at the 0.05 level and ** significant at the 0.01 level/* istotne na poziomie 0,05 oraz na ** poziomie 0,01

Source: own study

Źródło: opracowanie własne

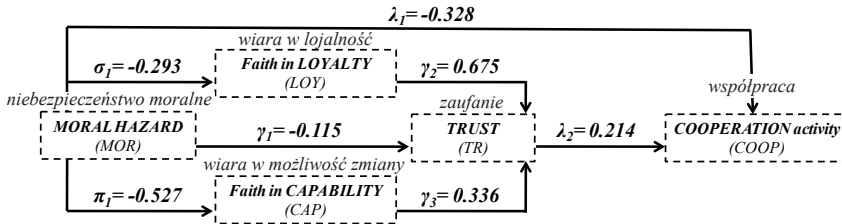


Figure 2. Way-model complemented with regression coefficients

Rysunek 2. Model drogi uzupełniony o wyniki modeli regresji

Source: own study

Źródło: opracowanie własne

trust-determinants of Sholtes model (the CI does not overlap!), which means that the faith in loyalty is much more important regarding the trust than the CAP.

Models III and IV estimated the impact of moral hazard on LOY and CAP depending variables. The examinations have revealed significant relations and also proved that the moral risk erodes the faith in capabilities rather than loyalty.

By fitting the estimated coefficients in the way model, we can analyze the impact of moral hazard on cooperation activity (Fig. 2). We have presumed in our model that the moral risk affects the cooperation activity in four „ways”: (1) indirectly, the strength of this impact is -0.328 (λ_1); (2) through indirect impact on trust (TR), the strength of which is -0.025 ($\gamma_1 \times \lambda_2$); (3) by reducing the faith in loyalty, where the degree of the whole impact is -0.042 ($\sigma_1 \times \gamma_2 \times \lambda_2$); and (4) through the impact on the changes of faith in capabilities, the strength of which is -0.038 ($\pi_1 \times \gamma_3 \times \lambda_2$). The main empirical results are described in figure 2.

Conclusions

The study analyses the impact of moral hazard on cooperation activity by using a way-model. In our model we divided the impact of negative experiences of cooperation on the cooperation activity into direct and indirect part, where the direct impact was explained through the decline of trust. In fact, we did nothing else than divided the Pearson-coefficient ($r = -0.433$) between independent (MOR) and depending variable (COOP) into two parts. Our results prove that the direct impact of moral hazard is more significant (-0.328) because it gives about 75% of the Pearson-correlation value, while the totality of impacts appearing through the changes of trust represent the remaining 25% ($-0.025 + -0.042 + -0.038 = -0.105$). All the above confirm that the moral risk, on the one hand, can directly and negatively affect the cooperation activity of farmers, but an indirect impact should also be considered, which becomes obvious through the decline of trust between farmers.

Summing up the experiences of the research, we can declare that although the statistical analyses have proven the negative impact of moral hazard on cooperation willingness but we cannot state in general that the low cooperation willingness in the machinery sharing arrangements can obviously be attributed to moral risk.

Our results raise the possibility of continuing the research in two directions. On the one hand, by expanding the size of the sample by ensuring the national representativeness. Due to the area limits (Békés county) and the low number of elements, the above results cannot be generalized at national level. On the other hand, it will be necessary to involve further explanatory factors in order to explain the cooperation activity. Besides new institutional economics, the game theory can also help in this work.

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Streszczenie

Przedstawiono analizę wpływu nadużyć w ramach porozumień o współpracy w zakresie wzajemnego udostępniania sprzętu rolniczego pomiędzy gospodarstwami specjalizującymi się w produkcji roślinnej na Węgrzech. Wyniki badań dowodzą, że występują przypadki nadużyć, lecz ich znaczenie jest znikome w odniesieniu do relacji jakie występują między rolnikami. Jednocześnie analizy statystyczne wykazały, że przypadki takie mają negatywny wpływ zarówno bezpośredni, jak i pośredni na współpracę.

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