# Co-operation and economic relationship as determinants for competitiveness in the food sector: the Spanish wheat to bread chain

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*Abstract*— **The objective of the paper is to investigate the impact of co-operation amongst stakeholders of the food chain on enterprise competitiveness. The analysis focuses on the Spanish wheat to bread chain.**

**A theoretical model is developed which covers the main components that define competitiveness (profitability, turnover, market share, customer loyalty and product quality), quality supply chain relationship (trust, commitment and satisfaction) and the main factors explaining supply chain relationship (i.e. quality and frequency of the communication, personal bounds, etc.).**

**The Spanish wheat to bread supply chain has been chosen to empirically test the model. This sector is very fragmented all along the chain, with a high number of wheat farmers, millers and bakers. Exchanges in the sector are mainly done in the open market but there is an increasing tendency to maintain stable relationships with suppliers to assure quality. Therefore, stakeholders in the wheat to bread chain are mainly using two types of economic relationships: "repeated market transactions" and "spot market" but the former is by far the most used.**

**Based on data from a standardised survey with farmers, processors and retailers a structural equation modelling approach has been applied to empirically test the influence of relationship quality on stakeholders' competitiveness in the Spanish wheat to bread chain.**

**The main conclusion of the study is that, as the quality of the relationship in the Spanish wheat to bread chain improves the stakeholder' competitiveness increases. The results also reveal that quality of the relationship in the Spanish wheat to bread chain is based on trust, satisfaction and commitment with buyers/sellers and strongly influenced by communication quality and quantity. In addition, the outcome shows that the quality of communication has an indirect positive effect on stakeholders' competitiveness through the relationship quality. Finally, the only factor that will influence the quality of the relationship is the equal power distribution along the chain. Moreover, personal bounds positively influence the quality of communication in the bread Spanish supply chain.**

*Keywords*— **competitiveness, food, Spain.**

## I. INTRODUCTION

The agri-food sectors of many countries are witnessing moves towards closer vertical co-ordination which refers to the means by which products move through the supply chain from production to consumption (Hobbs and Young, 2000). There is an increasing need for co-ordination, stressing out the establishment of closer and long-term relationships along the supply chain, as a way to build more efficient and responsive supply chains in order to deliver exceptional value to consumers. Then, co-ordination in supply chains is becoming more of a necessity than an option (Matopoulus *et al.,* 2007). Changing consumer demands, advances in technology, environmental pressures, information technology, credit and risk issues and the reduction of global trade barriers are some of the drivers that are forcing firms to move toward closer vertical co-ordination, shifting away from more traditional relationships (i.e. spot market) to the development of longer-term and more integrated supply chain relationships (i.e. repeated transactions, vertical integration) with their buyers/suppliers (Young and Hobbs, 2002). In the food market, the need for businesses to build quality relationships is also greater than in other economic activities because the new requirements on traceability increases the need for co-ordination between actors in the food chain in order to allow tracking back the final food product. Similarly, Boehlje *et al.,* (1999) mentioned that main reasons for businesses to establish quality supply relationships are four: *i)* changing consumers' demands with higher requirements in the food they consume (i.e. increased concerns on health and safety, processing methods, animal welfare, etc.); *ii)* advances in technology and productivity (as a response for new consumers requirements on differentiated food products); *iii)* changes in government regulation and policies (in particular those aiming to reduce subsidies and protection, and to increase regulation with respect to consumer concerns); and *iv)* resource reliance (because of resources shift to compete in the market, from more traditional physical factors to more information based factors). On the other hand, Hobbs and Young (2001) wrote that potential market efficiencies from closer vertical co-ordination may improve the relative competitiveness of businesses and result in an outward shift of the demand function through the ability to tailor product

quality to the needs of specific consumers' demands. In the same line, a recent study on inter-enterprises relations in selected European countries conducted by Eurostat (Eurostat, 2007) concludes that relationship among enterprises are motivated by various reasons with the common aim of boosting competitiveness. Findings from this study indicate that firms highly believe that longer-term relationship had a positive impact on their competitiveness in the past, but more important, they highly expected that longer-term relationships would increase their competitiveness over the next three years.

Most probably, these have been important reasons for the increasing use of more stable and longer-term economic relationships in the Spanish wheat to bread supply chain. This sector is very fragmented all along the chain, with a high number of wheat farmers, millers and bakers. One of the main characteristics of the wheat market in Spain at the producer level is the lack of a classification system for different wheat qualities preventing the offer of homogenous quality. Then, exchanges in the sector were mainly done in the open market but there has been a sharp tendency to maintain stable relationships with suppliers to assure the required quality. Other new characteristic of the wheat to bread sector is the increasing demand for a greater variety of breads. Few years ago, bread in Spain was a homogenous product consisting manly of "baguettes" made of white bread. However, in the last few years, the market has demanded a greater variety of bread (i.e. whole grain, multi-cereals) and more convenience (i.e. bread baked all day long). Then, new shops, "bread boutiques" and stores with facilities to bake bread from frozen dough have emerged. Therefore, the new bread demand and subsequent product innovation has induced increasing co-ordination. Then, nowadays, the most use economic relationships in the wheat to bread chain are "repeated market transactions with buyers/suppliers" and "spot market" mainly but the former is by far the most used.

Thus, the objective of the paper is to investigate whether more stable and longer-term relationships in the Spanish wheat to bread supply chain positively influence stakeholders' competitiveness. In order to achieve the main objective, first the quality of the supply chain relationships along with their main determinants, such as communication, is analyzed; second, the positive impact of supply chain relationships on stakeholders' competitiveness is measured.

To achieve this aim, a model is developed where the main components that define competitiveness (profitability, turnover, market share, customer loyalty and product quality), quality supply chain relationship (trust, commitment and satisfaction) and the main factors explaining supply chain relationship (i.e. quality and

frequency of the communication, personal bounds, etc.) are established.

Data was gathered from a survey conducted to farmers, processors and retailers in the wheat to bread chain in Spain (the region of Aragon) from November 2006 to April 2007. The questionnaire was used face to face and through mail to a total number of 175 stakeholders. Using these data, a structural equation modelling approach has been applied to empirically test the influence of quality supply chain relationship on stakeholders' competitiveness in the wheat to bread Spanish supply chain.

The paper is structured as follows. Section 2 presents the theoretical framework and the hypotheses specification. Section 3 describes the methodology, the gathering of the data and the variables definition. Section 4 presents the empirical application and the results as well as the hypotheses verification. Finally, section 5 concludes with a discussion of implications.

## II. THEORETICAL FRAMEWORK

### A. Literature review

Few empirical papers have been conducted with the aim to analyse quality relationships in food supply chains and/or their impact on different stakeholders' outcomes. However, a greater number of empirical studies on quality supply relationships have been conducted in other economic activities. The first empirical work on food supply chains relationships has been conducted by Bath and Rexha (1999) who developed a conceptual model of buyer-seller relationship in the seed potato industry in Asia. They focus on the role of trust in building quality relationships in the seed potato supply chains. In the same line, Bath (2003) analyses the level of trust and their determinants in the relationship between growers and other agents in the fresh fruit and vegetable chain in Australia. Batt (2001) analyses the nature of the long-term relationships between Filipino potato farmers and their seed suppliers. The model confirms that there is a positive relationship between satisfaction and the potato farmer's desire to maintain a long-term relationship with their most preferred seed supplier. However, it would appear that the farmer's commitment is derived directly from satisfaction, rather than via trust. Batt and Wilson (2001) analyse the nature of the relationships between wineries and grape growers in Western Australia. They find that relationship quality is a composite measure of satisfaction, trust and commitment. They also find that other aspects related to the relationship quality are post-purchase satisfaction; the extent to which the benefits achieve from the relationship exceeds the outcomes and, the communication. Hansen *et al.,* (2002) explore the effect of

trust in the relationship, among members and between members, and cooperative managers of two agricultural marketing cooperatives (grain and cotton) in USA. Findings indicate that trust is an important factor to ensure the maintenance of members in the cooperative. Batt and Miller (2004) examine the nature of the relationship between wholesale and retail nurseries in Western Australia. In particular, the key dimensions of satisfaction, trust, commitment, communication, power dependence and the willingness of the partner to make specific investments were examined. Clare *et al.,* (2005) investigate how to improve the relationship between red meat processing companies and the farmers in New Zealand. Results indicate that suppliers and buyers have a far closer relationship than the relationship between each of them and the meat processing company. This suggests that the development of closer supply chain relationships between suppliers and meat companies would be necessary to improve the relationship.

Moreover, some studies on relationship quality for specific food supply chains have been conducted in Europe. Boger *et al.,* 2001 analyse supply chain relationships in the Polish pork sector finding that low levels of co-operation between farmers and processors exist in the Polish hog supply chain, although closer vertical relationship seems to appear. Fisher *et al.,* (2007a) analyse the role of trust in selected agri-food chains in four EU countries together with the main factors influencing relationship quality in these chains. Results indicate that trust is more pronounced among SMEs, which are characterised by the existence of personal relationships between business partners. If economic power is distributed unevenly in the agri-food chain (i.e retailers dominate most chains), trust towards the more powerful may be limited. Schulze *et al.,* (2006) developed a model of relationship quality for the pork and dairy sector in Germany to assess the impact of an improved quality relationship with the supplier on the stakeholder intention to switch buyers. Findings indicate that quality relationship is a construct formed by satisfaction, commitment and trust which affects the willingness to co-operate closer with the buyer/supplier. In particular, the intention to switch buyers can be reduced significantly by enhancing relationship quality. Fisher *et al.,* (2008) analyses the role of economic relationships and communication in selected European agri-food chains. Their findings indicate that the most important factor on the goodness of agri-food buyer-supplier relationships is effective communication, with two components, frequency and quality. The existence of personal bounds and equal power distribution between buyers and suppliers are the second most important determinants of relationship quality. They define relationship quality by four dimensions: trust, commitment, satisfaction and positive collaboration history.

*B. Model development and hypotheses formulation*

The model in this paper is developed with the aim to analyse the impact of an improved quality relationship in the Spanish bread supply chain on stakeholders' competitiveness. Then, the first hypothesis poses the link between quality relationship and stakeholders' competitiveness to be studied. In particular, it is expected a positive association between quality relationship and competitiveness (Hobbs and Young, 2001 and Eurostat, 2007). Thus, the first hypothesis of our model is defined as follows:

**H$_1$:** The quality of the relationship is positively related to the stakeholder' competitiveness

Second, we have to identify the factors that may improve relationship quality. In the literature, a large set of internal and external factors to the chain have been identified. However, factors affecting relationship quality are specific to the chain under study. In other words, the factors will drastically differ from food chains to chains in other sectors (industry, services, etc). In this paper, we have used to establish the possible factors affecting relationship quality the model on quality relationships developed by Fisher *et al.,* (2008). They empirically test a model on quality relationships in different agri-food chains in several European countries finding that main factors determining relationship quality are: *i)* communication (quality and quantity); *ii)* existence of personal bounds; *iii)* equal power distribution and; *iv)* local embededdness.

According to this model, the second hypothesis is defined as follows:

**H$_{21}$:** Communication quality is positively related to the relationship quality

**H$_{22}$:** Communication quantity is positively related to the relationship quality

Communication can be defined following Morh and Nevin (1990) as the glue that holds together a channel of distribution. They build a theoretical model that positively relates communication strategies to quality relationship defined by coordination, satisfaction and commitment. In the agri-food sector, Schulze *et al.,* (2006) also find a positive relationship between communication quality and quantity and quality relationship in the pork chain in Germany.

The third hypothesis is defined as:

**H$_{3.1}$.** Personal bounds is positively related to the quality of the relationship

**H₃.₂**. Local embeddedness is positively related to the quality of the relationship

**H₃.₃**. Equal power distribution is positively related to the quality of the relationship

Once the model has been built, we have to determine the indicators that measure the two unobservable variables in the model (competitiveness and quality relationship).

Competitiveness has been defined, in the economic literature, in either general or more specific ways. The OECD and the European Commission provide general definitions. The OECD defines competition as the ability of companies, industries, regions, nations, and supranational regions to generate, while they are and remain exposed to international competition, relatively high factor income and factor employment levels on a sustainable basis (OECD, 1996). The EU Commission understands competitiveness as a sustained raises in the standards of living of a nation or region and as low a level of involuntary unemployment as possible. Maintaining and improving its position in the global market is the main competitiveness criterion at the level of an industrial sector (European Commission, 2007). More specific definitions can provide the key indicators of competitiveness. Competitiveness, at firm level, is the ability to consistently and profitably deliver quality products and services, which customers are willing to purchase in preference to those of competitors (Annual Competitiveness Report, 1998). This definition raises the importance of profitability, product quality and customer loyalty in achieving competitiveness. The following definition also pointed out the importance of product quality. A firm is competitive if it can produce products and services of superior quality and lower costs than its domestic and international competitors (European Management Produce and Market, Annual Competitiveness Report, 1998). Finally, agribusiness competitiveness has been defined as the sustained ability to profitably gain and maintain market share (Martin *et al.*, 1991). This definition outlines the importance of profitability and market share on the competitiveness concept. Table 2 shows the competitiveness indicators finally used in the model.

In the literature of supply chain, a huge amount of studies has analyzed the dimension that defines quality relationships for different supply chains and from different disciplines (marketing channel, industrial marketing, consumer marketing, transaction cost economics, supply chain management, etc.). They state that relationship quality is a higher-order concept that gathers different dimensions that bring together the nature and strength of the relationship. However, no consensus has been reached on the specific dimensions to include in the relationship quality concept (Smith, 1998). In addition, Naudé and Buttle (2000) state that there is no one measure to define a good

relationship but there are different types of quality relationships, each composed of different blends of different dimensions (trust, satisfaction, etc.). In particular, the studies on quality relationship in agri-food chains mentioned before, suggest that quality relationship is a multidimensional construct formed from different dimensions, mainly, trust, satisfaction and commitment. First, it is widely recognize that trust is an essential dimension of relationship quality (Crosby *et al.*, 1990; Ganesan, 1994; Morgan and Hunt, 1994; Doney and Cannon, 1997; Smith, 1998; Garbarino and Johnson, 1999; and Naudé and Buttle, 2000). This dimension has been of particular importance on empirical analysis for food supply chains (Bath and Rexha, 1999; Batt and Wilson, 2001; Hansen *et al.*, 2002; Bath, 2003; Batt and Miller, 2004; Fisher *et al.*, 2007a; Schulze *et al.*, 2006; and Fisher *et al.*, 2007b). Although different definitions of trust have been developed, we can consider trust as the existence of confidence in the reliability and integrity of an exchange partner and a willingness to rely on this confidence (Morgan and Hunt, 1994). Commitment has also been found an important element of quality relationship (Morgan and Hunt, 1994; Smith, 1998; Geyskens *et al.*, 1999; Garbarino and Johnson, 1999; Batt and Wilson, 2001; Batt and Miller, 2004; Lages *et al.*, 2005; Schulze *et al.*, 2006; and Fisher *et al.*, 2007b). Commitment is defined as an enduring desire to maintain a value relationship (Moorman *et al.*, 1992). Satisfaction has been mentioned to be a basic element in different relationship models (Crosby *et al.*, 1990; Smith, 1998; Garbarino and Johnson, 1999; Geyskens *et al.*, 1999; Naudé and Buttle, 2000; Batt and Wilson, 2001; Batt and Miller, 2004; Schulze *et al.*, 2006; and Fisher *et al.*, 2007b). Satisfaction is typically defined as the appraisal of a firm's working relationship with another firm (Geyskens *et al.*, 1999). Therefore, in this paper, we assume that quality relationship is a multidimensional construct of three dimensions, trust, commitment and satisfaction, following the studies by Smith (1998), Batt and Wilson (2001), and Schulze *et al.*, (2006).

## III. METHODOLOGY

### A. Structural Equation Modelling

#### 1. The structural equation model (SEM)

A structural equation modelling approach has been used to empirically test the influence of improved quality supply chain relationship on firms' competitiveness in the wheat to bread Spanish supply chain. This approach has been selected because the analysed concepts, competitiveness and supply chain relationship, cannot be directly observed,

but can be considered latent variables measured by one or more items. Moreover, the structural equation modelling allows the analysis of simultaneous relationships between dependent and independent variables affecting firms' competitiveness.

The Structural Equation Modelling (SEM) encompasses an entire family of models where the multiple and interrelated dependence relationships are estimated, and unobserved concepts are represented in these relationships (Hair *et al.*, 2001). The SEM generally involves the specification of an underpinning linear regression-type model together with a number of observed or measured indicator variables. By examining the co-variation between the observed variables, it is possible to: *i)* estimate the values of the coefficients in the underpinning linear model; *ii)* test statistically the adequacy of the model to represent the process (es) being studied; and *iii)* postulate, if the model is adequate, whether the relationships are plausible or they are consistent with the data. The first distinction made among variables in the model is between observed and unobserved random variables. Observed variables are called manifest or indicator variables and are directly observed. Latent variables are hypothetical constructs-abstract variables such as "quality" that are not directly measured or observed.

A structural equation model implies a structure of the covariance matrix among the observed random variables. Once the models parameters have been estimated, the resulting model-implied covariance matrix can be compared to an empirical or data-based covariance matrix. If the two matrices are consistent with each other, then, the structural equation model can be considered a plausible explanation of the relationships among the random variables.

Structural equation modelling incorporates different approaches to represent the models. One well-known framework is by Jöreskog and Sörbom (1989) where the general structural equation model can be represented by three matrix equations:

$$\eta = \Gamma \xi + B\eta + \zeta \qquad (1)$$
$$Y = \Lambda y\eta + \varepsilon \qquad (2)$$
$$X = \Lambda x\xi + \delta \qquad (3)$$

Equation (1) is the structural model for latent variables where $\eta$, $\xi$ and $\zeta$ are random vectors of latent endogenous variables, latent exogenous variables, and latent errors for i =1,2,…N observations; B is a matrix which relates endogenous to endogenous constructs and, $\Gamma$ is a matrix which relates exogenous to endogenous constructs.

Relating the unobserved latent constructs to observed variables (manifest variables), the measurement model is represented by equations (2) and (3). The observed variables (Y and X) are vectors of observed indications of the latent endogenous ($\eta$) vectors and the latent exogenous ($\xi$). The vectors $\varepsilon$ and $\delta$ are vectors of measurement errors. $\Lambda y$ and $\Lambda x$ are loadings of endogenous and exogenous indicators respectively, it means that they are regression coefficients relating Y to $\eta$ and X to $\xi$, respectively.

A structural equation modelling approach has been used to empirically test the influence of improved quality supply chain relationship on firms' competitiveness in the wheat to bread Spanish supply chain. This approach has been selected because the analysed concepts, competitiveness and supply chain relationship, cannot be directly observed, but can be considered latent variables measured by one or more items.

### 2. *Data gathering*

Data was obtained in a survey conducted to farmers, processors and retailers in the wheat to bread chain in Spain (the region of Aragon) from November 2006 to April 2007. The final questionnaire was employed either face to face or through mail to a total of 175[1]. In particular, 104 wheat farmers, 45 bread processors and 26 small independent bread shops (supermarkets and hypermarkets were not included in the population target because they were surveyed using an semi-structured questionnaire, results are not included in this paper). In order to approach farmers, there was a first contact with advisory extension services in the region as well as cooperatives and veterinary services. Twelve counties were selected because of their productive intensity and diversity. The directors of these services got in touch with farmers as they had to approve voluntarily to respond the questionnaire. There was a request for the directors of the extension services to select a wide variety of wheat producers; although not a proper statistical strategy was established.

Farmers were interviewed face to face at the extension services facilities. In the case of agri-food industries, it is very difficult to interview company managers. Thus, a mixed strategy was followed to get the questionnaires filled. The first step was to send letters with questionnaires and there were some responses through a prepaid stamped envelope. The second step was to get in touch, through the telephone, trying to get their answers. The last step was to

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have a face to face interview after arranging a meeting. Retailers were approached directly through face to face interviews in their own stores. The final sample is characterized by region, size and business age (Table 1). Respondents are located in the region of Aragon, and many of them, in Zaragoza. The size of interviewed businesses is quite small, mainly for farmers and retailers, corresponding with the small size of the entire business population.

Around 60% of farmers and retailers have only 1 employee and 22% and 15%, respectively have two employees. Processors are also quite small although the size is higher than for the other actors in the chain. Around 25% of bread processors have more than 10 employees. Then, we can state that our sample mainly consists of Small and Medium (S&M) enterprises operating in the wheat to bread supply chain in Spain. Then, results and conclusions must be read taken into account that we are analysing S&M enterprises.

### Table 1 Sample characteristics

|  | Farmers |  | Processors |  | Retailers |
|---|---|---|---|---|---|
| Size (# of employees) |  |  |  |  |  |
| 1 employee | 68 (66%) | 1 to 3 employees | 13 (28.9%) | 1 employee | 15 (57.7%) |
| 2 employees | 22 (22%) | 4 to 10 employees | 21 (46.7%) | 2 employees | 4 (15.4%) |
| 3 or more employees | 13 (12%) | More than 10 employees | 11 (24.4%) | 3 or more employees | 7 (26.9%) |
| Average number of years on business | 17.7 |  | 22.4 |  | 16.1 |

The questionnaire was designed to fulfill the aim of analyzing the nature and quality of the bread supply chain relationship and the impact of improved quality relationship on stakeholders' competitiveness. This questionnaire was developed based on previous expert interviews conducted during the summer/autumn 2005. Face-to-face expert interviews, using a semi-structured questionnaire, were undertaken to explore the nature of chain relationships and communication, as well as underlying stakeholders' competitiveness. The final questionnaire contains 3 groups of questions. The first group consists on questions related to the type, nature and quality of the chain relationship. The second one has questions on information and communication strategies with the main buyer/supplier. Part three consists of questions related to the effect of relationship quality on competitiveness and to the factors that might influence the relationship quality. Finally, some questions on specific actor characteristics are included. At the beginning of the questionnaire, stakeholders were asked to focus on their main buyers/suppliers to whom the following questions were related.

## 3. Variables definition

The definition of the dimensions and factors in the model of quality relationship and competitiveness is shown in Table 2. Most of questions consist of seven point scales from 1 to 7, where 1 means the lowest rate and 7 the highest.

### Table 2 Measurement of the exogenous and endogenous variables

| Factors | Observed variables | Score | Variable name |
|---|---|---|---|
| Communication quality (F1) | Frequency of communication | 1= very poor ..... 7= very well | FREQ |
|  | Quality of communication | 1= very poor ..... 7= very well | QINFO |
| Relationship quality (F2) |  |  |  |
|  | Trust in this supplier/buyer | 1= very poor ..... 7= very well | TRUST |
|  | Commitment toward this supplier/buyer | 1= very poor ..... 7= very well | COMMIT |
|  | Satisfaction with this supplier buyer | 1= very poor ..... 7= very well | SATIS |
| Competitiveness (F3) | Profitability | 1= Negative effect 2= No effect 3= Positive effect | PROF |
|  | Turnover | 1= Negative effect 2= No effect 3= Positive effect | TURN |
|  | Market share | 1= Negative effect 2= No effect 3= Positive effect | SHARE |
|  | Customer loyalty | 1= Negative effect 2= No effect 3= Positive effect | LOYAL |
|  | Product quality | 1= Negative effect 2= No effect 3= Positive effect | QUAL |
| Personal Bonds (F4) | This relation is based on strong personal bounds | 1=strongly disagree ..... 7= strongly agree | PERSONAL |
| Local embeddeness | The majority of suppliers are located in the same region (yes or no) The majority of buyers are located in the same region (yes or no) | 1=No for both 2=Yes for one of them 3=Yes for both of them | EMBED |

| Equal power | We are equal partners in this relationship | 1=strongly disagree ..... 7= strongly agree | POWER |
|---|---|---|---|

## IV. RESULTS

Structural equation modeling (SEM) was employed to examine the general fit of the proposed model and to test the hypotheses. The data analysis procedure consists of a confirmatory factor analysis (CFA) to assess the measurement model and the SEM analysis to examine the overall relationships among the constructs (Anderson and Gerbing, 1988; Hair *et al*, 2001)[2].

### A. Testing the measurement model

The overall goodness-of-fit indices for the measurement model are $\chi^2_{(46)}$ = 82.1, the $\chi^2$ /46 =1.7847, smaller than 3; the Bentler-Bonett Normed fit index (NFI) = 0.918, the comparative fix index (CFI) = 0.961 and the root mean square error of approximation (RMSEA) = 0.067. Taken into account all of these fit indexes it can be said that there is a satisfactory fit between the proposed model and the data.

Reliability refers to the consistency of the measurement. Table 3 shows that the Alpha values, measuring scale reliability of communication quality (0.907), relationship quality (0.89), and competitiveness (0.80), exceed the recommended level of 0.70.

Convergent validity is evaluated by the t-ratio tests of the factor loadings. In Table 3 it can be observed that for each variable the t-values associated with each of the loading exceeds the critical value, at 1% significance level. It means that all variables are statistically significant in their specified constructs, verifying the hypothesised relationships between indicators and constructs. Thus, it can be concluded that the fit of the measurement model is quite reasonable.

The discriminate validity is achieved if the $\chi^2$ difference test (with 1 degree of freedom) is statistically significant. Then, when the $\chi^2$ of the model in which the two constructs are viewed as distinct factors but correlated is higher than the $\chi^2$ of the unrestricted model. Since every pair of 5 constructs need to be tested, we use the Bonferroni method where the probability for every comparison-wise has to be less than 0.01/10 = 0.001. Then, the $\chi^2$ difference must be less than the $\chi^2$ (0.001) (Table 4).

Table 3 Confirmatory Factor Analysis results. Standardized parameter estimates for the measurement model

| Variables | Cronbach's α | Standardized Factor loading | t-value (P<0.001) |
|---|---|---|---|
| Communication quality (F1) | 0.907 | | |
| FREQ | | 0.92 | (0.000)[a] |
| QINFO | | 0.89 | 11.665 |
| Relationship quality (F2) | 0.89 | | |
| SATIS | | 0.92 | (0.000)[a] |
| TRUST | | 0.91 | 16.343 |
| COMMIT | | 0.73 | 11.724 |
| Competitiveness (F3) | 0.80 | | |
| PROF | | 0.89 | (0.000)[a] |
| TURN | | 0.76 | 10.248 |
| SHARE | | 0.54 | 7.071 |
| LOYAL | | 0.56 | 7.363 |
| QUAL | | 0.54 | 7.026 |
| Personal bonds (F4) | 1 | | |
| PERSONAL | | 1 | (0.000)[a] |
| Equal Power(F5) | 1 | | |
| EPOWER | | 1 | (0.000)[a] |

[a] The value was not calculated because loading was set to 1.0 to fix construct variance

Table 4. Discriminate validity for the measurement model

| Construct pair | Standard measurement model $\chi^2_{(46)}$ = 82.1 (p<0.001) | |
|---|---|---|
| | Unidimensional model $\chi^2$(47) | $\chi^2$difference |
| (F1, F2) | 111.2 | 29.1 |
| (F1, F3) | 125.3 | 43 |
| (F1, F4) | 109.6 | 27.5 |
| (F1,F5) | 114.6 | 32.5 |
| (F2, F3) | 126.2 | 44.1 |
| (F2, F4) | 96.4 | 14.3 |
| (F2,F5) | 111.6 | 29.5 |
| (F3, F4) | 106.6 | 24.5 |
| (F3,F5) | 124.9 | 42.8 |
| (F4,F5) | 112.5 | 30.4 |

### B. Testing the structural model

The structural coefficients in the model have been estimated using the Maximum Likelihood Estimation procedure (MLE) with the AMOS 5.0 computer software. Table 5 presents the standardized parameter estimates for the structural model and the t-ratios. Standardized structural coefficient estimates are used to compare the relative importance of the independent variables. The results indicate that all the t-values for the standardized coefficients are above the 1.96 threshold. Thus, the estimated parameters are all statistically significant different from zero.

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[2] Only the best model in terms of statistical measures and goodness of fit is presented

| | | |
|---|---|---|
| $\chi^2$/g.l | (1-5) | 2.152 |
| PRATIO | Close to 1 | 0.68 |

Source: Arbuckle and Wothke (2004)

Table 5 SEM results: standardized parameter estimates for the structural model

| | | Parameters | t-values |
|---|---|---|---|
| Communication quality | Relationship quality | 0.52 | 6.695 |
| Relationship quality | Competitiveness | 0.38 | 4.619 |
| Personal bonds | Communication quality | 0.41 | 5.389 |
| Equal Power | Relationship quality | 0.21 | 3.125 |

The assessment of the overall fit of the proposed model which ensures that it is an adequate representation of the entire set of casual relationships, is shown in table 6, where absolute fit, incremental fit and parsimonious fit measures are used.

Absolute fit measures determine the degree to which the overall model (structural and measurement models) predicts the observed covariance or correlation matrix. The likelihood-ratio chi square $\chi^2$ (52 degrees of freedom) is 111.912 indicating that is statistically significant at the 5% significant level. Since the chi-square statistic is very sensitive to sample size, other measures are examined to assess the model goodness of fit. In fact the $\chi^2$/52 =2.152, smaller than 3 and the RMSEA value (0.08) indicate a reasonable error of approximation. Thus, these results mean that there is a good correspondence between the resulting model-implied covariance matrix and the empirical or data-based covariance matrix. Regarding the comparisons to a baseline model, the TLI, the NFI, the IFI and the CFI values were calculated, and they are at 0.90 (table 6), indicating that the proposed model can be acceptable. Finally, the parsimonious fit measures represent the degree of model fit per estimated coefficient. These measures attempt to correct for any "over fitting" of the model and evaluate the parsimony of the model compared to the goodness-of-fit (Hair *et al*, 2001). The results indicate that the model is parsimonious because the PRATIO value is close to 1 and $\chi^2$/52 is included between the interval values suggested by Arbuckle and Wothke (2004).

Table 6 Model goodness-of-fit of the overall model

| Measures | Optimum | Estimated model |
|---|---|---|
| *Absolute fit measures* | | |
| $\chi^2$ | | 111.912 |
| g.l | | 52 |
| P | p>0.05 | 0.000 |
| RMSEA | (0.05-0.08) | 0.081 |
| *Incremental fit measures* | | |
| TLI | >0.90 | 0.902 |
| NFI | >0.90 | 0.899 |
| IFI | >0.90 | 0.937 |
| CFI | >0.90 | 0.935 |
| *Parsimonious fit measures* | | |

Based on these findings, the proposed model on quality relationships in the wheat-to-bead Spanish chain appears statistically reasonable. Moreover, the three hypotheses stated in the paper have been verified and the main results are presented in the next section.

*C. Hypotheses verification*

The path diagram for the estimated model is shown in figure 1. This figure represents the latent variables as ellipses, the indicators as rectangles and the error and residual terms as circles. Moreover, the single-headed arrows are the causal relations. Path coefficient values are placed on the arrows from latent variables to indicators, or from one latent to another one. In addition, the standardized values (between 0 and 1) of the estimated coefficients for each indicator and for each latent variable are represented.

The casual relationship among quality relationship and competitiveness is statistically significant and positive. This means that hypothesis 1 is confirmed. Then, in the Spanish wheat to bread chain, as the quality of the relationship improves, the stakeholder' competitiveness increases. The high path coefficient values between the latent variable quality relationship and their indicators prove that, as expected, quality relationship is a multidimensional construct of trust, satisfaction and commitment. This means that the basis for a quality relationship in the wheat to bread supply chain in Spain is the trust, satisfaction and commitment with buyers/sellers. Moreover, competitiveness is also a multidimensional concept where profitability and turnover are the most important dimensions although, it also contains customer loyalty, market share and product quality. This result indicates that competitiveness is a concept that takes mainly into consideration only firms' economic indicators, such as profitability and turnover, although the firms' ability to increase market share through product quality, in order to establish customer loyalty or preference for those higher quality products are also comprised in it. Second, the positive and statistically significant estimate coefficient between the quality of communication, measured by quality and quantity, and the quality of relationship indicates that hypothesis 2 is verified. This result indicates that as communication quality and quantity in the wheat to bread supply chain increases, the quality of the relationships improves. Then, the quality of communication also has a positive effect on stakeholders' competitiveness through the relationship quality.

The second more relevant conclusion is that only one of the hypothesized factors that might explain the

relationship quality is, in fact, a relevant factor. This factor is the equally distributed power between stakeholders along the chain. However, neither the local embeddednes nor the personal bounds influence the quality of the relationship. Then, hypothesis 3 has been only partially verified, only the last part of the hypothesis ($H_{3.3}$) has been confirmed. This result indicates that whether the negotiation power is equally distributed in the wheat to bread chain positively affects the quality of the relationship. Moreover, personal bounds positively influence the quality of communication indicating that communication improves as personal bounds are closer along the chain. This result is on line with the small size of the stakeholders in the sample. In the paper we are analysing only small and medium stakeholders and the equally distributed power is important for them to build improved economic relationships. In addition, personal bounds is the key to enhance communication quality.

Fig. 1 Path diagrams of the estimated model
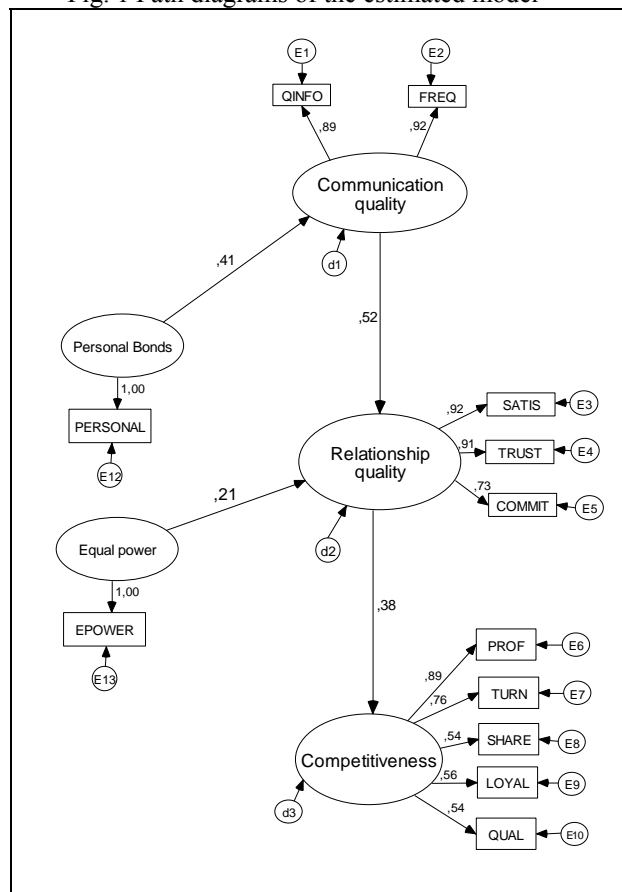


Note: The figures are standardised coefficients

V. CONCLUSIONS

In the Spanish wheat to bread supply chain exchanges were mainly done in the market but they are not using spot market relationship anymore but a more stable type of relationship, they mainly exchange commodities with the same buyer/retailers. Therefore, the most important type of economic relationship is "repeated market transactions". One of the main characteristics of the wheat market in Spain at the producer level is the lack of a classification system for different wheat qualities preventing the offer of homogenous quality. Then, exchanges in the sector were mainly done in the open market but there has been a sharp tendency to maintain stable relationships with suppliers to assure the required quality. Other new characteristic of the wheat to bread sector is the increasing demand for a greater variety of breads. Few years ago, bread in Spain was a homogenous product consisting manly of "baguettes" made of white bread. However, in the last few years, the market has demanded a greater variety of bread (i.e. whole grain, multi-cereals) and more convenience (i.e. bread baked all day long). Then, new shops, "bread boutiques" and stores with facilities to bake bread from frozen dough have emerged. Therefore, the desire to assure the required quality, the new bread demand and subsequent product innovation have been the reasons to move towards more stable economic relationships among stakeholders. The final aim of building more stable and higher quality relationships is to increase their competitiveness. This has been the aim of the paper, to investigate whether more stable and higher quality relationships in the Spanish bread supply chain positively influence stakeholders' competitiveness.

To fulfill this aim, a survey for the different stakeholders in the wheat to bread chain was conducted. The final sample of farmers, processors and retailers interviewed are located in the Spanish region of Aragon, and many of them, in Zaragoza. The size of interviewed businesses is quite small, mainly for farmers and retailers. Around 60% of farmers and retailers have only 1 employee and around 20% have two or three employees. Processors are also quite small and around 25% of bread processors have more than 10 employees. Consequently, the findings correspond to Small and Medium (SME's) enterprises operating in the wheat to bread chain in Spain.

The main conclusion is that in the Spanish wheat to bread chain, as the quality of the relationship improves, the stakeholder' competitiveness increases. Moreover, the quality of the relationship in the wheat to bread supply chain in Spain is based on trust, satisfaction and commitment with buyers/sellers. In addition, competitiveness is a broad concept that embraces firms' economic indicators, such as profitability and turnover, although the firms' ability to increase market share, through product quality, in order to establish customer loyalty or

preference for those higher quality products are elements of the business competitiveness. Second, as communication quality and quantity in the wheat to bread supply chain increases, the quality of the relationships improves. Then, the quality of communication has also a positive effect on stakeholders' competitiveness through the relationship quality. Then, in order to increase competitiveness, stakeholders in the chain have to implement quality communication systems with their buyers/suppliers and to build higher trust, commitment and satisfaction among them. The extent to which the different actors in the chain, such as farmers, processors and retailers, success in creating an improved communication system building higher trust and commitment as well as higher levels of satisfaction among them, their own competitiveness will increase.

Finally, the only factor that will influence the quality of the relationship is the equally distributed power among stakeholders in the chain. In the same way, the only factor that positively influences communication quality is the personal bounds. However, the influence of personal bounds on the communication quality is higher than the influence of equal distributed power on the quality of the relationship. Then, whether the negotiation power is equally distributed along the chain and the establishment of strong personal relations with their buyers/suppliers has positive impacts in their competitiveness through the improvements of both, the quality of the relationship and the communication.

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