System Dynamics and Innovation in Food Networks 2009

Proceedings of the 3rd International European Forum on System Dynamics and Innovation in Food Networks, organized by the International Center for Food Chain and Network Research, University of Bonn, Germany
February 16-20, 2009, Innsbruck-Igls, Austria
officially endorsed by

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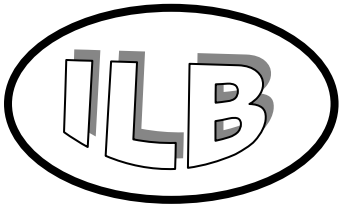

A Structural Analysis of Contractual Innovations within the CIS Milk Industry

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Abstract

Utilising primary survey data, this paper evaluates the relationships between a set of supplier development strategies and performance within the milk industry in Armenia and Ukraine. Improving supplier performance is a critical task for the dairy industry in the Former Soviet Union as, during the 1990s both the quantity and quality of agricultural output deteriorated sharply. Fragmented supply chains led to high transaction costs and, in some cases, market failure. Drawing on the work of Krause *et al.* (2000) and Doney and Cannon (1997), a theoretical framework is presented that proposes that, either directly or indirectly, supplier assessment strategies, supplier incentives, competitive pressure, direct involvement, and trust between buyers and sellers, lead to improvements in supplier performance. Data from 618 milk producers were analysed by structural equation modelling to test ten research hypotheses. All relationships are significant except those related to supplier assessment. In particular, the results indicate that both trust and competitive pressure have a direct and positive impact on performance improvement. Trust can be fostered by buyers providing feedback and performance data to suppliers. In contrast, direct involvement strategies are negatively related to performance improvement and weaken farmers' trust. Implications for managers are discussed along with suggestions for further research.

Acknowledgement

This paper draws on data collected as part of the Supporting the International Development of CIS Agriculture (SIDCISA) project, funded by EU INTAS (Grant No. 2004 EAST/WEST – 6928). Data collection was supervised/undertaken by Naira Mkrtchyan, Gagik Sardaryan, Alexander Skripnik and Vardan Urutyan. Their assistance is gratefully acknowledged.

1. Introduction

The potential linkage between a firm's performance and its suppliers' competencies and the nature of supply chain relationships has been widely recognised (Carr and Kaynak, 2007; Wagner, 2006). This has led to increasing consideration of strategies to improve suppliers' performance, particularly regarding quality, reliability, cost reduction and new product development. Such strategies are labelled by Krause *et al*. (2000) as 'supplier development' and defined as "any activity undertaken by a buying firm to improve either supplier performance, supplier capabilities, or both, and to meet the buying firm's short- and/or long term supply needs" (p.34). Several tools for supplier development have been advocated in the literature: supplier assessment, incentives for improved performance, enhanced competition amongst suppliers and the direct involvement of buyers in suppliers' activities such as through training and sharing market

intelligence (Carr and Kaynak, 2007; Krause *et al.* 2000; Krause *et al.* 2007; Wagner, 2006). Krause *et al*. (2000) used structural equation modelling to examine the relationships between such development strategies and performance, drawing on survey data from purchasing managers. Based on a mediated impact model, they conclude, amongst other things, that the direct involvement activities of buyers play a critical role in improving the performance of suppliers. Krause *et al.'s* (2000) framework has provided the basis for subsequent studies in North America and Western Europe (Carr and Kaynak, 2007; Krause *et al.* 2007; Wagner, 2006).

The objective of this paper is to analyse the relationship between supplier development strategies and performance in the milk industry in the Former Soviet Union. The theoretical basis of the analysis is Krause *et al*.'s (2000) mediated impact model, and the paper seeks to contribute to the literature on three grounds. First, previous work has been based largely on the views of purchasing managers (i.e. buyers). Validation of the linkages between supplier development strategies and performance requires the equivalent assessment from suppliers. This paper draws on responses from 618 dairy farmers concerning their relationship with milk processors in Armenia and Ukraine, two countries of the Commonwealth of Independent States (CIS)[1] for which the agri-food sector is of strategic importance. Second, previous analysis has been based largely on datasets for North America and Western Europe. Transitional and developing countries are typically characterised by a less stable market environment within which supply chain dislocation and failure are more common (Gow and Swinnen, 2001). It is important to assess whether strategies which are successful in mature Western markets can be successfully replicated elsewhere. Research on Supply Chain Management (SCM) problems in, and potential solutions for, the CIS remains scarce and as Lorentz *et al*. (2007, p.675) note: addressing the issue of adapting SCM-specific strategies 'from mature markets to transitional emerging markets would be another beneficial research approach'. Finally, Krause *et al.* (2000) conceptualise that specific actions undertaken by the buyer (supplier development strategies) determine supplier performance. However, recent SCM research suggests that this is too restrictive: performance is affected by the degree of trust between buyers and suppliers, where trust is conceptualised as a distinct entity (Doney and Cannon, 1997).

The paper is divided into six sections. The next section reviews the literature on strategies to raise supplier performance and discusses why this is a critical task for the CIS dairy sector. Section 3 presents the methodology, focusing on the augmented model of Krause et al. (2000). Sections 4 and 5 discuss the dataset and structural equation model results respectively. Section 6 reviews the results in the light of previous research, highlighting practical implications and offers suggestions for future research.

2. Review of Literature

Utilising resource-based theory and the internalization/externalization framework developed by Buckley and Casson (1976), Krause *et al.* (2000) categorize supplier development strategies as being either internalised or externalised activities. The latter refers to strategies that use external markets as a means to raise supplier performance. Three main externalised strategies have been advocated: competitive pressure, supplier assessment and supplier incentives.

Competitive pressure occurs where a buyer uses more than one supplier for a particular product or service and is often measured in terms of a buyer's ability to switch to an alternative supplier if so desired (Fynes *et al.*, 2005). For instance, a buyer may use a competitive bidding process

1.The CIS comprises all successor states of the Soviet Union excluding the three Baltic countries (Estonia, Latvia and Lithuania). In August 2008, Georgia declared that it would leave the CIS.

to reduce the cost of supplies. Firms may also purchase a particular good from several suppliers with the percentage of total spend awarded to a particular supplier depending on the latter's reliability, quality of goods or other indicators of performance specified by the buyer. For example Hingley (2005) documents how multiple food retailers in UK procure fresh fruit and vegetables through two to three 'super middlemen'. These 'super middlemen' compete against each other for a larger share of the retailers' business based on key performance indicators (reliability, margins achieved, quality, offering opportunities for differentiation of the retailer etc.).

Supplier Assessment can be defined as the process of evaluating a particular supplier's performance or capabilities. This may utilise data, for instance, regarding costs, quality, reliability and innovation (Handfield *et al.* 2002). This can provide the basis for feedback to suppliers, clarifying areas for improvement (Krause *et al.* 2000) and benchmarking. The latter incorporates an element of competition, in that buyers assess relative performance and seek to use this as a stimulus for improved performance (Stewart, 1995).

Supplier incentives are rewards or penalties controlled by buyers. Penalties may be imposed for, for instance, late delivery or the proportion of goods failing to meet quality standards being above a prearranged threshold. Rewards may be in form of monetary bonuses or offers of increased future business. For instance, in the diary sector it is common in most EU countries for processors to pay farmers bonuses for milk that exceeds preset thresholds for fat and protein content and/or impose penalties for excessive bacterial cell content or acidity (Dries and Swinnen, 2004).

In contrast to the three externalised strategies (competitive pressure, supplier assessment, and supplier incentives), internalised supplier development activities 'represent a direct investment of the buying firm's resources in the supplier' (Krause *et al.*, 2000, p.37). They involve the buyer engaging in *on-site* activities at the supplier (Monczka *et al.*, 1993). Common on-site direct involvement activities include training and education of a supplier's personnel. For instance, several foreign-owned food processors, that have entered the Central and Eastern European market, provide training courses for farmers, on topics such as how to improve feed regimes, milk hygiene and pest control (Gorton and White, 2007). In this case, buyers are internalising the costs of improving the quality and / or quantity of supplies. As these investments are non-transferable, they represent a relationship specific asset, the costs of which cannot be recovered if a farmer chooses not to sell to the processor after the training is provided. Buyers, therefore, must evaluate the costs of direct involvement and risks of defection against potential improvements in performance.

While the growth of supplier development strategies, and their potential linkage with supply chain performance has been widely acknowledged, robust research in this field has been relatively sparse. Krause *et al.* (2000) sought to address this gap in the literature by quantifying the relationship between supply chain performance and internalised (direct involvement efforts) and externalised strategies (competitive pressure, supplier assessment, and supplier incentives). They proposed two competing models to explain these relationships (Figure 1).

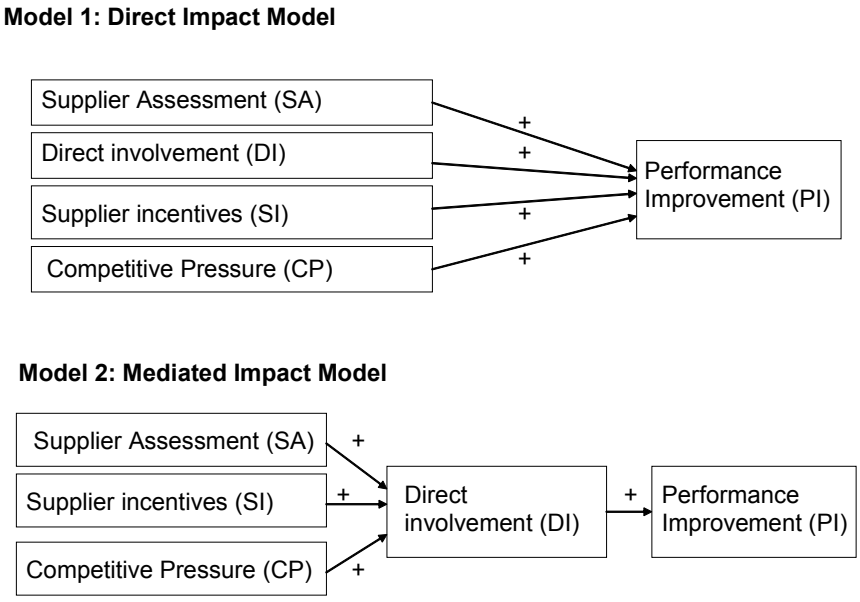

Figure 1. Krause's Competing Models of Supplier

Development

In the first model (labeled *direct impact)* it is assumed that each of the supplier development strategies directly leads to improvements in performance. In other words, no hierarchy is assumed between the supplier development strategies, so that internalized and externalized activities play a similar role. In the second framework (the *mediated impact model*), only the direct involvement strategy has a direct impact on supplier performance with all other processes having an indirect impact on performance improvements, mediated by direct involvement efforts. Empirical testing revealed that the mediated impact model more closely fitted the data and this model forms the theoretical basis for the analysis presented in this paper.

Recent work on determinants of improved supply chain performance has highlighted the importance of trust between actors (Crook *et al.* 2008; Krishnan *et al.* 2006). Drawing on the social psychology literature, marketers have defined trust as the perceived integrity and benevolence of a particular actor (Doney and Cannon, 1997). Integrity refers to the degree to which a partner's word or written statement can be relied on and the actor refrains from engaging in opportunistic behaviour. The second dimension of trust, benevolence, is the extent to which one partner is genuinely concerned about the welfare of the other partner and is motivated to seek joint gains (Doney and Cannon, 1997).

Crook *et al.* (2008) drawing on focus groups with US supply chain executives found that they perceived trust as a key 'lubricant' for business relationships without which 'improved supply chain effectiveness will not be shared' (p.169). Krishnan *et al.* (2006) found a positive direct relationship between trust and alliance performance but that this relationship was moderated by the type of uncertainty prevailing in a particular alliance. In the case of high environmental uncertainty, the relationship between trust and performance was weaker.

Supply chain failure as a result of opportunistic behaviour has been identified as a major problem in Central and Eastern Europe and the CIS (Swinnen, 2006). Common forms of opportunistic behaviour employed by buyers are late and non-payment. Gorton *et al.* (2000) in a cross-

national study of food processors found that late payments were the single, most important barrier to company growth in the Czech Republic and Slovenia and this factor was the third most important factor, out of twelve considered, in Hungary. In a survey of Bulgarian dairy farms, Swinnen *et al.* (2006) reported that between 30 and 40 per cent of the farms surveyed experienced significant payment delays, with an average of between 60 and 80 days. However it is not just buyers who may engage in opportunistic behaviour. In the CIS dairy sector, where technology for measuring milk quality is rudimentary, some farmers have acted opportunistically, by adding water to milk, where payment is based on volume, or lard where payments are based on fat content (Gorton *et al.* 2006).

Research on supplier – buyer relationships is particularly pertinent for the agri-food sector of the CIS as supply chain problems have severely inhibited competitiveness (Keyser, 2004; Lerman *et al.* 2004). For the dairy sector, the Soviet era was characterised by large state-owned processors (*kombinats*) which were supplied by collective (*kolkhoz)* and state (*sovkhoz)* farms. Collective farms were subject to state orders identifying to which *kombinat* their milk should be sold. There was, therefore, no formal competition between the buyers of milk, with the state controlling prices and the distribution of output. Following the dissolution of the USSR, most successor states have embarked on privatisation, price liberalisation and land reform programmes. The latter has involved either restructuring or completely breaking up state and collective farms, redistributing land and assets to members and former workers (Lerman *et al.* 2004). During the land reform process many herds were slaughtered and milking parlours destroyed. This has led to a much more fragmented supply base from which dairies can procure milk. For the CIS as a whole, milk production declined by 26 per cent between 1993 and 1999, after which volumes have stabilised (FAOSTAT, 2007). However, while production has stabilised since 1999, the number of cows has continued to fall. The scale of the decline has been dramatic: for the CIS as a whole between 1993 and 2006 the total stock of milking cows fell by 15.5 million, so that by 2006 the total herd was 23.7 million (FAOSTAT, 2007).

In the post-Soviet era, milk processors have faced significant milk supply problems. These have included a decline in the quality and quantity of milk available for purchase. Secondly, the break up of larger collective and state farms has meant that the proportion of milk produced by small-scale producers has risen. Processors have had to forge new supply relationships with a mass of new producers in an environment of high contract failure (Gorton et al., 2007; Vinogradova, 2006). By becoming more dependent on small-scale producers for sourcing milk, the transaction costs of milk procurement have risen significantly (Gorton et al., 2006). Thirdly, small-scale producers typically have fewer than 5 cows and lack adequate milk cooling tanks, so that high bacterial cell counts and contamination are common problems. Finally, the output from small-scale producers is highly skewed to the summer months, which is problematic for meeting the demands of retailers and final consumers. Given these problems, improving supplier performance is a critical challenge. Some dairies have sought to increase supplier performance, through the use of the internalised and externalised strategies described above. However, knowledge of what specific strategies have been successful is severely limited.

3. Methodology

Krause *et al.* (2000) demonstrated that a mediated model performed better in the context of improving supplier performance than a competing direct impact model. To build upon Krause *et al.*'s (2000) research, the present study expands upon the mediated model in the context of CIS milk procurement using the following hypotheses:

H1: The Direct Involvement strategy has a direct and positive impact on Performance Improvement.

H2: The Supplier Incentives strategy has a direct and positive impact on Performance Improvement

H3: The Competitive Pressure strategy has a direct and positive impact on Performance Improvement.

H4: The Supplier Assessment strategy has a direct and positive impact on Performance Improvement.

H5: The Supplier Incentives strategy has a direct and positive impact on Direct Involvement.

H6: The Competitive Pressure strategy has a direct and positive impact on Direct Involvement.

H7: The Supplier Assessment strategy has a direct and positive impact on Direct Involvement.

H8: The Trust strategy has a direct and positive impact on Performance Improvement.

H9: The Supplier Assessment strategy has an indirect and positive impact on Trust.

H10: The Direct Involvement strategy has a positive impact on Trust.

The only exception to the duplication of Krause *et al.* (2000) study is that three new hypotheses (H8, H9, H10), addressing the issue of trust have been added. These hypotheses were drawn from a model by Doney and Cannon (1997), and, as previously discussed, are appropriate to the context of eastern European milk procurement.

As a result there are six constructs in the model. Four of the constructs (direct involvement [DI], supplier incentives [SI], competitive pressure [CP], supplier assessment [SA]) are supplier development strategies replicated from Krause *et al.* (2000). The fifth construct is performance improvement [PI], which is also derived from Krause *et al.* (2000), while the sixth construct (trust [TR]) is taken from the work of Doney and Cannon (1997). Each of the six constructs was measured using multiple variables that are presented in Table 1. While closely following the questionnaire design of Krause *et al*. (2000) and Doney and Cannon (1997), modifications were made to some items to fit with the specific context of farmer – dairy processor relationships in the CIS. All items were measured using a 5-point Likert scale. Farmers were asked to concentrate on their relationship with their main buyer.

The factor Supplier Incentives (SI) was measured by items that included the offer of higher prices from the buyer (compared to alternative buyers), the reliability of payments, as late and non-payment is a major problem in Central and Eastern Europe and the CIS (Gow and Swinnen, 2001), price stability and the provision of extra services by the buyer such as credit. Such additional services provided by buyers have, in certain cases, stimulated improved performance (Gow and Swinnen, 2001; Gorton and White, 2007). Competitive Pressure (CP) was measured by asking respondents if their main buyer had multiple suppliers to choose from and whether the buyer may switch suppliers, on the basis of cost, when competition is fierce (Hahn *et al.* 1986). Supplier Assessment (SA) was captured by asking farmers whether their main buyer evaluated their performance according to pre-specified standards, provided feedback on the quality of their milk and their overall level of satisfaction. Direct Involvement (DI) was measured by items concerning the training and education of suppliers and site visits by the buyer.

Performance Improvement (PI) is based on four scale items, concerning whether the actions of the main buyer contributed to increasing farm output, improving living standards, profitability and quality of milk. Trust (TR) is based on eight scale items and is designed to capture the de-

gree to which the buyer has acted opportunistically and whether it is concerned with the long-term prosperity of suppliers. These items are drawn from Doney and Cannon (1997) and capture the two dimensions of trust: integrity and benevolence.

Table 1. Item and construct listing

Construct	Item	Survey question
DI (Direct involvement)	DI1	The buyer visits your premises to help improve performance
	DI2	The buyer provides training/education for you/your company
SI (Supplier incentives)	SI1	Reliability of payments by buyer
	SI2	Higher prices offered by buyer
	SI3	Extra services offered by buyer
	SI4	Price stability
CP (Competitive pressure)	CP1	My main buyer has many suppliers to choose from
	CP2	When competition is fierce, my main buyer will switch suppliers to cut costs
SA (Supplier assessment)	SA1	The buyer assesses your performance using established standards
	SA2	The buyer provides feedback about the quality of your milk
	SA3	Overall how satisfied are you with the relationship with your main buyer?
PI (Performance improvement)	PI1	The actions of my main buyer have contributed to increasing my output
	PI2	Being able to sell to our main buyer has improved the living standard of our household
	PI3	Being able to sell to our main buyer has improved the profitability of the farm operation
	PI4	The actions of my main buyer have helped improve the quality of my produce
TR (Trust)	TR1	My main buyer keeps the promises that it makes to us
	TR2	My main buyer is not always honest with us
	TR3	My main buyer is genuinely concerned that our business succeeds
	TR4	When making important decisions, my main buyer considers our welfare as well as its own
	TR5	Our main buyer is trustworthy
	TR6	We find it necessary to be cautious with our main buyer
	TR7	Our main buyer sometimes alters the facts slightly
	TR8	Importance of trust when selecting main buyer

The confirmatory application of structural equation modelling (SEM) was used to analyse the data based on the established theoretical framework adapted from Krause *et al.* (2000).

4. Data

Data collection occurred in two CIS countries: Armenia and Ukraine. The agri-food sector is of strategic importance for both states. Agriculture accounts for over 50 per cent of gainful employment in rural Armenia and within the most rural regions of Ukraine (NSS, 2003). Agriculture's contribution to GDP is also significant: accounting for approximately 25.5 per cent of Armenian GDP (World Bank, 2007). In Ukraine, agriculture's share of GDP is less (12.1 per cent) but its size, the country has 42 million hectares of agricultural land, means that it can be a major player on regional and world markets. Over 3.1 million people work in Ukrainian agriculture (FAOSTAT, 2007). Milk production accounts for approximately 20 per cent of the value of agricultural output in both countries.

As the focus of the work reported here is dairy farmer – processor relationships, sampling was restricted to primary producers who sell cows' milk. Consequently, those farmers without diary cows or who did not sell any of the milk produced were excluded from the study. Whilst this decision is clearly justifiable given the objectives of this study, it is not possible to draw direct comparisons between the sample and official milk production data (where it exists).
The sample was constructed on the basis of approximately 300 respondents for each country, and sought to achieve a representative cross-section of commercial dairy farms, agricultural companies, and household producers (providing they marketed at least some of their milk).
Given that Ukraine is the largest country solely situated in Europe, a decision was taken to focus upon the Dnepropetrovsk region (Dnipropetrovs'k Oblast). Within the region the sample was drawn from the five *rayons* with the most significant commercial dairy output. Armenian respondents were taken from all regions (*marzes*) with significant commercial milk production. The geographical area and populations of Armenia and the Dnepropetrovsk region of Ukraine are similar, so a comparable sample size was considered appropriate, with a slightly higher figure for Ukraine to reflect the greater number of large agricultural enterprises present in the market. Potential respondents were identified for each country using a combination of sources, namely: national statistical agencies, local and regional authorities, agricultural agencies, local livestock experts and village mayors.
In total, the sample comprises 618 useable responses. Data collection occurred via face to face interviews, conducted on-farm, using a standardised questionnaire. Questions relating to each scale item, as detailed in Table 1, were included.

5. Results

In keeping with conventional structural equation modelling procedure, the model was evaluated by the two-step process described by Hair *et al.* (1998) and Schumacker and Lomax (1996). The latter authors describe how the measurement model is first used to determine the relationship between the constructs and their items. This analysis is then followed by the structural model which determines the relationship between the constructs. This section of the paper is dedicated to describing the results of this two-step process.

Measurement model

Prior to structural equation modelling analysis, all items were assessed for distribution normality and were found to be free of excessive kurtosis and skewness scores. Following this, the measurement model was analysed using AMOS 16.0 with the maximum likelihood estimation method. Table 2 details the results of this analysis.

Table 2. Properties of the standardised measurement model

Property	Recommended value	Value
CMIN/DF	≤ 5.00	6.56
NFI	≥ 0.90	0.86
CFI	≥ 0.80	0.88
RMSEA	≤ 0.08	0.08

While the comparative fit index (CFI) and root mean square error of approximation (RMSEA) values are both within the limits recommended by Arbuckle (2007), the degrees of freedom (CMIN/DF) and normed fit index (NFI) did not meet the recommended values. In response to

this, an exploratory factor analysis search by specification search was conducted using AMOS 16.0 and it was found that the model could be improved by removing the Supplier Incentives (SI) construct. A review of the measurement items also yielded an improvement to the measurement model. Survey items 1.8 (item SA3) and 1.9e (item TR8) were not in keeping with the other items used to measure their respective constructs. Since Bagozzi (1994) and Bollen and Lennox (1991) recommend that such constructs with 'stand-alone' items should be formative rather than reflective, these two items were removed from the model and all constructs are maintained as reflective. The revised model, excluding the SI construct and survey items SA3 and TR8, is presented in Figure 2.

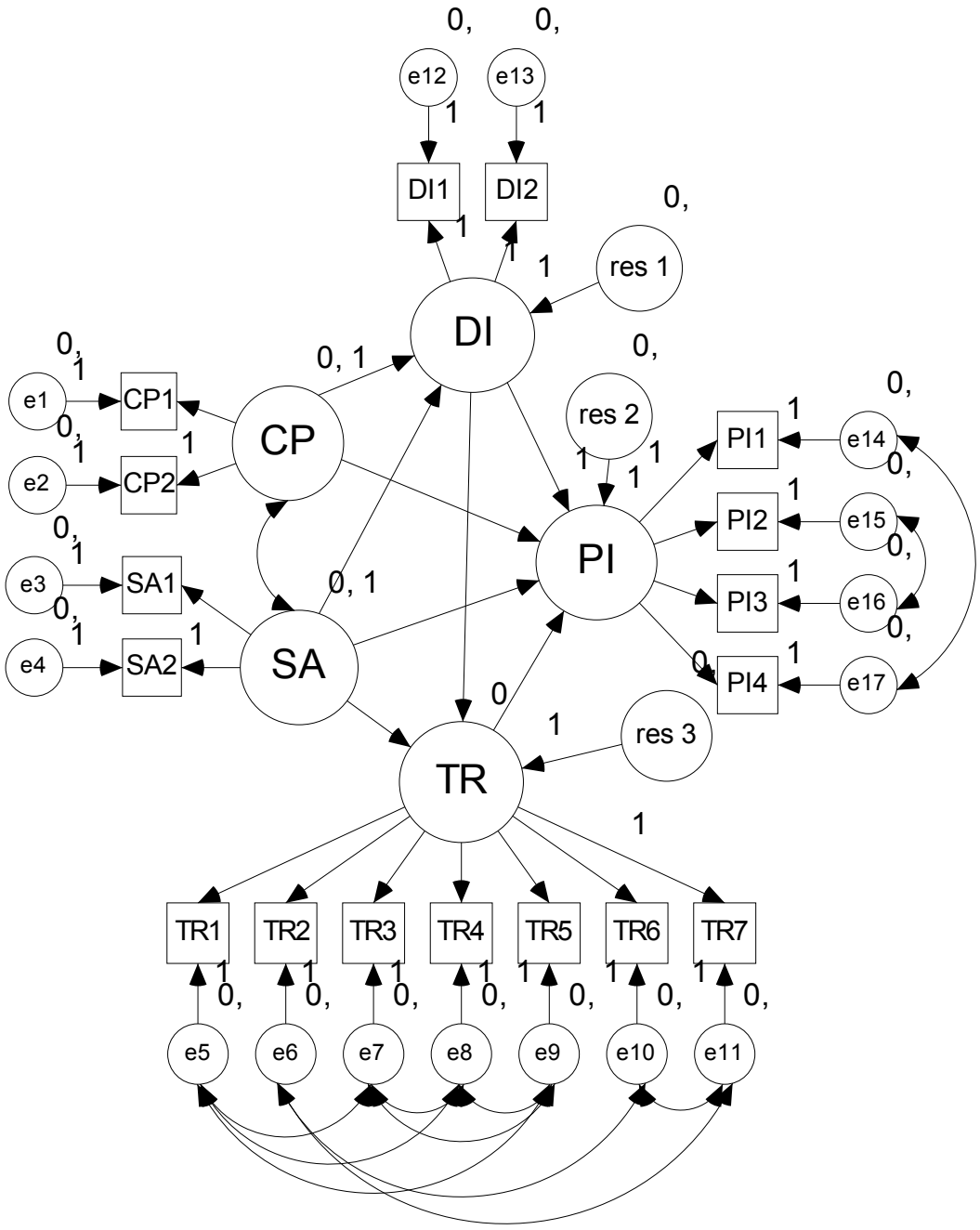

Figure 2. Structural analysis of contractual innovations within the CIS milk industry (AMOS 16.0 output)

Table 3 presents the properties of the standardised measurement model after removing the SI construct and shows that the goodness of fit criteria are satisfied. The CMIN/DF value has slightly increased after this second analysis although it is still above the recommend value. The NFI, CFI and RMSEA have improved and are within Arbuckle's (2007) recommended limits.

Table 3. Properties of the standardised measurement model without 'Supplier incentives' construct

Property	Recommended value	Value
CMIN/DF	≤ 5.00	7.05
NFI	≥ 0.90	0.90
CFI	≥ 0.80	0.92
RMSEA	≤ 0.08	0.08

Structural model

While analysis of the measurement model determines the relationship between the model and its measurement items, the structural model is conducted to determine the relationship between the model's constructs (Hair *et al.* 1998). Table 4 presents the regression weight (RW), standard error (SE), critical ratio (CR), standard weight (SW) and the level of significance as determined by the *p*-value for each hypothesised relationship. The relationships can also be presented as a path diagram but due to the complexity of the diagram, tabulated results are presented here and the path diagram is presented in Appendix 1.

Table 4. Properties of the structural model

Hypothesis	Constructs			RW	SE	CR	SW	Significance[1]
H1	PI	<	DI	-0.78	0.39	-2.02	-1.00	**
H3	PI	<	CP	0.25	0.06	4.39	0.25	***
H4	PI	<	SA	0.55	0.43	1.27	0.56	N/S
H6	DI	<	CP	0.18	0.04	4.21	0.14	***
H7	DI	<	SA	1.20	0.05	25.25	0.94	***
H8	PI	<	TR	0.69	0.15	4.68	0.48	***
H9	TR	<	SA	0.62	0.20	3.05	0.90	**
H10	TR	<	DI	-0.87	0.16	-5.38	-0.61	***
	CP2	<	CP	1.00			0.96	
	CP1	<	CP	0.29	0.03	8.94	0.32	***
	SA2	<	SA	1.00			0.67	
	SA1	<	SA	0.78	0.05	16.02	0.54	***
	DI1	<	DI	1.00			0.86	
	PI1	<	PI	1.00			0.84	
	PI2	<	PI	0.62	0.03	18.30	0.62	***
	PI3	<	PI	0.63	0.03	19.51	0.65	***
	PI4	<	PI	1.04	0.03	37.38	0.85	***
	TR7	<	TR	1.00			0.66	
	TR6	<	TR	0.40	0.05	8.75	0.28	***
	TR5	<	TR	1.01	0.05	18.88	0.80	***
	TR4	<	TR	1.20	0.06	18.50	0.78	***
	TR3	<	TR	1.18	0.06	18.48	0.78	***
	TR2	<	TR	0.71	0.05	14.71	0.51	***
	TR1	<	TR	0.84	0.05	15.81	0.65	***
	DI2	<	DI	0.76	0.03	28.32	0.82	***

[1] *** indicates significance at $t_{0.001} > 3.091$, ** indicates significance at $t_{0.005} > 2.576$

Analysis of the structural model (Table 4) indicates that all but one of the relationships within model are highly significant. The only exception is the relationship between the performance improvement and supplier assessment constructs where the relationship is not significant (p = 0.21). As the 'Supplier incentives' construct was omitted from the model, H2 and H5 are no longer considered.

H1: The Direct Involvement strategy has a direct and positive impact on Performance Improvement. This hypothesis was not supported as the standardised regression estimate was negative (-1.00), however, the relationship is significant. This suggests that there is indeed a statistically significant negative relationship between a buyer's direct involvement with its supplier and performance improvement.

H3: The Competitive Pressure strategy has a direct and positive impact on Performance Improvement. This hypothesis was supported because of the positive standardised regression estimate (0.25) and the highly significant *p*-value.

H4: The Supplier Assessment strategy has a direct and positive impact on Performance Improvement. This hypothesis was supported because of the positive standardised regression estimate (0.56) but was not significant because of its *p*-value (0.21).

H6: The Competitive Pressure strategy has a direct and positive impact on Direct Involvement. This hypothesis was supported because of the positive standardised regression estimate (0.14) and the highly significant *p*-value.

H7: The Supplier Assessment strategy has a direct and positive impact on Direct Involvement. This hypothesis was supported because of the positive standardised regression estimate (0.94) and the highly significant *p*-value.

H8: The Trust strategy has a direct and positive impact on Performance Improvement. This hypothesis was supported due to the positive standardised regression estimate (0.48) and the highly significant *p*-value.

H9: The Supplier Assessment strategy has a positive impact on Trust. This hypothesis was supported because of the positive standardised regression estimate (0.90) and the significant *p*-value.

H10: The Direct Involvement strategy has a positive impact on Trust. This hypothesis was not supported as the standardised regression estimate was negative (-0.61), however, the relationship is highly significant. This suggests that there is a statically significant negative relationship between a buyer's direct involvement with its supplier and the amount of trust suppliers have in their main buyer.

6. Concluding discussion

The analysis reveals important insights regarding the determinants of performance improvement in the CIS. The inclusion of trust into the model is vindicated as it has a direct and positive impact on performance improvement. The CIS has suffered from high levels of opportunistic behaviour and this has hindered the functioning of supply chains. One strategy for increasing trust, as revealed by the analysis is supplier assessment – providing feedback and performance data (items SA1 and SA3). In an environment of suspicion this can improve transparency. One frequent complaint of farmers in the region is that they themselves cannot evaluate the quality of milk and so do not know if penalties or bonuses relating to fat, protein or cell con-

tent are justified. Adhering to established standards and providing verifiable data on milk quality can improve trust and performance.

Competitive pressure also has a direct and positive impact on performance improvement. It also encourages direct involvement. This suggests that the fear of losing a buyer stimulates farmers to maintain better relationships and take up training and education provided by processors. This mirrors the findings of Gorton and White (2007) who found that the most dysfunctional supply chains in the CIS were in locations where privatisation and restructuring had not occurred, with little competition between buyers or suppliers. Ensuring effective competition at both producer and processor levels should be an important element of any development strategy. Overall, competitive pressure is more uneven in the CIS than mature market economies (Iudanov, 2007) and this may explain why it a more important factor than in Krause *et al.*'s (2000) work.

Direct involvement, drawing on surveys of buyers, has previously been viewed as a positive factor for raising supplier performance. Our work with suppliers implies a more nuanced view. A statistically significant negative relationship between direct involvement and performance improvement is revealed. Direct involvement is also negatively linked to trust. The latter may reflect that on site visits are viewed as a form of checking up or 'snooping', signalling that buyers do not trust suppliers. This engenders mutual suspicion. Direct involvement should be handled with care and buyers cannot assume it will always be welcomed.

There are two possible reasons for the negative linkage between direct involvement strategies and supplier performance. First, it is a strategy of last resort; processors seek to avoid the costs of site visits and on the ground training. They will only do so only where there is an absence of large farms with experienced management (Swinnen, 2007). Second, training and education alone may be insufficient to raise performance. For instance the poor quality of milk from Ukrainian small-scale producers is the result of, in some cases, a lack of knowledge of suitable feed regimes but also the absence of milk cooling tanks and inferior breeds. Without adequate investment, the benefits of training and education cannot be fully utilised.

The supplier incentives construct was excluded from the model. This may appear surprising as one would expect actions such as the provision of additional services to farmers, such as credit, as a stimulant for improved performance. Case study evidence, however, indicates that provision of credit to farmers has had very mixed results on performance (Gow and Swinnen, 2001). In some cases, credit from processors provides the means to purchase essential raw materials without which production would cease. However, as reported by Gow and Swinnen (2001), processors in Central and Eastern Europe have suffered from credit being diverted to other uses. Often the latter has been difficult to prove conclusively and buyers have been unable to seek legal redress. In an environment of low transparency, providing credit to farmers is not a panacea for improving farm performance. Additional services have to be appropriate to the specific needs of farmers and their use verifiable, so that misuse can be detected, with adequate systems of redress.

These findings suggest two fruitful avenues for further research.. Our finding that direct involvement has a significant, negative influence on performance improvement could be verified by interviewing milk producers. It is important to understand how direct involvement strategies could be implemented without alienating farmers. Similarly, supplier incentives to milk producers should be investigated further. The 'supplier incentives' construct was excluded from the model to improve its goodness of fit and, as discussed above, buyers must offer producers carefully-tailored additional services so not to suffer the consequences of misuse. It would be useful to conduct case study based research with buyers to determine the specific types of goods and services that are 'safe' to offer but worthwhile to their suppliers.

Overall, we have found that the mediated impact model developed by Krause *et al.* (2000) provides a useful basis for studying practices that can improve supplier performance in the CIS milk industry. From a theoretical point of view, we have successfully incorporated 'trust' as a

factor in the model but also offer some practical insights into the mechanisms of the CIS milk industry.

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Appendix 1. Standardised path model for the structural analysis of contractual innovations within the CIS milk industry