THE ECONOMICS OF FARM ORGANIZATION IN CEEC AND FSU

PAVEL CIAIAN[1], JAN POKRIVCAK[2], DUSAN DRABIK[3]

[1] Katholieke Universiteit Leuven, Belgium; and Slovak Agricultural University in Nitra, Slovakia. E-mail: ciaian@yahoo.com

[2] Slovak Agricultural University in Nitra, Slovakia. E-mail: Jan.Pokrivcak@uniag.sk

[3] Slovak Agricultural University in Nitra, Slovakia. E-mail: Dusan.Drabik@fem.uniag.sk

Paper prepared for presentation at the joint IAAE- 104th EAAE Seminar

Agricultural Economics and Transition:

„What was expected, what we observed,

the lessons learned."

Corvinus University of Budapest (CUB)

Budapest, Hungary. September 6-8, 2007

ABSTRACT

In Western Europe, USA and other developed countries agriculture is dominated by small family farms. In Central and Eastern European Countries (CEEC) and Former Soviet Union (FSU) dual structure of farms exists. There are large corporate farms (CF) and small family farms (FF) in CEEC and FSU. Our paper shows that both CF and FF specialize in commodities in which they have comparative advantage. CF specialize in capital intensive products and in products with low labor monitoring. FF specialize in products with higher labor monitoring requirements. The implication of this paper is that farm structure determines in which products the country will be competitive on international markets. This is especially important for transition countries where high transaction costs hinder the change of farm organization. For this reason in transition countries suffering from high transaction cost the choice of product structure is more important than the choice of farm organization.

Key words: farm structure, production specialization, transaction costs, CEEC, FSU

1 INTRODUCTION

In Western Europe, USA and other developed countries agricultural sector is dominated by relatively small family farms. The situation is different in Central and Eastern European Countries (CEEC) and Former Soviet Union (FSU) where dual structure of farms exists. There are large corporate farms (CF) and relatively small family farms (FF) in CEEC and FSU. Average farm size in CEEC and FSU is significantly higher than in Western Europe or USA (Table 1).

Literature from the 1990s predicted that the large cooperative farms in CEEC and FSU would transform into family farms and the farm structure in CEEC would become similar to that in Western Europe and the USA because FF are more efficient than CF (SCHMITT 1991; CSAKI AND LERMAN 1996; HAGEDORN 1994). This transformation has not occurred, however.

Growing empirical literature tried to explain why CF did not transform into FF by comparing efficiency of FF and CF in different countries of CEEC and FSU (BRÜMMER 2001; MATHIJS AND SWINNEN 2001; HUGHES 2000; MATHIJS AND VRANKEN 2000). The paper of GORTON AND DAVIDOVA (2004) summarizes the findings on efficiency of farms in CEEC. Out of 7 papers reviewed, 2 found that FF were more efficient than CF, 4 found mixed results and 1 found that CF were more productive than FF. The paper also finds that in countries where markets for inputs and services for small farms are more developed and where there is longer experience with private farming, FF tend to be more efficient. In countries were this is not the case the results are mixed (GORTON AND DAVIDOVA 2004). Therefore, literature on efficiency does not provide a clear explanation why CF have not transformed into FF. A more detailed analysis of FF and CF is needed.

Table 1: Farm size in EU-15 and USA

	Average farm size (ha)
EU-15	20
USA	197

Source: European Commission, USDA.

The paper by CIAIAN AND SWINNEN (2006) provides a partial equilibrium theoretical model that explains why CF persist. Large scale CF continue to use large part of land because emerging family farms face significant transaction costs to obtain land from the established CF. Transactions costs include costs involved in bargaining with the farm management, in obtaining information on land and tenure regulations, in implementing delineation of the land and dealing with inheritance and co-owners (SWAIN 1999; PROSTERMAN AND ROLFES 1999; CIAIAN AND SWINNEN 2006).

From the literature it follows that there are significant transaction costs to transform existing CF into FF and because of this CEEC and FSU are still dominated by large scale CF. In other words, large transaction costs help CF to keep a large share of land at the expense of FF.

Transaction costs explain why CF can keep their dominant position in CEEC and FSU even if FF are more efficient. If many CEEC and FSU are stuck with CF, an important question arises: Do profit maximizing CF produce the same commodities as profit maximizing FF? To put it another way, does production structure of CF differ from production structure of FF? Or, does farm organization has an impact on production structure? ALLEN AND LUECK (2002) developed a model explaining how characteristics of products affect the choice of farm organization. Their model is based on trade-off between moral hazard and gains from specialization. Our approach is complementary to that approach. We consider the choice of farm organization as given because of initial conditions (existence of large cooperatives at the end of communist era) and high transaction cost of the change of organization form; and investigate how farm organization affects the production structure. ALLEN AND LUECK (2002), on the other hand, investigate how product characteristics affect the choice of farm organization. Their approach does not consider transaction costs of changing of farm organization.

Whether farm organization affects production structure is an important question for policy makers because transaction costs of the change of farm organization can be affected by political decisions and it is important to know how farm organization affects production structure of agricultural sector and how it is related to the loss of efficiency. Theoretically the paper provides insights into the impact of transaction costs on production structure and development of production structure in transition countries.

The paper is organized as follows. The next section briefly discusses the development of farm structure in CEEC and FSU. The third section is devoted to capital intensity and monitoring of labor in agriculture, which is followed by a section on empirical evidence of farm specialization. The last section summarizes and draws conclusions.

2 DEVELOPMENT OF FARM STRUCTURES IN CEEC AND FSU

The structure of agriculture in CEEC and FSU in the communist period was strongly biased towards extremely large farms directly controlled by the state. The average farm size

ranged from 1 157 hectares in Poland to around 124 770 hectares in Turkmenistan. This size was very large compared to average farm size in market economies such as the EU or USA (Table 1).

In the beginning of the 1990s private property rights were restored by privatization process. In CEEC, except for Albania, land and agricultural assets were restituted to former owners. FSU and Albania distributed land and assets to farm workers. Hungary and Romania combined the distribution of land and assets to workers with the restitution to former owners (CIAIAN AND POKRIVCAK 2007; SWINNEN AND ROZELLE 2005; LERMAN, CSAKI AND FEDER 2004; LERMAN 1999).

Farm restructuring followed after privatization process. New private owners of farm assets and land were allowed to break away from cooperative farms and to start family farming. This led to the creation of family farms that were significantly smaller in size than cooperatives, but comparable to their Western European or American counterparts (Tables 1 and 2). Not all cooperative farms broke up into family farms, however. Some cooperatives were transformed. That is, old socialist cooperatives were turned into cooperatives of owners of agricultural assets (including land), joint-stock companies, limited-liability companies or partnerships. During this process the size structure of farms changed toward smaller units.

Depending on the methods of privatization and government policies of restructuring, different farm structures emerged in different transition countries. While in Slovakia, the Czech Republic and most FSU countries, agriculture is still dominated by large transformed corporate farms, Albania and Baltic States have created many small size family farms. There is a broad spectrum of farm structures in between these two extreme cases (Table 2).

3 CAPITAL INTENSITY AND MONITORING OF LABOR IN AGRICULTURE

There are several studies that evaluate advantages of FF relative to CF. According to these studies FF do not suffer from moral hazard problem as farmer is residual claimant. On the other hand, FF are hindered by lack of labor specialization, which reduces the marginal product of labor. Furthermore, FF face higher costs for capital compared to partnerships, or corporations, and therefore use less capital, implying a smaller farm with less equipment compared to partnerships and factory-corporate farms (ALLEN AND LUECK 2002; POLLAK 1985).

ALLEN AND LUECK (2002, p. 179 - 180) explained how the choice of farm organization changes with the type of product:

- As the importance of labor specialization increases, the FF becomes less likely and CF becomes more likely,
- As the number of tasks increases, the FF becomes less likely,
- As the length of a stage (such as length for planting and harvesting in terms of time, temperature, rainfall, etc.) increases, the FF becomes less likely,
- As the number of cycles (the number of times per year the entire production cycle can be completed) per year increases, the total amount of time that a single task is undertaken increases over a give year, making the FF less likely,

Table 2: Farm structures in transition countries

Family farms	Transformed cooperative farms	Year

	Share of TAA (%)	Average size (ha)	Share of TAA (%)	Average size (ha)	
Albania*	96	–	4	–	1998
Bulgaria	44	1	55	861	1997
Czech Republic	28	20	72	937	2003
Hungary	59	4	41	312	2000
Poland	87	8	13	–	2003
Romania	55	2	45	274	2002
Slovakia	12	42	88	1185	2003
Slovenia	94	–	6	–	2000
Estonia	63	2	37	327	2001
Latvia	90	12	10	297	2001
Lithuania	89	4	11	483	2003
Armenia	32	–	68	–	1997
Azerbaijan	9	–	91	–	1997
Belarus	16	–	84	–	1997
Georgia	24	–	76	–	1997
Kazakhstan	20	–	80	–	1997
Kyrgyzstan	23	–	77	–	1997
Moldavia	27	–	73	1 400	1997
Russia	11	–	89	6 100	1997
Tajikistan	7	–	93	–	1997
Turkmenistan	0.3	–	99.7	–	1997
Uzbekistan	4	–	96	–	1997
Ukraine	17	–	83	2 100	1997

Notes: TAA – Total Agricultural Area; * for arable land only

Sources: Bulgaria: Bulgarian Ministry of Agriculture and Forestry; Czech Republic: Czech Statistical Office; Estonia: Statistical Office of Estonia; Hungary: European Commission; Poland: Central Statistical Office; Latvia: Statistical Office of Latvia; Lithuania: Statistical Office of Lithuania; Slovenia: Statistical Office of the Republic of Slovenia, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan: Lerman, Csaki, and Feder (2002); Albania: Albanian Ministry of Agriculture; Slovakia: Ministry of Agriculture; Romania: Romanian National Institute of Statistics.

- As variance in the stage-specific shock (e.g. pests, weather, etc.) increases, the FF becomes more likely,
- As the cost of monitoring labor increases, the family farm and partnership become more likely.
- As farm organization shifts from FF to CF, capital stock per farm increases.

ALLEN AND LUECK (2002) do not consider transaction costs to change farm organization from CF to FF. The literature on transition countries (e.g. CIAIAN AND SWINNEN 2006), however, asserts that these transaction costs are significant; hindering the

growth of family farms. Therefore, in transition countries like CEEC and FSU the crucial choice is not between farm organization, that is between FF and CF, but rather what production structure is chosen by CF and FF, respectively. High transaction costs protect the existence of CF, but CF have still to choose the production structure to strengthen their competitiveness on the land market relative to growing FF; and on the output market relative to FF at home as well as with respect to international competitors.

Farms choose production structure in which they have comparative advantage. The comparative advantage of large CF is in capital intensive product types for which monitoring of labor is relatively low and in which specialization of labor is possible. On the other hand, small FF have comparative advantage in products in which labor monitoring is important, measurement of labor effort is difficult and capital intensity is unimportant.

Next, we empirically evaluate agricultural commodities taking into account monitoring requirements and capital intensity. Based on this, we identify in which products FF and CF have comparative advantage.

Data for measuring labor monitoring requirements and capital intensity explicitly for each commodity is not available. Therefore labor per hectare for a farm type specialized by commodity serves as a proxy for labor monitoring requirement per commodity. Amount of labor per hectare for a farm type specialized by commodity was obtained from FADN (Farm Accountancy Data Network) data of the European Commission. Number of labor per hectare is measured as annual work unit (AWU)[1] per hectare. Capital intensity was also computed for each farm type specialized by commodity as a ratio of capital costs[2] to labor costs[3]. We considered the following six farm types: 1) Farm specialized in cereals, oilseed and protein crops; 2) Farm specialized in field crops (root crops, combined cereals and root crops, field vegetables, or other field crops (tobacco, cotton, etc.); 3) Farm specialized in permanent crops (horticulture, vineyards, olives, fruits); 4) Farm specialized in livestock (dairy, cattle, sheep); 5) Farm specialized in granivores (pig and poultry); and 6) Mixed farms (mixed crop farms, mixed livestock farms, mixed livestock and crop farms). FADN data were not available for FSU countries. Data were available only for 8 transition countries from Central and Eastern Europe (the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia). To check the robustness of results we performed the same analysis for EU-15 member states. We used ordinary least squares (OLS) estimation with White heteroskedasticity-consistent standard errors to address heteroskedasticity problem.

In our regressions dependent variables were AWU per hectare for year 2004 in the case of 8 CEEC; and AWU per hectare averaged over five years, 2000-2004, in the case of EU-15. Explanatory variables were farm types and country dummies (not reported). Country dummies were included to take account of the country specific effects. The results are shown in Tables 3 and 4. To estimate the capital intensity, dependent variable was capital costs divided by labor costs for each farm type for 2004 in the case of 8 CEEC and capital costs divided by labor costs averaged over five years, 2000-2004, in the case of EU-15. Similarly, explanatory variables were farm types and country dummies (not reported) to take account of the country specific effects. Results are shown in Tables 5 and 6.

[1] AWU measures the total labor input of holding expressed in annual work units (equal to full-time person equivalents).
[2] Capital costs include depreciation, energy costs, machinery and building current consumption.
[3] Labor costs include wage costs.

Table 3: Labor per hectare in CEEC

	Cereals, oilseed and protein crops	Field crop	Permanent crop	Livestock	Granivores	Mixed farms
Cereals, oilseed and protein crops	–	-0.02	-0.32***	-0.02	-0.19***	-0.04**
Field crop	0.02	–	-0.30***	0.01	-0.16**	-0.02
Permanent crop	0.32***	0.30***	–	0.30***	0.13	0.28***
Livestock	0.02	-0.01	-0.30***	–	-0.17**	-0.02
Granivores	0.19***	0.16**	-0.13	0.17**	–	0.15**
Mixed farms	0.04**	0.02	-0.28***	0.02	-0.15**	–

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: own calculations

Table 4: Labor per hectare in EU-15

	Cereals, oilseed and protein crops	Field crop	Permanent crop	Livestock	Granivores	Mixed farms
Cereals, oilseed and protein crops	–	-0.01	-0.33***	-0.02	-0.09***	-0.03**
Field crop	0.01	–	-0.31***	-0.01	-0.08***	-0.02
Permanent crop	0.33***	0.31***	–	0.30***	0.24***	0.29***
Livestock	0.02	0.01	-0.30***	–	-0.07**	-0.01
Granivores	0.09***	0.08***	-0.24***	0.07**	–	0.06**
Mixed farms	0.03**	0.02	-0.29***	0.01	-0.06**	–

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: own calculations

The result of regression estimating labor requirements per hectare (AWU per hectare) are shown in Tables 3 and 4 for CEEC and EU-15, respectively. There is a high level of consistency between CEEC and EU-15 results. A positive value (e.g. 0.32 for row 3 denoting permanent crops and column 1 denoting cereals, oilseeds and protein crops) implies that the respective type of farm in row 3 (farm specialized in permanent crops) has labor requirement per hectare higher (by 0.32) than a farm in column 1 (farm specialized in cereals, oilseed and protein crops). The opposite holds if the estimated parameter is negative. Livestock farm type (row 4) has labor requirement lower by 0.30 than permanent crop farm (column 3). From Tables 3 and 4 it can be concluded that the highest labor per hectare is required for permanent crops, followed by granivores, livestock, field crops and cereals and oilseeds.

Table 5: Relative capital costs to labor costs in CEEC

	Cereals, oilseed and protein crops	Field crop	Permanent crop	Livestock	Granivores	Mixed farms
Cereals, oilseed and protein crops	–	2.1	9.2*	-9.4*	3.5	-1.0
Field crop	-2.1	–	7.1	-11.6**	1.4	-3.1
Permanent crop	-9.2*	-7.1	–	-18.6**	-5.6	-10.1
Livestock	9.4*	11.6**	18.6**	–	13.0**	8.5
Granivores	-3.5	-1.4	5.6	-13.0**	–	-4.5
Mixed farms	1.0	3.1	10.1	-8.5	4.5	–

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: own calculations

Tables 5 and 6 show estimation results for capital intensity by farm type. The interpretation of the results is the same as in Tables 3 and 4. Similar to labor monitoring estimates, there is relatively high consistency between CEEC and EU-15 results but for the EU-15 statistical significance of the estimations is stronger. The results reported in Tables 5 and 6 show that livestock production is the most capital intensive followed by cereals, oilseeds, permanent crops and field crops.

Table 7 summarizes the importance of labor monitoring and capital intensity by farm types. Based on the results obtained from the estimations, we constructed ranking of labor monitoring requirement and capital intensity for each farm type. The farm type that requires most labor per hectare or the farm type that is the most capital intensive received 5 stars, while the farm type that is the least capital intensive or requires the least labor per hectare received 1 star. Mixed farms were excluded from analysis because labor monitoring requirement and capital intensity cannot be associated with a specific product type unambiguously. Mixed farms are involved in both animal production and crop production. Based on the ranking in Table 7, we identified sectors in which FF and CF have comparative advantage. From the Table 7 we can conclude that CF have comparative advantage in cereals and oilseed production, while FF have comparative advantage in permanent crops. Cereals and oilseed production have low labor requirement and are capital intensive. Permanent crops are just the opposite, they have high labor requirement, while capital intensity is low. The evidence is mixed for animal sector and field crops.

Table 6: Relative capital costs to labor costs in EU-15

	Cereals, oilseed and protein crops	Field crop	Permanent crop	Livestock	Granivores	Mixed farms

Cereals, oilseed and protein crops	–	9.4***	11.5***	-2.2	3.4	5.1*
Field crop	-9.4***	–	2.1	-11.6***	-6.0**	-4.3**
Permanent crop	-11.5***	-2.1	–	-13.7***	-8.1***	-6.4***
Livestock	2.2	11.6***	13.7***	–	5.6**	7.2***
Granivores	-3.4	6.0**	8.1***	-5.6**	–	1.7
Mixed farms	-5.1*	4.3**	6.4***	-7.2***	-1.7	–

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: own calculations

Table 7: Importance of labor monitoring requirements and capital intensity by farm type and farm comparative advantage

	Cereals, oilseed and protein crops	Field crop	Permanent crop	Livestock	Granivores
Labor monitoring	*	* *	* * * * *	* * *	* * * *
Capital intensity	* * * *	*	* *	* * * * *	* * *
Comparative advantage	CF	?	FF	?	?

Notes: ? – unambiguous decision
Source: own calculations

4 FARM SPECIALIZATION – EMPIRICAL EVIDENCE

In this section we test whether observed product specialization of CF and FF is consistent with theoretical hypothesis and with the predictions provided in Table 7.

Consistent data on FF and CF production structure was not available. Therefore we could not conduct a direct test for product specialization of FF and CF. We followed two indirect approaches to test our hypothesis instead. First, we tested how product structure changes with farm size and we note that CF are generally large and FF are small. Second, we tested how production structure at a country level in transition countries changes with the share of FF on land use. If our hypothesis holds, then in a country where FF dominate, production structure will be biased toward products in which FF have comparative advantage. In other transition countries where CF prevail, the production structure will be biased towards products in which CF have comparative advantage.

We used Eurostat data to conduct the first test. We collected data for 10 CEEC: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovenia, Slovakia, and Romania. For each country land use data for 8 farm size intervals were collected for two

available years: 2003 and 2005. The exception is Bulgaria and Romania for which data were available only for 2003 year. The following six land use categories were considered: 1) Cereals and oilseeds, 2) Industrial plants; 3) Forage plants; 4) Potatoes and Sugar beet; 5) Fresh vegetables, melons, strawberries; and 6) Permanent crops.

For estimation we used OLS with White heteroskedasticity-consistent standard errors to address heteroskedasticity problem. Dependent variables were the six land categories expressed as shares of utilized agricultural area (UAA) and averaged over the two available years: 2003 and 2005, except for Bulgaria and Romania in which case only data for 2003 were used. Explanatory variables were logarithm of farm size and country dummies (not reported) to take account of the country specific effects. For farm size, average of the lower and upper value of each of the 8 intervals was calculated and this value was used for estimation. Results are shown in Table 8. To check the robustness of our results, we conducted similar estimations for EU-15. The results are shown in Table 9.

Consistent with our predictions in previous sections, large farms tend to specialize in cereals and oilseeds while small farms specialize in permanent crops. Since small farms tend to be FF while large farms are mostly CF in transition countries we can conclude that CF specialize in cereals and oilseeds while FF specialize in permanent crops. Results are similar for CEEC and EU-15. Furthermore, FF also specialize in fresh vegetables, melons and strawberries which have similar product characteristics to permanent crops. Inconclusive evidence was obtained for field crops (potatoes and sugar beet). In CEEC small farms specialize in potatoes and sugar beet while in EU-15 this is the opposite. It is because CEEC use more labor intensive technology to produce potatoes and sugar beet, while EU-15 countries use capital intensive production. Forage plants increase with the farm size in both CEEC and EU-15. This is an indication that livestock production is concentrated on larger farms. Production of industrial crops also increases with farm size in both EU-15 and CEEC.

The second test was performed at a country level. We conducted 4 OLS regressions with the following dependent variables, respectively 1) Cereals and oilseeds area as a share on arable and permanent crops area, 2) Labor intensive crop area[4] as a share on arable and permanent crops area, 3) Livestock units per hectare, and 4) Number of pig per hectare. These data was collected from Faostat for 23 transition countries. For each country we used average value for five years, 1999-2003. The explanatory variables were share of FF on land use, cereal yield as a proxy for land quality, amount of arable land per capita, and GDP per capita as a proxy for technology. Various sources of explanatory variables were used. Data sources on FF share of land are reported below Table 2. Cereals yield, arable land and population were collected from Faostat, while GDP per capita came from the United Nations database. In total, we obtained data for each country for one year. Because there is no consistent time series on the share of FF on land use. All variables in the model are in logarithm form. The results are reported in Table 10. OLS estimation with White heteroskedasticity test was performed. As shown in Table 10, no heteroskedasticity was found in all estimated models.

Table 8: Land use specialization and farm size in CEEC

[4] The crop included in this category: fruit, vegetables, sugar beets and potatoes.

	Cereals and oilseeds (% of UAA)	Industrial plants (% of UAA)	Forage plants (% of UAA)	Potatoes and Sugar beet (% of UAA)	Fresh vegetables, melons, strawberries (% of UAA)	Permanent crops (% of UAA)
C	9.14***	1.53*	2.29*	5.50***	1.81***	7.06***
Farm Size	6.12***	2.33***	0.91***	-1.31***	-0.41***	-1.60***
	(0.000)	(0.000)	(0.007)	(0.000)	(0.000)	(0.000)
R-squared	0.88	0.87	0.78	0.63	0.65	0.64

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; p-value in parentheses; UAA – Utilized Agricultural Area
Source: own calculations

Table 9: Land use specialization and farm size in EU-15

	Cereals and oilseeds (% of UAA)	Industrial plants (% of UAA)	Forage plants (% of UAA)	Potatoes and Sugar beet (% of UAA)	Fresh vegetables, melons, strawberries (% of UAA)	Permanent crops (% of UAA)
C	-10.32***	-1.76***	14.92***	-0.91	2.66***	17.92***
Farm Size	5.53***	0.66***	0.88*	0.62***	-0.73***	-6.41***
	(0.000)	(0.000)	(0.067)	(0.001)	(0.002)	(0.000)
R-squared	0.77	0.65	0.73	0.64	0.35	0.74

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; p-value in parentheses
Source: own calculations

In countries where the share of FF on land use is higher, a smaller area tends to be allocated to cereals and oilseeds and more to labor intensive crops. Furthermore, in countries where the share of FF on land use is higher, number of livestock and pigs per hectare is higher than in countries with lower share of FF on land. This is in contradiction with the prediction that forage increases with farm size as reported in Tables 8 and 9. This could be due to the fact that CF may produce forage for the market and not for farm consumption by own animals. SEROVA (2002) also observes that in Russia households are more involved in livestock breeding and producing high value products like fruits and vegetables, while corporate farms are specialized in cereal crops, oilseeds, and feed crops.

Table 10: Regressions results

	Cereals and oilseeds	Labor intensive crops	Livestock units per hectare	Pig per hectare
Constant	-2.058	-5.98*	-6.928*	-31.571***
	(0.395)	(0.053)	(0.085)	(0.009)
FF	-0.114**	0.137*	0.199*	0.853***
	(0.045)	(0.077)	(0.052)	(0.006)
CERAL YIELD	0.136	0.476	0.428	2.150
	(0.611)	(0.176)	(0.348)	(0.104)
ARABLE LAND PER CAPITA	-0.007	-0.442***	-0.724***	0.454
	(0.947)	(0.006)	(0.001)	(0.394)
GDP PER CAPITA (2003)	0.041	-0.275	-0.016	0.668
	(0.529)	(0.024)	(0.914)	(0.126)
R-squared	0.19	0.65	0.66	0.73
White Heteroskedasticity Test - no cross terms (Prob. Chi-Square)[1]	0.38	0.41	0.76	0.31

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%; p-value in parentheses
Source: own calculations

5 CONCLUSIONS AND DISCUSSION

In transition countries land markets are characterized by high transaction costs which help CF to keep their dominant positions. However, CF compete with FF for land resources and in domestic and international output markets. Both CF and FF specialize in commodities in which they have comparative advantage. This paper shows that CF specialize in capital intensive products and in products with low labor monitoring. FF specialize in products with higher labor monitoring requirement.

The implication of this paper is that farm structure determines in which products the country will be competitive on international markets. This is especially important for transition countries where high transaction costs hinder the change of farm organization. For this reason in transition countries suffering from high transaction costs the choice of product structure is more important than the choice of farm organization. With zero transaction costs farm organization would adjust as predicted by ALLEN AND LUECK (2002).

The second implication of our paper is that the literature comparing efficiency of CF and FF in transition countries should also take into consideration transaction costs of using markets. In many transition countries output markets suit large CF and prevent development of FF. Indirectly this is also related to contracting and vertical integration. Labor intensive products (e.g. permanent crop products such as fruits) usually require different type of contracting and vertical integration than for example capital intensive products (such as cereals and oilseeds). The existence of transaction costs in transition countries that hinder the development of contracting and vertical integration for one type of products will again have impact on efficiency of CF relative to FF.

REFERENCES

ALLEN, D. W., LUECK, D. (2002): The nature of the Farm, Contracts, Risk, and Organization in Agriculture. Cambridge, Massachusetts: MIT Press.
BRÜMMER, B. (2001): Estimating confidence intervals for technical efficiency: the case of private farms in Slovenia. *European Review of Agricultural Economics* 28, 285–306.
CIAIAN, P., POKRIVCAK, P. (2007): Agriculture Reforms and Development in East-Central Europe. In: Sergi, B. S., Bagatelas, W. T. and Kubicova, J. (eds.), *Industries and Markets in Central and Eastern Europe*, Aldershot; Burlington: Ashgate, Forthcoming in 2007.
CIAIAN, P., SWINNEN, J.F.M. (2006): Land Market Imperfections and Agricultural Policy Impacts in the New EU Member States: A Partial Equilibrium Analysis. *American Journal of Agricultural Economics*, 88(4), pp. 799-815.
CSAKI, C., LERMAN, Z. (1996): Agricultural Transformation in Central and Eastern Europe and the Former USSR: Issues of Land Reform and Farm Restructuring. Paper Presented at the VIIIth Congress of the European Association of Agricultural Economists, Edinburgh.
GORTON, M., DAVIDOVA, S. (2004): Farm Productivity and Efficiency in the CEE Applicant Countries: A Synthesis of Results. *Agricultural Economics* 30:1–16.
HAGEDORN, K. (1994): Changing Organisation of Agriculture as a Result of the Transformation Process. Paper Presented at the Workshop "The Impact of CEE Agricultural Reform on Domestic and International Markets", Leuven, 10–11th June.
HUGHES, G. (2000): Total productivity of emergent farm structures in Central and Eastern Europe. In: Banse M., Tangermann, S. (Eds.), Central and Eastern European Agriculture in an Expanding European Union, CABI, Walingford, pp. 61–87.
LERMAN, Z. (1999): Land reform and farm restructuring: What has been accomplished to date? *American Economic Review*, 89 (2) May 1999.
LERMAN, Z., CSAKI, C., FEDER, G. (2004): *Agriculture in Transition: Land Policies and Evolving Farm Structures in Post-Soviet Countries*. Lanham, MD: Lexington Books.
MATHIJS, E. AND SWINNEN, J.F.M. (2001): Production Organization and Efficiency during Transition: An Empirical Analyses of East German Agriculture. *Review of Economics and Statistics* 83:100–107.
MATHIJS, E., VRANKEN, L. (2000): Farm restructuring and efficiency in transition: evidence from Bulgaria and Hungary. Selected Paper, American Agricultural Economics Association Annual Meeting, Tampa, Florida, July 30–August 2.
POLLAK, R. A. (1985): A transaction costs approach to families and households, *Journal of Economic Literature*, 23, June, 581-608.
PROSTERMAN, R.L., ROLFES, L. (Jr.). (1999): Review of the Legal Basis for Agricultural Land Markets in Lithuania, Poland and Romania. Paper presented at the Second World Bank/FAO Workshop, Warsaw, 27–29 June.
ROZELLE S., SWINNEN J.F.M. (2004): Success and failure of reforms: Insights from transition agriculture. *Journal of Economic Literature*, vol. XLII, no. June, pp. 404 - 456.
SCHMITT, G. (1991): Why is the Agriculture of Advanced Western Countries still Organised by Family Farms? Will this continue to be so in the Future? *European Review of Agricultural Economics* 18:443-458.
SEROVA, E. (2002): *Evolution of the Farm Structure in Russia's Agriculture: Background and Perspectives*. Paper presented at the Conference on "Pre-accession Strategy of Czech Agriculture towards EU," Held on occasion of the 90th anniversary of Czech Institute of Agricultural Economics (VUZE), Prague, 27-28 September, 2002.
SWAIN, N. (1999): Agricultural Restitution and Co-operative Transformation in the Czech Republic, Hungary and Slovakia. *Europe-Asia Studies* 51:1199–1219.