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## **The Choice of Supply Channels in Hungarian Fruit and Vegetable Sector**

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## **The Choice of Supply Channels in Hungarian Fruit and Vegetable Sector**

### **Abstract**

The agricultural reform in Hungary broke the previously vertically integrated agri-food system in different lines. The structures in agriculture, food industry and food retailing have fundamentally changed. These changes have also influenced the vertical governance structures in agri-food sector. The aim of this paper is to investigate the choice of farmers among various supply channels in Hungarian fruit and vegetable sector employing the framework of transaction cost economics. Our analysis is based on a survey among fruit and vegetable producers in Csongrád county in respect the choice of marketing channels. A multinomial logit model is applied to reveal on the determinants influencing the choice among various supply channels. The results seem to contradict some of the basic propositions of transaction cost economics.

### **1. Introduction**

The vertical co-ordination has been an important topic in agricultural marketing literature since the beginning of industrialization in agriculture. *Vertical co-ordination* can be defined as „the alignment of direction and control across segments of production/marketing system” (King 1992). Recent literature (e.g. Barkema and Drabenstott, 1995, Peterson and Wysocki, 1997) has distinguished two extreme co-ordination mechanisms: spot markets (external co-ordination) and vertical integration (internal co-ordination). Peterson and Wysocki (1997) instead of discrete governance structures define the term of vertical co-ordination continuum that moves from external mechanisms to internal mechanisms with three transitional stages (contracts, strategic alliances, formal co-operation) between two extreme polar forms. They have noted, opposite to the common approach of the agricultural marketing literature (e.g. Ouden et al., 1996), that single ownership is not necessary for vertical integration, but centralized control is necessary.

The agriculture is traditional risky business, but in transition countries agricultural producers should face some additional difficulties. The transition can be described by considerable uncertainties which caused mainly agricultural policy and recession of the economy. Furthermore, in these countries public institutions are ineffective in ensuring contract enforcement. The absence of enforceable contract to set up any kind of vertical coordination has become extremely difficult. Therefore, searching new partners for long run, relation-specific investments have been associated with high transaction costs for farmers. In addition, this creates severe barriers for price discovery involving high transaction costs to co-ordinate market exchanges. Under these conditions, it is expected that spot markets dominate over other co-ordinate mechanisms. In those sub-sectors, where any type of production contracts does exist, agricultural producers face the hold-up problems (e.g. delayed payment for delivered products, or ex post price reduction by retailers), which are stressed strongly by Gow and Swinnen (1998). These problems are very severe for those subsector dominating fragmented and small-scale farms, like fruit and vegetable sector.

Recently there are some studies focusing on various governance structures of agriculture in transition countries employing different frameworks (e.g. Boger 2001, Rudolph, 1999, Gow et al., 2000, Zaharieva et al. 2001). The aim of the paper is to identify and explain farmers' choice among various supply channels in a transition agriculture employing the case of the Hungarian fruit and vegetable sector. We present an empirical analysis of the key determinants based on transaction cost economics. Our analysis is based on a survey among vegetable producers in one Hungarian county (Csongrád) in respect the choice of marketing channels. The resulting data are applied for a multinomial logit model to test the theoretical prediction.

The remainder of the study is organized as follows. The second section briefly reviews the literature on the vertical coordination employing transaction cost economics. The survey design and the variables are described in the section 3. The results are presented in section 4. The last section summarises and offers some conclusions on the implications for the vertical coordination mechanisms of Hungary's fruit and vegetable sector.

## **2. Transaction costs and vertical coordination**

The applications of transaction cost economics on problems of agri-food chain have become increasingly popular in agricultural economics in the nineties. This section provides a selected review about this literature. Frank and Henderson (1992) analyzed the influence of transaction costs as determinants of vertical coordination in 42 U.S. food industry applying multiple OLS regressions. Empirical analysis supports the hypothesis that transaction costs - uncertainty, input supplier concentration, asset specificity and scale economies - are a primary motivation for vertical coordinating via nonmarket arrangements.

Behner and Bitsch (1995) investigated the existing relations between propagators and vegetable growers in northern Germany. They employed comparative institutional analysis based on secondary and primary data (interviews). The authors found that the information asymmetry problems develops out of a combination uncertainty, opportunistic behaviour and evaluation difficulties. For a persistent relationship, reputation, "fair dealing" in case of reclaiming and advisory service for the growers provided by the propagators are the most important factors.

Weleschuk and Kerr (1995) examined the market for special crops in western Canada focusing two existing forms of governance, ex ante contracting and ex post bargaining applying qualitative analysis. The evidence suggest that neither governance structure will lead to an efficient level of investment in the production of special crops. As a result the full potential for diversification into special crops may not have been realized in western Canada.

Hobbs (1996) analyzes the transaction costs as key factors for processors' selection of supply channels in U.K. meat processing sector. The conjoint analysis based on survey data from 93 meat processors shows that particularly monitoring costs arising from traceability are important to the choice of vertical coordination. In addition, pressures

for greater traceability increases the demand from downstream firms to move towards closer forms of vertical coordination.

Hobbs (1997) attempts to measure the importance of transaction costs in cattle sector affecting the choice between live-ring auction and direct-to-packer sales. She employs two-limit tobit model for data from a survey of 100 cattle producers in U.K. She found that four transaction cost variables were significant, namely grade uncertainty surrounding direct direct-to-packer sales, the risk of non sale at auctions, the time spent at the auction and adequacy of the packer procurement staff.

Poole et al. (1998) try to identify the important factors affecting producers' marketing decisions and to suggest whether a formal contract would facilitate producers' marketing decisions, reduce uncertainty and thus lower transactions costs in Spanish citrus industry. The evidence, based on a survey of 300 citrus producers, show that the importance of uncertainty concerning prices and payment in producers' marketing decisions. More specifically, the certainty of payment, guaranteed by reputation and by previous experience , and price that is guaranteed not be reduced during the season.

Zaharieva et al. (2001) investigated the choice of supply channels by Bulgarian wine makers applying case study approach. They identified four types of channels which differs in the costs of using them and effectiveness of information transmission from processors to growers. The case studies revealed that despite the difficulties created by the underdeveloped market and barriers in finding investment financing, the expected long-run benefits of vertical integration offered sufficient incentives to firms to pursue alternative ways of accomplishing this initiative.

Boger (2001) examined the marketing arrangements between Polish hog producers and buyers in an evolving markets. She employs various multivariate techniques based on a sample of 200 Polish hog producers. The multinomial logit analysis suggests that producers' choice between large processors as opposed to traders and local slaughterhouses can be predicted by type of contract. The cluster analysis shows four distinct groups of farmers according to investment in specific assets, ability to

safeguards assets, degree of coordination with buyers, use of grading and written contracts and extent of bargaining power.

In short, this selected review of recent empirical studies on transaction cost economics in the field of vertical coordination in agricultural markets shed light on the usefulness of this framework for analyzing of economic agents in agri-food systems. These studies attempted to identify factors explaining existence of various vertical co-ordination forms along agri-food chain, based on different methodological background from case study to econometric investigation both industry and firms level. However, they do not support unambiguously the transaction cost explanations of vertical coordination.

### **3. The sample and the key variables**

The study investigated the choice of farmers among various supply channels in Hungarian vegetable sector during the 2000-2001 season. The hypothesis that producers' decision among various marketing channels is influenced by transaction costs and asset specificity is tested employing data collection from a survey of Hungarian vegetable producers was drawn from one Hungarian region – the Csongrád county. The questionnaire was prepared in consultation with members of local agricultural extension services. Due to financial constraints we used postal surveys<sup>1</sup>. It should be emphasized that the sample is not random. The survey targeted larger, market oriented farmers in a traditional vegetable grower region of Hungary. The size of the sample is 66, but we reduced number of observations to 62 due to missing values.

Table 1 reports key variables. According to Juhász (1999) we distinguish eight types of supply channels. But, after receiving questionnaires, four marketing channels were identified which differ in the costs of using them: wholesale markets, wholesalers, marketing cooperatives and producer organizations. Following Hobbs (1997) we divided the transaction costs into three groups for empirical analysis: information costs, negotiation costs and monitoring costs. In addition, we attempted to measure the human and physical asset specificity.

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<sup>1</sup> Further details of the survey and a copy of the questionnaire are available from the authors upon request.

**Table 1 Variables used for the empirical analysis**

<b>Variable</b>	<b>Description</b>	<b>Units</b>
<b>Dependent variable</b>		
Chain	Type of supply channels	0-3
<b>Independent variables</b>		
<i>Information costs</i>		
infac	Difficulties to access useful information	1-5
infime	Time spent discovering partners by transaction	1-5
infph	Do you own phone and/or fax	1-3
inmob	Do you own mobile phone	0-1
infunc	Is it problem not knowing what price before selling	1-5
<i>Negotiation costs</i>		
transp	Who delivers products to buyer	1-5
transpcost	Who carries the costs of transporting to the buyer	1-5
freq	How often did you sell products to the buyer	1-7
barg	Can you negotiate the transactional terms with the buyer	1-5
pay	Do you satisfy with conditions of payment	1-5
close	It would be a problem if your buyer terminates business relations with you	1-5
<i>Monitoring costs</i>		
monunc	Is it a problem that product may not graded as expected before selling to buyer	1-5
moninf	Is not being present when products are graded a problem	1-5
<i>Physical asset specificity</i>		
invpast	Have you invested in your business last year	0-1
invplan	Do you plan invest in the future years	0-1
<i>Human asset specificity</i>		
age	Age of farmer	1-5
educ	Final level of education	1-9



#### 4. Results

The results of the multinomial logit model, that satisfied theoretical expectations and yielded reasonable significant results, are reported in Table2.

**Table 2 Results of multinomial logit model for the choice of supply channels**

Independent variables	Wholesalers Chain=1	Marketing cooperative Chain=2	Producer Organization Chain=3		
AGE	-0.560 (-0.858)	1.701 (2.896)***	1.445 (2.528)**		
INVPAST	0.319 (0.338)	-0.237 (-0.240)	1.657 (1.724)		
INFMOB	0.415 (0.348)	2.603 (2.288)**	1.567 (1.453)		
BARG	-0.105 (-0.228)	-1.430 (-3.044)***	-1.139 (-2.614)**		
MONINF	0.254 (0.725)	-0.961 (-2.360)**	-0.929 (-2.380)**		
Number of observations: 62		Likelihood Ratio Index (DF): 0.283 (12)			
Log Likelihood: -57.218		Likelihood Ratio Test (DF): 45.229 (12)			
Restricted Log Likelihood: -79.833					
Predicted					
Actual	Chain=0	Chain=1	Chain=2	Chain=3	Total
Chain=0	7	0	0	4	11
Chain=1	3	3	0	1	7
Chain=2	1	1	14	5	21
Chain=3	2	0	6	15	23
Total	13	4	20	25	62

Note: The definition of all variables is described in Table 1. DF refers to degrees of freedom. Outcome Chain=0 is the comparison group. \*, \*\*, \*\*\* Significant at the 10, 5 and 1 per cent significance levels

The estimation model is statistically significant at the 1 percent level. The likelihood ratio test statistics suggests that the hypothesis of all slope coefficients being zero can be rejected at the 0.01 percent significance level. The likelihood ratio of 0.28 and the model's ability to correct prediction 63 percent of the observations indicate a reasonable goodness-of-fit. The prediction power of the model when it comes to explaining actual classifications into four categories somewhat differs between the individual categories. Whereas 63-67 percent of all farms with the choice of wholesale markets, marketing cooperatives and producer organization are satisfactory predicted, the percentage of the choice of wholesalers being correctly classified substantially lower with 43 percent.

Table 2 shows that variables are not significant for the choice of wholesalers. Our results suggest that the probability of the choice of marketing cooperative is significantly and positively influenced by the age of farmer (AGE) and having mobile phone (INFMOB), and negatively by the bargaining power (BARG) and the possibility of monitoring (MONINF). However, physical asset specificity (INVPAST) does not have a significant influence on the farmers' decision in respect to wholesalers.

The probability of choosing to sell to a producer organization is positively influenced by the farmer's age (AGE) and negatively by the bargaining power (BARG) and the possibility of monitoring (MONINF). But, the influence on the physical asset specificity (INVPAST) and information costs were not significant on the farmers' decision in choosing of a producer organization.

It must be emphasized, as Greene (2000) pointed out, that the meaning of coefficients is not straightforward, the marginal effects provide a better interpretation of the model results. Therefore, marginal effects are reported in Table 3. The age of farmers decreases the probability of the choice of wholesale market and wholesalers, whereas the opposite true for the marketing cooperative. It appears that older farmers do not trust enough in traders on wholesale market and wholesalers. They usually prefer stable business relationships provided by marketing cooperatives and producer organization to riskier connections.

**Table 3 Marginal effects of the multinomial model for choice of supply channels**

Independent variables	Wholesales market Chain=0	Wholesalers Chain=1	Marketing cooperative Chain=2	Producer Organization Chain=3
AGE	-0.171 (-3.029)***	-0.103 (-2.160)**	0.178 (2.384)**	0.095 (1.267)
INVPAST	-0.089 (-0.856)	-0.019 (-0.348)	-0.328 (-2.058)**	0.436 (2.755)***
INFMOB	-0.233 (-2.010)**	-0.072 (-1.035)	0.349 (1.789)*	-0.044 (-0.226)
BARG	0.144 (2.755)***	0.053 (1.635)	-0.149 (-2.227)**	-0.047 (-0.724)
MONINF	0.104 (2.197)**	0.057 (1.723)	-0.081 (-1.323)	-0.080 (-1.261)

Note: The definition of all variables is described in Table 1.

\*, \*\*, \*\*\* Significant at the 10, 5 and 1 per cent significance levels

Investments in last year (INVPAST) enhance the probability that farmers sell their product to a producer organization, while it negatively influence the use of marketing cooperatives. The sign of INVPAST is negative, but not significant for wholesale markets and wholesalers. Therefore, our hypothesis that asset specificity of the investment will lead producers to seek the supply channel providing the greater safeguards can not be confirmed.

The variable INFMOB is included in the model to assess to what extent the information costs influence the channel choice. Our results indicate that it is significant for wholesale markets with negative sign and marketing cooperatives with positive sign. The INFMOB were negative and not significant for wholesalers and producer organizations. This contradicts to a priori expectations that information costs have a negative effects on the choice of a more stable supply channel.

The bargaining power (BARG) increases the probability of selling to wholesale market, whereas the probability of the use of marketing cooperatives is negatively affected by bargaining power. This fits with our hypothesis that the absence of bargaining power producers attempt to sell through marketing cooperatives improving their chance to get a better price. While farmers with good bargaining power prefer a more individualistic business strategy, i.e. selling to wholesale markets or wholesalers.

The grade information asymmetry (MONINF) has a positive and significant influence on the farmers' decision in choosing of wholesale markets. This confirms with our hypothesis that monitoring costs increase the probability of selling to wholesale markets. Other variables were not significant. Noteworthy is that the results of multinomial logit model in Table 2 show a negative and significant effect for marketing cooperatives and producer organizations. It is interesting that although the signs of marginal effects are also negative, conforming to a priori expectations, but they are not significant.

The existence of hold up problem is strongly emphasized feature of transition agriculture (e.g. Gow and Swinnen, 1998). However, it is interesting to note that the variable PAY applied as a proxy of enforcement costs was not significant in first experiments of estimations or yielded poor results, thus we excluded from the final model. This contradicts to our a priori expectations. The reason may be, similarly to Boger (2001) findings on Polish hog markets, that producers in general enjoy immediate cash payment.

## **5. Conclusions**

It is very common problem in transition countries, like in Hungarian agriculture, that agri-food chains are still suffering from underdeveloped market institutions. This creates many difficulties for efficient exchange and set up reliable co-ordination mechanisms. Empirical evidence suggests that multinational firms and other large-scale companies in the food industry can solve some inefficiencies, including hold-up problems (Fertó, 1999). However, their activities can cover only a small proportion of

the Hungarian agri-food sectors. But, a majority of farmers face significant market uncertainties without reasonable risk-sharing techniques, especially in sub-sectors dominated fragmented small-scale farmers, like fruit and vegetable sector. Fertő and Szabó (2002) argue that marketing co-operatives can also solve some problems arising from missing and embryonic market institutions. The aim of this paper is to identify and explain the choice of farmers among various supply channels in Hungarian fruit and vegetable sector investigating the relationships between transaction costs, asset specificity and the supply channels used for selling of vegetable products.

In summary, the farmer's decisions with respects to supply channels are influenced differently by transaction costs. Producers sell to wholesale market are strongly and negatively affected by the farmer's age, information costs, and negatively by the bargaining power and monitoring costs. Our model yielded similar results for the wholesalers, but the age variable was only significant. Producers' choice selling to marketing cooperative or producer organization are somewhat different. The probability that farmers sell their product to marketing cooperative is influenced by the age and information costs positively, whereas by the asset specificity and bargaining power negatively. Our results indicate a similar picture for producer organization without significance, except asset specificity with opposite sign and significance. We may conclude that the choice of supply channels contradicts to some of the basic propositions of transaction cost economics.

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**Appendix****Descriptive statistics of all variables**

	Mean	Std.Dev.	Minimum	Maximum	Cases
CHAIN	1.85	1.13	0	3	66
INFAC	2.95	0.86	1	5	61
INFTIME	12.34	30.62	1	99	64
INFPH	2.05	0.33	1	3	65
INFMOB	0.80	0.40	0	1	66
INFUNC	2.39	1.14	1	5	66
TRANSP	4.67	0.90	1	5	66
TRANSPCOST	4.73	0.83	1	5	66
FREQ	5.43	1.82	1	7	63
BARG	2.63	1.28	1	5	65
PAY	3.75	1.26	1	5	65
CLOSE	1.62	0.86	1	5	66
MONUNC	3.43	1.04	1	5	61
MONINF	2.60	1.37	1	5	62
INVPAST	0.50	0.50	0	1	66
INVPLAN	14.14	33.98	1	99	66
AGE	3.14	0.86	1	5	66
EDUC	5.00	11.97	1	100	66