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MORAL HAZARD PROBLEM AND COOPERATION WILLINGNESS: SOME EXPERIENCES FROM HUNGARY

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

Keywords: *cooperation; Hungary; moral hazard; trust.*
JEL code: *D23, Q13.*

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ПРОБЛЕМИ МОРАЛЬНОГО РИЗИКУ І ГОТОВНОСТІ ДО СПІВПРАЦІ: НА ПРИКЛАДІ УГОРЩИНИ

В статті розглянуто вплив морального ризику на співпрацю в питаннях спільного використання техніки на угорських рільничих фермах. Результати емпіричного дослідження підтверджують, що моральний ризик присутній, хоч і незначною мірою, у відносинах між фермерами. Статистичне обстеження доводить, що моральний ризик негативно позначається на діяльності, пов'язаній зі співпрацею. Цей вплив може бути розділений на дві частини: прямий і непрямий; це означає, що моральний ризик може зменшити готовність до співпраці у фермерів через зниження довіри. Результати також показують, що низький рівень співпраці в даний час частково пояснюється моральним ризиком в групі опитаних фермерів.

Ключові слова: *співпраця; Угорщина; моральний ризик; довіра.*

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ПРОБЛЕМЫ МОРАЛЬНОГО РИСКА И ГОТОВНОСТИ К СОТРУДНИЧЕСТВУ: НА ПРИМЕРЕ ВЕНГРИИ

В статье рассмотрено влияние морального риска на сотрудничество в вопросах совместного использования техники на венгерских полеводческих фермах. Результаты эмпирического исследования подтверждают, что моральный риск присутствует, хоть и незначительно, в отношениях между фермерами. Статистическое обследование доказывает, что моральный риск негативно сказывается на сотрудничестве. Это воздействие может быть разделено на две части: прямое и косвенное; это означает, что моральный риск может уменьшить готовность к сотрудничеству у фермеров путем снижения доверия. Результаты также показывают, что низкий уровень сотрудничества в настоящее время отчасти объясняется моральным риском в группе опрошенных фермеров.

Ключевые слова: *сотрудничество; Венгрия; моральный риск; доверие.*

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Introduction: background, motivation and aim. 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 partnership of farmers might have a major role in improving the profitability of farms and reducing the production costs. In this sense, cooperation of farmers in agricultural economies of countries with structural and efficiency problems (Takacs, Gyorgy, Sadowski, 2005) can be especially important to achieve the goals of sustainable agriculture.

In the 1990s, there were some attempts 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, Takacs, 2001). The empirical research on the subject points out that the reason for failure is low cooperation willingness of farmers (Takacs 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 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 — farmers work together within several groups and they make oral or written agreements (contracts) for 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 within 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 the areas related to the costs of concluding 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 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.

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 task model (Holmstrom, Milgrom, 1991); double moral-hazard model (Agrawal, 2002); and team production model (Alchian,

Demsetz, 1972). The latter model is relevant 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, cooperation between farmers can rather be regarded as a network of farmers (agents) than in principal-agent relation. Nevertheless, it often happens in machinery sharing that a farmer temporarily acts as a principal or an agent and these roles are changed from time to time.

In the literature on team production, the concept of moral hazard was introduced by Holmstrom (1982). The main point is the following: when partners in a team are rewarded on the basis of joint efforts and at least one input cannot be observed by others, it will encourage 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 (Sucala et al., 2010). 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.

A lot of authors suggested solutions for the problem of moral hazard in the team production model. They mostly agree that the major factors in reducing risks are social norms (Larsen, 2008), peer pressure (Barron, Gjerde, 1997) and dynamics (Radner, 1986). The former ideas are basically based on the fact that cooperation agreements among farms are often intertwined with personal (emotional) ties (friendship, neighbourhood, family), thus the reduction of efforts of any partys in the cooperation could be "expensive" for him in social sense, so it reduces moral hazard.

Moral hazard emerging in economic relations between farmers results in the reduction of trust level (Larsen, 2008), and due to this our research has been extended in this direction, too.

Trust is very important in human relations, thus it is very significant in cooperation among farmers, too. Questions of trust — as research topic — have become 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. Some of them contain one or more definitions of trust or some classifications of categories related to the term. Here only some very important references will be made.

To be able to understand the development of trust in cooperatives and possible ways to influence it, different authors (McAllister, 1995; Hansen et al., 2002; Wilson, 2000; Borgen, 2001; Szabo, 2010 etc.) classify many types of trust (cognitive and affective types etc.) as well as different levels of trust in cooperative organizations (between two members, among multiple members in general, as well as between members and management).

One of the most cited papers on this matter is by McAllister (1995). The author identifies two main types of trust: affective and cognitive. The former is more subjective and emotional bonded, while the latter is mainly based on rational calculations and empirical evidence. Hansen et al. (2002) develop these categories further and also use a process based approach. They also distinguish two types of trust: among members and also between members and management.

Wilson (2000) classifies different trust hierarchies, and gives an overview and critique of social capital and trust, including references to agribusiness economics. He also examines the changing types of trust in business relationships (trust mix) over time and states that weak trust can be changed into semi-strong trust or later even into strong trust. He also argues that trust which alters the terms of trade can reduce transaction costs and create additional (time) resource and flexibility for management.

Based on the large volume of agricultural economics literature, Sodano states "that trust is essential to guarantee the success of cooperative relationship" (Sodano, 2002). Referring to the existing literature, she also emphasizes "the role of trust in facilitating vertical contractual relationship as well as horizontal coordination in the agricultural sector through grower associations and cooperatives" (Sodano, 2002). In searching for a "workable" definition of trust, Sodano presents two main types of trust: (1) trust as a form of social organization (impersonal trust), and (2) trust as an exchange coordinating means or governance structure (interpersonal trust).

Bakucs et al. (2008) give a theoretical background of trust in agricultural cooperatives, including references for more detailed reviews. Fairbairn (2008) in searching for the cooperative advantage and questioning whether cooperatives should have social goals as well, apart from economic ones, states: "To realize the importance of trust and social capital to cooperatives — the importance of culture — is to some extent to return to the roots of cooperation (Fairbairn, 2008). Torok, Hanf (2009) also argue that "trust plays an important role for farmers to join a marketing cooperative in transition countries".

We used Sholtes's trust model in our research, basing on earlier research experiences (Takacs et al., 2006). Sholtes (1998) placed trust in the matrix of loyalty and capability (Figure 1). We can speak about trust if faith in loyalty as well as in capability has high values among partners.

		Capability "The value I consider my partner is capable and qualified"	
		Low	High
Loyalty "The value I believe my partner likes me and he will support me in future"	High	SYMPATHY	TRUST
	Low	MISTRUST	RESPECT

Source: based on Sholtes (1998).

Figure 1. **Level of trust among business partners on the basis of loyalty to each other and the presumed capability level**

Material 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, Bekes county. The research involved private farmers of

3 statistical microregions (NUTS-4 level), namely Oroshaza, Bekescsaba and Mezokovacshaza. We collected information on 132 private farms (n = 132) during the survey.

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.

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 (see Table 1).

*Table 1.* **The questions of the survey**

Moral hazard[1] (MOR)   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)
Trust (TR)   Q4. How much do you trust your fellow farmers in general? (scale from 1 to 7)
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)
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)
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 a year.)   Q11. Please evaluate the machinery of your farm, how many times they are lended 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)

Source: own construction based on Baranyai, 2010.

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[1] As it was discussed in theoretical background, we 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 concentrate 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 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.

Out of 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 2:
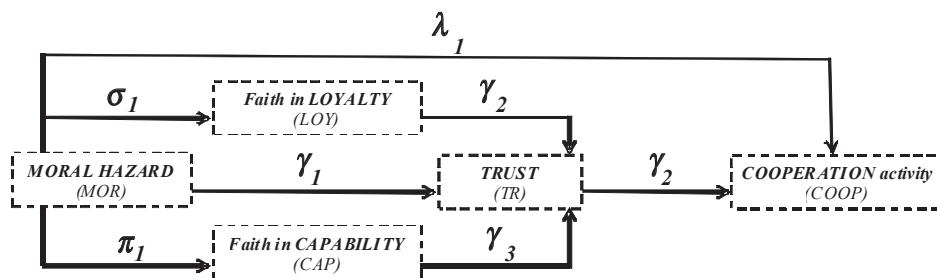
Source: Own construction.

Figure 2. **The logic of way-model structure**

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). 4 regression models can be described on the basis of Figure 2:

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

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

Model III: $\qquad LOY = \sigma_1 \times MOR + RESID_3$ $\qquad$ (3)

Model IV: $\qquad CAP = \pi_1 \times MOR + RESID_4$ $\qquad$ (4)

where: λ_i; γ_i; σ_i; π_i: partial standardized coefficients (beta); $RESID_i$: residuals.

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

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

Results. The descriptive statistics of variable set in the regression models are listed in Table 2. The experiences of the empirical research prove that moral hazard is obvious among the surveyed farmers but its average level (2.42) cannot be regarded as significant (the theoretical maximum is 7.00).

Sholtes (1998) led back 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 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%.

Table 2. **Descriptive statistics of the variable set**

Descriptors		MOR	LOY	CAP	TR	COOP
Mean		2.42	3.59	3.94	3.77	1.47
CI 95%	Lower Bound	2.11	3.26	3.72	3.41	1.28
	Upper Bound	2.73	3.92	4.16	4.14	1.66
St. Dev.		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 calculation.

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 the 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 the research we ran 4 regression models of the way model and the main results are summarized in Table 3.

Table 3. **Summary of the results of regression models**

Models	Standardized Coefficients (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*

*Remark:* * significant at the 0.05 level and ** significant at the 0.01 level.
Source: own calculations.

In model I, we estimated the impact of moral hazard (MOR) and trust (TR) on cooperation activity (COOP). The results have statistically proven that moral hazard and faith in the economic relations affect the cooperation activity: as it could be expected, moral risk has negative, while 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 moral risk reduces — although very weakly — the level of trust between partners. Another interesting experience that there is significant difference between the "strength" of trust-determinants of Sholtes model (the CI does not overlap!), which means that faith in loyalty is much more important regarding trust than 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 moral risk erodes 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 (Figure 3). 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 3.
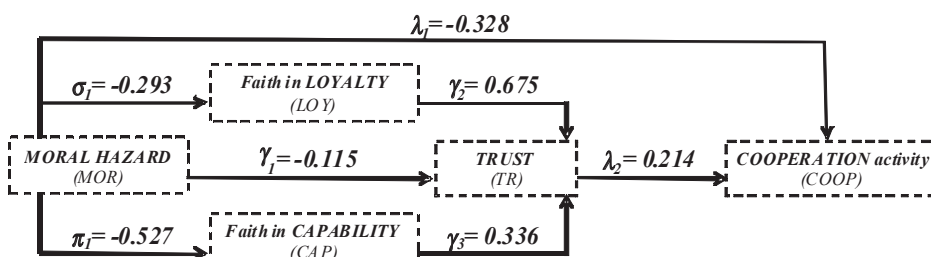
Source: own construction.

Figure 3. **Way-model complemented with regression coefficients**

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 then 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 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 represen-

tativeness. Due to the area limits (Bekes county) and the low number of elements, the above results cannot be generalized at the 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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