The Choice of Farm Organization. A Hungarian Case

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Abstract

The literature on the agricultural transformation in Central an Eastern European countries usually neglect the investigation of organizational forms in agriculture. This paper is the first to analyze the choice of organization forms in transition agriculture employing transaction cost theory. The analysis is based on Hungarian FADN data in 2003. In general, our results do not support the theoretical predictions on the choice of farm organization, but confirm the differences in capital level and farm area observed in different farm organizations. The divergence between theory and empirics shed light on the importance of path dependency in explaining of farm organizations.

Keywords: Transition agriculture, farm organization, family farm

1. Introduction

There is a continuously growing literature on the agricultural transformation in Central an Eastern European countries (see survey Brooks and Nash 2002; Rozelle and Swinnen 2004). Moreover, extensive literature deals with farm productivity and efficiency in these countries (Gorton and Davidova 2004). These studies focus mainly on the factors explaining farm efficiency. However, the investigations of organizational forms in agriculture were usually neglected in empirical research. The literature on farm organizations concentrated exclusively on the issue emerging farm structures in transition countries from normative point of view. Namely which type of farm organization is superior in agriculture in terms of efficiency and productivity? But, less research focus on the question: which factors explain the organizational choice of farmers? The literature on the choice of farm organization is limited (Schmitt 1991, 1997, 1997a; Allen and Lueck 1998; Lema et al. 2003). In addition, Brem and Kim (2000) and Brem (2002) investigate the restructuring of socialist large scale farms but do not deal with family farms. This paper is the first to analyze the choice of organization forms in transition agriculture employing a New Institutional Economics framework. More specifically, we have applied the model developed by Allen and Lueck (1998) to test the usefulness of the transaction cost theory for transition agriculture. The next section presents the theoretical foundation of the empirical model. Section 3 outlines empirical methodology and data set. The results of

the regression analysis are presented in section 4. Section 5 contains a summary and some conclusions.

2. Theoretical framework

The literature on transitional economies, especially 'family farm debate', usually neglects the definitions of family farm and does not provide an appropriate typology of farms. It should be noted that these definitional issues are very important for empirical works and policy implications. For example empirical literature on production efficiency typically uses the statistical classification of farms, for example considers private farms as family farms, and economic organizations identify as corporate farms, which is not unambiguously true. Thus, employing statistical categories in various estimations may lead to misleading conclusions. Therefore, we briefly review two approaches to farm organizations and some definitions of family farms.

2.1 Classification issues

There are two major typologies of farms in the theoretical literature on farm organization. First, considering the *stage production*, three different farm ownership structures can be distinguished: family farms, partnerships, and corporate farms (Allen and Lueck, 1998). Family farm is considered when a single farmer owns the output and controls all farms assets, including all labor assets. The family farm avoids the problem of moral hazard, but this arises at the cost of foregone specialization gains. Family farms also face higher capital costs compared to the other two structures due to a limited possibility of self-financing. Factory-style corporate farms are the most complicated agricultural organizations where many people own the farm and labor is provided by large groups of specialized fixed wage labor. Partnerships are intermediate farm forms, where two or three owners share output and capital and all provide labor.

Second approach based on the division of responsibility for labor inputs and the managerial implementation of decisions and control the following main organizational forms can be classified: lessee-worker, pure share-tenant, and owner-manager

(Roumasset, 1995). Lessee-worker is considered in case of rent contracts with no hired labor, with very little specialization, and the lessee taking responsibility for both labor and most of managerial functions. The pure owner-manager form represents complete specialization between labor and management. Share-tenancy is an intermediate arrangement that motivates the tenant to monitor labor shirking and to make and execute the day-to-day production decisions. A number of variations of these pure forms are possible, and they can be noticed in practice. Taxonomy of agricultural firms according to specialization in labor, decision making and control is as follows: owner operator, lessee worker, sharecropper, pure share tenant, share manager, lessee manager, owner manager and hired manager. The common feature of these two classifications is the optimal handling of moral hazard and of production uncertainty.

There is more attention on defining of family farms in the literature. Gasson and Errington (1993) characterized family farms by following elements: business ownership is combined with managerial control in the hands of business principals, these principals are related by kinship or marriage, family members provide capital to do business, family members including business principals do farm work, business ownership and managerial control are transferred between the generations with the passage of time, and the family lives on the farm. Djurfeldt (1996) argue that Gasson and Errington do not provide a formal definition for family farms; consequently it cannot be used for comparative studies over historical time or between different societies. Therefore he introduced the term of 'notional family farm' that is characterized by an overlapping of three functional units: the unit of production (the farm), the unit of consumption (the household), and the unit of kinship (the family); stressing that family labor is indispensable for its reproduction according to notional family farm. Therefore, if the farm does not require family labor for its reproduction, it cannot be considered a notional family farm anymore. The Gasson-Errington framework is extended by Reed et al. (2002) including the social and cultural dimensions of farming which make family farms both sociably sustainable and culturally viable.

Raup (1986) defines the family farm as an agricultural organization in which the major fraction of control over the most durable inputs, land and labor is exercised or

contributed by a family unit. He emphasize the importance of control, which means that the ownership of durable inputs is not indispensable, e.g. the ownership of the land used in production. He argues that the family farm can be identified if total annual labor does not exceed 3 men per years.

The main empirical issue in analysis of farm organization is that statistical typology does not correspond with the theoretical framework. The data are usually available about various agricultural production structures which are important for efficiency investigations, but it does not provide information about farm organization.

Hill (1993, 1996), using Farm Structure Survey of the European Community, divides farms into three groups. First, family farm, where is the ratio of Family Work Unit per Annual Work Unit (FWU/AWU) greater than 0.95. Second, intermediate farms, where family farms is supplemented by hired labor, but still does not exceed 50 per cent (0.5<FWU/AWU<0.95), Finally, non-family farms, where hired labor contributes the majority of work (FWU/AWU<0.5).

2.2. Theory

There are two complementing explanations on farm organizations. The first approach is based on farm household theory (Schmitt 1991, 1997, 1997a and Schmitt et al. 1996). Schmitt argues in his subsequent works that the persistence of family farm in developed countries is the consequence of limited economies of size relative to the size of family's labor capacity. The farm household, being often restricted to family labor, is extended to hired labor. Hired workers are employed mainly at farms either as a substitute for or in addition to family labors. The reason why family labor is not substituted by hired labor to a much greater extent are not only monitoring and supervision costs. The possible substitution is restricted by different requirements of professional qualification. In short, the advantage of family farms results from their flexibility to adjust production capacities, while particularly the engagement of non-family labor suffers from severe frictions such as fixed wages and employment regulations. The employment of many hired farm workers is burdened high and increasing transaction cost; therefore the family farm is superior to corporate farms.

The main critics against Schmitt's argument are the lack of empirical evidence due to the role of transaction cost in explaining the persistence of family farm. He provides some indirect evidence in analyzing structural changes of farms in Germany between 1979 and 1994. Schmitt (1997a) shows that if farm size is measured in terms of farm labor per farm, the concentration of farms has been towards farms employing less than one hired labor and less than two family labor and hired workers in total.

The empirical evidence on extent and effects of transaction costs are limited and focus on developing world. Dong and Dow (1993) investigate the monitoring cost in Chinese agricultural teams. They find that the labor supervision absorbed about 10-20 percent of total labor time during 1970-1976. Frisvold (1994) investigates the assumption that family and hired labor are homogeneous inputs using Indian farm-level data. His results indicate that family member supervision is required to increase hired labor productivity. Output loss attributable to operating at reduced supervision intensity was greater than 10 per cent on over 40 per cent of the plots. Evenson et al. (2000) analyze supervision activities reported of rice farmers in Philippines. They find that transaction costs have a negative effect on farm efficiency, but this partially is offset by increased supervision intensity which enhances efficiency.

The other stream of the research, based on modern theory of firm, takes into account the trade-off between moral hazard and gains from specialization (Allen and Lueck 1998), They present a model of farm organization with one end of a spectrum pure family farms and at the other corporate farms. The authors emphasize the role of seasonality and the biological nature of agricultural production in explaining of farm organizations. The seasonality and biological character of production not only increase the costs of labor monitoring but also determine to what extent gains from specialization are important. While the occurrence of sequential production stages limit the gains from specialization, these become more important and labor can be monitored more easily if the effects of nature can be eliminated or reduced. As larger farms have better access to capital, removing the effects of nature will change the nature of the farm from family-based to corporate. Therefore, the extent to which the trade-off between moral hazard incentives on the one hand and gains from specialization and better access to capital on the other favors a certain organizational form depends on the influence of biological factors in the production process. Family

farms will still dominate in sectors where this influence is high, such as in land-intensive crop production. Corporate farms will prevail where the influence of nature is reduced through technological innovations, such as in capital-intensive livestock production.

Allen and Lueck (1998) using data from Canada and the USA show that seasonality and randomness so limit the benefits of specialization that family farms are optimal, but when farmers are successful in mitigating the effects of seasonality and random shocks to output, farm organizations gravitate toward factory processes and corporate ownership. Lema et al. (2003) analyze the factors that explain the predominance of family farms in Argentina employing Allen-Lueck model. The results suggest that despite the differences in relative prices and public policies moral hazard and limited specialization are important reasons to support the choice of family farms.

3. Data and empirical methodology

The analysis is based on Hungarian Farm Accountancy Data Network (FADN) private farms database. the Hungarian FADN system data were collected from 1893 farms above 2 European Size Units based on representative stratified sampling according to four criteria: legal form, farm size, production type and geographic situation. The database contains data of 1400 private farms and of 493 economic organizations. After an appropriate cleaning of data, the final sample contains 1498 observations in 2003 including 1131 private farms and 353 economic organizations.

Table 1 shows the description of variables. The FADN farm classification (private farm and economic organization) does not provide appropriate information about organization forms in terms of our interest. Therefore we classify the farms using both Hill (1993) and Raup (1986) typology. Following Raup classification we have 586 family farms and 898 non-family farms, corresponding numbers for Hill's grouping are 651 and 883. These numbers shed light on the difference between FADN and other conceptual classifications.

TABLE 1 Description of Variables

Variable Name	Definition of Variable
Dependent variables	
FAMILY FARM^{H}	1 if family farm; 0 not
FAMILY FARM^{R}	1 if family farm; 0 not
FARMTYPE	1 if family farm; 2 if intermediate farm; 3 if corporate farm
LAND	Total land on the farm in hectares
CAPITAL	Total capital assets in thousand forints
Independent variables	
CYCLE>1	1 if farm produce crops that have more than one cycle; 0 if not
CYCLE<1	1 if farm produce crops that have fewer than one cycle; 0 if not
ANIMALS1	1 if farm produce milk, pork and poultry; 0 if not
ANIMALS2	1 if farm produce beef and lamb; 0 if not
RENTED LAND	share of rented land in total land
AGE	Age of farmers in years

Note: h and r superscripts describe farm classification based on Hill and Raup.

Following Allen and Lueck (1998), we divide the crops into two categories: crops that always have at least one cycle per year and crops that may have less than one cycle per year. Taking into account characteristics of our sample livestock production are separated into two groups: Animals1 contains milk, pig and poultry farms, while Animal2 consists beef and lamb farms. The estimated equations also include the rented land the age of farmer as control variables.

In order to investigate the factors affecting the choice of farm organizations the logit is employed. For the choice of farm organizations, the dependent variable is specified, whether the farm is a family or non-family farm. The multinomial logit model is applied for the choice of farm organizations, where three outcomes: family farm, intermediate farms, and corporate farms. We used the family farm as a reference category.

4. Empirical results

The analysis comes in two parts. First, we estimate the determinants of farm organization between family and non-family organizations. Second, we estimate the effect of the choice of farm organization on the size of farm in terms of the value of capital and area controlled by the farm. We also test the sensitivity of our results on different classifications of farm.

4.1 The choice of farm organization

We focus on three predictions by Allen and Lueck (1998) model. First, as the number of production cycles increases the family farming will be less common. Second, as the importance of specialization increases the family farm becomes less likely. Finally, as the monitoring costs on labor increase the family farm becomes more likely. The sample size is slightly smaller than the original sample because of missing data for RENTED LAND variable.

TABLE 2 Logit Model for Farm Organization

	FAMILY FARM^{H}	FAMILY FARM^{R}
CYCLE>1	0.400	0.939
	(0.251)	(0.006)
CYCLE<1	-1.602	-0.676
	(0.000)	(0.107)
ANIMALS1	-0.579	-0.005
	(0.047)	(0.985)
ANIMALS2	-0.591	0.568
	(0.385)	(0.347)
AGE	-0.009	-0.001
	(0.118)	(0.822)
RENTED LAND	-1.677	-0.988
	(0.000)	(0.000)
Constant	0.855	-0.663
	(0.083)	(0.168)
N	1394	1394
McFadden's R^2:	0.112	0.061
Log-Likehood	-852.638	-880.192
Correctly classified (%)	65.71	63.13

Note: H and R superscripts describe the farm classification based on Hill (1993) and Raup(1986); p values are in parentheses

The logit model for the choice of organization forms shows that cycles variables have the opposite signs for both specifications. The variable CYCLE<1 is statistically significant for Hill model, while variable CYCLE>1 is significant for Raup model. The estimated coefficient of ANIMALS1 variable has expected sign for both model and it is significant for the Hill model. The ANIMALS2 variable has expected sign for Raup model, but it is not significant. The estimated coefficients of control variables have expected sign and RENTED LAND are statistically significant. The estimates show that the older farmers are more likely to organize their operations as non-family farms; moreover the family farms use less rented land.

Brem and Kim (2000) emphasise that farm structures in transition countries are more complex than that presented by Allen and Lueck (1998). Therefore, the next set of regression results we also consider intermediate farms as a third option for the organizational choice of farmers. The marginal effects of multinomial logit model of factors affecting farmers' choices are presented in Table 3.

TABLE 3 Marginal effects of Multinomial Logit Model for Farm Organization

	FAMILY FARM	INTERMEDIATE FARM	CORPORATE FARM
CYCLE>1	0.140	0.075	-0.215
	(0.142)	(0.034)	(0.016)
CYCLE<1	-0.278	0.181	0.096
	(0.000)	(0.028)	(0.324)
ANIMALS1	-0.059	0.056	0.003
	(0.161)	(0.073)	(0.962)
ANIMALS2	-0.081	0.106	-0.025
	(0.540)	(0.315)	(0.850)
AGE	-0.002	0.001	0.002
	(0.355)	(0.896)	(0.182)
RENTED LAND	-0.258	-0.041	0.408
	(0.000)	(0.098)	(0.000)

Note: p values are in parentheses

The results are similar to logit model, the variables CYCLE and ANIMALS2 have opposite sign for family farm and corporate farm. The ANIMALS1 have predicted signs but it is insignificant for both outcomes. The CYCLE and ANIMALS variables have positive signs for intermediate farms, and the estimates are statistically

significant. The estimated coefficients on the control variables imply that the younger farmers are more likely to organize their operations as family farms, while older farmers prefer intermediate and corporate farms. In addition, family and intermediate farms use less rented land.

The multinomial logit model has an important restriction known as the independence of irrelevant alternatives (IIA), which is formally described:

(1) $$\frac{\Pr(y=m|x)}{\Pr(y=n|x)} = exp(x[\beta_{m|b} - \beta_{n|b}]),$$

where the odds do not depend on other outcomes that are available (Scott and Long 2003: 207).

Table 4 Tests of IIA Assumption

Hausman test		
	χ^2	P value
1	-9.778	1.000
2	-0.060	1.000
3	-0.416	1.000
Small-Hsiao tests		
	χ^2	P value
2	2.899	0.894
3	7.082	0.420

Stata provides two tests of the IIA assumption. First test is developed by Hausman and McFadden (1984) that was improved by Small and Hsiao (1985). To check whether the IIA assumption is strong enough, both Hausman and Small-Hsiao tests were run for the choice of farm organization. Results show that the IIA assumptions are met for our model (Table 4.).

4.2 The size of farm

The theory predicts that the level of capital will be lowest for family farmers who face the highest cost of capital and largest for corporate farms that face the lowest cost of capital. First, we used total capital assets as a measure of a farm's capital intensity. We employ three different classifications of farms to test the sensitivity of our results. The OLS estimates include the same set of exogenous variables as used in the farm

organization models. The results show that coefficients have predicted signs and they are significant for all specifications, that is family farms use less capital than non-family farms. The estimates suggest that older farmers tend to have more capital stocks.

TABLE 5 The OLS Estimation of Farm Capital

Variable	CAPITAL		
FAMILY FARM^{H}	-48531.54		
	(0.000)		
FAMILY FARM^{R}		-52270.06	
		(0.000)	
FARMTYPE			34118.81
			(0.000)
CYCLE>1	-76058.38	-69404.56	-70066.65
	(0.000)	(0.000)	(0.000)
CYCLE<1	-58643.15	-49304.84	-57126.76
	(0.010)	(0.029)	(0.011)
ANIMALS1	-7588.67	-1401.30	-6107.432
	(0.336)	(0.852)	(0.419)
ANIMALS2	-84530.61	-71989.24	-81771.82
	0.000	0.000	0.000
AGE	446.22	525.93	405.10
	(0.100)	(0.052)	(0.131)
RENTED LAND	63869.92	70148.36	53006.74
	(0.000)	(0.000)	(0.000)
Constant	101761.73	86676.62	15654.71
	(0.000)	(0.000)	(0.511)
n	1394	1394	1394
R^2	0.1760	0.1641	0.1569
F(7,1386)	25.42	32.45	27.90

Note: H and R superscripts describe the farm classification based on Hill (1993) and Raup(1986); p values are in parentheses

We used farm area as an alternative proxy for farm's capital intensity, and we estimate the previous model by substituting land area for capital. Because farm area includes rented land, the variable RENTLAND is omitted from the FARM LAND equation. The OLS regression results confirm prediction, i.e. family farms use less area of land than non-family farms. The estimates also suggest that older farmers use more land.

TABLE 6 The OLS Estimation of Farm Land

Variable	FARM LAND		
FAMILY FARM^{H}	-310.25		
	(0.000)		
FAMILY FARM^{R}		-270.78	
		(0.000)	
FARMTYPE			208.64
			(0.000)
CYCLE>1	-87.46	-99.19	-6.04
	(0.004)	(0.001)	(0.850)
CYCLE<1	-413.64	-397.62	-343.08
	(0.000)	(0.000)	(0.000)
ANIMALS1	-264.45	-239.89	-226.35
	(0.000)	(0.000)	(0.000)
ANIMALS2	-287.12	-248.36	-224.04
	(0.000)	(0.000)	(0.000)
AGE	2.95	3.24	2.92
	(0.002)	(0.001)	(0.001)
Constant	362.28	320.31	-256.47
	(0.000)	(0.000)	(0.000)
n	1484	1484	1484
R^2	0.1951	0.1194	0.1569
F(6,1477)	35.87	34.64	33.99

Note: H and R superscripts describe the farm classification based on Hill (1993) and Raup (1986); p values are in parentheses

5. CONCLUSIONS

In this paper we investigated the choice on farm organization in Hungary employing transaction costs economics framework. In general, our empirical study rejects the theoretical predictions of Allen-Lueck model impacts on farm organization in Hungary due to crop cycles and monitoring costs. But, the theoretical model correctly predicts the differences in capital levels and farm acreage observed in different farm organizations. Sensitivity analyses were carried out to examine how robust our results are to reasonable alternative specifications regarding to the definitions of farm types. Theoretical and empirical literature does not provide a guide to the appropriateness of

the specifications, so we employed a number of heuristic estimations. In sum, it appears that our results are robust to these alternative specifications.

Previous studies on Hungarian agriculture focusing on productivity provide some contradictory results. First studies have been based on data sets for the mid-1990s. Hughes (2000) present evidence that small farms in Hungary (within his sample less than 30 ha) seemed more efficient. Mathijs and Vranken (2001) investigate farm-specific technical efficiency in Hungarian crop and dairy farms, and confirm the superiority of family farms over corporate farms in crop farming, but rejected it in dairy farming. Gorton et al. (2003) find that the majority of commercially oriented farms are profitable. However, these results should be compared with care because of using different classification of farms.

Our results shed light on the weakness of theory of farm organizations. Transaction costs economics framework does not take into account the consequences of path dependency which is an important element in explaining of the evolution of farm structures. For example, the starting position of different types of farms has significant influence on survival of farms. Rizov and Mathijs (2003) show that older and larger farms are more likely to survive, farm growth decreases with farm age when farm size is held constant and that learning considerations are important. Farm organization forms are more complex as the model of agricultural firms is assumed. In addition, the role of agricultural policy, the links of farmers to input markets also should be considered. Therefore, further research is necessary to better understand organization forms in transition agriculture.

REFERENCES

Allen, D.W. and Lueck, 1998. The Nature of the Farm. Journal of Law and Economics, 41, 343-386.

Brem, M. 2002. Organisational Change in Agricultural Transition. Mechanisms of Restructuring Socialist Large Scale Farrms. Acta Oeconomica, 52 (1), 25-55

Brem, M. and Kim J.-M. 2000. The status of agricultural producer co-operatives in East European Countries. Korean Journal of International Agriculture, 3, 238-256.

Brooks, K. and Nash, J. 2002. The Rural Sector in Transition Economies. In: Gardner, B. and Rausser, G.C. (eds.). Handbook of Agricultural Economics. Vol. 2A. Amsterdam: North-Holland, 1547-1592.

Dong, X. and Dow, G.K. 1993. Monitoring Costs in Chinese Agricultural Teams. Journal of Political Economy, 101 (3), 539-553.

Djurfeldt, G. 1996. Defining and Operationalizing Family Farm from Sociological Perspective. Sociologia Ruralis, 36 (3) 340-355.

Evenson, R.E., Kimhi, A. and DeSilva, S. 2000. Suprevision and Transaction Costs: Evidence from Rice Farms in Bicol, The Philippines. Paper prepared for Presentation at the Meetings of American Agricultural Economics Assocation.

Friswold, G.B. 1994. Does supervision matter? Some hypothesis tests using Indian Farm-Level Data. Journal of Development Economics, 43, 217-238

Gasson, R. and Errington, A 1993. The Farm Family Business. CAB Intenational, Wallingford.

Gorton, M., Kovacs, B., Mizik, T., Davidova, S., Ratinger, T. and Iraizoz, B. 2003. An Analysis of the Commercially Oriented Farms in Hungary. Post-Communist Economies, 15 (3), 401-416.

Gorton, M. and Davidova, S. 2004. Farm productivity and efficiency in the CEE applicant countries: a synthesis of results. Agricultural Economics, 30 (1), 1-16.

Hausman, J. and McFadden, D. 1984. A specification test for the multinomial logit model. Econometrica, (52) 1219—1240.

Hill, B. 1993. The 'Myth' of the Family Farm: Defining the Family Farm and Assessing its Importance in the European Community. Journal of Rural Studies, 9 (4), 359-370.

Hill, B. 1996. The numerical importance of family farming in the European Community. In. Carruther, S.P. and Miller, F.A. (eds.): Crisis on the family farm: ethics or economics. CAS Paper 28. Reading Centre for Agricultural Strategy. 138-143.

Hughes, G. 2000. Total Productivity of Emergent Farm Structures in Central and Eastern Europe, in M. Banse & S. Tangermann (eds), *Central and Eastern European Agriculture in an Expanding European Union* (Wallingford, CABI Publishing,), 61–87.

Lema, D., Barrón, E., Brescia, V. and Gallacher, M. 2003. Theory of the Firm and Farm Ownership in Agrentina: An Empirical Assessment. Poster presented at the IAAE conference, Durban.

Mathijs, E. and Vranken, L. 2001. Human Capital, Gender and Organisation in Transition Agriculture: Measuring and Explaining the Technical Efficiency of Bulgarian and Hungarian Farms. Post-Communist Economies, 13 (2) 171-187

Rizov, M. and Mathijs, E. 2003. Farm Survival and Growth in Transition Economies: Theory and Empirical Evidence from Hungary. Post-Communist Economies, 15 (2) 227-242

Raup, P.M. 1986. Family Farming: Rhetoric and Reality. Staff Paper P86-56 Department of Agricultural Economics and Applied Economics, University of Minnesota, St.Paul.

Reed, M., Lobley, M. and Winter, M. 2002. Exploding the Family Farm Business: Analysing how the fragments 'family', 'farm', and 'business' hold together. Concerence Paper, Agricultural Economics Society, Aberystwyth, 8-10 April 2002.

Roumasset, J. 1995. The nature of the agricultural firm. Journal of Economic Behaviour and Organization, 26, 161-177.

Roumasset, J. and Uy, M. 1987. Agency Costs and the Agricultural Firm. Land Economics, 63 (3) 290-302.

Rozelle, S. and Swinnen, J.F.M. 2004. Success and Failure of Reform: Insights from the Transition of Agriculture. Journal of Economic Literature, 42 (2) 404-456

Schmitt, G. 1991. Why is the agriculture of advanced Western economies still organized by family farms? Will this continue to be so in the future? European Review of Agricultural Economics, 18, 443-458.

Schmitt, G. 1997. Unvolkommene Arbeitsmärkte, Opportunitätskosten der Familienarbeit und Betriebsgrösse. Zur Problem der optimalen Betriebsgrösse in der Landwirtschaft. Berichte über Landwirtschaft, 75, 35-65.

Schmitt, G. 1997a. Betriebsgrösse und Lohnarbeitskäfte in der Landwirtschaft – Wie relevant sind Transaktionkosten wirklich? Berichte über Landwirtschaft, 75, 224-249.

Schmitt, G., Schulz-Greve, W. and Lee, M-H. 1996. Familien- und/oder Lohnarbeitskräfte in der Landwirtschaft? Das ist hier die Frage. Berichte über Landwirtschaft, 74, 211-231.

Small, K. and Hsiao, C. 1985. Multinomial logit specification tests. International Economic Review, 26, 619-627.