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Contractual Relationships in the Hungarian Milk Sector

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ABSTRACT

In this paper we present an empirical analysis of farmers' contracting choice in the Hungarian milk sector using 2005 milk producer survey data, employing transaction cost economics. We focus on analysing some key determinants of farmers' contracting choices: type of contracts, duration, number of contractors, incentives provided in the contract and business history of farmers and buyers. Some of the main results include the importance and effect of farm size, quantity of milk delivered, planned short and long run or contract related investment on farm, the possibility of farmer to influence prices on the contracting choices.

Keywords: transaction costs, contracts, milk products, Hungary.

1. Introduction

The combination of transition and globalization since the early 1990s has caused dramatic changes in supply chains of transition countries. After almost two decades of agricultural policy reforms in transition countries, the agriculture in these countries can be still described as facing considerable uncertainties. Contrary to the expectations at the early stage of transformation, the farm structure can be characterized by a dual structure comprising a very large number of small farms and a small number of large-scale farms, based mainly on the successors of former cooperatives and state farms. Small scale farms are predominant in terms of farm number in the Central and Eastern European (CEE) countries (Csáki and Forgács, 2008). Moreover, the subsistence farms also play an important role in CEE countries' agriculture (e.g. Kostov and Lingard, 2002 or Mathijs and Noev, 2004). After previous vertically integrated supply chains collapsed in the early transition years with privatization and company restructuring (see next section), vertical coordination recently has started to increase again only slowly, because of a combination of factors, such as rising standards and major market imperfections (Gow and Swinnen, 1998, 2001). In these countries, public institutions are still ineffective in ensuring contract enforcement. The absence of enforceable contracts to set up any kind of vertical coordination has created difficulties. In addition, this creates severe barriers for price discovery, involving high transaction costs to coordinate market exchanges. Farmers in the CEE countries also face new issues arising from globalization. Similarly to the developed countries, a profound and rapid retail revolution can be observed. The emergence of the modern retailing sector in these countries leads to additional adjustment problems for agricultural producers, especially in sub-sectors dominated by fragmented and small-scale farms (Dries et al., 2004, Reardon and Swinnen, 2004). However, since the structure of the agrifood business has undergone a dramatic change since the beginning of the 1990s the impact of the internationalization of retailers is even more striking (Hanf and Dautzenberg, 2007). Recent research provides an excellent overview of the impacts of globalization of the food supply chain on small scale farmers in developing and transition countries (e.g. McCullough et al., 2008, Reardon et al., 2009, Swinnen, 2007, Vorley and Fearn, 2007). These studies highlight the importance of market imperfections on both product and input markets, hindering the farmers' capability to access to modern supply chain. Econometrics focused empirical models of market power and price transmission analysis should provide additional insight into the in-between-market levels functioning of the agricultural supply chains. Conclusions however are mixed and sometimes contradictory. Considering the dairy sector, Hockmann and Vöneki, 2009, analysis the possibility of tacit collusion on the Hungarian raw milk market, using a structural equation model and reject the perfect competition null hypothesis. More recently, Bakucs et al., 2009 employs a unique firm level dataset to analyse the market power in the Hungarian dairy sector. Results support the earlier Hockmann and Vöneki, 2009 findings. Horizontal and more importantly vertical price transmission analysis on the Hungarian milk market (Bakucs et al., 2009 or Bakucs and Fertő 2008) show however that markets are well integrated, and results conclude the sector is not characterised by transmission asymmetries. Although there are no direct links between market power and price transmission analysis, one reason of possible asymmetries could well be the use of market power by processors or retailers.

In the light of the above presented inconclusiveness of empirical research, this paper analysis a specific issue of food supply chain, which has a pivotal role for the potential of farms to access the modern agro-food chains in transition countries: links to product markets. This issue also has important policy implications. First, increasing market saturation and growing concentration processes in retailing and processing have led to stronger competition within the different stages of the food chains. Together with market power, particularly located in the downstream sectors, these two factors might put pressure on agricultural prices and income, ultimately implying that traditional agricultural policy measures may not be efficient to maintain the farmers' income

The amount of literature on the role of contracts in agri-food chain is ever increasing. However, most theoretical and empirical research focuses on developed countries' agriculture (e.g. Hueth et al., 1999; Goodhue 2000; Bogetoft and Olesen 2002; Goodhue et al., 2004; Fraser 2005). Recently, some studies have focused on various agricultural governance structures in transition countries employing various frameworks (e.g. Rudolph, 1999, Gow et al., 2000, Zaharieva et al., 2002, Fertő and Szabó, 2002), but studies concentrating on the role of contracts in transition agriculture are limited (Boger 2001; Boger and Beckmann 2004). Fertő (2009) provides an overview on the recent literature on producers-buyers relationship in transition agriculture.

In transition countries, where public institutions are ineffective when it comes to ensuring contract enforcement, price systems are generally still inefficient. The absence of enforceable contracts to set up any kind of relationship between farmers and food processors or retailers has become extremely difficult. Therefore, finding new partners for long run, relation-specific investments has been associated with high transaction costs for market players. In addition, this creates severe barriers for price discovery, involving high transaction costs when coordinating market exchanges. In those sub-sectors where any type of production contracts do exist, agricultural producers face hold-up problems (e.g. delayed payment for delivered products, or *ex post* price reduction by retailers), which are stressed by Gow and Swinnen (2000). Although food processors and retailers have significant market power, they also struggle to establish long-term relationships with farmers.

The aim of this paper is to identify and explain farmers' contract choice and contract design among various supply channels in transition agriculture by examining the Hungarian dairy sector using survey data. The paper is an extension of the previous work by Szabó and Bárdos (2006) on Hungarian milk sectors. Applying logit models, we present an empirical analysis of the key determinants of contracting choice based on Transaction Cost Economics (TCE).

The remainder of the study is organized as follows. The second section briefly reviews the literature on transaction cost economics and its implications on contracts, while Section 3 provides an overview on the Hungarian dairy sector. Survey design and the variables are described in Section 4, while results are presented in Section 5. The last section summarizes and offers some conclusions on the implications for the market mechanisms of Hungary's beef sector.

2. Transaction costs theory and contracts

The theoretical framework for the analyses of the various aspects of the producers – buyers (processor or retailers) relationships can be divided into two groups. The first approach is based on the transaction cost economics. Transaction costs economics (TCE) claims that firm's vertical boundaries decisions are determined by characteristics associated with efficiency of the chosen form of organisation (Williamson 1985). Williamson (1991) identifies three alternate forms of transaction governance: market, hybrid and hierarchy. The core prediction of the TCE is that the governance mode (market, hybrid and hierarchy) that minimises transaction costs is the preferred option. Transaction costs include the costs of negotiating and written contracts and the costs of monitoring and enforcing contractual performance. The theory focuses on identifying the characteristics of transactions that are best suited to a particular governance mode. The principal attributes of transactions, according to TCE are asset specificity (AS), uncertainty (U) and frequency (F). Together, these three attributes determine the following relationship (Ménard and Valceschini 2005) signs show the predicted impact of a positive variation of each characteristic on transaction costs:

$$TC = f(AS, F, U) \quad (1)$$

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The main general hypotheses of TCE in the relevant empirical literature are the following. First, as asset specificity increases, hybrids and hierarchies become preferred over markets. Second, when asset specificity is present to a considerable degree, uncertainty raises the transaction costs associated with market governance. Third, when both asset specificity and uncertainty are high, hierarchy is the most cost-effective governance mode.

The various aspects of contract including contract decision, duration and contract design are also central theme in the TCE. However, the structure of contractual agreements may vary with the objectives of the contracting parties, underlying production relations, and the nature and size of informational and strategic impediments to contract formation and enforcement. As a consequence, the theory provides no unifying structure for the specification and testing of contract design hypotheses (Lyons 1996, Masten and Saussier 2000). The empirical literature on contractual agreements in the CEE's agriculture focuses on the following hypotheses. First, the likelihood of the long-term contractual agreements increases with the value of relationship-specific investments. Second, contractual relationship will be less formal and there will be less reliance on legal enforcement, the greater is the expectation that trade will continue into the future. Third, the existence of contract will increase with the frequency with which exchange takes place and the extent to which the transaction needs specific investments. Finally, the size of firms will be positively associated with the propensity to write formal contracts.

In this paper we focus on analysing the determinants of the following five specific contracting choices: type of contract, duration of contract, number of contractors, incentive and business history (length of contractual relationships).

3. Dairy sector in Hungary

After the fall of the socialist economic system, restructuring process in the Hungarian dairy sector began. One of the most notable phenomena was an exceptional decrease of the number of dairy farms. In the 1995-2007 period, the number of dairy farms in Hungary decreased by 59% leaving approximately 7500 dairy farms in the sector. The fall in the number of dairy cows was an immediate consequence. The number dropped from almost 500 thousands in 1992 to 323 thousands in 2007. Now, Hungarian raw milk production amounts to roughly 1.8 billion litres (around 180 litres *per capita*). In Hungary, milk is predominantly produced by agricultural enterprises. In 2005 their share in number of dairy cows accounted for 67% whereas family farms' share was 33%. The average herd size in agricultural enterprises was 295 and on individual farms 6.2.

The transformations in the processing sector during the transition period, lead to a quick consolidation of the industry. The number of dairy processing companies decreased from roughly 170 in 1996 to 58 in 2007. As a consequence, the concentration ratio increased, the C5 index reaching 60% in 2001 already, remaining around this level ever since. Much of the industry consolidation process was heavily relying on Foreign Direct Investments (FDI). FDI measured as share in owners' equity exceeded 80 per cent already in 2000.

The retail level however, followed a different path than the upstream levels of the sector. Due to several factors (privatisation, the emergence of multinational retail chains, high number of small private entrepreneurs) at the beginning of the transition period, the number of retail units rocketed from 25,000 in 1990 to 60,000 by the end of the decade. This trend was reversed after 2000 with a fast concentration process (by the end of 2007 the number of retail units fell back to 45,000), the main actors of the retail level becoming the super and hypermarkets. Now, the five largest retail companies account for two-thirds of grocery sales, whilst the ten largest for 90%, thus Hungary has a relatively high retail concentration amongst the New EU Member States, being close to the EU average.

4. The sample and key variables

To investigate producers-processors contracting characteristics and to test the determinants of contracts, a questionnaire was designed and data were collected from Hungarian milk producers from each county. The aim was to obtain a database so that proxy variables could be constructed. The sample of 300 for the postal survey was selected from the 1900 members of the Hungarian Dairy Product Council (HDPC) consisting of 528 joint companies and 1368 producers delivering directly to processors. We cut the upper and lower 10% of the sample considering the quantity of the quota. On basis of milk quota, HDPC's members own 75% of the total quota quantity. All members

have some kind of contractual relationship(s) with the processors. 68 questionnaires were correctly filled and processed. The questions were classified into six groups with special respect to basic data of the farm, characteristics of contract(s) applied, bargaining power (of the producers), (changes of) relationships with trading partners, (specific) investments, as well as access to information. The preparation of the survey was assisted by the Hungarian Dairy Product Council (HDPC).

The five dependent variables correspond to the five contracting choices analysed in this study:

D1: *Type of contract*. The dependent binary variable takes the value of 1 if the contract is based on oral agreement only, and 0 if there exists a written formal contract.

D2: *Duration of contract*. The dependent binary variable takes the value of 1 if the contract is for more than a year, and 0 if shorter.

D3: *Number of contractors*. The dependent variable measures the number of organisations the farmer has contractual relationships with (1, 2 or 3).

D4: *Incentive*. The dependent binary variable takes the value of 1 if the contractor provides incentives (price premiums, fodder, cooling equipment, etc.) and 0 otherwise.

D5: *Business history*. The dependent binary variable takes the value of 1 if the contractual relationship between farmer and processor is longer than a year and 0 otherwise.

A large number of dependent variables were used to explain contracting choices:

Cownumber measures the size of the farm using the herd size as proxy, *milk* is the quantity of milk in kilograms marketed in 2004, *age* measures the age of farm owner/manager, *education* (values from 0 to 7) of farm owner/manager, level of *trust* towards the contractor (values from 1 to 5), *pcontact* (values from 1 to 5) measures the importance of personal contact between farmers and contractors, *pinfluence* (values from 1 never to 5 often) measures whether the farmer can influence the purchase price, *support* (intensity level from 1 never to 5 often) measures whether the farm benefits from additional support (cooling equipment, credit, fodder etc.) from the contractor. The *contractinv* binary variable takes the value of 1 if there have been contractual relation specific investments on the farm (i.e. investments whose purpose is explicitly is the improvement of market business relationships), and 0 otherwise, *investment* is a binary variable that takes the value of 1 if the farmer plans to make investments on farm within a year, and 0 otherwise, *lateinvestment* is also a binary variable taking the value of 1 if the farmer plans to invest on medium-run (more than a year time span) and 0 otherwise. Finally, *time* is a complex variable measuring the time spent to gather price information and bargain with buyers per transaction. Takes the value of 1 if spent time per transaction is less than 30 minutes, 2 if it is less than an hour, 3 if between 1 – 3 hours, 4 if between 3-5 hours, and 5 if longer.

Therefore, the theoretical model we test is:

$\text{Logit}(D1, \dots, D5) = f(\text{explanatory variables})$.

Table 1 presents the descriptive statistics of the explanatory variables (number of observations, mean, standard deviation, minimum and maximum values).

Table 1 Descriptive statistics of explanatory variables

Variable	No. of Obs.	Mean	Std. Dev.	Min	Max
cownumber	68	129.602	158.980	6	720
milk	67	823626.4	1246813	13601	6300000
age	68	43.955	17.333	29	70
education	68	4.147	2.166	1	7
trust	68	4.073	1.374	1	5
pcontact	68	3.779	1.572	1	5
pinfluence	68	1.411	0.717	1	4
support	68	1.573	0.851	1	4
contractinv	68	1.5	0.610	1	2
investment	68	1.455	0.584	1	2
lateinvestment	68	1.308	0.525	1	2
time	68	2.117	1.178	1	5

There are a number of interesting conclusions from the descriptive statistics. The average farm in the sample is fairly large, with almost 130 cows, the owner is on average educated, with agriculture specific degree, delivering on average 823 tons of milk/year. Contract related variables show the importance of trust (high, above 4 average, personal contact between farmer and processor, but it also shows the limited possibilities of farmers to influence prices (average 1.5 of maximum 4), and the limited additional support they might receive from contractors (1.5). Table 2 presents the frequency distribution of dependent variables representing contracting choices.

Table 2 Frequency of dependent variables

Value	type of contract	duration	number of contracts	of incentive	business history
0	51	54	-	13	12
1	19	16	51	57	58
2	-	-	16	-	-
3	-	-	1	-	-

Table 2 reveals most contracts being formal, written ones, but the length of these contract is mostly for a year only. The large majority of farmers have one contractor only at a given time 16 have to and only 1 has contractual relationships with 3 processors. The role of incentives is evident, 57 farmers taking advantage of buyer provided support. And finally, the frequencies of business history variable emphasize the importance of long term business relationships.

5. Results

Given the nature of the data collected and the various relationships to be examined, we estimate several logit models. All models and specification tests are estimated using STATA. The coefficient of determination (R^2) of regressions is between 15 and 20%, acceptable for this kind of analysis.

1. Type of contract

The estimated coefficients of the logit model with respect to the choice between oral and forma, written contracts are presented in Table 3. Size (number of cows owned), age of farm manager, and the possibility of farmer to influence the purchase price are significant explanatory variables of the type of contract choice.

Table 3 Logit models: type of contract

Variable	coefficient
cownumber	-0.008***
age	0.050*
contractinv	0.458
trust	-0.219
pinfluence	1.007**
time	-0.317
_cons	-3.253*
N	68
McFadden's R^2	0.1976
Loglikelihood	-30.684

Note: ***significant at 1%, **significant at 5%, *significant at 10%

Size has a moderate influence upon oral or formal contract choice, however it has the expected sign, i.e. larger farmers are more likely to choose written contracts than smaller ones. The coefficient of *pinfluence* is plausibly positive, indicating that the possibility of influencing prices is possible where oral contracts exist only. One would expect the level of *trust* between the farmer and contractor to play an important role in the choice of oral or formal contracts. However in this regression, the *trust* variable does not appear to significantly influence the type of contract. Finally, *age* plays a significant role in the choice between oral and formal contracts. Older farmers seem to prefer oral contracts in favour of written ones.

2. Duration of contract

The determinants of whether the contract agreement is valid for more than a year are presented in table 4. Significant determinants are the size (*cownumber*), whether the farmer plans to make investments on farm (*investment*) and the level of to which extent the farmer is able to influence the purchase price (*pinfluence*). The effect of farm size is

again moderate but with the expected sign, suggesting that larger farms are more likely to have longer than a year contracts. Contrary to our expectation, the coefficient of *investment* variable is negative, resulting that farmers planning to make within a year investments on the farm are more likely to choose one year contracts. Similarly, the ability of farmer to influence purchase prices is more possible with shorter contracts than longer ones. Contracts spanning a longer time period are likely to be more detailed with fixed purchase prices, therefore farmers hoping to exercise a positive influence upon purchase prices are probably choosing shorter duration contracts. Again, amongst the non-significant variables, the variable measuring the level of *trust* towards the contractor is surprisingly not significant.

Table 4 Logit models: duration of contract

Variable	coefficient
cownumber	0.004*
age	0.014
investment	-1.087*
trust	-0.176
pinfluence	-1.123**
time	0.432
_cons	0.234
N	68
McFadden's R ²	0.1398
Loglikelihood	-29.740

Note: ***significant at 1%, **significant at 5%, *significant at 10%

3. Number of contractors

Table 2 shows that most farmers in the sample have one contract at a given time, few have 2 and only one has 3 parallel contracts. The ordered logit regression of the determinants of contract numbers are presented in table 5. Size (*cownumber*) has again the expected sign, suggesting larger farmers make business with one purchaser/processor whilst for smaller ones is easier to have several parallel contracts. Significant determinants of number of contracts are whether the farmer plans to make contract specific investments on farm (*contractinv*), level of *trust* and the *time* spent with gathering information and bargaining contract options (*time*). With the exception of *time*, significant coefficients have the right sign, indicating that contract relating investments strengthen the business relationship between contractor and farmer, the latter choosing less parallel contracts. *Trust* has a large significant negative coefficient, indicating that if the buyer is trusted, there is no need for more contracts with other purchasers. Farmers with a low level of *trust* towards the downstream markets prefer more than one contract, thus spreading possible contract or contract enforcement related risks. The duration of price information and bargaining contract details has an unexpected

positive sign, suggesting that the complexity of contract negotiation leads to more contracts.

Table 5 Logit models: number of contractors

Variable	coefficient
cownumber	-0.003
age	0.001
contractinv	-1.278**
trust	-0.466**
pinfluence	0.360
time	0.835***
N	68
McFadden's R ²	0.1702
Loglikelihood	-34.887

Note: ***significant at 1%, **significant at 5%, *significant at 10%

With ordered logit regressions, for the validity of results, it is required to reject the parallel regression hypothesis. The chi square statistic with 6 degrees of freedom equals 12.67, corresponding to 0.048 probability. Thus we may reject the parallel regressions null hypothesis, allowing performing an unbiased ordered logit regression.

4. Incentive

The role of contractor provided incentives is analysed in this section. Table 6 presents the determinants of contract choice from this perspective.

Table 6 Logit models: incentive

Variable	coefficient
milk	-0.000*
education	0.018
lateinvestment	1.458*
pcontact	0.182
support	-0.249
time	0.488**
N	67
McFadden's R ²	0.1581
Loglikelihood	-23.772

Note: ***significant at 1%, **significant at 5%, *significant at 10%

The quantity of *milk* delivered, whether the farmer has long-run plans of performing investments on farm (*lateinvestment*) and the *time* needed for information gathering and contract bargaining proved to be significant variables. Those farmers planning to make longer run investments on farm are more likely to prefer incentives. Even though it is significant, the coefficient of *milk* is only marginally different from zero, suggesting that

farmers delivering larger quantities of milk are less likely to go for the incentive contract option. The coefficient of *time* variable is positive, plausibly suggesting that it is more likely that contracts providing incentives take longer to agree upon.

5. Business history

Table 2 shows that most farmers have a longer than a year business relationship with the downstream industry. Coefficients and significance level of variables determining the business history, i.e. whether the farmer has longer or shorter than a year contract relationship with the contractor are presented in table 7.

Table 7 Logit models: business history

Variable	coefficient
cownumber	0.002
age	-0.007
lateinvestment	-1.489*
trust	-0.567*
pinfluence	-0.953*
time	-0.796**
_cons	9.420***
N	68
McFadden's R ²	0.1956
Loglikelihood	-25.490

Note: ***significant at 1%, **significant at 5%, *significant at 10%

Significant variables are whether the farmer plans medium-run investments on farm, level of *trust*, the possibility of farmer to influence the purchase price and the *time* required on average to gather price information and bargain contract options. Variable coefficients have the right sign, suggesting that complex and long contract bargaining process decreases the business history, i.e. farmers prefer quick negotiations. The possibility of farmers to influence prices has negative effect upon longer business history. One possible explanation of this result could be that farmers are easily changing business partners if they think they will be able to influence purchase prices through new partners and contracts.

6. Conclusions

We analysed the contracting choice of Hungarian dairy farmers using survey data. We focused on the determinants of choice between five different contract options, type of contract, duration of contract, number of contracts, incentives provided in the contract and business history of the partners. A list of logit models provided largely significant estimation coefficients. With a few exceptions the sign of coefficients is according to theory or indeed common sense. Most important results can be summarised as follows: (1) older farmers, with the expectation to influence purchase prices are more likely to choose oral contracts, whilst larger farmers marginally though, but favour written, formal

contracts. (2) larger farmers prefer longer contracts, however those farmers who believe they may influence purchase prices choose shorter than a year contracts. Contrary to expectations, short-run investments on farm do not positively influence the choice of longer contracts. With more half of farmers in the sample planning within a year farm investments, one would theoretically expect that investing farmers wish to secure income for longer time periods giving up their possibilities of influencing purchase prices. (3) in line with results of similar empirical studies, larger farmers and those planning contract specific investment on farm prefer one contractor. The role of trust is important, if the buyer is trusted there is no need for parallel contracts. (4) The incentives provided by the contract is important choice for those planning long run investments. Negotiating incentive contracts needs significantly more information and bargain time than other contracts. (5) finally, the analysis of business history between farmer and contractor provided mixed results. Although 58 farmers in the sample have longer than a year and only 12 other contracts, some the signs of logit regression coefficients seem to be against intuition. Those farmers, who plan loner-run investments and have a high level of trust towards contractors seem to shift between business partners more often. Longer than a year contracts indeed take more time to agree upon. This study hopefully ads to the better understanding of farmers' contracting choices in a CEE country, Hungary.

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