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Moderating effect of traceability on value chain governance of credence goods: a perspective of the New Institutional Economics framework

This paper reviews the application of New Institutional Economics (NIE) theoretical assumptions and the way they relate to value chain governance and are moderated by traceability and information technology. Through literature review, NIE assumptions are examined by comparing how they are partially mitigated by traceability. The effect of these mitigations is realised in the readjustment of value chain governance typologies to suit lean and more competitive and visible value chains. The findings are based on the fact that information asymmetry, bounded rationality and behavioural uncertainty have given rise to incomplete contracts, especially in the agri-food sectors of most developing economies. Supply chain actors in this sector have the constant burden of assurance in ascertaining that credence goods remain authentically safe. The moderating effect of traceability is therefore proposed to reduce these uncertainties and is as such a form of assurance to promote both a holistic approach in compliance with standards and a seamless mechanism for product and process integration. However, this moderating effect, despite being novel in the value chain governance discourse, needs to be empirically ascertained. The novelty of this paper is based on the agricultural development agenda of developing economies in the light of the discourse on market-oriented reforms, following multilateral trade liberalisation and especially structural adjustment programmes in developing countries. The consequent increase in world market integration has led to the promotion of value chain strategies and reconsideration of how food is governed in these markets.

Keywords: agri-food chain, transaction costs, information asymmetry, bounded rationality, behavioural uncertainty

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Introduction

Changes in agri-food markets have significantly affected the typology of agri-food value chains. (Jaffee 2003; Henson and Reardon; 2005; Swinnen; 2014). Consolidation of the power of retailers or end-use markets, and globalisation of supply chains have occurred in the last two decades (Lee *et al.*, 2012). Other major drivers and contributors to these changes include increasing competition from global market participants, and economies of size and scope in production and distribution. These changes have introduced different forms of vertical integration and alliances, which are now increasingly dominating the agri-food value chain as opposed to the traditional (spot) agricultural markets (Kherallah and Kirsten, 2002).

In addition to reorganisation of supply chains, changes in the determination of food product safety have been extended to subtle characteristics that were initially classified as known prior to purchase (search goods), or after purchase (experience goods) and those that are currently discerned with difficulty after consumption (credence goods) (Martino and Perugini, 2006). A credence good is a complex, new product with quality and/or safety aspects that cannot be known to consumers through sensory inspection or observations in consumption. The quality and safety characteristics that constitute credence attributes include (a) food safety; (b) healthier, more nutritional foods (low fat, low salt etc.); (c) authenticity; (d) production process that promotes a safe environment and sustainable agriculture; and (e) 'fair trade' attributes (e.g. working conditions) (Reardon *et al.*, 1999).

In meeting these demands, there has been a rise in third party certification bodies and a transition in governance typologies from traditional agricultural (spot) markets to relational, hierarchical and vertically-integrated governance

structures. The extent of these changes have been described by Busch (2011) as a 'cacophony of governance'. Buhr (2003) suggests there is ambiguity about the impact of information technology and information systems on organisation structure. Although it has been suggested that the greater use of networks would eventually lead to market-like relationships among firms, Buhr (2003) concluded that the more the use of inter-organisational networks, the more hierarchical would be the trading relationships.

This paper contends that traceability and traceability systems as information management tools play a moderating role in agri-food value chain governance as backed by the theoretical underpinning of New Institutional Economics (NIE) theories of Transaction Cost Economics (TCE), Principal Agency Theory (PAT), Property Rights Theory (PRT), Network Theory (NT) and Resource Based View (RBV). NIE principles bridge the gap between market uncertainties and market assurances by determining the nature of transactions through the institutions of contracts, property rights, conventions and authority. Contracts respond to market conditions, either assisted by prevailing institutions where these are supportive by giving assurance, or hindered where they are incomplete, hence creating uncertainty (Hubbard, 1997; Kherallah and Kirsten, 2002).

This paper is structured as follows. Firstly, the theoretical background is clarified. Secondly, the relaxed NIE assumptions of imperfect information, existence of transaction costs and bounded rationality are related to the literature on value chain governance structures. Thirdly, traceability is proposed as a moderator in mitigating the NIE assumptions in the context of the nature of contracts and the consequent adjustment of agri-food value chain governance structures, while promoting competitive advantage of the supply chain actors.

Theoretical background

NIE recognises the cost of transacting as determined by institutions and institutional arrangement to be key to economic performance (Kherallah and Kirsten, 2002). These institutions are the institutions of contracts, property rights, conventions and authority (Hubbard, 1997). The rise of NIE was affirmed by the acknowledgement of the role of institutions and relaxes the assumptions of neo-classical economics of perfect information, zero transaction costs and full rationality. To NIE, these assumptions are moderated as imperfect information, existence of transaction costs and bounded rationality. Some of the theories discussed under the NIE include transaction cost economics (TCE), property rights theory (PRT), principal agency theory (PAT), network theory (NT) and resource-based view (RBV).

The choice of these theories under the NIE framework and specific to this research relates to the considerations that, firstly, the theories from previous research have gained prominence in the supply chain management (SCM) discourse. Defee *et al.* (2010) audited various theories applied in logistics and SCM research and found that SCM research “is at the intersection of multiple disciplines including strategic management, purchasing, manufacturing, marketing, retail and logistics” (p.405). Secondly, this choice is related to the conclusions of Halldorsson *et al.* (2007) that the first three theories answer the question of how to structure a supply chain when viewed as a collaboration between institutions and the latter two ascribe what is needed to manage a particular internal structure of an organisation. TCE, PRT and PAT are typically used to identify the best organisational structure within institutions (Coase, 1937; Williamson, 1985, 1999; Eisenhardt, 1989). NT and RBV view the use of resources by institutions as dynamic ways of promoting inter-organisational relationships that are unique and competitive. Thirdly, to a large extent, SCM research is derived from these disciplines’ theoretical paradigms. Specifically, the five theories can be clustered as competitive (RBV), microeconomic (TCE, PAT and PRT) and systems (NT), which form 52.8 per cent of the theories analysed. TCE and RBV formed the largest number of theoretical incidences, of 10.4 and 8.6 per cent, respectively (Defee *et al.*, 2010). Fourthly, these theories inform this research on how to structure a supply chain by ascribing what is required in each structure. Fifthly, these five theories are based on the larger NIE framework that seeks to overcome the limitations of Neo-Classical Economics and Old Institutional Economics frameworks. Finally, the TCE theory, PAT and PRT elaborate on particular characteristics of information asymmetry, uncertainty and opportunism as related to traceability, and asset specificity is related to NT and RBV theory under governance relations.

Transaction cost economics

NIE posits that institutions are transaction cost minimising arrangements. The main focus of TCE is the definition of the main structures and coordination of transactions through markets or hierarchies. Transaction costs are thus conceived as the costs of carrying out any exchange, whether between

firms in a market place or by transfer of resources between stages in vertically-integrated firms. Hobbs (1996) separates transaction costs into three components: *information costs* that are related to information about products, prices, inputs and buyers and sellers; *negotiation costs* that arise from the physical act of the transaction especially in writing of contracts, and *monitoring costs* that emanate after an exchange has been negotiated.

TCE relates to two main assumptions, human behaviour and environmental characteristics. The assumption about human behaviour further relates to opportunism and bounded rationality. Opportunism as defined by Williamson (1979) as ‘self-interest seeking with guile’ recognises that businesses and individuals sometimes seek to exploit situation(s) to suit their own advantage. In as much as opportunism may not be prevalent, the theory however recognises it as often present in some instances. TCE also views humans as bounded rational individuals who, although they may always intend to make rational decisions, have physically limited capacity to evaluate accurately all possible decisions and alternatives. Bounded rationality recognises this human limitation in the face of complex situations and future uncertain events (Selten, 1990). On the other hand, the assumption about environmental characteristics further elaborates asset specificity, uncertainty and frequency of transactions. Asset specificity was defined by Williamson (1985) as ‘a durable investment undertaken in support of particular transactions’. It ensures that resources in a given transaction relationship are not transferable to other activities (Greenberg *et al.*, 2008). Williamson (1989) elaborates six asset-specific types related to site specificity, physical asset specificity, human asset specificity, dedicated assets, brand name capital and temporal specificity.

The uncertainty characteristic contrasts with the perfect information assumption of the neo-classical economists. Information about the past, present and the future state is not perfectly known for various reasons; in such a state it would be difficult to determine *ex-ante* opportunistic behaviour as well as confirm *ex-post* bounded rationality. It would be prudent to consider these aspects in the light of contract formulation for the unanticipated changes in circumstances surrounding a transaction (Ji *et al.*, 2012). Owing to uncertainty, the formulation of contracts *ex-ante* and the ability to verify compliance *ex-post* have largely led to emergence of incomplete contracts. The frequency of transaction assumption implies that if transactions are infrequent, then the cost of alternative governance structures may not be justified. Therefore, the volume, number and/or time spread in transactions are important considerations even with the previous assumptions. If they are infrequent, alternative governance structures may not be necessary.

Principal agency theory

Eisenhardt’s (1989) review of PAT was concerned in answering, firstly, the agency problem which aims at establishing the goals of the principal to the agent and the verification of what the agency is doing, and secondly, the problem of risk sharing, especially when the principal and the agent have different attitudes towards risk. The focus of this theory is thus

to determine the most efficient contract governing a given principal-agent relationship while focussing on the assumptions of the NIE framework. In the light of the principal not knowing the outcome of the agent's behaviour, the agency problem presents itself in view of the agent behaving inappropriately, either by the misgivings of moral hazard or adverse selection. The solution to moral hazards and adverse selection in the context of simple contract is based on investment in information systems that would reveal the agent's behaviour to the principal or by the formulation of outcome-type contracts. However, a trade-off in cost occurs to the principal in the form of the cost of measuring behaviour and the cost of measuring outcomes and transferring the risk to the agent.

Property rights theory

PRT focuses on improvement in social welfare by elaborating on the rights to use, to own income from, and to transfer or exchange assets and resources (Coase, 1960). Property rights discourse highlights diverse views, especially in so far as claims to portions of rights are concerned. In view of this, the concerned parties are said to lay claim to portions of rights in what Alchian and Demsetz (1973) refer to as 'bundles of property rights'. PRT therefore complements an organisational economics approach that informs analysis of both institutions and governance within interrelated disciplines such as strategic management and economics.

The tenets of PRT stem from the argument of incomplete contracts as an improvement to PAT theory. NIE posits that contracts are consequentially incomplete in view of imperfect information, bounded rationality and the transaction costs involved in negotiating and monitoring of the contract, i.e. the *ex-ante* and *ex-post* costs respectively. Hart and Moore (1999) define incomplete contracts as 'contracts that either party would wish to add contingent clauses, but are prevented from doing so by the fact that the state of nature cannot be verified (or because states are too expensive to describe *ex-ante*)'. As a result, PAT is mediated by PRT with the introduction of common asset ownership either through joint ventures or alliances. Kim and Mahoney (2005) affirmed that "the modern property rights theory complements extant agency theory and transaction costs theory by introducing ownership concepts in an incomplete contract setting and emphasising relation-specific assets (both physical and human asset specificity)" (Kim and Mahoney, 2005, p.227).

Some aspects of ownership in an incomplete contract are arrived at due to the limitation of measuring costs, specifically *ex-post* monitoring costs. Many quality attributes are characterised as credence attributes by buyers in the absence of monitoring information asymmetry arising from experience; this asymmetry increases transaction costs for downstream food firms and requires confirmation after experience (Martino and Perugini, 2006). Barzel (1982) elaborated this emergent issue with the view that "measurement is by the seller, whether in advance or at the time of exchange. Quite often, however, measurement is automatic, or its cost is greatly reduced as the commodity is used. Therefore, substantial savings will result if measuring is left to the buyer to be performed at the time of consumption" (p.32).

This arrangement of vesting to the consumer the responsibility for certainty measurement is made tenable by the arrangements espoused in product guarantees, warranties, share contracts, brand names and labels. Measurement of value by the consumer minimises the *ex-ante*, opportunism and uncertainty costs.

Resource based view theory

Madhok (2002) posed the questions that are most often raised by entrepreneurs and business partners alike. These include: (a) why is an activity organised within firms and not purchased from the market; and (b) why is an activity organised within a particular firm and not another? RBV theory strives to answer these questions and others. To some, the firm has been viewed from the cost aspect such as in the TCE theory; yet to others, the view of the firm has been related to incentives and safeguards which has yielded theories related to PAT and PRT. The resurgence of interest in the firm has been reviewed from the role of the firm's resources as the foundations of the firm's strategy. RBV theory is hinged upon the foci of the resources and capabilities of the firm (Skjoett-Larsen, 1999). Asher *et al.* (2005) make the link between PRT and RBV theory by affirming that firms have continually placed emphasis on their resources such as intellectual property rights and knowledge-based resources and capabilities.

Grant's (1991) framework through which the RBV approach to strategy analysis is applied entails identification, classification and appraisal of the potential of the competitive advantages of the firm's resources and capabilities, selection of a strategy which best optimises these to external opportunities and, finally, identification of resource gaps that need to be filled. While resources are appraised as factors available or owned by firms for the purpose of achieving a desired end, capabilities are viewed as abilities of the said resources to perform certain tasks. Resources and capabilities in the RBV theory result in competitive advantage that is boosted by their characteristics that are value-adding, rare, costly to imitate and with limited transferability (Zajac and Olsen, 1993; Skjoett-Larsen, 1999). These are referred to as the strategic resources or the core competencies of a firm. Non-transferability of resources can be occasioned by geographical immobility, imperfect information, firm-specific resources and immobility of capabilities (Grant, 1991). The ultimate aim of these resources and capabilities is to promote competitive advantage as the degree to which a firm reduces its costs, exploits opportunities and neutralises threats (Newbert, 2008).

Network theory

Individual firms depend on resources controlled by other firms. Jraisat (2011) noted that network relationships create information sharing by enabling buyers and sellers to have access to resources and knowledge beyond their abilities through long-term relationships. NT includes three interrelated components: activities, actions and resources. Actors are defined by the resources they control and the incentives they perform; the relationships between a firm in a network arrangement generates two separate types of interactions, namely exchange processes and adaptation processes (Skjo-

ett-Larsen, 1999). While the former includes exchange of information, goods and services, and social processes, the latter includes mutual modifications of products, administrative systems and production processes in order to achieve a more efficient exploitation of resources (Skjoett-Larsen, 1999).

Adaptation processes help to strengthen the bonds between partners; they also signal mutual relationships that can be improved to increase stability. NT therefore affirms the definition of SCM as the integration of key processes from the final customer to the original suppliers that provide products, services and information that adds value for customers and other stakeholders (Rogers *et al.*, 2002).

Nature of contract in agri-food supply chains

From the NIE literature the need for contracts is to reduce uncertainties while promoting assurance (Hubbard, 1997). Part of the challenge in all contracts is uncertainties in relation to incomplete contracts. Cannon *et al.* (2000) argue that when a transaction involves relationship-specific adaptations and are (a) subject to dynamic forces and future contingencies that cannot be foreseen or (b) involve ambiguous circumstances where tasks are ill-defined and prone to exploitation, the difficulty of writing, monitoring and enforcing contracts is increased and their overall governance effectiveness weakened. This happens to be the case in most agricultural contracts in the wake of globalisation. In this case, efforts to govern geographically-dispersed relationships on the basis of detailed and formal contracts – without the benefit of some additional clauses – are not likely to enhance performance.

The nature of contract is construed to be related to aspects of rights and obligations of the contracting parties. Following from human limitation in unforeseen events, information is said to be limited or skewed. Despite this limitation, parties continue to contract to safeguard their interests as related to ownership rights. Ownership rights, interpreted in the economic sense as property, offer an effective mechanism for providing economic agents with appropriate incentives to create, maintain and improve assets (Chaddad and Cook, 2004; Chaddad and Iliopoulos, 2013). For these authors, ownership rights relate to two distinct concepts: residual returns (or claims) and residual rights of control. “Residual rights of control are defined as the rights to make any decision regarding the use of an asset that is not explicitly attenuated by law or assigned to other parties by contract” (Chaddad and Cook, 2004, p.349). While residual claims are understood as “the rights to the net income generated by the firm, i.e. the amount left over after all promised payments to fixed claim holders (e.g. employees and debtors)” (Chaddad and Cook, 2004, p.349). Residual rights of control emerge from the impossibility of crafting, implementing and enforcing complete contracts. Because all contracts are unavoidably incomplete, it is the residual right of control over an asset that defines who is the owner of an asset (Grossman and Hart, 1986).

Propositions to the moderating effect of traceability on NIE assumptions

There is a lack of common understanding of the term ‘traceability’ (Ringsberg and Jönson, 2010). However, van Dorp’s (2002) discussion of the concepts of ‘track’ and ‘trace’ have been adopted as the main roots for the development of the traceability concept. These provide for product tracking and forward and backward traceability. Kelepouris *et al.* (2007) clarified the concept of product traceability depending on the direction in which information is recalled in the chain. Backward tracking relates to finding the origin and characteristics of a product from one or several criteria, while forward traceability is the ability at every point of the supply chain to find the locality of product(s) from one or several given criteria. The definition by the European Union of traceability as “the ability to trace and follow a food, feed, food-producing, animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution” (EC, 2002) is adopted in this research.

The moderating role of traceability is adopted in this research to mitigate partly the NIE assumptions of information asymmetry and behavioural uncertainty while promoting some level of assurance related to Barzel’s (1982) product right guarantee. This gives the first proposition that:

P1: *The moderating effect of traceability may determine the nature of food governance relationships along the food supply chain by replacing loose contractual relationships with formal and short-period contracts with a high information base.*

Associated with the reduced asymmetric information, delayed rights/guarantees and transactions costs, supply chain management efficiency is improved, while an indirect effect resulting in change in governance structures is here proposed. The basis of this view is the property right division theory of Barzel (1982) which supports the idea that, by delayed right or through provisions of guarantees and warranties offered to the downstream actors and consumers, costs related to human opportunism, monitoring and compliance, and behavioural uncertainty would be minimised to a large extent. Consequently, the second proposition is:

P2: *Implementation of traceability systems provides delayed rights through an ex-post punishment mechanism that binds the producer in the food supply chain to be charged in the likelihood of failure to comply with safety and standards.*

Prior to implementing traceability systems, transactions between a given contracting company as the principal and contracted agents, say in an agricultural setting, were completed when agents delivered the products to the contracting company. The ownership of all dimensions of the products were transferred from the contracted agents to the company. When quality and safety issues arise, the contracting company would suffer liabilities due to the opportunistic behaviour

and bounded rationality of the unscrupulous agents. The contracting company would eventually lose its reputation, suffer claims of tort liability and added costs from the losses accrued due to product recall. On implementing traceability system(s), such a simplistic principal agency transaction would be regarded as incomplete since the agent who supplies the products as per the contractual agreement still keeps ownership of one dimension tagged to food safety guarantee despite it having transferred the ownership of the other dimensions of the products to the contracting company. It is by selling the product to consumers, especially of credence good(s), that food safety and quality attributes are confirmed upon consumption. It is therefore after this *ex-post* exchange (consumption) that a transaction is considered complete and hence the delayed right of ownership on the part of the agent persists until this confirmation that was first given as a guarantee is assured as promised. Through traceability systems, the *ex-post* information revealing mechanism of the product trace leads to either punishment by product recalls due to non-compliance or reward by increased customer confidence and trust. Traceability systems would thus mitigate for *ex-ante* opportunism, bounded rationality and *ex-post* information asymmetry, and also discourage moral hazards such as misuse of chemicals.

Without traceability systems, transaction costs in defining property rights of 'all bundles of rights' in food safety attributes would be high and incomplete since not all rights are clearly defined *ex-ante* as witnessed in credence goods. In order to control the opportunistic behaviour while facilitating value chain coordination, there is a need for formal and informal governing instruments. Traceability systems are thus proposed to act both as a formal legitimate rule – the procedure of enforcement that follows a certain normative requirement and fulfils a criterion of integration (Mueller *et al.*, 2009) – while complementing the informal rules or voluntary standards.

Asymmetric distribution of information has been attributed as the essence of many problematic aspects of food supply. All standards, either public or private, related to food safety and quality have a critical information element. Carlton and Perloff (1989) cite the following reasons for information asymmetry, namely: (a) information varies in its reliability, hence not all information can be processed as accurate, some may be deemed to be inaccurate; (b) information may well be withheld and hence the search and collection of information may be costly; (c) owing to human limitation, a consumer can only retain limited amounts of information; due to bounded rationality, information is processed subjectively by different actors; and (d) owing to limitation in knowledge on the subject matter, processing information on all products correctly is limited due to lack of expert knowledge.

In the light of these limitations, two means of remedying information asymmetry have been appraised positively, especially in agricultural commodities, namely the use of quality labels and traceability. Raynaud *et al.* (2002) argued in favour of quality labels by asserting that consumers may not know automatically the quality of the products or the accuracy of the information supplied to them. Informed experts or agents would signal to the consumer on the quality of the products and hence reduce the cost of the ultimate consumer's search and measurement costs.

On the other hand, Hobbs (2004) proposed the use of traceability systems to mitigate information asymmetry depending on the desired result of traceability implementation. Firstly, reactive traceability systems enable *ex-post* cost reduction after a problem has arisen. This is enabled through a trace-back of food to the source of contamination in what Coff *et al.* (2008) describe as the effect of traceability to origin or attribution and quality assurance. Secondly, Hobbs posits that the adoption of traceability systems is promoted by threats of legal action against firms producing unsafe food and the resulting damages that may result from a lack of demonstrable products or process trace or tracking. Resende-Filho (2007) and Resende-Filho and Buhr (2008) highlight two directions that traceability as a liability function has taken. They state that information asymmetry on food safety and quality has developed due to adverse selection or withholding of information and problems related to opportunistic behaviour. As a result, a common point in promotion of signalling (Martino and Perugini, 2006) and use of traceability systems has been embraced with the aim of protecting institutions' reputation and also as an incentive mechanism to enhance compliance among the agri-food value chain actors. The ability to trace products allows liability for food safety systems to be easily established along the supply chain while reducing the monitoring and enforcement costs for consumers and downstream food distributors and exporters (Hobbs, 2004). This proposition has been empirically established by Altal (2012) with the finding that consumers' perceived risk was mitigated by traceability, although at a price.

Accordingly, between quality labels and traceability, the latter solution seems to out-weigh the former in terms of the challenges of limiting information. Sodano and Verneau (2009) envisioned three kinds of firms that would exploit the maximum benefit of traceability systems: (a) firms such as the retailers of private quality labels and supermarkets will invest fewer resources against tort liability since the cost burden will be to the suppliers; (b) firms which already produce information could save on resources as they cover themselves against opportunistic behaviour in the presence of asymmetric information; and (c) traceability systems can give assurance to the third-party providers and hence reduce their costs through the certificate of origination (Jahn *et al.*, 2005). Traceability therefore mitigates brand proliferation and price discrimination.

Supply chain integration and value chain governance management

Supply Chain Integration (SCI) is considered as the degree to which a focal/lead firm collaborates strategically with its supply chain partners and collaboratively manages intra- and inter-organisation processes (Flynn *et al.*, 2010; Maleki and Cruz-machado, 2013). The eventual goal of SCI is to achieve effective and efficient flows of products and services, information, money and decisions, to provide maximum value to the final customer.

Frohlich and Westbrook (2001) state that SCI through forward integration promotes the flow of materials and ser-

vices while backward integration promotes sharing of information from customers back to the suppliers. SCI indicators can include internal integration and external integration (Maleki and Cruz-machado, 2013), and product integration and process integration (Huo *et al.*, 2014), while some scholars have within external integration alluded to both supplier and customer integration (Nogueira Tomas *et al.*, 2014). The focus in this paper on supply chain integration from the perspective of internal integration, including both product and process integration (Helmi *et al.*, 2013), supplier integration and customer integration (Boon-itt and Wong, 2011), gives a third proposition that:

P3: *Adoption of traceability as an information management tool can promote supply chain integration of suppliers, products, processes and customers.*

Supply chain integration is required internally within and across functions and externally across suppliers and customers (Boon-itt and Wong, 2011) in order to achieve optimal results in traceability application. Internal integration is characterised by full systems visibility across functions such as procurement, production, logistics, marketing, sales and distribution; this forms the key driver for competitive advantage in supply chain management (Van Hoek and Mitchell, 2006). The goal of internal integration is to develop a process-oriented focus while concentrating on coordination across functional areas (Richey *et al.*, 2010). Supplier integration promotes effective alignment, information sharing and participation in the interactions between firms and their suppliers requires cooperation, coordination and collaboration (Moharana *et al.*, 2012). By including joint efforts in product development, problem solving and technology exchange, among others. On the demand side of a supply chain, customer integration is achieved through the understanding of product, culture, market and organisation in such a way that the chain members respond rapidly to the customer's needs and requirements. Both supplier and customer integration focus on coordination and collaboration efforts that occur among supply chain members.

While SCI promotes performance, it also redefines governance values in the way organisations interact and relate. Governance change is related to changing the organisations' ways of doing things by way of inclusive communication, strong working relationships, joint accountability and senior management involvement. These facilitate internal integration, interdependency, common goals and objectives, communication and information sharing as some of the factors considered to be key to the effective governance of firm relationships with others through external integration (Richey *et al.*, 2010). Ultimately, SCI aims at promoting interdependency, structures or formative relationships which are communicated through exchange of information, collaborative alignment, profitability and competitive advantage (Engelseth, 2009). In spite of the benefits achieved through SCI, discussion of value chain governance must continue. For instance, Denolf *et al.* (2015) report that information sharing cannot be explained solely by governance structures; information systems as information tools can affect the nature of governance structures.

The emergent new approaches to supply chain value management are largely based on allocation of resources to core competencies and an increasing trend towards outsourcing and sub-contracting of non-core functions. This has resulted in a general loss of control over the stages of the production and distribution processes, especially to geographically dispersed regions. Vurro *et al.* (2009) broadened the concept of value chain governance from inter-firm relationships to global fora due to the coincidence of falling regulatory barriers to international trade, advances in communication technologies and declining transportation costs. This approach also led to the review of Coase's discourse on a firm's operations and governance as based on TCE.

Gereffi (1994, 2001) highlights the typologies of buyer-driven versus producer-driven forms of governance. Producer-driven commodity chains are found in capital-intensive sections that require a huge capital outlay; while buyer-driven governance relates to retailers or markets providing the leading role in managing the supply chains. The role of the lead firm is considered a key factor in coordination of activities, goods/services and information along the supply chain (Ponte and Gibbon, 2005; Gibbon *et al.*, 2008).

Gereffi *et al.* (2005) reported that, owing to the wide range of inter-firms governance types in the global industries there is the recognition of the complexity of inter-firms relationships in the global economy. To them, "the key insight is that coordination and control of global scale production systems, despite their complexity, can be achieved without direct ownership" (p.81). The view of governance as coordination emphasises global value chains compared to the view of governance as a driver that is based on the understanding of global commodity chains. This nuance points to the value dimension of the coordination.

Gereffi *et al.* (2005) added three distinct types of *modular*, *relational* and *captive* governance forms to Williamson's categories of *markets* and *hierarchies*. This typology is based on three determinants (a) the complexity of information and knowledge transfer; (b) codification of information and knowledge transmitted to actors in a transaction; and (c) the capabilities of actual and potential suppliers in relation to the requirements of the transactions (Gereffi *et al.*, 2005; Gibbon *et al.*, 2008) (Table 1).

Global food supply chain systems seem to combine all the four aforementioned characteristics of governance. Martino and Perugini (2006) contextualise the need for a proper governance of food supply chains in relation to factors related to food quality and safety. To them, the subject of food safety

Table 1: key determinants of global value chain governance.

Governance type	Complexity of transaction	Ability to codify transactions	Capability in the supply-base	Degree of explicit coordination and power asymmetry
Market	Low	High	High	Low
Modular	High	High	High	↕
Relational	High	Low	High	
Captive	High	High	Low	High
Hierarchy	High	Low	Low	

Source: Gereffi *et al.* (2005)

is situated in relation to the provisions of TCE theory and its relevance to food safety, quality, information asymmetry, uncertainty, opportunism and governance structures. They characterised food safety as products with a typical asymmetric information pattern regarding the upstream and downstream supply chain actors, where poor quality is punished by the market while lack of safety may involve legal sanctions. The main motivation for quality assurance strategies is to create quality differentiation, increase consumers' trust and reduce exposure to risk of food safety incidents and subsequent liability cases (Hatanaka *et al.*, 2005).

However, these alternative strategies come at an added cost that is normally passed on to the consumer. Despite the additional cost for quality, the underlying character of quality assurance is the aim of giving information on conformance; from this reality, one draws the inferences that (a) information issues have an impact on product and process quality in the agri-food chain; (b) greater information shortages are correlated to stronger integration of supply chain members; and (c) enhanced traceability reduces information costs for consumers arising from quality verification. As such, the key determinants of complexity of transaction, ability to codify transactions and capability of the supply base as affected by traceability may be viewed to be high and hence work towards modular type of governance with a low degree of explicit coordination and power asymmetry.

Discussion

The New Institutional Framework offers a platform for broadening the agricultural development agenda related to the moderating role of traceability and the eventual value chain governance structures adjustments in agri-food chains. The supply chain as a key operational objective of traceability is related to provision of critical information regarding quality and safety of food, origin and quality assurance, control and governance. The moderating effect of traceability in the entire supply governance structure is proposed, albeit theoretically, to further the discourse that (a) agri-food value chain governance has changed from loose contractual relationships that previously relied largely on trust and were governed by spot markets to implementation of formal short-period contracts largely relying on high information base and lean processes; (b) traceability systems act both as a formal legitimate rule while complementing the informal rules in the food supply chain governance through the promotion of delayed rights, especially for credence goods; (c) adoption of traceability systems gives assurance to third party certification agencies about the certification of origin of traced products and hence reduces the costs and duplicity; and (d) adoption of traceability as an information management tool may promote supply chain integration of suppliers, products, processes and customers.

In terms of policy development, the NIE approach is to understand the need of institutions through which knowledge is discovered and employed to facilitate the coordination of economic activity. The costs of these institutional arrangements, together with the technology employed, determine the total costs of production and transaction and so help to

determine competitiveness. Where information and knowledge acquisition can be made easily accessible, transaction costs are lowered and competition increased, ultimately supporting the demands of both the developing economies and developed economies in their financial needs and quality and safe products respectively.

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