To contract or not in the food sector of transition economies? Evidence from the dairy sector in FYROM

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1. Abstract

Countries still confronted with transition process express different patterns of contractual arrangements in the agricultural sector. The inefficiencies in their legal systems and problems with contracts enforcement in many instances force informal contracting arrangements instead. This paper empirically tests the transaction cost specifics determining the presence or absence of contracts to regulate transactions between the dairy farmers and their processing partners in the Former Yugoslav Republic of Macedonia (FYROM). In order to stimulate investments and initiate progress in this sector, it is necessary to establish tighter coordination trough long-term formal contracts which will eliminate the present uncertainties and risks.

Keywords: contracts, dairy, empirically test, transaction cost, FYROM.

2. Introduction

The transitional processes which took place in the early 90s induced a series of reorganization's waves in the agricultural value chains of countries with ex-communist backgrounds (Van Herck et al. 2011). The existing rules and institutions regulating transactions in agriculture no longer applied, and there was a need for adaptation and an effective mechanism that will re-establish those links and effectively organize the agricultural sector (ibid). The process of transition created uncertainties in which all actors in the agricultural sector needed to adapt their productive, organizational and transactional behavior. In cases of high uncertainties and specific investments devoted to these transactions, market-driven solutions are not favored and tighter relations between the partners involved in these transactions are preferred (Swinnen, 2003). In the continuum between markets and hierarchies, contracts are one hybrid governance structure with an intermediate strength of integration between the transacting partners. They serve as an effective tool for synchronizing different viewpoint at the same time creating a safety-net against opportunistic behavior from either of the transacting party (Williamson, 1985).

In-depth analysis on how transaction costs determine the contracting patterns between the dairy farmers and dairy processors has not been the subject of investigation in previous research works in FYROM. Therefore, in this paper we aim to empirically test the effect of transaction specifics on the existence or absence of formal contracting in the case of the dairy value chain in the country.

3. Transaction costs (TC) and contracting

Contracts are hybrid forms of governance which capture some of the advantages offered by the vertical integration, as well as reduce the complexities and uncertainties of the spot markets. However, regardless of the transaction cost reducing specifics, contracts are also known to be incomplete and costly to enforce, which is especially evident in the case of under developed legal systems such as in the countries in transition (North, 1990). They are incomplete since it is impossible to foresee all the outcomes of the transaction in advance, and costly to enforce since when there is a third party involvement it is complicated to know whether all the obligations in the transactions were meet. Furthermore, agri-food chains are characterized by uncertainties because of the specifics associated with product's characteristics, and the specific equipment required to maintain quality and to prolong their

duration. From a transaction cost perspective, the costs of transacting and accordingly the governance structure are influenced by three different types of TC dimensions: asset specificity, uncertainty and complexity (Williamson, 1985). On farm level asset specific investment include specific dairy breeds and equipment for preserving milk quality. However, investments in milking and cooling equipment are also important for increasing productivity, and their level is, in many instances, an indicator of the farm size and type. On dairy processing level, the most important asset is the installed capacity for milk processing. Due to these large investments, there is often limited competition among the dairy processors and possibility for opportunistic behavior by the processor. The extortion of market power is often reflected by the unwillingness of dairies to legally obligate towards the small dairy farmers (MacDonald et al., 2004). On the other hand in order to achieve full utilization of the installed capacity, dairy farmers are dependent on relations with the dairy farmers (especially farmers of larger-scale). Since both sides in the transaction face some kind of a lock-in situation, it is expected that they would be willing to have contracts regulating the transactions. Uncertain environments such as the dairy farming and producing, enhanced by the institutional environment uncertainties decrease the possibilities and willingness to invest in specific assets for agricultural production. The risk is further enhanced by the perishable nature of agricultural products as one of the many reasons for the necessity of specifying the trading terms a prior to the transaction (Masten, 2000). Contracting in agriculture may be classified as formal and informal agreements which can be in either verbal or written form.

4. Analytical framework

When analyzing the determinants whether to contract, it is impossible to include all the variables which influence the decision outcome. Therefore, we include in the empirical model, the transaction cost specifics which we think are part of the contracting patterns between the dairy farmers and their processing partners (dairies) for this particular case:

$$\boldsymbol{\pi_i} = \boldsymbol{\beta X_i} + U_i \ ; \text{where,}$$

$\boldsymbol{\pi_i}$ is the probability of the dairy producer having a formal contract with a dairy to deliver and supply milk, $\mathbf{X_i}$ is a vector (set) of explanatory variables, $\boldsymbol{\beta}$ is the vector of coefficients and U_i is the error term with a cumulative density function F (U) These are also the data which were available and the farmers were willing to share in the survey. The existence of formal contracts (yes/no) is the dependent variable which is seen from a dairy farmer perspective. Dairy farmers were asked if they have formal contracts with the dairy or not, and accordingly our dependent variable was assigned binary variables; 0 if the dairy farmers do not have written agreement/contract with the dairy and 1 if there is a written agreement/contract with the dairy. Based on the transaction cost dimensions, the model includes three different sets of independent variables such as: asset specificity, uncertainty and frequency. Beside the asset specific dimensions of the transaction (human skills and site specificity included), there are certain socio-economic and farm characteristics as well as information on the size of their herd, number of dairy cows in order to assess their farm size and investments in productive dairy breeds. The empirical model was estimated using a probit estimation procedure via a maximum likelihood estimation procedure.

5. Data and survey design

Dairy farming in FYROM is traditional, with individual households accounting for 97% of the total number of dairy farms in the country. There are 40,737 dairy farms, spread in different parts of the country, but one-fourth of them are commercial milk-producing farms. Traditional small farmers have low productivity of milk production, averaging 2,800 litres./cow in the period from 2006 to 2011. Holstein-Friesian dairy breed is present in 40% of dairy farms and the mixed breed represents 44% of the total dairy cow herd (MAFWE, 2012). On the processing side there are 77 processing capacities of different size. Only 2% of these dairies have capacities over 80,000 liter per day and 65% of them fall into the category of less than 5,000 liters per day (MAFWE, 2012).

Estimating the above empricial model including all the transaction specificities requires a specialized survey conveyed through a questionnaire that included 90 questions. The final survey was conducted during the period stretching from August to December 2011 and was answered by 213 dairy farm housholds located in five selected regions where close to 59% of the dairy cows and 60% of the cow milk production in the country is concentrated (SSO, 2012). The applied mode used to conduct the survey is face-to-face interviews.

6. Results

The explanatory power of this econometric model as expressed by the McFadden R^2 value of this model has a value of 0.3728 (Table 1 bottom) and the fraction of correct predictions with value of 76.3%, which reveals quite a good fit and predictive ability of the model. It is important to stress that the econometric model that has been selected incorporates explanatory variables that are deemed to be either the most significant from a statistical point of view or that play a crucial role in determining the decision by a dairy producer to have a formal contract with a dairy. With this in mind, several variables linked to human capital specificities such education and years of experience were dropped because they were not significant at all. This is most likely the result of high collinearity among these explanatory variables. The estimated model assumes a reference point consisting of the following variables: Bitola region (REG1), the Holstein-Friesian breed (BREED1) and farmers who do not have very frequent meetings with dairy representatives as opposed to those farmers who have regular meetings on a weekly, monthly or yearly basis.

Through the sign and size of the marginal effects we can see the variables which shape up the existence or absence of formal contracting in the case of the dairy value chain in FYROM. The analysis shows that the dairy capacity variable (DAIRYCAP) is significant and has a positive impact.. This means that the size of the dairy is of great importance for contracting with dairy farmers or larger the dairy's capacity is the higher the probability that the dairy will be willing to maintain a contract with dairy farmers. Another variable that influences the probability of farmers to have formal contracts with certain dairy, is the *type of breeds* making up his/her dairy herd. As already stated, the reference point for breed variables concerns dairy farmers which have specialized dairy cows such as the Holstein-Friesian breed (BREED1). However it is important to note that BREED4 (mixed-breeds) has a significant and positive impact on the probability of farmers to have a written agreement with a dairy. Mixed breeds are the prevailing breed in the country, and even though BREED4 is made up of cross-breeds kept for dual purposes, the dairies which tend to ensure a constant intake of raw milk have an incentive to have a formal contract with this category of dairy farmers. By

Table 1: Description of explanatory variables, regression results and marginal effects

Explanatory variables		Abbreviation	Mean	Estimated coefficients	Marginal Effect
		Constant		**-2.53770**	-0.64091
Asset specificity					
Structure of dairy herd (type of breeds)					
1=Dairy farm has Holstein-Friesian cows, 0=other.		**BREED1**	0.899		
1= Dairy farm has Simmental cows, 0=otherwise		BREED2	0.143	- 0.31051	-0.07842
1= Dairy farm has Brown Montafon , 0=otherwise		BREED3	0.119	**-1-70081**	-0.42955
1= Dairy farm has mixed breeds, 0=otherwise		BREED4	0.181	**0.71970**	0.18176
1= Dairy farm has other breeds		BREED5	0.086	**- 0.97485**	-0.24620
Milking equipment					
1= Mechanized equipment, 0=Manual equipment		MILKEQUIP	0.718	**0.56651**	**0.14308**
Cooling equipment					
1=Cooling equipment provided by dairy, 0=other.		DUMMDAIRY	0,132	0.51247	0.12943
Years of owning farm		OWNFARM	17.37	**-0.04915**	**-0.0186**
Production specificity					
Production region	1 = Bitola	**REG1**	0.335		
	2 = Priilep	REG2	0.288	*0.92582*	*0.23382*
	3 = Skopje	REG3	0.088	0.56673	0.14313
	4 = Tetovo and Gostivar	REG4	0.192	0.46471	0.11737
	5 = Krusevo	REG5	0.097	**3.75446**	**0.94821**
Milk yield (litres/cow)		MYIELD	3593.7	**0.000275**	**0.00007**
Land for crop production (hectares)		ACROP	9.56	-0.01136	-0.00287
Trust specificity					
Satisfaction with contract					
From 1=completely unsatisf. to 5=completely satisf.		SATISFACT	2.71	**0.329719**	**0.08327**
Frequency of meeting with dairy representatives					
1 = Monthly, 0 = otherwise		FREQVISIT1	0,550	*0.789195*	*0.19932*
1 = Weekly, 0 = otherwise		FREQVISIT2	0,204	0.491568	0.12415
3 = Annual, 0 = otherwise		FREQVISIT3	0,152	0.666822	0.16481
Number of years of relation with the same dairy		LENGTHC.	19.20	0.026228	0.0066
Cooperation with other farmers		COOPFARM	3.72	-0.07379	-0.01864
Uncertainty (lock-in-aspect)					
Future investment plan 1 = yes, 0= No		FUTINV	0.529	**-0.80217**	**-0.20259**
Other variable					
Capacity of the dairy plant where milk is delivered		DAIRYCAP	128.48e03	**4.70e-06**	**1.19e-06**
McFadden R^2: 0.3728			Fraction of correct predictions: 0.7630		

Notes: The figures in bold and italic bold characters denote a significance of explanatory variables at 5% and 10% levels, respectively. For the variable DAIRYCAP, units of masurement are in litres of milk per day. The variable COOPFARM takes the following values: 1 = never, 2 = rarely, 3 = occasionally, 4 = frequently, 5 = constantly

contrast, farmers who have Brown-Montafon (BREED3) or other breeds (BREED5) have a lower probablility to have a contract with a dairy.

In terms of the *site specificity*, the reference point concerns dairy farmers located in the Bitola regionin (REG1). Farmers located in REG2 (Prilep) and REG5 (Krusevo) tend to have a higher probability of having formal contracts with the dairies. These two regions are in immediate or close proximity to two of the three largest dairy processing capacities, situated in Bitola and the fact that the two variables REG2 and REG5 have a positive influence on the probability of farmers to have a contract with dairy seems to confirm the need for a dairy to have a regular supply of milk despite higher delivery costs.

The dummy variable denoted by FUTINV (future investment plans) is highly significant with however a sign opposite to what was expected. A plausible explanation is that farmers who do not have contract are small-scale farmers with possible intentions to expand but do not expect to have contracts to support this expansion. On the other hand, the contract-satisfaction variable (SATISFACT), or the fact that the dairy farmers who have contracts are satisfied indicates a positiv effect on the proability of having a contract. It is expected that the on-farm investments are to increase the milk yields and therefore increase the probability of formal contracting. The same applies when asset specific investments in cooling and milking equipment are undertaken. In the case of cooling equipment which is assigned by the dairy, it is the dairy instead of the dairy farmers which would want to safe-guard this investment and in this respect establish a contract. The two dummy variables MILKEQUIP (i.e. a farmer who has simultaneously a cooling and milking equipment) and DUMMDAIRY (a farmer who has received from cooling equipment from the dairy) have a positive impact on the probability of having a contract. The same applies to the MYIELD variable which also shows a positive effect on the probability of a farmer having a contract with the dairy. SATISFACT - the variable referring to the level of satisfaction of dairy farmers - has a statistically significant impact with an expected positive sign. The more satisfied farmers are with the dairy they cooperate with, the higher is the possibility that they will want to continue with the same transacting partner and renew their formal contracts with the dairy. Surprisingly, the OWNFARM variable measured by the number of years of owning farm has a negative effect on contracting, which can be justified by the fact that owning a farm for a long time is linked to older dairy producers who do not have a strong incentive to have contract with a dairy.

7. Summary and Conclusions

The analysis of the transaction cost specifics that influence the governance of the transactions between the dairy farmers and their processing partners in FYROM can considerably add to the knowledge on the contracting patterns in agri-food systems of transtion countries. The decision of whether to contract or not in the dairy sectors in transition countries is especially important when there is a typical contract ineffectiveness confirmed by the different forms of formal and informal contracting arrangements which regulate the relations of dairy farmers with their processing partners. The evidence from the dairy sector in FYROM indicates that the institutional setting in the sector is still uncertain, and there are still possibilities for informal contracting patterns. This uncertainty was furthermore confirmed with the only case of Foreign Direct Investment in the sector - the Swedmilk dairy, which offered farmers notable contracts and contracting terms, encouraging them to invest in improvments on their farms and dairy breeds. With the dairy's bankruptcy (in 2009), the contracts could not be enforced, leaving farmers with large debts and even larger mistrust in the value of contracts (Tuna and Nilsson, 2012). This inability of contracts to safe-guard the necessary asset specific investments in the dairy sector in FYROM, substantially delays the anticipated progress in the sector. Farmers are unwilling to invest in specialized breeds and equipment, thus expose themselves on risk of opportunism from the dairies; In order to initiate progress in this sector, it is necessary to establish a firm institutional setting. Our results show that, there is larger possibility that farmers will want to continue cooperation with the same transacting partner and renew their formal contracts with the dairy when they are more satisfied with the terms of cooperation. Tighter coordination ought to be reached with long-term formal contracts, which could eliminate the present uncertainties and risks, and in this way stimulate investments in farm enlargement, specialized breeds, mechanization and equipment.

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