HUMAN CAPITAL AND THE AGRARIAN STRUCTURE IN TRANSITION: MICRO EVIDENCE FROM ROMANIA

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Abstract

This paper examines determinants of the agrarian structure in transition economies with an emphasis on the role of rural households' human capital. Farm restructuring has resulted in a broad range of farm types, such as co-operatives, partnerships, individual farms and combinations of them. In our theoretical model the fact that household resources are allocated into different organization modes is attributed to the utility maximization strategy of heterogeneous agents deriving income from uncertain sources in the face of absent or imperfect factor markets. Empirical results from a multinomial logit model estimated with data from two-year nation-wide survey of Romanian rural households support the hypothesis that the current agrarian structure is primarily determined by both the human capital characteristics of and economic risks faced by the households.

Key words: human capital, rural households, farming, economic transition, Romania
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This paper examines determinants of the agrarian structure in transition economies with an emphasis on the role of rural households' human capital. Farm restructuring has resulted in a broad range of farm types, such as co-operatives, partnerships, individual farms and combinations of them. In our theoretical model the fact that household resources are allocated into different organization modes is attributed to the utility maximization strategy of heterogeneous agents deriving income from uncertain sources in the face of absent or imperfect factor markets. Empirical results from a multinomial logit model estimated with data from two-year nation-wide survey of Romanian rural households support the hypothesis that the current agrarian structure is primarily determined by both the human capital characteristics of and economic risks faced by the households.

1 Introduction

Under central planning, the agrarian structure in former communist countries was dominated by large-scale collective and state farms. Economic reforms involved both the privatisation of agricultural production assets and the restructuring of state and collective farms which resulted in important changes in the agrarian structure. Several farm types, such as individual farms, partnerships, co-operatives and various combinations of them emerged. A broad range of farm types can be found in most transition countries, but their relative importance differs considerably across the region (Lerman, 2001; Swinnen et al., 1997). One of the transition countries with most variety in the agrarian structure is Romania. Currently in Romania, besides the dominant individual farm organization mode, hybrid modes such as combinations of individual farming and co-operative farming, as well as part-time farming are also widely observed (e.g., Davidova and Thomson, 2003; MAF et al., 1997; Rizov, 2003).

The incentive of a rural household to adopt a particular farm organization is determined by the trade-off between the advantages and disadvantages characterizing each of the farm types. For example, advantages of individual farming include lower transaction costs associated with reduced inefficiencies due to the right of co-determination. Potential disadvantages include the loss of economies of scale in risk management, input purchasing, and marketing. Further, there might be "exit costs" for co-operative members to leave the collective farm, and "entry costs" to start up an

individual farm. These costs are affected by land reform, privatisation and transformation regulations (Mathijs and Swinnen, 1998).

While the role of human capital during transition has well been recognized, no study formally models or empirically estimates its impact on the agrarian structure in transition economies. In the development literature, the role of human capital is emphasized in the "agricultural ladder" hypothesis (Higgs, 1973; Rao, 1971, Reid, 1976; Spillman, 1919). At the bottom of the ladder, agents with a low level of human capital are employed as landless hired workers. The next step up the ladder involves cultivating some land either individually under a sharecropping contract or under some other form of co-operation. For this, agents need to have a higher level of both farming skills and capital. The ladder's top rang is the owner-operator. In related work Agrawal (1999), Allen (1982), Hallagan (1978), Newbery and Stiglitz (1979) have developed screening models where different contracts are offered by landlords as way of screening tenants of different skills.

This framework is useful for understanding the post-communist transformation of the agrarian structure. Rural households, beneficiaries of the land reform, face the choice of managing their land and acting as entrepreneurs, leasing the land to others, or looking for alternative options (e.g., co-operation) to utilize their assets. This paper develops an analytical framework where the fact that resources are allocated into different organization modes can be attributed to the utility maximization strategy of rural households with differential asset portfolios, both in terms of quality and quantity. Households that become individual operators are expected, relative to ones choosing co-operative farming, to possess greater business acumen as well as conventional labour force skills and better access to financial capital, which minimizes their production risk exposure. This selection process is complicated by factor market imperfections characterizing transition.

The generalization we introduce in our analysis includes (i) allowing for differential efficiency or farming skill levels across agents and (ii) allowing agents to be risk averse and considering their risk premiums explicitly. The framework developed here provides an explanation of several structural issues in transition agriculture such as the existence of hybrid modes of production organization and the co-existence of different organization modes. Furthermore, we examine empirically, by the means of a multinomial logit model, the organization mode choices of rural

households, using unique two-year household survey data from Romania, a country characterized by a diverse agrarian structure.

The paper is organized as follows: In section 2, the analytical framework is developed. In section 3, the empirical methodology, data and variables are described. The estimation results are reported in section 4, followed by discussion and conclusion in section 5.

2 Analytical Framework

Skills, risks and household production

Human capital determines the farming and in general, managerial skills of rural households.[1] The market for managerial skills in agricultural production is imperfect due to two fundamental information problems. First, human capital, and thus managerial skills, vary widely across households, but cannot be judged *ex ante* (Johannisson and Senneseth, 1993; Knight, 1957). Second, due to the high nature-dependence of agricultural production, it is very difficult to measure managerial input *ex post* (Allen and Lueck, 1998; Binswanger and Rosenzweig, 1986; Feder, 1985). As a result, Akerlof's (1970) "lemon dilemma" applies to the market for managerial skills in agricultural production.

Thus the output from the household's endowment of capital and labour depends in general on the farming efficiency or skills of the agent managing the farm operation and on the economic risks under which the household operates, assuming it is risk averse.[2] Economic risks are determined by the institutional arrangements and functioning of capital/input markets, thus the risk measure controls for these important factors.[3] Five modes of organization (see further for details) are analysed: individual farming, co-operative farming, hybrid farming where individual farmers participate in a co-operative, part-time farming, and absentee-landowners not engaged in farming at all.

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[1] In general, human capital increases agent's productivity in self-employment through its managerial skill effect. At the same time human capital endowment directly and positively affects agent's employment opportunities (Becker, 1965; Foster and Rosenzweig, 1993; Sahn and Alderman, 1988).

[2] We refrain here from any intrahousehold decision-making and coordination issues and consider an integrated household or an agent (as in e.g., Ahituv and Kimhi, 2002).

[3] The impact of institutional factors and capital market imperfections on agricultural production organization, specifically in the case of Romania, is analysed in more detail in Rizov et al. (2001) and Rizov (2003).

In individual farming both labour input and managerial skills, affecting farming efficiency are supplied by the household. One could think of the individual farmer's input as a vector of inputs in managerial/supervisory functions, pure labour, maintenance of assets, etc. In contrast, in co-operative farms the labour supplied is of wage type and usually is more narrowly specialized while the management functions are performed collectively by members or their representatives.

Agricultural production also requires capital inputs such as land, machinery, seeds, fertilizers, etc. The use of these inputs depends on the level of technology and availability. Because in our analysis we are particularly interested in the ability and managerial effort of agents as determinants of the agrarian structure, we have suppressed the capital inputs in the notation.[4] However, in the empirical analysis we explicitly control for capital endowment. Thus the household production function may alternatively be thought of as a reduced-form profit function, $q=ef(l)$, where e is the efficiency or skill factor that is determined by the agent's human capital endowment (and more generally, by her knowledge or technology) and l is the labour input in farming.[5] f is a standard production function for an agent with efficiency factor e=1. It is assumed that $f(0)$ is a positive constant equal to the required rate of return on the assets employed.

When the agent solely manages the farm (as it is in the case of individual farming) the efficiency factor e would equal e^I, corresponding to the individual farmer's efficiency level. When farming is organizer in a co-operative most of the managerial and allocation decisions would be carried out collectively and the efficiency factor e would equal e^A, which is assumed to be a constant and exogenous to the individual farmer's efficiency level. In a hybrid mode of organization, the managerial functions and thus the effects of efficiency factors are divided between individual farming and co-operative farming, in proportions corresponding to the asset shares allocated to these

[4] For example, Rees and Shah (1986) apply similar modelling approach in their analysis of self-employment. Moreover, households received farm assets as a result of the land reform, which was just completed at the time of analysis. Therefore, the farm capital endowment is, to a large extent, exogenous and not affected by accumulation over the household life cycle while human capital is.

[5] With the current state of technology, we assume the same level of labour intensity both in individual farms and in the new private co-operative farms. The monitoring and moral hazard problems are associated mainly with application of farming skills and making managerial decisions, so that the factor intensity can be considered the same across farming modes. Moreover, in Romania during transition new private co-operative farms that were

production modes. Thus if the share of assets used in individual farming is r and that allocated to co-operative farm is (1-r), the efficiency factor e of using household assets is $e=[(1-r)e^A+r\theta e^I]=[e^A-r(\theta e^I+e^A)]$, where θ is a multiplicative risk factor in individual farming, with a mean value of 1.

The risk factor θ captures various uncertainties, in individual farming compared to farming in a co-operative, related to production, prices of inputs and outputs, etc. In co-operative farming these uncertainties are minimized by different smoothing mechanisms. The distribution of θ is known but its exact value for the period is unknown. Due to the fact that θ is unknown in any specific moment, agents cannot indirectly infer other agents' efficiency from knowledge about the actual (observable) output.

Thus, the output, q of the household assets is $q=ef(l)=[e^A-r(\theta e^I+e^A)]f(l)$. Note that when r=0 (co-operative farming mode), e reduces to e^A and when r=1 (individual farming mode) - to θe^I. Also note that when the household (farm) labour input is zero (with the managerial input being exogenous to the household), the production organization reduces to the absentee-landowner mode.

As a labour supplier, household has a fixed amount of total labour per period, which is normalized to 1 and a market determined opportunity cost, w per unit of labour from working in the labour market where it can sell its labour.[6] Thus the household has a market determined reservation utility level, $U^M=U(w)$.[7] Similar assumptions apply to the utility maximization of the household as a capital asset owner so that U^M is also affected by the household capital endowments. U is a standard utility function, implying that agents are risk averse.

The household maximizes the expected utility (EU) of its income Y, which is given by:

$$Y=R^A+r\theta e^I f(l)+(1-l)w. \qquad (1)$$

In this notation, the household receives income $R^A=(1-r)e^A f(l)$ from a co-operative farm. This income is independent from the managerial skills of the household. In addition, from the share of assets

established are far smaller than their predecessors and moral hazard problems are much less of an issue (Davidova and Thompson, 2003).

[6] For simplicity of notation we do not distinguish formally between different types of household labour; l is labour input in farming and the reminder (1-l) is the off-farm labour.

allocated to an individual farm, r ($0 \leq r \leq 1$), the household receives income in return to its skills applied in farming.[8]

In maximizing its utility the household chooses an optimal share r^* of assets allocated to individual farming, subject to expected utility EU from the allocation being no less than household's reservation utility, U^M. The expression for r^* is derived by considering a two-stage decision problem of the household (see the Appendix) so that:

$$r^* = (e^{I^*} - e^A)/2\pi(r=1), \qquad (2)$$

where, $e^{I^*} = \theta e^I$. $\pi(r=1)$ is the Arrow-Pratt income risk premium defined by the condition that the expected utility of the risky income with no insurance should equal the utility of the expected income minus the risk premium.

As evident, only the difference in skill levels and not their absolute values is relevant to the organization mode choice.[9] The range of the risk premium is important to be considered as well. Several empirical studies (Nabi, 1986; Roumasset and Uy, 1987; Roumasset, 1995) have suggested a range of the risk premium 5-20 per cent of the output. We can use equation (2) to determine the optimal organization mode for a variety of situations.

Optimality of various organization modes

■ *Co-operative farming mode*: The co-operative farming mode ($r=0$) is the optimal organization for farming households if the optimal allocation share is $r^* \leq 0$. That is if the numerator in equation (2) is zero or negative, i.e., $e^{I^*} \leq e^A$. Thus, main motivation for choosing co-operative

[7] In general, the wage rate w and the reservation utility of different labour suppliers would vary with their level of human capital and thus with their level of skills (see further for discussion).

[8] This formulation also captures the absentee-landowner mode of organization where the reservation utility of income derived from off-farm work is higher than the expected utility derived from farming. Then $R=R^A$ is exogenous capital (rental) income determined by the market and w is the wage rate.

[9] Our model is also capable of explaining puzzling differences in decolectivization across transition countries. For example, the sharp contrast in the shift to individual farming in Albania compared to Slovakia can be explained by the substantial differences between relative efficiencies of individual farmers, compared to co-operatives, in these two countries.

farming mode is the higher efficiency of the co-operative compared to that of some individual farmers.[10]

■ *Individual farming mode*: It follows from equation (2) that the individual farming mode is the optimal organization if $r^*\geq 1$, that is, the numerator is greater than or equal to the denominator. Then $e^{I^*}-e^A\geq 2\pi(r=1)$. Note that in the first best world with zero risk premium, the right hand side of the above equation will be zero so that the individual farming mode will be optimal whenever $e^{I^*}\geq e^A$. In the real world and especially in the conditions of economic transition, risk premium can be significant. Thus the individual farming mode can be optimal only when the farming efficiency of the household is superior to that of the co-operative by a considerable amount. According to empirical studies this difference in efficiency is about 20 percent (see, e.g., Mathijs and Swinnen, 2001).

■ *Hybrid farming mode*: Hybrid farming is optimal when $0<r^*<1$. Thus by combining the results for the previous two modes we can write the following condition for hybrid farming to be optimal: $e^{I^*}-2\pi<e^A<e^{I^*}$. Note that in the first best world ($\pi=0$), the hybrid mode of farming would be rarely observed, i.e., only when $e^A=e^{I^*}$. However, in the conditions of economic transition with high production risks, individual farming becomes less attractive due to the high risk-premium of individual farmers who absorb themselves alone the entire risk of agricultural production. In most cases, risks decline as one moves towards a hybrid-farming mode. Clearly the latter may be optimal for a certain range of e^{I^*} above e^A ($0<e^{I^*}-e^A<2\pi(r=1)$). Thus it can be seen that reduction in the cost associated with risk that hybrid farming entails is the primary motivation for choosing this mode of organization.

■ *Absentee-landowner mode*: From the first order condition (equation A1 in the Appendix), marginal product of labour in farming is equal to its price, w. When the marginal product in farming is lower than the market wage w, off-farm employment will be optimal. A realistic assumption is that w depends on agent's human capital and skills so that, $w=w(e^I)$ with $w(e^I)'>0$ (see e.g., Lemieux,

[10] Note that r^* is chosen in the first decision stage (see the Appendix) so that in the second stage some agents with high U^M ($e^A f_l<w$) might still allocate labour to off-farm employment and thus become absentee-landowners. It could also be the case that households with high level of human capital allocate assets to a co-

2002; Low, 1986; Sadoulet et al., 1998). This fact suggests that for households with high level of human capital (implying also that $e^{I*} \geq e^{A}$ and $r^*=1$) the opportunity cost of labour will be correspondingly high and will eventually outweigh the marginal product in farming. Therefore, at certain relatively high levels of human capital, off-farm occupations and absentee-landownership will become optimal.

■ *Part-time farming mode:* The necessary condition for part-time farming, as with the individual farming mode, is that the efficiency of part-time individual farmers is sufficiently higher than that of the co-operative farm. The sufficient condition then, follows from the household optimization with respect to labour allocation (see equation A1 in the Appendix) and is: $(1-p)e^{I}f_l=w-\tau$, where $p=1-E\theta U'/EU'=\pi_r/\theta e^{I}f$ is the marginal risk premium of the household associated with production risks ($0 \leq p << 1$), f_l is the derivative of $f(l)$ with respect to l and τ measures, explicitly, the transaction costs of supplying labour to off-farm work.[11] The existence of transaction costs and risk premium implies that the part-time farming mode will be optimal within the interval $(0; |\tau-pe^{I}f_l|)$.

From this analysis two main hypotheses can be derived. First, on average a larger share r^* will be associated with a higher relative farming efficiency of the household (see equation 2).[12] Our analysis suggests (as in the "agricultural ladder" hypothesis) that least skilled farming households tend to join a co-operative, medium skilled are hybrid farmers, and most skilled are individual farmers. The part-time farmers and absentee-landowners have high (off-farm) reservation utility, which is associated with higher levels of general (observable) human capital.

Second, the risk premium, π $(=0.5\alpha\upsilon)$ can be higher for some agent than for other either because they are more risk-averse ($\alpha=-U''/U'$ is higher, i.e., the utility function is more concave) or

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operative farm but work in off-farm employment. This case, effectively, is not different from leasing out land and thus results in absentee-landowner mode.

[11] Households face transaction costs both in the case where they act as suppliers and in the case where they act as employers of labour. There are search and transport costs in the supply case (see, e.g., for relevant discussion Lopez, 1986). In the demand case, well-known market imperfections such as labour heterogeneity and moral hazard exist (see, e.g., Binswanger and Rosenzweig, 1986 and Heltberg, 1998).

[12] Considering the numerator in equation (2), e^{A} is stationary and the change in e^{I*} is the factor driving the change in r^*. Moreover, π is likely to be smaller for richer households, usually with higher e^{I*}. Further, in the empirical analysis, asset endowment will be used as an important proxy for the risk premium required by the household.

because they face higher variance, υ, in their income. Thus, as the risk premium and transaction costs of the household increases, the incidence of hybrid and part-time farm organization modes increases as well.

3 Empirical Methodology, Data and Variables

To analyse empirically the household organization choices that shape the agrarian structure, we apply the approach of McFadden (1984), where the differences across organization modes follow a logistic distribution function. The multinomial logit model is then the appropriate technique for estimating determinants of the household choice of organization mode. The relative likelihood of each mode is measured as the likelihood of the mode considered, relative to the base mode, which here is the co-operative farming (for details on the specification of the estimator see Rizov, 2000).

We use data from two nation-wide representative surveys of Romanian landowning rural households. The first, was organized in 1996 by the Romanian Ministry of Agriculture and Food (MAF), the World Bank, and co-sponsored by the European Commission. The second survey was organized in 1998 by the Policy Research Group (PRG), K.U.Leuven and financed by the European Commission. The sample is comprised of 754 randomly selected rural households that were surveyed both in 1996 and 1998. The sampling was carried out in two stages with stratification in the first stage. Sample strata were function of the agricultural profile of the commune and the development level of the county (judets) in which the communes were located.

Dependent variable

Data show that by 1998, the majority of rural households were engaged in some form of individual farming while co-operative farming was in decline. Using a classification based on both land and labour allocation we distinguish five modes of organization as analysed in section 2: full-time individual farming, part-time individual farming, hybrid farming, co-operative farming, and absentee-

landowners (see table 1).[13] Households which have allocated all their land in individual farms and are involved full-time in farming (the household head and the spouse together allocate more than 50 per cent of their labour to farming), we define as "full-time individual farmers". They represent 59.28 per cent of the total number of rural households. "Part-time individual farmers" which use all their land themselves but are part-time involved in farming represent 17.17 per cent. "Hybrid farmers" are defined as full-time farming households that have allocated part of their land in co-operative farms and retained the remainder in their own individual farms. The hybrid farmers are a phenomenon specific not only for Romania but also for Bulgaria and several other transition countries. They represent 17.80 per cent of the total number of rural households in the sample. The group of households that have allocated all their land in co-operative farms and do not carry on any individual farming, but are employed full-time in farming consists of 2.84 per cent. For the two-year period, between the two surveys, the number of farmers in this mode declined from 4.57 per cent in 1996 to 1.11 per cent in 1998. Finally, there is another small share of rural households, which are not employed in agriculture at all and lease their entire land out. These are, for example, industry and public services wage employees or old pensioners. They form the group of "absentee-landowners" and make up for the remainder of 2.91 per cent.

- Table 1 about here -

Thus *the dependent variable* (ORG) reflects the organization mode choices of rural households. It is discrete with five categories representing the options of each household. These are: co-operative farming (COOP_F), leasing out/absentees (ABSENTE), full-time individual farming (FULTM_F), part-time individual farming (PARTM_F), and hybrid farming (HYBRD_F). Because the number of observations in the mode COOP_F in 1998 is just 8, we can only estimate the model using a pooled sample for both years.[14]

[13] We also experimented with other classification schemes by varying land and labour allocation criteria (see also Rizov, 2003). The scheme adopted proved to be most closely approximating the agrarian structure pattern observed in Romania over the period of analysis. Due to missing information, the number of households retained for the analysis is 722.

[14] A year dummy variable is introduced in the regressions. Assuming that with time markets in transition economies develop, such dummy variable can be interpreted as an indicator of decreasing transaction costs and the risk premium required by the households (see further).

Explanatory variables

We use three groups of explanatory variables: human capital variables, physical capital and finance variables and variables characterizing the socio-economic environment. In table 2, we report summary statistics and give description of the explanatory variables while in table 3 we report the means and standard deviations of the explanatory variables for each of the organization modes.

- Table 2 about here -

■ *Human capital variables*: Measuring human capital and managerial skills, respectively, is a complex task (Fafchamps and Quisumbing, 1999; Wydick, 1999). We consider two separate sets of human capital variables for each household. In the first set, individual characteristics are averaged over all adult household members. The second set contains only information about the household head. Using average human capital characteristics may mask variations within the household. The head of the household is likely to have more decision-making power than other household members. Thus, using two alternative specifications allows us to derive conclusions about the intrahousehold decision-making. Age, education and broader labour market experience are used as proxies of human capital and managerial skills.

- Table 3 about here -

Age is a commonly used measure for general work experience. However, above certain level, it may be negatively correlated with agent's attitudes toward risk and motivation of being a self-employed farmer. Both age of the household head (AGEHH) as main decision-maker and average age of adult household members (AGEHM) are used in different specifications. Possible non-linearity in the impact of age is captured through the variation of coefficients across organization modes.

Education, measured by years of schooling, is expected to have a positive impact on the ability of an agent to start up and run a farm and business, in general. At the same time, however, higher level of education would imply higher opportunity cost of labour of an agent as wage earner, thus making off-farm occupations relatively more attractive. This hypothesis is tested by including in

the regression the years of schooling of the household head (EDUHH) and alternatively average years of schooling of household members (EDUHM).[15]

Broader work experience is expected to have an important influence on the choice of organization mode. To capture this effect, we introduce two dummy variables. The first, COMUTHH (COMUTHM), is calculated for the household head and for the household, respectively, and equals one if there has been commuting before 1989 for work in a town while living in a village. We expect that agents working in a town, while living in a rural area would have more diverse experience and connections, and hence relatively higher managerial skills. The second variable, MIGRATE, equals one if the household has migrated from a town to a village after 1989, the beginning of the reforms, and is expected to have a negative impact on individual farming as it suggests a lack of experience within agriculture.

■ *Physical capital and finance variables*: Owning assets have an important impact on households' decisions what organization mode they will choose as capital endowments affect their attitude towards risk (Ahituv and Kimhi, 2002). Asset-rich households are less risk averse and require lower income risk premium (Nabi, 1986; Pratt, 1964). Furthermore, the ownership of assets secures the access and their use on the farm when markets for these assets are still missing or ill functioning. In the same time farm assets can be used as collateral for securing loans and thus soften the liquidity constraint.[16] Considering the fact that assets were mainly obtained as a result of the recent land reform and that markets were ill functioning in Romania during the period of analysis we assume that the asset variables are exogenous. We use as controls in the regressions variables measuring labour, land, farm machinery and buildings owned by the household.

Household labour supply (ADULTS) is measured by the number of household members in working age, i.e. between 15 and 65 years. Due to the nature of agricultural production, the relation

[15] Following Jolliffe (1997) and Yang (1997), an alternative measure, the schooling of the most educated member of the household, was also used in sensitivity analysis and yielded results consistent with other measures. Furthermore, besides the variables included in the regressions reported here, we have experimented with the education of parents as a proxy of family background. In all cases this variable was not significant and therefore was not included in the final specification.

of household labour with modes involving individual farming is expected to be positive, as more labour available within the household would imply better opportunity for carrying on and expanding an individual farming operation. In the same time, more labour available would imply higher likelihood of diversification and undertaking off-farm occupations, if labour market is flexible enough.

Land owned by the household (OWNLAND) is traditionally the main agricultural asset. Availability of a larger land holding is hypothesized to have a positive impact on individual farming by relaxing capital constraints. However, if the amount of land is not matched by the quantity and quality of other farm assets and household's managerial skills, then modes other than individual farming might be chosen.

Security of land tenure is an important consideration with respect to land ownership. Availability of legal land title directly affects the agent's attitude towards risk. Thus, secure property rights are an important precondition to set up an individual farm, and hence a positive relation with the level of individual farming is expected. In the same time, secure land title will facilitate land leasing, thus making more likely part-time farming and absentee-landownership. We introduced a dummy variable (TITLE), which equals one if a legal title on the farmland existed in 1996 and zero otherwise.

Farm machinery is an important asset for every farmer affecting technology and effectiveness of production. In the economies in transition it is also often used as collateral for securing loans. As a proxy for the size of owned farm machinery, we constructed a weighted index (MACHINERY), which reflects the presence of six machinery and equipment items (trucks, tractors, ploughs, combines, carriages, sowing equipment). The following weights were used: truck = 1, tractor = 1, plough for tractor = 0.2, combine for cereals = 2, carriage = 0.5, sowing machine = 1.

Farm buildings are another asset important for the production process and their availability also affects credit constraints. As a proxy for the size of owned farm buildings (BUILDINGS), we

[16] It is a common practice in the economies in transition, including Romania, that for lending banks require collateral. Most of the loans are secured with machinery and buildings but land with legal title is also accepted

constructed an unweighted index for four buildings items (cattle stables, storage facilities, sheep shelters and multipurpose sheds).

■ *Socio-economic environment variables*: Characteristics of the environment within which the rural household operates importantly affect both its entrepreneurial motivation and attitudes towards risk. We use proxies for market access, for tradition and experience with individual farming at county level, and for the effect of advancement in transition process.

Market access (ACCESS) is a measure of accessibility of the local markets.[17] It is an index variable that ranges between 4 and 13 with larger values associated with shorter distance to the nearest town market and railway station. We expect a positive correlation of this variable with the individual farming mode because better access to markets will lower transaction costs for individual farm operators. A good access to markets, however, may facilitate the attractiveness of other organization modes, particularly those involving off-farm work.

Tradition of individual farming (FTRADITION) is proxied by the pre-reform (in 1985) share of land in individual farms at county level. There was a wide regional variation (between 0.03 and 40.67 per cent) in the level of individual farming during the communist period in Romania. In counties with more individual farms the farming skills are expected to be more appropriate for present conditions and also the attitudes towards risk more in favour to individual farming modes.

Effect of the transition process on the agrarian structure is proxied by a dummy variable (TIME), which is equal to one for observations in 1998 and zero otherwise. Assuming advancement in economic reforms with time, we would expect positive time effect on modes involving individual farming. However, the development of markets would improve off-farm opportunities as well.

(Euroconsult and CWFS, 1995).

[17] This variable might well be related also to price levels that would influence farm profitability. Because of the lack of price information in our data it is not possible to separate out this effect. One can argue, however, that the price effect is not important because there was no significant regional price variation in Romania due to government policy of equal prices across regions during and before the period when the survey was carried out.

4 Estimation Results

We report in tables 4 and 5 the estimation results for the likelihood of households choosing among the five modes of organization analysed in the previous sections and the relative importance of factors influencing the decisions. In table 4 the measures of human capital are based on household head characteristics, while in table 5 the average household human capital characteristics are used. The results of both specifications by and large are robust and consistent with the theoretical model. The coefficients of the human capital variables have got the expected signs, however, their significance vary between the two specifications. When the household head characteristics are considered, the age is the most important determinant of the organization choice, while when the average household characteristics are used, education is of the highest significance. In general, it seems that the human capital of the household is more important in making organization choices than the characteristics of the household head alone. Therefore, we discuss further the results based on the average household characteristics, as reported in table 5.

- Table 4 about here -

Column 1 examines the probability of being a hybrid farmer relative to farming only in a co-operative farm. The education variable has a positive coefficient, significant at 0.01 level. Significant (at 0.10 level) and positive is also the coefficient of the dummy variable showing diverse experience gathered through commuting for work in a town. It is possible that the behaviour of hybrid farmers is determined by their general knowledge and connections (social capital) which allows them to cope with production risks better than co-operative farmers.

- Table 5 about here -

From farm physical capital variables, OWNLAND and BUILDINGS have got significant and positive coefficients. Availability of legal title on land has also significant positive effect on starting up an individual farm. This together with the negative (but not significant) coefficients of ADULTS and MACHINERY is in support to the hypothesis that hybrid farming may be a phenomenon occurring due to relatively insufficient appropriate human capital, and thus farming skills, available on-farm relative to the farm physical capital endowment. This result also supports the notion that

asset-richer households are characterized by a lower risk premium and thus are more likely to start farming individually.

Further, better access to markets, tradition with individual farming and advancement in reforms all play highly significant positive role in determining the choice of hybrid farming compared with co-operative farming. These results confirm that even households with moderate farming skills would be able to cope better with production risks when general economic conditions improve.

The results for the full-time individual farming mode, reported in column 2 are of special interest, as the households that have chosen to farm full-time individually represent the largest share (59.28 per cent) of the sample. Furthermore, the shift from collective to individual farming is in the focus of agricultural policies in most transition economies.

Human capital variables play important role in general. However, the age variable despite having the expected negative sign is not statistically significant. Education has a highly significant positive sign and supports the hypothesis that individual farmers are characterized by better education implying higher managerial skills. However, it would not imply that an increase in the years of schooling increases the attractiveness of full-time individual farming in a linear manner (point estimate 0.2321) relative to being part-time farmer (column 3, point estimate 0.3511). As common sense suggests more diversified work experience represented by pre-reform commuting for work in a town increases the probability of possessing better managerial skills and social capital, and thus the likelihood of undertaking individual farming.

The coefficients of physical capital variables are positive but only those of machinery and household labour are statistically significant. The availability of legal land title has also significant positive impact and indicates that better land tenure security decreases risk in individual farming. The point-estimate here (0.9678) is higher than the one for hybrid farming mode (0.7850) implying that farmers use co-operation as a risk management strategy. Furthermore, having secure access to physical capital decreases the risk of agricultural production in general.

From socio-economic environment characteristics, variables representing market access and advancement of transition process are positive and significant. The coefficient of tradition with individual farming is not significant despite having a positive sign.

Column 3 shows the results for the probability of becoming a part-time farmer relative to joining a co-operative farm. To make comparisons with the full-time individual farming mode, we must compare the coefficients in column 3 to the corresponding coefficients in column 2. Doing so indicates that the human capital variables such as age and education are even more important determinants of the part-time farming choice as the directions of the effects are the same. The age coefficient here is negative and significant indicating that part-time farmers are much younger than all others involved in farming. The positive coefficient of EDUHM in column 3 must be interpreted in similar fashion as with the full-time farmers. As common sense suggests, better education increases the probability of working off-farm relative to being a full-time farmer. In addition, part-time farmers have also more diversified work experience gathered through commuting for work in a town.

The possession of physical capital, such as farm machinery and buildings together with security of land tenure plays significant positive role in carrying on individual farming. However, when the number of household members in working age is relatively large it is more likely that some of them find occupations off-farm.

As with the full-time individual farmers, from socio-economic environment characteristics, variables representing market access and advancement in transition process are significant and positive. The coefficient of tradition with individual farming is not significant.

Column 4 shows determinants of the odds of being an absentee-landowner relative to becoming a co-operative farmer. From a statistical point of view, the most significant of the human capital variables are both age and education. The positive sign of age implies that the group of absentees consists, besides agents with high opportunity costs, also of retired people that already left the labour market. In the same time, it is more likely that a household would chose this mode if it migrated from a town and thus had no farm experience. The sign of the age variable might reflect also increased desire for security as age increases and thus less motivation to carry on risky individual farming.

With respect to physical capital variables, it is worth mentioning that all of them have the expected signs but are not significant except land title where the coefficient exceeds its standard error with a factor of four. The availability of legal land title has a positive and statistically significant

coefficient meaning that an important condition for existence of the group of absentee-landowners leasing their total land out is the security of land tenure.

Finally, the socio-economic environment variables have similar impact as in the case with part-time farmers. In addition, lack of tradition with individual farming plays here significant role.

5 Discussion and Conclusion

The results of the paper are potentially useful for understanding and predicting the impact of various policy changes on the rural economies of transition countries. Our analytical framework and empirical analysis show that low skilled households are more likely to adopt co-operative farming mode; those with medium skill levels will be hybrid farmers. Individual farmers will have even higher skills and reservation utility, which is in support to the "agricultural ladder" hypothesis (Reid, 1976; Spillman, 1919). However, households with higher skills can be expected to have higher opportunity costs and thus opt for off-farm employment. Absentee-landowners group seems to be mixed by including retired households. It is confirmed that they possess high general human capital endowment but no specific farm experience.

In this context, our analysis provides household-level information about factors that determine the agrarian structure in transition economies. Human capital endowments generally have significant effect on the choice of organization mode. Young and well-educated agents are more likely to start up an individual farm but also to opt for off-farm jobs, fact which is reflected in the large and significant coefficients for part-time individual farmers group. Considering household human capital measures, age does not play significant role in the choice between co-operative, hybrid and individual farming. However, hybrid and full-time individual farmers are somewhat better educated than co-operative farmers. The higher importance of the average education of the household, compared to the education of the household head alone, implies that intra household decision-making is quite democratic and that there is an active exchange of knowledge within the household. Diversified work experience matters for the choice on the co-operative-individual farming continuum. Agents who commuted for work to a town and who did not migrate from elsewhere are

more likely to start up their own individual farm. Finally, larger households are more likely to engage in both individual farming and off-farm work.

Controlling for physical capital endowments shows that those variables also play significant role in the household's choice of organization mode and thus in shaping the agrarian structure. This fact suggests that factor markets are missing or ill-functioning thus imposing high risks to households undertaking farming. Individual farmers, part-time or full-time, distinguish themselves from hybrid and co-operative farmers by owning more farm machinery and by having more secure land titles. Land holdings and farm buildings have most significant impact on choosing hybrid-farming mode. This result is in agreement with human capital effects and the thesis that farm households endowed with physical capital in excess of their farming capability will opt for some form of co-operative farming. It is noteworthy that co-operative and hybrid farmers have less secure land title thus facing higher risks than individual farmers.

Finally, the socio-economic environment seems to have played important role in affecting the agent's required risk premium. Market access is important for opting out of co-operative farming and starting up an individual farm. However, in the same time market access improves off-farm employment opportunities. Tradition of individual farming at county level is only important for becoming a hybrid farmer while the lack of such tradition implies more absentee-landowners. Overall, with the advancement in transition process, the co-operative farming mode is being replaced by other modes predominantly hybrid farming and individual farming which currently dominate the agrarian structure in Romania.

To conclude, two-track policies allowing households to optimise their position in the agrarian structure, according to abilities and skills, can be suggested. First, policies improving the functioning of agricultural input and output markets will reduce risks associated with farming and thus allow households to specialise. Second, policies improving the flexibility of labour market as well as active labour market policies will allow households to optimally diversify their sources of income. Such policies will generally result in higher incomes and improved welfare of rural households.

APPENDIX

Solution to the household decision problem

We consider a two-stage decision problem of the household.[1] In the first stage, the landowning household decides (binding decision) with respect to the share, r of assets allocated to individual farming. In the second stage r is taken as given and the household chooses its farm labour, l. Using backward induction, we first analyse the second stage of the decision problem for arbitrary r and then we consider the first stage decision where the optimal share, r^* is chosen.

■ *Choice of farm labour input l*: For given r, the household as labour supplier chooses l, so as to maximize its expected utility, EU: Max_l=EU[(1-r)$e^A f(l)$+$r\theta e^I f(l)$+(1-l)w]. The first order condition with respect to l is:

$$(1-r)e^A f_l+(1-p)re^I f_l=w, \qquad \text{(A1)}$$

where p=1-E$\theta U'$/EU' is the marginal risk premium of the household associated with production risks ($0\leq p<<1$) and f_l is the derivative of $f(l)$ with respect to l.[2]

Equation (A1) suggests that in equilibrium, the household has to balance the benefit of increased input, l, against the cost of additional input, w. Thus, we have obtained the standard labour allocation equation where the marginal product of labour in farming is equalized with the price of labour, w. When the (risk adjusted) marginal product in farming is lower than the market wage, the household will choose off-farm employment, and when the price of labour is lower than its marginal product, household will allocate its labour to farming operation.

Finally, we can also write l as an indirect function of r, $l=l^*(r)$, i.e., for a given share r there is a unique optimal level of l that maximizes household utility.

■ *Choice of individual farming share r*: Now we consider the first stage of the decision problem. In this stage the optimal share r is chosen so as to maximize the household's expected

[1] We analyse household decision process in two notional stages where labour and land are allocated. One can argue that allocations are simultaneous, however, specific to transition economies is the fact that in the pre-reform period by and large labour was the main household resource that allocation decisions were made about. Farm assets were acquired as a result of the recent land reform and therefore households are likely to still separate their factor allocation decisions during transition.

utility: $\text{Max}_r = EU[(1-r)e^A f(l) + r\theta e^I f(l) + (1-l)w]$, subject to $l = l^*(r)$. Differentiating with respect to r yields (assuming interior solution, $r \in (0,1)$):

$$EU'[-e^A f(l) + (1-r)eAf_l(l)l_r + \theta e^I f(l) + r\theta e^I f_l(l)l_r - l_r w] = 0, \quad \text{(A2)}$$

where l_r is the derivative of l with respect to r. Collecting terms containing $l_r EU'$ and using equation (A1), it can be seen that they add up to zero (implication of the envelope theorem). Then equation (A2) simplifies to: $-e^A f(l) + (1-p)\theta e^I f(l) = 0$ or

$$(e^{I^*} - e^A) f - p e^{I^*} f = 0, \quad \text{(A3)}$$

where $e^{I^*} = \theta e^I$ and $f = f(l)$ for simplicity of notation.

Further, following Pratt (1964), in order to carry on our analysis, we substitute marginal risk premium, p with Arrow-Pratt income risk premium, π.[3] For an agent facing a risky income of the form, $\theta B(r,l,\ldots) + C(l,\ldots)$, where θ is the multiplicative risk factor which has an expected value of one and $C(l,\ldots)$ represents terms independent of θ, the following relation holds in equilibrium: $p = \pi_r / B_r$. The subscripts on the functions denote partial differentiation with respect to the subscript. In our model $B = r\theta e^I f$, thus at the equilibrium (i.e., at $r = r^*$ and $l = l^*$), $p = \pi_r / \theta e^I f$. Using this expression for p in equation (A3) and substituting $\partial e / \partial r = (e^{I^*} - e^A)$ yields the condition that have to be satisfied by the optimal share, r^*: $\partial / \partial r (ef - \pi) = 0$. This condition implies that the optimal organization involves the share r, which maximizes the (risk adjusted) expected output net of the risk premium.

After substituting expressions for e and π, normalizing the output f of an average farm to be 1, dropping the constant term $e^A f$, and multiplying by –1, the household's objective function B can be written as: $B = r^2 \pi(r=1) - r(e^{I^*} - e^A)$. Optimizing with respect to r yields equation (2): $r^* = (e^{I^*} - e^A) / 2\pi(r=1)$.

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[2] It is also likely that households face transaction costs in supplying labour to the market such that the real wage rate will be $w - \tau$, where τ measures the transaction costs. Considering transaction costs explicitly together with production risk premium can help to explain the existence of the part-time farming mode.

[3] The Arrow-Pratt income-risk premium π is defined by the condition that the expected utility of the risky income with no insurance should equal the utility of the expected income minus the risk premium. For small variances of income, Pratt (1964) has shown that the risk premium is $\pi = 0.5\alpha\upsilon$, where α is the degree of absolute risk aversion of the agent and υ represents the variance of income. In our model υ is a function of r and π can be written as: $\pi(r) = 0.5\alpha\upsilon(r\theta e^I f) = 0.5\alpha r^2 \upsilon(\theta e^I f) = r^2 \pi(r=1)$.

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TABLE 1

Distribution of households among five organization modes

Organization Mode	*1996*		*1998*		*Total sample*	
	Number	*%*	*Number*	*%*	*Number*	*%*
COOP_F	33	4.57	8	1.11	41	2.84
HYBRD_F	115	15.93	142	19.67	257	17.80
FULTM_F	432	59.83	424	58.73	856	59.28
PARTM_F	117	16.20	131	18.14	248	17.17
ABSENTE	25	3.46	17	2.35	42	2.91
Total	722	100.00	722	100.00	1444	100.00

TABLE 2
Means and standard deviations of the explanatory variables

Variable	*Definition*	*Mean* (*St. Dev.*)
AGEHH	Age of household head	65.81 (11.49)
EDUHH	Number of years of schooling of household head	6.39 (3.25)
COMUTHH	Dummy variable equal to 1 if household head has commuted to a town for work before 1989 and 0 otherwise	0.17 (0.37)
AGEHM	Average age of household members	58.54 (14.79)
EDUHM	Average number of years of schooling of household members	6.75 (2.85)
COMUTHM	Dummy variable equal to 1 if household members have commuted to a town for work before 1989 and 0 otherwise	0.30 (0.45)
MIGRATE	Dummy variable equal to 1 if household migrated from a town after 1989 and 0 otherwise	0.09 (0.28)
ADULTS	Number of household members in working age, between 15 and 65	3.11 (2.99)
OWNLAND	Hectares of land owned by the household	3.15 (2.11)
TITLE	Dummy variable equal to 1 if household possessed legal title in 1996 and 0 otherwise	0.38 (0.48)
MACHINERY	Equivalent number of machinery owned	0.21 (0.55)
BUILDINGS	Equivalent number of buildings owned	2.19 (1.13)
ACCESS	Index measuring the access to markets	10.32 (3.52)
FTRADITION	Pre-reform (1985) level of individual farming, %	10.20 (11.17)
TIME	Time dummy variable equal to 1 for observations in 1998 and 0 otherwise	0.50 (0.50)

TABLE 3
Means and standard deviations of the variables by organization mode

Variable	*Organization mode* (ORG)				
	COOP_F	**HYBRD_F**	**FULTM_F**	**PARTM_F**	**ABSENTE**
AGEHH	71.80	68.08	65.89	60.72	73.05
	(7.05)	(9.12)	(9.88)	(16.55)	(12.01)
EDUHH	4.75	5.58	5.86	7.42	6.39
	(2.58)	(2.94)	(3.00)	(3.81)	(3.12)
COMUTHH	0.07	0.10	0.19	0.21	0.08
	(0.26)	(0.30)	(0.39)	(0.40)	(0.28)
AGEHM	66.67	61.58	58.77	51.96	66.68
	(14.17)	(13.22)	(13.92)	(17.19)	(11.62)
EDUHM	4.53	6.06	6.78	7.90	5.58
	(2.33)	(2.74)	(2.71)	(3.04)	(2.94)
COMUTHM	0.11	0.20	0.33	0.36	0.12
	(0.31)	(0.39)	(0.47)	(0.48)	(0.32)
MIGRATE	0.10	0.09	0.06	0.05	0.12
	(0.29)	(0.29)	(0.23)	(0.22)	(0.32)
ADULTS	1.86	1.33	3.37	3.75	2.08
	(2.80)	(2.52)	(2.97)	(2.91)	(2.86)
OWNLAND	2.92	3.67	3.08	2.97	2.63
	(1.83)	(2.03)	(2.11)	(2.17)	(2.07)
TITLE	0.34	0.36	0.38	0.40	0.43
	(0.47)	(0.48)	(0.48)	(0.48)	(0.50)
MACHINERY	0.26	0.11	0.24	0.24	0.07
	(0.89)	(0.27)	(0.59)	(0.58)	(0.17)
BUILDINGS	1.83	2.38	1.94	2.24	1.60
	(1.20)	(1.05)	(1.15)	(1.11)	(1.30)
ACCESS	7.36	10.19	10.23	10.71	10.36
	(4.03)	(3.51)	(3.67)	(3.16)	(3.50)
FTRADITION	8.49	5.87	11.51	11.41	5.98
	(11.12)	(7.50)	(11.42)	(11.80)	(6.94)
TIME	0.08	0.56	0.53	0.50	0.40
	(0.28)	(0.49)	(0.50)	(0.50)	(0.49)
Number of observations	41	257	856	248	42

TABLE 4

Multinomial logit analysis of organization mode probabilities (with household head human capital)

Dependent variable: Organization modes **(ASSOC_F, HYBRD_F, FULTM_F, PARTM_F, ABSENTE)**				
Variable	**HYBRD_F**	**FULTM_F**	**PARTM_F**	**ABSENTE**
	(1)	(2)	(3)	(4)
AGEHH	-0.0410 ***	-0.0604 ***	-0.0732 ***	0.0004
	(0.0159)	(0.0165)	(0.0163)	(0.0021)
EDUHH	0.0262	0.0461	0.0981 **	0.0881 *
	(0.0466)	(0.0446)	(0.0461)	(0.0480)
COMUTHH	0.2770	0.7540 *	0.8381 *	0.1942
	(0.4362)	(0.4173)	(0.4244)	(0.5262)
MIGRATE	0.1842	-0.1964	-0.6428	0.5414 *
	(0.4699)	(0.4441)	(0.4511)	(0.2927)
ADULTS	-0.0577	0.0885 *	0.0942 *	0.0474
	(0.0523)	(0.0501)	(0.0519)	(0.0673)
OWNLAND	0.1820 **	0.0872	0.0783	-0.0716
	(0.0771)	(0.0753)	(0.0770)	(0.1023)
TITLE	0.7679 ***	0.8838 ***	0.9404 ***	1.3295 ***
	(0.3047)	(0.2944)	(0.3018)	(0.3644)
MACHINERY	-0.4143	0.6194 *	0.6800 *	-0.2725
	(0.4097)	(0.3803)	(0.3870)	(0.6133)
BUILDINGS	0.4286 ***	0.1370	0.0480	-0.0846
	(0.1221)	(0.1159)	(0.1199)	(0.1552)
ACCESS	0.1659 ***	0.1698 ***	0.2520 ***	0.1897 ***
	(0.0306)	(0.0319)	(0.0331)	(0.0449)
FTRADITION	0.0446 ***	0.0111	0.0085	-0.0202
	(0.0149)	(0.0141)	(0.0144)	(0.0185)
TIME	3.4803 ***	2.9774 ***	3.0706 ***	2.3948 ***
	(0.5324)	(0.5305)	(0.5262)	(0.5745)
Constant	1.2253	0.6724	0.9851 *	1.0569
	(0.8596)	(0.5532)	(0.5727)	(0.7569)
Number of observations				1444
Log Likelihood				-1315.98
Pseudo R^2				0.27

Notes.

1) The outcome "COOP_F" is the comparison mode. Thus each column shows the determinants of the log of the ratio of the probability of choosing the organization mode described at the top of the column to the probability of choosing "COOP_F". Variables are defined in table 2.

2) Figures in parentheses are standard errors. ***, ** and * denote 0.01, 0.05 and 0.10 level of significance, respectively.

TABLE 5

Multinomial logit analysis of organization mode probabilities (with household human capital)

Dependent variable: Organization modes **(COOP_F, HYBRD_F, FULTM_F, PARTM_F, ABSENTE)**				
Variable	**HYBRD_F**	**FULTM_F**	**PARTM_F**	**ABSENTE**
	(1)	(2)	(3)	(4)
AGEHM	-0.0052	-0.0070	-0.0282 ***	0.0253 **
	(0.0099)	(0.0095)	(0.0097)	(0.0130)
EDUHM	0.2006 ***	0.2321 ***	0.3511 ***	0.2237 ***
	(0.0563)	(0.0541)	(0.0558)	(0.0702)
COMUTHM	0.5874 *	0.8992 ***	1.0214 ***	0.1456
	(0.3438)	(0.3367)	(0.3316)	(0.4558)
MIGRATE	0.2020	-0.2519	-0.6717	0.6532 *
	(0.6088)	(0.4580)	(0.4646)	(0.3829)
ADULTS	-0.0318	0.1351 ***	0.1442 ***	0.0551
	(0.0480)	(0.0474)	(0.0461)	(0.0625)
OWNLAND	0.1452 **	0.0529	0.0425	-0.0817
	(0.0725)	(0.0708)	(0.0724)	(0.0973)
TITLE	0.7850 ***	0.9678 ***	1.0528 ***	1.3611 ***
	(0.3050)	(0.2959)	(0.3020)	(0.3650)
MACHINERY	-0.2919	0.6292 *	0.6896 *	-0.1744
	(0.3957)	(0.3708)	(0.3735)	(0.1583)
BUILDINGS	0.3117 **	0.2165 *	0.0422	-0.1255
	(0.1249)	(0.1227)	(0.1195)	(0.5939)
ACCESS	0.1386 ***	0.1536 ***	0.2428 ***	0.1861 ***
	(0.0328)	(0.0318)	(0.0340)	(0.0460)
FTRADITION	0.0590 ***	0.0119	0.0061	-0.0328 *
	(0.0144)	(0.0139)	(0.0136)	(0.0183)
TIME	3.4660 ***	2.9260 ***	3.1106 ***	2.4312 ***
	(0.5313)	(0.5293)	(0.5257)	(0.5745)
Constant	1.0358	0.4128	0.8416	1.1561
	(0.7521)	(0.5863)	(0.6912)	(0.7239)
Number of observations				1444
Log Likelihood				-1411.81
Pseudo R^2				0.34

Notes.
1) The outcome "COOP_F" is the comparison mode. Thus each column shows the determinants of the log of the ratio of the probability of choosing the organization mode described at the top of the column to the probability of choosing "COOP_F". Variables are defined in table 2.
2) Figures in parentheses are standard errors. ***, ** and * denote 0.01, 0.05 and 0.10 level of significance, respectively.