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*Full Length Research Paper*

# Multi-governance choices by smallholder farmers in the pineapple supply chain in Benin: An application of transaction cost theory

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**The present study validates the new construct “Multi-governance choices”, to sharpen our understanding of how and why smallholder farmers select among alternative governance structures. Primary data were collected from a sample of 219 pineapple farmers in Southern Benin. Results from a multivariate probit model analysis showed that farmers involved in outgrowing schemes were less likely to be involved in other type of governance structure, indicating the specificity of this type of transaction arrangement in Beninese pineapple supply chain. Results also show that the specificity of the investments, transaction connectedness, market stability, institutional support and market attributes are key factors affecting the choice of governance structure. The study suggests that further research is needed into the impact of selected governance structures on pineapple quality and farmer’s income.**

**Key words:** Multi-governance structure, governance choice factors, multivariate probit, transaction attributes.

## INTRODUCTION

Over the past decade, pineapple production has increased more than four-fold from 50,000 tons in 2000 to 222,000 tons in 2009 in Benin (World Bank, 2010). Production is consumed locally (35%), exported in the sub-region (40%), and processed into juice (15%). Regional exports in dried form are 8% and exports to the European Union share only 2% (GTZ and MAEP, 2008). It is estimated that the value of pineapple production in 2006 amounted to €19.8 Millions (4.3% of agricultural GDP and 2.1% of the total GDP) and the number of direct and indirect jobs created in the value chain were 15,000 and 25,000, respectively. The success of the pineapple supply chains is of high importance for Benin. Pineapple production follows a two-year cycle and requires a

significant level of investment often beyond the financial capacity of the individual smallholder. For smallholders to make profit from selling in local, regional and export markets, they have established bi- or multilateral forms of governance structures. Within the existing portfolio of governance structures in the pineapple supply chain (PSC) ranging from spot market to collective actions, farmers are simultaneously making several choices for access to pineapple – characterised by various quality levels sold in different markets.

Considering the lack of scientific evidence on the determinant and factors affecting multiple choices of governance structure, it becomes necessary to investigate the following questions: (i) in a context of different governance structures (GS) alternative choice, are the farmers’ selections independent or related? and (ii) what are the intrinsic (farm and farmers socioeconomic characteristics) and extrinsic (enabling

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institutional support, market and transaction attributes) factors affecting the governance structure choices in the PSC?

From the transaction cost theory (TCT) perspective, the rational farmer will choose a governance structure that is best performing in minimizing the production and transaction costs (Williamson, 1985). Failures have been reported of projects that had potential to reduce transaction costs such as contract farming (Glover and Kusterer, 1990), cooperatives and producers' associations (Bijman and Wollni, 2008).

Traditional economic theories on comparative advantage of the supplier in selecting the governance structure have significantly contributed to understanding trade at local and international levels, but do not fully explain how the multiple choices of governance structures by chain actors can be explained with empirical evidence.

The added-value (specificity) from this paper is that it simultaneously considers both intrinsic (firm and farmers characteristics) and extrinsic (enabling environment, transaction attributes) constructs to explain the choice of governance structure. The study contributed to validate a new construct, namely "Multi-governance", the simultaneous use of more than one governance structure, to deepen the understanding of how and why farmers select governance structures in less developed countries.

Under transaction cost theory, the paper helps in understanding the major reasons guiding the choice of chain governance structure in pineapple supply chain using a broader range of explanatory factors than previous studies. The study provided empirical evidence in the transaction cost theory and the choice of governance structure, as well as the consideration of the connectedness of the transaction as a determinant construct of transaction attribute in explaining the choice of governance structure.

## Theoretical background

Transaction cost economics (TCE) is an approach for the study of economic systems and organizations. TCE is based on an integrated perspective of institutions, the law and economics (Rao, 2003). The contribution of Coase<sup>1</sup> (1937) marked the starting point of the recognition of the role of transaction costs in the theory of the firms. The main approach of TCE is, as Williamson (1989) suggested, to assign attribute differentiated transactions to governance structures in a transaction-cost-minimizing manner.

Transaction cost was interpreted broadly as the comparative costs of planning, adapting, and monitoring task completion under alternative governance structures<sup>1</sup>.

In another perspective, North (1990) described these as 'the costs of measuring the valuable attributes of what is being exchanged and the costs of protecting rights and policing and enforcing agreements'.

These definitions indicate the prior focus of TCE on the institutions and evolution of governance structures in relation to the role of transaction costs. In other words, TCE primarily focuses on the costs involved in making transactions rather than the costs of producing a product.

Production cost for a particular task/function is the cost of performing that task, and is borne by the firm performing it. Several factors affect production costs including resource requirements, scale effects, and buyer experience. However, transaction costs are known as the costs allocated to write, monitor, and enforce the contract. These costs include the costs of running a market-based system, or the costs associated with the allocation of tasks to external agencies or outsourcing (Bello et al., 1997).

According to Williamson's transaction cost framework (Williamson, 1991), the magnitude of the transaction costs is determined by some key attributes including specific investments, level of uncertainty, bounded rationality and connectedness of the transaction. Governance is viewed in terms of the design of the particular mechanisms supporting an economic transaction where there is an exchange of property rights. TCE tries to derive the optimal governance structure under a certain set of situational contingencies (Barney and Hesterly, 1999).

Under TCE reasoning, a continuum of three major forms of governance structures, ranging from spot-market and hybrid exchanges to vertical integration known as hierarchical governance structure, are distinguished (Figure 1). Hybrid forms of governance structures include bilateral contracts (classical, neo-classical and relational contract arrangements), networks (collective trading, partnership) and alliances (cooperatives, joint venture).

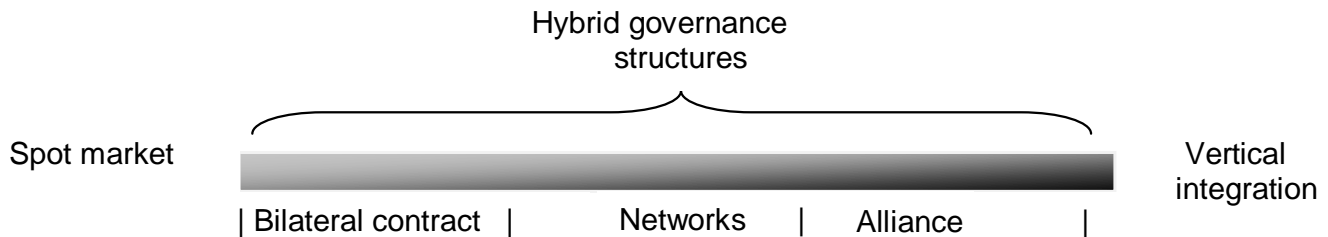
Following Williamson (1985), in case of a high level of collaboration and relationship between buyer and seller the GS will be close to the vertical integration mode, whereas in cases of lower levels of relationship, the GS will be close to the spot-market mode. In the TCE framework, the costs of any transaction comprise the *ex ante* and *ex post* costs.

*Ex ante* costs are incurred before and during the transactions, such as search costs, information costs, and the costs of negotiating and developing a contract or agreement.

*Ex post* costs are the costs that rise after the transactions, such as the costs of monitoring and enforcing contracts or agreements (Williamson, 1996). *Ex post* transaction costs, also known as 'coordination costs' among organizational theorists (Douma and Schreuder, 2002), are resources utilized for creation, including the maintenance, and the use of institutions and organizations (Furubotn and Richter, 2000).

Following insight of Coase (1937), Williamson (1985)

<sup>1</sup> Coase, with his concept of institutional structures of production has extended his analysis of the nature of the firm to all modes of organizations



**Figure 1.** Continuum of governance structures in the chain. Source: Adapted from Ménard (2004) and Pascucci (2010).

has elaborated tools for exploring the mechanisms of governance based on these contributions, a significant amount of knowledge has accumulated about the different structures that can support and secure transactions.

Several factors influence the choice of a mode of governance structure by actors involved in a transaction. The anticipated complexity of decomposing tasks among partners and of coordinating across organizational boundaries is a major factor in the choice of a specific mode of governance and in the design of mechanisms for monitoring the arrangement (Gulati and Singh, 1998).

The influence of the institutional environment on the choice a governance structure is still unclear in the literature (Hobbs, 1997; Ménard, 2004). Regarding the number of parties to be included in the arrangement that involves a difficult trade-off between bilateral and multilateral agreements, chain actors have to make a decision. The bilateral arrangements are easier to monitor but involve higher dependency; while the multilaterals make the management of the relationship more complex, but allow comparisons and benchmarking, a powerful tool for constraining opportunism (Menard, 2004).

However, as for how interactions are undertaken among agents, North (1981, 1990 and 1991) has insisted on the importance of the rules of the game for understanding how actors play that game, choosing ways to organize transactions.

Williamson (1991) went a step further in introducing the possibility of shifts in parameters that could explain changes in the mode of governance at the micro level. Based on Williamson's model, Oxley (1999) has developed an econometric test, showing how the legal definition and the implementation of property rights significantly influence the choice between equity and market-based contracts in hybrid arrangements designed for transferring technologies.

Economics started with a dichotomist view between systems based on decentralized decisions and systems planned from the centre, expressed in various but similar ways: 'markets and plans' (Coase, 1937), 'markets and hierarchies' (Williamson, 1975), 'hierarchies and polyarchies' (Sah and Stiglitz, 1986).

As stated by Grandori (1997), a third type of

governance form has been added: clans (Ouchi, 1980), trust (Bradach and Eccles, 1989), democratic poliarchies (Lindblom, 1977), networks (Thompson et al., 1991 and many others), and constitutional ordering (Sabel, 1993). These categorizations have been proposed, but they are difficult to compare properly with the two types of markets and hierarchies (Grandori, 1997). Therefore, the growing literature on the class organizations known as hybrid forms of governance structure, standing between markets and hierarchies, raises important questions about their nature and role in a market economy.

A previous study (Arinloye et al., 2010) on the pineapple supply chain in Benin identified additional market type governance structures, and three other types of governance structure falling into the hybrid class namely relational based GS, outgrowing schemes, and the farmers' organisation type of GS.

### Empirical measurement of the governance structures

First of all, the governance structure indicates the type of inter-relation agreement that is used between farmers and traders. Different forms of chain governance are considered. They include spot market relationship, the reputational based arrangement, the outgrowing scheme (minority holdings) and collective actions (producers' organisations).

As argued before in our propositions, these modes of transaction arrangements incorporate a full range of governance structures that can be ranked along the continuum between arms-length arrangements and full integration (Powell and DiMaggio, 1991; van de Vrande et al., 2009; Williamson, 1985).

Each of the types of governance structure is considered as a multiple choice equation system, where farmers have a possibility to select one or more than one GS among the four possible alternatives. The following are the descriptions of the different GS types in the pineapple supply chain:

**Spot market GS:** It is characterised by a handshaking and one shot and unrepeatable relationship between buyer and seller (Williamson, 1985).

**Relational-based GS:** It is an informal form contracting

based on relation and previous experiences between buyer-seller (Bradach and Eccles, 1989; Gibbons et al., 1994; Menard, 2004). It is classified under bilateral form of governance structure (Pascucci, 2010) and raises the issue of trust in the transaction. Several authors see trust as a way to secure transactions when contracts are incomplete (Zucker, 1986; Bradach and Eccles, 1989). This reputational selection is guided by familial and/or friendship relations between both parties and the transactions are characterised by a high level of trust and commitment.

**Outgrowing scheme GS:** It is considered as bilateral contract farming between small farmers and processors or traders. It implies that the buyer has a high control in: (1) controlling production and harvesting practices on the farm to ensure pineapple quality, (2) providing the farmer with a loan to buy inputs and accomplish the production on time, (3) giving inputs (growing material, Ethephon<sup>2</sup>, fertilizers, etc.) directly to farmers, and (4) training and monitoring farmers on good production practices (Brüntrup and Peltzer, 2006). This type of GS is generally accomplished under short or medium term contracts (one harvest or one production cycle) and falls under marketing specification, resource-providing and product management types of contracts (Baumann, 2000). The emphasis here is on partners monitoring and controlling their actions and decisions through specific and identifiable organizational devices that they have intentionally designed and agreed upon.

**Farmers' association GS:** It implies that the farmer is membership of an organization that provides all needed assistance through (1) monitoring, (2) grouped selling, (3) assisting members in finding markets, and (4) social assistances. Farmers' association can easily benefit from extension service and financial supports. This form of governance is characterised by long term contracts, it generally lasts as long as your membership of the association is still valid (Wennink and Heemsker, 2006).

## MATERIALS AND METHODS

### Research model

In the research model, different factors are hypothesized to affect the choice for a particular chain governance structure. They include (1) the socio-economical characteristics of the actors and the firms, (2) the transaction attributes (including asset specificity, uncertainty, and connectedness of the transactions) and (3) the institutional environment (Figure 2).

### Firm characteristics

The firm characteristics<sup>3</sup> include the following constructs: geographical location (distance between production area and market), farm size (hectares), ratio of land dedicated to pineapple

growing to the total cultivated land). Other major factors are related to the actors' dynamic capabilities (that is, capability to cope with the changes in market and environment and to satisfy customers' needs), age, trust and commitment between farmer and buyer.

Farmers feel safer in a market setting where they maintain long-term relationships with their buyers (Lu, 2007). Moreover, the farm size is expected to have a positive relationship with farmers' decision process as shown by various studies (Akinola, 1987; Polson and Spencer, 1991). This leads to hypothesize that large scale farmers who located far away from the market place will be likely to be involved in long-term relations and more integrated chain governance structures.

### Asset specificity

Asset specificity refers to the extent to which non-fungible assets are tied to particular transactions specified by contracts or other forms of commitment (Williamson, 1985). Assets are specific to a particular use if the returns they provide are valuable only in that use, relative to any alternative use. The degree of asset specificity may be assessed in terms of the investment value that is lost when the asset is switched from its intended use to an alternative use.

Based on these three assumptions, TCE explicitly considers the efficiency implications of adopting governance mechanisms in transactions. Williamson identified site, physical, human, temporal and dedicated asset specificity as distinct types of transaction-specific investments. In the present study focus was on the human and investment assets specificity.

Human asset specificity refers to relation-specific 'know-how' developed between actors involved in the transaction. As defined by Heide and John (1992), human asset specificity addresses areas such as empirical knowledge specific to a particular supplier's product, or it is the time and effort that goes into learning about a supplier's specific requirements (Artz and Brush, 2000). Following Williamson, we operationalized human asset specificity using different constructs: membership of a pineapple farmers' association, investment on education, and the experience cumulated across the year in pineapple farming. The evidence is that the probability of choosing a hierarchical form of governance structure is significantly and positively influenced by the human and physical specificity. When the specificity of the asset is high, the risk for actors to be facing a hold-up (non-transferability) problem is great.

Menard (2004) stated that the likelihood of contract-based arrangements is even higher when weak uncertainty combines with investments that cannot be redeployed for another transaction. This may lead the farmers to choose an integrated form of governance structure in order to protect their investment. It can therefore be assumed that the greater the human and asset specificities, the more likely the actors will be involved in an integrated form of governance structure.

### Uncertainty

When transactions are conducted under uncertainty, it can become very costly or impossible to anticipate all contingencies (Frank and Henderson, 1992). The theory states that uncertainty causes firm leaders to rely more on nonmarket coordination methods. Also, the greater the uncertainty in the market, the more the actors restrict their range of possible exchange partners to those with whom they have had prior interactions and have transacted in the past (March, 1988; Podolny, 1994). It is therefore important to determine the types of transaction uncertainty that affect the choice of governance structure.

As stated by Ruben et al. (2007), the more uncertain the environment of the supply chain, the more "central" governance is

<sup>2</sup> Ethephon is a chemical product with substantial commercial value as a plant growth regulator with a trade name Ethrel. The chemical name of this compound is 2-Chloroethylphosphonic-acid (Qu et al., 2004)

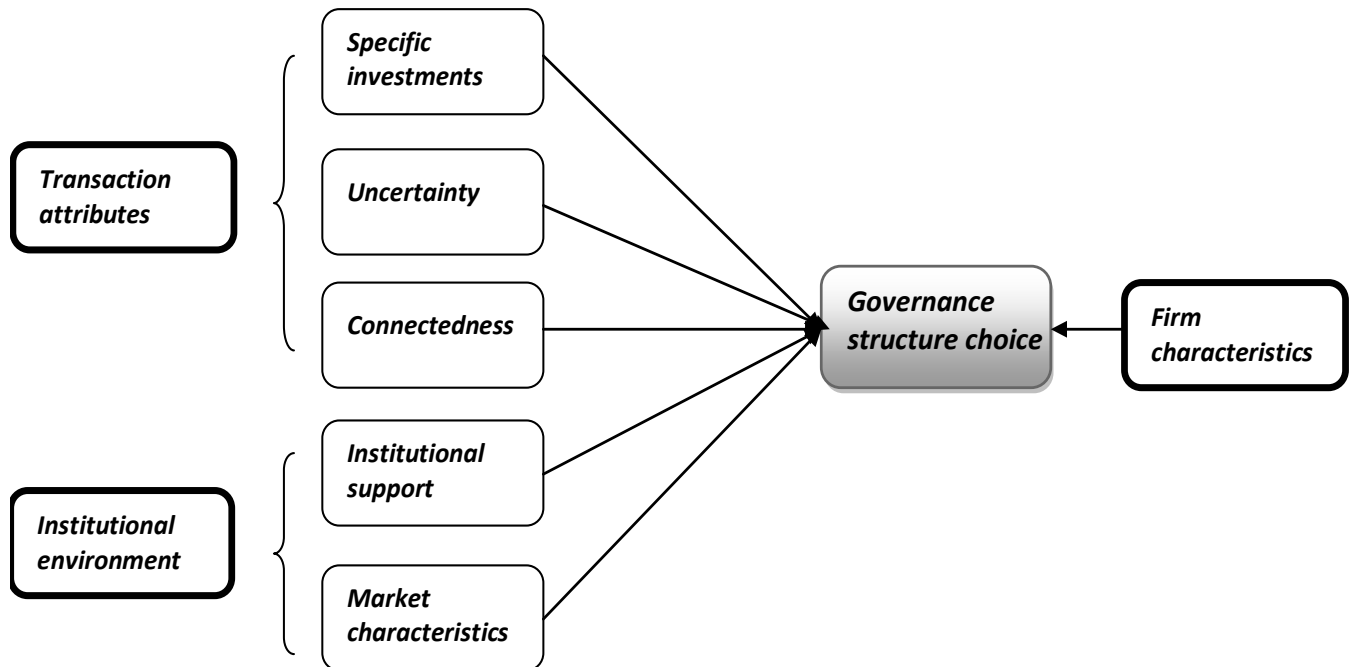


Figure 2. Research model.

needed to guarantee that the outlet selection objectives of all stakeholders are attained. High uncertainty may discourage a supplier from making specialised asset investments if appropriate safeguards are absent (Lu, 2007).

To measure the uncertainty, we used information about the stability of the price, the quality and quantity of pineapples delivered to buyers over the time. The pineapple producers may be part of a contractual arrangement for producing specific labelled products (organic or fair trade pineapples for EU markets) that require specific investments, and at the same time maintain other production, not included in the agreements, to which they can switch. When they have this capacity to reduce uncertainties associated with the agreement, they adopt a mode of governance close to market arrangements (Sauvee, 2000, 2002). Hence, the higher the uncertainty with respect to price, quality and quantity, the more integrated is the governance structure.

### Connectedness

Transactions differ in how they are connected to other transactions, especially those involving investments which are highly specific. It is possible that the assets or service they yield are strongly complementary. Some transactions are largely dependent on others giving rise to hold-up problem and locked-in effects (Slangen et al., 2008).

An example of connectedness is the relation between water and an irrigation system. A strong relationship exists between both assets. Without water, the irrigation system is useless and also in the other way around. This raises the question of property right, ownership and the best governance structure. When the involved parties have divergent interests, the coordination problem becomes more difficult increasing the transaction cost.

For understanding the behaviour of any single supplier within a supply chain, the two critical characteristics of ties in a supply chain are the supplier's dependence on the dominant buyer and the connectedness to the other network of suppliers (Cook, 1977;

Provan, 1993). When the supplier's dependence on the buyer is high, it results in high cooperation (Provan, 1993). Also when transactions involve a high degree of connectedness to other transactions, or are executed in small batches, or occur over short periods of time, there will be increasing coordination costs (Bogetoft and Olesen, 2004; Rindfleisch and Heide, 1997; Wood and Parr, 2005).

When the transactions have a strong connection, a strong coordination mechanism is favourable. The need for such mechanisms influences the transaction costs (Meyer et al., 1992). The stronger the ties between the buyer-seller, the higher the transaction connectedness will be (Wong and Chan, 1999).

In the present research, we measure the transaction connectedness with the following constructs: awareness of chain actors of the quality required by the customers of their buyers and the awareness of the price paid by them, and the connectedness of the harvesting period to the demands of traders and consumers' demand. We assume that the higher the degree of transaction connectedness, the more likely it is that the actor is involved in a more integrated GS.

### Institutional environment

Institutions refer to a broad range of meanings and are often used confusedly. Douglass North has been one of the first scholars to link institutions and economic performance. The works of Davis and North (1971) and North (1990) are quite enlightening to understand how institutions affect economies and economic agents. He distinguishes between the institutional environment and institutional arrangements.

The institutional environment sets the rules of the game of human interactions and the institutional arrangements are the players of the game. The institutional environment can be either formal (public, legal, governmental) or informal (social, moral). Institutions enable, constrain and direct human interaction (Nelson and Sampat, 2001). They reduce uncertainty by setting the rules of

the game and hence creating a stable structure to human interaction allowing decreasing transaction costs.

Several authors have argued that the relative importance of formal institutions increases as the scope of market exchange broadens and deepens (Dixit, 2004; Fafchamps, 2006). One reason is that setting up formal institutions requires high fixed costs but low marginal costs, whereas informal institutions have high marginal costs. Examples of formal institutions can be credit institutions, property rights, constitutions, etc. Informal institutions rather refer to norms of behavior, conventions, self imposed codes of conduct, reputation, etc.

In the present study, we consider the influence of an enabling institutional environment such as institutional support, good control agronomical practices and capacity building, quality control (norms and standards) services, market facilities, subsidies etc. and how these can influence the farmer's choice of one (or more) governance structure in pineapple supply chain.

### Survey design

Questionnaires were elaborated to collect data needed to assess factors affecting the choice of a governance structure in the pineapple supply chain. The questionnaires were designed based on the theoretical background and the information from previous studies on the Benin PSC (Arinloye et al., 2010, personal communication).

Questionnaires were pre-tested with 10 key informants in Allada and Cotonou districts. The pre-test allowed adjusting the questionnaire with focus on relevant questions. In addition, 7-point Likert scale was changed to a 5-point scale (1 = not agree at all, to 5 = totally agree), to make them better suited to a low literacy level of the people to be interviewed.

### Data collection

Data were collected by face-to-face semi-structured interviews. The respondents were selected using the following criteria: acreage under pineapple cultivation in 2009, that is, small scale (< 1 ha), medium scale (between 1 to 5 ha) and large scale (> 5 ha), membership of an integrated/spot market governance regime (with and without contract, cooperation, organisation, outgrowing, etc.), distance to urban market (located in Cotonou), and trading with exporters or regional market sellers (from Nigeria). Other factors as such stated by Campbell's (1955), of being knowledgeable about the phenomenon under study as well as being able and willing to communicate with the researcher, also constituted major selecting criteria of respondents.

In Table the study presents an overview of the number of respondents in each category. Data was collected between September 2009 and July 2010. As more than 95% of pineapples produced in Benin are coming from the Atlantique Department (district), respondents were randomly selected from this area, based on the aforementioned criteria, using a randomly stratified sampling<sup>3</sup> scheme. Pineapple farmers were traced with the assistance of the agricultural extension services department in the

Atlantique region, which provided the name list of farmers in each district.

The second source of information on pineapple farmers was the pineapple producers' association and councils. Equally, important was information from the literature review. In total 219 farmers were interviewed across Ze (rural), Abomey-Calavi (peri-urban), Allada (rural), Toffo (rural), and Tori-Bossito (rural) representing the main pineapple production zone in Benin (Table 1).

### Analytical approach

The study intends to explain the effect of internal and external factors (transaction attributes, social capital, institutional environment and socio-economic characteristics) on governance structure and outlet choice, and therefore two dependent variables are investigated.

As one actor can be involved in one or more than one type of governance structure, we found it appropriate to use a multivariate probit model to analyse the determinants of governance structure in the pineapple supply chain in Benin. *Multivariate probit* estimates M-equation probit models, by the method of maximum simulated likelihood (Cappellari and Jenkins, 2003).

The variance-covariance matrix of the cross-equation error terms has values of 1 on the leading diagonal, and the off-diagonal elements are correlations to be estimated ( $\rho_i = \rho_{ij}$ , and  $\rho_{ii} = 1$ , for all  $i = 1, \dots, M$ ). *Multivariate probit* evaluates the M-dimensional Normal integrals in the likelihood function. For each observation, a likelihood contribution is calculated for each replication, and the simulated likelihood contribution is the average of the values derived from all the replications. The simulated likelihood function for the sample as a whole is then maximized using standard methods. A detailed description of this model is shown in Greene (2003) and Train (2003). In this model, the governance structure is considered as a system of a multiple choice equation ( $i = 1 \dots 4$ ;  $j = 1, \dots, n$ ) respective to each type of governance structure.

$$GoverStr_{ij} = \alpha_{0j} + \beta_{1j} TransAttrib_{ij} + \beta_{2j} InstEnv_{ij} + \beta_{3j} Caract_{ij} + \varepsilon_{ij} \quad (1)$$

Where: GoverStr<sub>ij</sub> = Governance structure i choice by the farmer j, TransAttrib<sub>ij</sub> = Transaction attribute i of the farmer j, InstEnv<sub>ij</sub> = Institutional environment, Caract<sub>ij</sub> = Firms characteristics,  $\varepsilon_{ij}$  = Error terms and  $\alpha_{ij}$ , the coefficients to be estimated.

The software package STATA is used to estimate the empirical version of Equations (1) using farm-level data from the 219 respondents.

## RESULTS AND DISCUSSION

### Governance structure selection

Data collected from 219 pineapple farmers indicates that more than 90% are involved in spot market GS (Table 2) followed by and relational based GS (58%), association (41%) and outgrowing scheme (21%).

Table 3 summarises the number of GS in which one farmer involved. As indicated, most of the respondents (80%) are involved in at least two types of governance structure. These categories of farmers involved multi-governance structure are used to simultaneously select at least two type GS. Farmers who are exclusively choosing one type of GS are considered as having zero degree of multi-governance. As one farmer can be

<sup>3</sup> Stratified sampling is commonly used probability method that is superior to a simple random sampling as it reduces sampling error. A stratum (or criteria) is a subset of the population that share at least one common characteristic. Examples of stratum might be the farm size, or members and non-members of association (StatPac, 2010). We first identified the relevant criteria and their actual representation for a sufficient number of subjects. "Sufficient" refers to a sample size large enough for us to be reasonably confident that the stratum represents the population of pineapple farmers estimated at 4,000 in 2010 by extension service agents in Atlantique department.

**Table 1.** Sample sizes of each type of farmer par location.

Category of famers	Locations/districts					Total
	Abomey-Calavi	Zè	Allada	Tori-Bossito	Toffo	
Small-scale [ $< 1$ ha]	20 (9.1)	32 (14.6)	25 (11.4)	18 (8.2)	18 (8.2)	113 (51.6)
Medium-scale [1 – 5 ha]	19 (8.7)	19 (8.7)	17 (7.8)	12 (5.5)	13 (5.9)	80 (36.5)
Large-scale [ $> 5$ ha]	6 (2.7)	8 (3.7)	3 (1.4)	5 (2.3)	4 (1.8)	26 (11.9)
Total	45 (20.5)	59 (26.9)	45 (20.5)	35 (16)	35 (16)	219 (100)

(\*) cell percentage in brackets.

**Table 2.** Types of governance structure identified.

Types of governance structure	Observation	Percent (%)	Std. Err.	[95% Conf. Interval]
Spot market	198	90.41	0.020	0.865 0.943
Relational	128	58.44	0.033	0.518 0.650
Outgrowing	47	21.46	0.028	0.160 0.269
Association	91	41.55	0.033	0.350 0.481
Total	464			

**Table 3.** Number of governance structure in which a famer is involved.

Degree of multi-governance	Observations	Percent (%)	Std. Err.	[95% Conf. Interval]
Farmers with 1 type of GS	44	20.09	0.027	0.147 0.254
Farmers with 2 types of GS	111	50.68	0.033	0.440 0.574
Farmers with 3 types of GS	58	26.48	0.029	0.206 0.324
Farmers with 4 types of GS	6	2.74	0.011	0.006 0.049
Total	219.00	100.00		

**Table 4.** Distribution of farmers respective to the farm size and the number of GS.

Farm size	Total number of GS in which famer is involved				Total
	1	2	3	4	
Small $< 1$ ha	28 (63.64)	67 (60.36)	18 (31.03)	0 (0)	113 (51.6)
Medium 1 - 5ha	14 (31.82)	32 (28.83)	29 (50)	5 (83.33)	80 (36.53)
Large $> 5$ ha	2 (4.55)	12 (10.81)	11 (18.97)	1 (16.67)	26 (11.87)
Total	44 (100)	111 (100)	58 (100)	6 (100)	219 (100)

Pearson  $\chi^2$  (6) = 23.9541 Pr = 0.001. (...) Column percentage in brackets.

involved in one or more types of governance structures, this implies that the farmer has more than one exchange relationship.

Considering that for each farmer, one governance structure is used per exchange relationship. Farmers indicated that the main reason of selecting multi-governance structure is to safeguard their investment and avoid post harvest loses of the pineapple fruits rejected from international market (of weighting and sorting).

Table 4 presents a distribution of respondents respective to their farm size and the number of GS in which they are involved. It can be inferred that most of the farmers with low level of multicity of GS (that is,

involved in one or two GS, 63 and 60%, respectively) are producing pineapple under small farm land ( $< 1$  ha) while those with more than two GS are mostly producing on medium (1 to 5 ha) and large farm size ( $> 5$  ha).

The computed Pearson  $\chi^2$  to test at six (6) degree of freedom to test the differences between farmers' categories shows that there is a significant difference between the four (4) categories of farmers considering their farm size.

Farmers with high production potentials in terms of land surface under pineapple production are most likely engaged in 3 or 4 types of GS simultaneously in pineapple supply chain.

### Determinant of governance structure choices

Prior to the regression of the multivariate probit model, a factor analysis was conducted to reduce the dimensions of the variables. Bartlett's Test of Sphericity determines whether each variable is independent, and Kaiser-Meyer-Olkin (KMO) determines the sampling adequacy (Chen and Fu, 2011). KMO takes values between 0 and 1, with small values meaning that overall the variables have too little in common to warrant a factor analysis.

Kaiser (1974) recommends accepting values greater than 0.5 as barely acceptable. Values between 0.5 and 0.7 are mediocre, values between 0.7 and 0.8 good, values between 0.8 and 0.9 are great and values above 0.9 are superb (Field, 2005). According to Kaiser (1974) Criterion, Eigenvalues is a good criterion for determining a factor. Factors with Eigenvalues less than one should not be considered.

The summary of computed factor loadings, the KMO and the Eigenvalues are presented in Appendix 1. With KMO values varying between 0.6 and 0.7 we can deduce that the sampling is fairly adequate. Bartlett's Test Chi2 are significant at 1% ( $p < 0.01$ ) showing that the selected dependant variables for factors analysis are not correlated. All the selected factors have Eigenvalues greater than one with all factors having a variance superior to 0.7 responding to the variance extraction rule "Factors with Eigenvalues less than 0.7 should not be considered. The factors analysis allowed to adequately generating the explanatory variables included in the regression model.

Additionally, the Appendix 2 and 3, respectively present the summary statistics and the correlation matrix of the variables used in the multivariate probit regression. The result of this econometric regression is presented on Table 5.

As presented in the regression output the Wald test is used to examine whether any of the parameters of the model that currently have nonzero values could be set to zero without any statistically significant loss in the model's overall fit to the data ( $\beta_{1i} = \beta_{2i} = \beta_{3i} = 0$ ). It tests the overall significance of the variables included in the econometric model (McGeorge et al., 1997; Ryan and Watson, 2009). Results show that the Wald Chi2 is statically significant at the 1% level, which indicates that the subset of coefficients of the model are jointly significant and that the explanatory power of the factors included in the model is satisfactory.

The Likelihood ratio test is also significant, implying that the null hypothesis of all the  $\rho$  (Rho) values are jointly equal to zero, is rejected. This shows the goodness-of-fit of the model. Basically, the  $\rho$ -values explain the degree of correlation between each pair of the dependant variable levels (each type of governance structure).

Individually considered, we found three  $\rho$ -values statistically significant. The  $\rho_{31}$  (correlation between the outgrowing scheme GS and the spot market), the  $\rho_{32}$

(correlation between outgrowing scheme and the relational based GS) and  $\rho_{43}$  (correlation between the farmers' association and outgrowing scheme) are negatively correlated and statistically significant at 5% critical level ( $P < 0.05$ ). This generally implies that farmers involved in the outgrowing scheme governance structure are less likely to be involved in another type of governance as well; showing the specificity and exclusivity of this type of transaction arrangement in the pineapple supply chain. According to transaction cost economics, dependencies of GS are the result of switching costs, investments worth less or nothing outside specific governance (Williamson, 1975).

Looking at the factors affecting the choice of each type of governance structure, we notice that different factors determine the farmer's decision (Appendix 1). First, the human specific investment is significantly and negatively correlated with the spot market GS. This shows that there is no specific investment made in the transaction under market governance, neither in the knowledge acquisition and capacity building with respect to production practices, nor when shifting to another product or buyer. This result is in line with the transaction cost theory stating that the lower the human and asset specificity, the more likely the actors are involved in less constraining and less integrated arrangements.

Also the specific human investment is found to be significantly and positively correlated in the relational based GS. This implies that the choice of relational based governance structure, where farmers preferably chose their buyers based on social relationships (familial and/or friendship), is determined by the farmers' capacity to invest in human assets. This may be justified by the fact in this kind of buyer-seller relationships there is high degree of trust between the parties involved.

The transaction connectedness refers to how the transactions differ in how they are connected to other transactions in the chain (see Appendix 1 for more details on factors loading for transaction connectedness).

Milgrom and Roberts (1992) argued that when the transactions have a strong connection, strong coordination governance is favourable. We find a negative and statistically significant correlation between the transaction connectedness and the spot market governance structure, on one hand, and a positive and significant correlation with outgrowing scheme and farmer association type of governance structure on the other hand.

The transaction connectedness has been measured by the farmers' awareness of the demand attributes of the customers of the first hand customers, which can be a trader, a processing company or an exporter. The transaction connectedness also considers the connection between a farmer's production system and agronomic practices (floral induction treatment, Ethephon application and harvesting period) and the second hand buyer's demand attributes and quality requirement. We can infer



**Table 5.** Multivariate probit estimation for governance structure choice.

Factors description	Types of governance structures				
	Spot market	Relational	Outgrow	Association	
Transaction attributes	Human specific investment	-0.28*	0.28*	0.19	-0.12
	Asset specificity investment	0.12	0.61***	0.16	0.16
	Uncertain behavior	0.12	-0.12	-0.09	-0.04
	Connectedness of transaction	-0.26*	-0.04	0.30**	0.31**
	Market stability	-0.13	-0.10	0.23**	-0.30*
Institutional environment	Institutional support	-0.10	-0.22	-0.22*	1.62***
Market attributes	Predefined marketing arrangement	0.34**	-0.17	0.02	0.48**
	Diversification of preferences	-0.12	0.09	-0.24*	0.00
	Permanente pineapple demand	0.14	-0.45***	0.03	0.22
Farm and farmer's characteristics	Farm size	0.08	-0.09	0.00	0.65**
	Ratio pineapple farm/total farm land	-0.01	-0.51	1.38***	-0.81
	Geographical position to market	-0.21	-0.07	0.05	0.09
	Trust and commitment	-0.26*	1.69***	0.02	0.00
	Age	0.01	0.001	0.01	0.01
	Experience in pineapple farming	0.05*	0.01	-0.03	-0.02
	Education level	0.14	0.08	0.01	0.27
	Bargaining power	0.06	0.01	-0.30	0.08
	Dynamic capability	-0.29	0.18	0.06	1.36***
Constant	1.31	0.90	-1.31*	-2.92**	
p21			-0.14		
p31			-0.33**		
p41			0.14		
p32			-0.25**		
p42			0.07		
p43			-0.36**		
Number of observations			219		
Wald chi2 (df)			373.68 (76)***		
Likelihood ratio test Ho : $\rho_{21} = \rho_{31} = \rho_{41} = \rho_{32} = \rho_{42} = \rho_{43} = 0$ ; $\chi^2(6) = 11.5727^*$					

\* P < 0.1, \*\* P < 0.05, and \*\*\* P < 0.01.

from that result that the more farmers are engaged in a highly coordinated type of GS, the more likely they are aware of the end consumer's quality requirements, and the more they adjust production practices to fulfil the demand. It can be inferred that the more "hierarchy" the GS is expected to be positively correlated with transaction connectedness.

One positive and favourable indicator for choosing an outgrowing scheme is the stability and consistency of the buyer preferences. This factor positively and significantly correlates with outgrowing scheme GS choice and negatively with farmers' association GS choice. The demand quantity is less stable and less consistent with farmers involved in association based GS in contrary with those involved in outgrowing scheme.

Another construct that was considered in explaining the farmers' choice of a governance structure is the institutional environment in which he is transacting. Under institutional environment, we considered the facilities and supports received from private and public services for product quality and income improvement. These include technical and financial support, training on good agronomical practices, quality norms and standards, market facilities, etc. Results show that the choice for a farmers' association governance structure is positively and significantly influenced by differences in the form of institutional assistance received by farmers.

Considering the social capital and collective actions that are observed in associations, the public and private sectors are most likely to support groups and

associations, rather than a bilateral transaction, such an outgrowing scheme or a relational based GS. Also, the national policies of agricultural development give more priority in assisting collective actions (association, cooperatives) than individuals.

Market attributes were also considered in assessing the farmer's choice of governance structure. Among the different indicators we used to measure the market attributes (pre-agreed market arrangement based on price and demanded quality, and the requirements of specific production practices and the quantity by the buyer. The results show a positive significant correlation with two types of governance structure: the spot market and the associative GS. For the first one, an unexpected correlation sign is obtained. The hypothesis was that when more pre-agreements exist in market arrangements, farmers are more likely to go for an integrated type of governance structure to safeguard their investments (Williamson, 1985).

The research findings show that within a spot market transaction arrangement, the quantity and price can be agreed at the moment and the place where the transaction takes place. It is important to note that in the pineapple supply chain, under a spot arrangement, the market agreements are generally informal (oral) without any written and formal engagement. The drawback of this informal arrangement is that the agreed transaction can unexpectedly be changed at any moment of the transaction, which generally is not the case within a farmer association GS.

We also found that the farmer's preference to be involved in several exchange relationship determines his choice of governance structure. The buyers in outgrowing scheme GS present a less diverse requirement. This result is in line with our previous result on the stability of buyer requirements over time.

As a control variable, the farmers and the farm characteristics have been included in multivariate probit model. Results show that farmers involved in an association are those having many hectares for pineapple production. As the farmers are generally not only producing pineapple, the importance land devoted to pineapple production as compared to other crops was calculated using the ratio of land used for pineapple cultivation to the total acreage of cultivated land in the year of 2009. We can infer from the regression model that the farmers under outgrowing scheme arrangement devote more of their land to pineapple production as compared to other categories of farmers.

It was previously demonstrated that the spot market GS is characterised by less human specific investment while the reputation based GS is characterised by a high specific investment. The argument used was based on the degree of trust between chain actors. Considering trust and commitment as variables allowed testing this assumption. The findings show that the choice of relational based GS is favoured by the high and significant degree of trust and commitment between

buyer and seller involved in the transaction. By contrast, the result also shows that the spot market arrangement is made by farmers with low trust and commitment to their buyers.

Other control variables include the farmer's age, his experience in pineapple farming, his education level (schooling), and his bargaining power with the buyer and dynamic capacity. Among these factors, the farmers' experience in pineapple production and his dynamic capability (changing production practices in order to respond to the market demand) are shown to be positively significant at 10 and 5% critical levels (Table 4), respectively, for the spot market and the farmers' associations GS. This implies that the more dynamic farmers are generally choosing associative relationships and those with a lot of farming experience are found bargaining under a spot market form of arrangement.

## Conclusion

The transaction cost economy provides many insights into the choice of governance structure, suggesting that everything remaining constant, the rational actor will chose a governance structure that is best performing in minimizing the production and transaction costs. This article provides empirical evidence to the transaction cost theory and one step further in the Williamson's attributes of transaction by emphasizing the connectedness as a determinant transaction attribute that worth consideration in analysing the choice of the governance structure in less developed counties like Benin.

A new construct of "multiple-governance" structure is investigated in order to increase the understanding of how and why farmers select among these governance structures and what guides their decision.

The Multi-governance choice has been observed as a strategy of farmers to safeguard their investments. This strategy established by small-scale farmers to sell the different categories of their product quality to different supply chains was also analysed.

Farmer involved in the outgrowing scheme GS are less likely to be involved in another type of governance as well; showing the specificity and exclusivity of this type of transaction arrangement in the pineapple supply chain.

With regard to the choice of each type of GS, results can be used as powerful tool in defining intervention strategies in promoting the contract enforcement in bi - or multilateral partnerships in agri-food chains.

This paper does not investigate the influence of the selected GS on the pineapple quality and farmer's income, which are determinant for policy recommendations. Further investigation may consider these aspects.

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