



## **Global supply chains and compliance capabilities for new regulatory regimes**

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### **Abstract**

Opening up North American markets in 1994 lowered entry barriers to international trade. However, new non-statutory regulations have modified previous ways global value chains were governed, reducing supplier substitutability capacity of lead firms, increasing rigidity of governance structures and raising market entry barriers for new suppliers.

The paper is based upon a study on compliance capability building along international fresh produce supply chains from Mexico to US (2007-2008). The main regulatory regimes these are to comply with are rather self-regulations and Public Private Partnerships (“voluntary”).

This is a comparative case study of 4 international fresh produce supply chains (11 firms), based upon small sample size indexes construction, following a selective/explanatory reasoning. It was assessed the relationship between compliance levels and different regulatory regimes, it is argued that, although security responsibilities are being transferred equally to all supply chains to develop private hierarchies to prevent bioterrorism acts, there are unintended consequences according to their capability building for each regulatory regime.

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## 1) Introduction

### *Liberalization and integration of North American markets*

Opening up North American markets in 1994 though NAFTA lowered the entry barriers to intraregional trade, but more illustrating is measuring the integration<sup>2</sup> process that NAFTA triggered compared to their market relationship with the rest of the world (Table 1).

**Table 1: Share of US trade (exports+imports) with NAFTA partners vs. rest of the world\***

|  | 1989 | 1994 | 2003 | NAFTA Effect |
|--|------|------|------|--------------|
| 0--Food And Live Animals                               | 25%  | 40%  | 56%  | ↑            |
| 1--Beverages And Tobacco                               | 11%  | 12%  | 25%  | ↑            |
| 2--Crude Materials- Inedible- Except Fuels             | 41%  | 59%  | 53%  | ↓            |
| 3--Mineral Fuels- Lubricants And Related Materials     | 30%  | 44%  | 60%  | ↑            |
| 4--Animal And Vegetable Oils- Fats And Waxes           | 18%  | 29%  | 42%  | ↑            |
| 5--Chemicals And Related Products                      | 24%  | 34%  | 29%  | ↓            |
| 6—Manufactured Goods                                   | 46%  | 58%  | 64%  | ↑            |
| 7--Machinery And Transport Equipment                   | 37%  | 44%  | 51%  | ↑            |
| 8--Miscellaneous Manufactured Articles                 | 14%  | 22%  | 27%  | ↑            |
| 9--Commodities & Transactions Not Classified Elsewhere | 17%  | 58%  | 64%  | ↑            |
| Total  | 35%  | 41%  | 46%  | ↑            |

\* Share =  $\frac{\text{US exports to Canada and Mexico} + \text{US imports from Canada and Mexico}}{\text{US exports to the rest of the world} + \text{US imports from the rest of the world}}$

(US exports to the rest of the world + US imports from the rest of the world)

Source: US Department of Commerce, 2004

Notwithstanding Mexican fresh produce suppliers were on that track to integration since long before engaging in vertical relationships in the 1960's, NAFTA became the platform for reducing trade barriers and easing access to global markets for new North American suppliers, increase competition and competitiveness across the region, therefore opportunities for buyer-driven value chains to substitute or include suppliers increased. The assumption was that potential suppliers were gaining equal opportunities to access to international value chains.

### *9/11 and transferring security responsibilities to the international food supply chains*

<sup>2</sup> For a discussion on Deep and Shallow integration see Centre for the Analysis of Regional Integration at Sussex: <http://www.sussex.ac.uk/Units/caris/index.html>

September 11 and more importantly, the reactive elicited regulations, changed the reality in North America. US concerns on terrorism appears to be one of the most important aspects for public intervention. This was reflected in its expenditure in security, with growth on the Department of Homeland Security (including project BioShield) greater than the average growth of total US budget from 2004 to 2005, 12.4% and 7.8% respectively (Homeland Security, 2006, p. 5; Office of Management and Budget, 2006, p. 22).

Afraid of the risk of using international food supply systems to deliver biological agents by terrorists, the US government re-located resources and created regulations to prevent so. But in addition to public agencies, the industry was included in its security system. On the other side, apart from a Public regulation ("US BioAct", 2002), in association with the industry, it was developed a regulation called Customs-Trade Partnership Against Terrorism, and Fast and Secure Trade (C-TPAT/FAST). The food industry on the other hand tightened and updated their previous standards and certification systems to include issues related to the new security agenda; afraid of being accountable for any bioterrorism act, they enforced more toughly their standards (Self-Regulations). Therefore, States and business itself increasingly transferred responsibilities to the International food supply chains to protect the population from bioterrorist attacks<sup>3</sup>. In consequence, industry capacity to protect the population became a matter of 'compliance capabilities' at various levels: firm, supply and value chain levels.

#### *The relevance of compliance capabilities*

Technological capabilities are processes and resources in place to improve production organisation, processes, equipment, product or projects engineering (Bell & Pavitt, 1995, p. 78; Figueiredo, 2003, p. 609). Capabilities vary according to different unit of analysis; in this study we refer to chain levels, and more precisely at international fresh produce supply chain levels.

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<sup>3</sup> This division of labour is the delegation of States functions to business and creation of regulatory agencies, while business create internal controls and mechanisms of self-regulation in the shadow of the State (Ayres & Braithwait, 1992).

The type of capabilities we refer to here are ‘not’ for product, service, or technology development, but for skills, operating practices and systems capacity (Figueiredo, 2002, p. 8), more recently called soft technologies (Tether, 2003, p. 483). Hence, we define ‘*Compliance Capability Building*’ as *the creation, development or adaptation of physical technologies, organizational structures, and linkages to meet new regulations.*

*Aim of the paper*

The aim of the paper is to explore the relationship between new regulatory regimes and the compliance capability building, and more precisely, the unintended consequences of different regulatory regimes in global supply chain governance structures dynamics. Hence, the paper research question is: how different regulatory regimes impact on the supplier dependency (captivity) to the buyer and on power asymmetry along the supply (value) chain?

*Structure of the paper*

Following this introduction, the paper engages in a brief theoretical discussion on regulations and value chain governance, followed by the methodological approach and operationalisation of theoretical constructs, as well as the argument about why comparative case studies is the best possible way to assess the phenomenon. A fourth section presents the analysis of regulatory regimes, compliance and governance structures, with the relevant relationship between supplier substitutability capacity of lead firms and the governance structures dynamics. The final section, hypothesise about the mechanisms to jeopardise the dynamics of global supply chain governance structures.

## **2) Theoretical discussion**

*Regulatory regimes*

Combining regulatory regimes is a way of assuring the effectiveness of the interventions. Some of them are: command and control (Braun & Wield, 1994), self-regulation and enforcement of self-regulation (Ayres & Braithwait, 1992; Ogus, 1994), market control, incentive-based, rights and liabilities, public compensation, among others (Baldwin & Cave, 1999). In the case of the United States counter bioterrorism regulations, there are mainly three regulatory regimes. Public

Regulations (PRs): standard-based regulations, compulsory and follow a command control regulatory model; Public-Private Partnership Regulations (PPPs): performance-based regulations, not compulsory, and follow a systems of rewards regulatory model; and finally, Self Regulations (SRs): relational agreements, norm-based regulations, not necessary contractual, and follow a reputation damaging control system.

But, what is the rationale for having three different regimes? Arguably, the State acknowledge the limits of its own PRs to ensure security across international supply chains; hence the PPPs come to cover aspects not considered otherwise. It may be possible that PRs and PPPs are not enough to meet some customer needs, or might be affecting the competitiveness of lead firms; therefore these firms require SRs to be implemented along the supply chains. However, implementing SRs do not entail any benefit from the State, therefore the incentive to comply with PPPs remains important.

Contesting positions argue about goodness or burdens of regulations for business efficiency. It is important to admit even industries push for regulations, setting standards, rules, norms, and even lobby for new laws that “allow fair game among firms”. This is the case of agro-business when single firms invest resources to improve performance, resulting in sub-optimal outcomes, leading them to enforce regulation to all actors of the chain (Ruben, Slingerland & Nijhoff, 2006).

On the other hand, Regulatory & Governance (Ayres & Braithwait, 1992; Jordana & Levi-Faur, 2005; Levi-Faur, 2005; Meseguer, 2005) does not argue against the existence of ‘losers’ in the economy, or inefficiencies, however, it fails to assess for such impacts, or, how firms after a regulation manage or not to meet specific regulations.

Furthermore, allowing a fair game among firms is not a straightforward process considering that for some firms regulations are relatively more stringent since they are farther from compliance than others.

Hence, regulatory and governance studies should consider assessing the impact of the implementation of certain regulatory regimes at all levels possible: firm, supply chain, industrial organisation, regional, etc.

#### *Value Chain Governance*

The distinctive feature of the new security regulations is that they target not only firm's but entire international supply chains' behaviours. For that reason, it is important analyzing the ways in which connected resources (network facilities, vehicles, and logistics communication and information systems / technologies) are managed to operate logistics activities, to produce, and to deliver goods to the customer at the same time they assure safety and security for the population.

Supply chain management studies do not normally consider how these chains are actually governed, or how the complex knowledge (embedded in regulations) is codified and managed, and how they build up capabilities in relation to new requirements.

The Theory of Value Chain Governance (VCG), based upon Gereffi's contribution on global commodity chains and power asymmetry (Gereffi, 1994), followed by important contributions (Dolan & Humphrey, 2000; Gereffi, Humphrey & Sturgeon, 2005; Humphrey & Schmitz, 2002; Kaplinsky & Morris, 2001; Porter, 1985; Schmitz, 2005) and incorporation of the Resource Base View on technological capabilities (Bell & Pavitt, 1995; Figueiredo, 2003), provides the analytical tools to understand the management of value and supply chains.

The factors influencing value chain governance include 1) Complexity of transactions, 2) Codifiability of information, 3) Capability of suppliers, 4) History, 5) Institutions, 6) Geographic and social context, 7) Evolving rules of the game, 8) Path dependence, and other elements. However, only the first three are operational in a typology of value chain governance (VCG).

Governance structures are market, modular, relational, captive and hierarchical. There is an increasing asymmetry of power when moving from market to hierarchical governance types (Gereffi, Humphrey & Sturgeon, 2005, pp. 81, 85, 87).

According to the theory, the former factors should also predict behaviours of each of the partners in international fresh produce supply chains. If governance structures tend to markets, both parties will experience low costs of switching to new partners. If they tend to be modular, suppliers will respond to customer's specifications (requiring more than just price information). In case of relational, there is a mutual dependence and high asset specificity of the supplier. Captive governances drive suppliers to significant switching costs and are monitored and controlled by lead firms; and suppliers have narrowed range of tasks, keeping design, logistics, component purchasing, and process technology upgrading in power of lead firms (Gereffi, Humphrey & Sturgeon, 2005, pp. 86-87).

This study focuses on international food supply chains from Mexico to the US, which corresponds to a quasi-hierarchy according to (Humphrey & Schmitz, 2002, p. 1023) or captive (Gereffi, Humphrey & Sturgeon, 2005, p. 83).

Suppliers in this region also experience a captive type of governance, even though dependency levels are not as deep as the case of UK and Africa (Humphrey & Schmitz, 2000, pp. 7-8). In other leading exporting region of fresh produce from Mexico (Sonora), interdependency levels have increased as a result of US intermediaries investing in agriculture and post-harvest facilities, driving chains into higher vertical integration (Borbon-Galvez, 2000, p. 75, , 2001), a situation characterised by buyer-driven governance.

However, in the case of growers/packers from Sinaloa, capabilities have been built without the assistance of US distributor (buyer) infrastructure. In order to be self reliant, these exporters have had to build infrastructure, credit relationships, technology, marketing knowledge, and technical assistance. They have managed to do this so that they now have the best technology available in the world and are making their own investments in infrastructure, e.g. greenhouses (Calvin &

Barrios, 1999, pp. 60-61). This might suggest that products supplied from some regions from Mexico to US markets might not necessarily flow through captive or quasi-hierarchical structures, but instead modular and relational ones, an important issue for those interested in the degree of independence and self-determination in agriculture.

Power asymmetry, dependency, coordination, and upgrading are likely to evolve in global supply chains, according to different levels of complexity of transactions, ability to codify them, and capability of suppliers; therefore, from the VCG perspective, we would expect that capability changes across international fresh produce supply chains from Mexico to US are pulled by lead firms' specification and supplier adaptation to new security standards, affecting the buyer-driven global value chain governance structure.

Different Regulatory regimes (PR, PPPs, and SR) take place in single supply chains at the same time. Regulation is often seen as a cost of business that can be changed by shifts in the regulatory environment. On the positive side, such changes would affect all firms equally, so conventional theory would suggest that competitive advantage is not altered.

However, a Resource Based View suggests that not all firms may develop capabilities at the same rate or with the same depth changes in the regulatory environment under these conditions is therefore capable of changing relative competitive position. Moreover, in an international context, Regulatory regimes differentially applied to foreign and domestic producers can disadvantage foreign producers.

**Table 2: C-TPAT Statistics April 2005**

| Business Type                                    | Certified | Rejected | Certified to Rejection Ratio (CRR= Certified/Rejected) | Pending Additional Info. | Grand Total | Share     |
|--|-----------|----------|--|--------------------------|-------------|-----------|
| Air Carrier                                      | 26        | 7        | 3.7  | 6                        | <b>39</b>   | <b>0%</b> |
| Consolidator, NVOCC, Ocean Trans Inter, Intl Air | 428       | 59       | 7.3  | 153                      | <b>640</b>  | <b>8%</b> |

|   |             |             |                      |             |             |             |
|---|-------------|-------------|----------------------|-------------|-------------|-------------|
| Importer<br>Licensed U.S.<br>Customs Broker | 2521        | 794         | 3.2                  | 1315        | <b>4630</b> | <b>56%</b>  |
| Mexican Non-<br>Related<br>Manufacturer     | 10          | 13          | 0.8                  | 30          | <b>53</b>   | <b>1%</b>   |
| Mexican Related-<br>Party<br>Manufacturer   | 118         | 67          | 1.8                  | 105         | <b>290</b>  | <b>3%</b>   |
| Rail Carrier                                | 7           | 1           | 7.0                  | 4           | <b>12</b>   | <b>0%</b>   |
| Sea Carrier                                 | 74          | 18          | 4.1                  | 29          | <b>121</b>  | <b>1%</b>   |
| U.S. / Canada<br>Highway Carrier            | 719         | 304         | 2.4                  | 244         | <b>1267</b> | <b>15%</b>  |
| U.S. / Mexico<br>Highway Carrier            | 142         | 203         | 0.7                  | 155         | <b>500</b>  | <b>6%</b>   |
| U.S. Marine Port<br>or Terminal<br>Operator | 24          | 8           | 3.0                  | 16          | <b>48</b>   | <b>1%</b>   |
| <b>Grand Total</b>                          | <b>4574</b> | <b>1533</b> | <b>3.0</b>           | <b>2190</b> | <b>8297</b> | <b>100%</b> |
| <b>Status Share</b>                         | <b>55%</b>  | <b>18%</b>  | <b>3.8 (Average)</b> | <b>26%</b>  | <b>100%</b> |             |

Source: (Rojas, 2005)

US firms are also subject to a number of the Regulatory regimes governing food security following 9/11. However, there are claims (MacPherson, McConnell, Vance & Vanchan, 2006, p. 268) that those regimes have been differently applied to US domestic and foreign (particularly Mexican) firms (Kerr, 2004, p. 6; Wieck, 2006, p. 11). Under these conditions, one may speak of raising non-tariff barriers when responding to different Regulatory regimes. Assessing efforts to overcome these barriers at both the firm and diplomatic levels constitutes an important contextual issue to be at least acknowledged.

Regulatory regimes may increase rigidity of organisational structures of the supply chain, resulting in higher vertical integration cause by requiring contracts among parties to incorporate and coordinate security measures. This would increase complexity, asset specificity and therefore vertical integration. Barriers to entry and exit could increase. Again, persistence of capabilities of suppliers along value chains, according to VCG theory and transactions costs, is based upon the need to negotiate processes and outcomes with a network of suppliers to assure

that they are compliant – vertical integration reduces these costs but also reduces competition among suppliers that might otherwise drive down costs (Frank & Henderson, 1992, pp. 949-950; Williamson, 1981, p. 558).

VCG acknowledges that regulatory environment may change relative competitive position of firms, however, it fails to evaluate these effects, therefore, additionally it is uncertain how social regulations impact governance structures of international supply chains and firms.

Moreover, in an international context, regulatory regimes differentially applied to foreign and domestic producers can be source of disadvantage. US firms are also subject to a number of regulatory regimes governing food security following 9/11. However, there are claims (MacPherson, McConnell, Vance & Vanchan, 2006, p. 268) that those regimes have been differently applied to US domestic and foreign (particularly Mexican) firms (Kerr, 2004, p. 6; Wieck, 2006, p. 11). Under these conditions, one may speak of raising non-tariff barriers when responding to different regulatory regimes. Assessing efforts to overcome these barriers at both the firm and diplomatic levels constitutes an important contextual issue to be at least acknowledged.

### **3) Methodology**

#### *Research questions*

As previously stated, the research question is: how different regulatory regimes impact on the supplier dependency (captivity) to the buyer and on power asymmetry along the supply chain?

This question is sectioned in two parts: one to answer dependency and other for power asymmetry along the supply chain. In the following section it is developed the ways to operationalize them and the way to account for relationships between variables.

1. What is the difference in the supplier dependency, comparing supply chains with different compliance levels?
2. What is the difference in the asymmetry of power distribution along the chain, comparing supply chains with different compliance levels?

Multiple units of analyses are possible in a supply chain study (firm, business to business relation, and supply chains). Regulations are to be built by individual firms; however, the aim is to influence the whole 'supply chain' therefore that is the level to consider as unit of analysis. The parts that were cumulated to form the supply chain are the Grower/Packer/Shipper, the Distributor in the United States, and the transport provider between the Shipping point in Mexico and the Distribution centre in United States.

The independent variables are compliance levels. However, it is necessary to distinguish between PPPs and SRs compliance levels<sup>4</sup>. SRs compliance is measured by their number of food safety certifications<sup>5</sup> holding across the supply chain. Hence, it is necessary to capture the amount of food safety regulations across the supply chains. In total there were 8 safety certifications (Scientific certification, Primus Lab, HazMat, GAP-Good Agricultural Practices, Good Manufacturing Practices-GMP, Senasica, and Normex).

PPPs on the other hand, was analyzed through four levels of compliance for each firm, 0% in case of companies not implementing C-TPAT/FAST guidelines at all, 33% if there is an implementation process but certification not yet accepted, 66% if accepted for certification but not yet audited or waiting for certification after audit, and 100% if certified.

The dependent variables are power distribution and supplier dependency (captivity). The variable captivity was captured by three indicators: asset specificity (Williamson, 1991, pp. 281-284) measured developed, % exclusivity sales (Pietrobelli & Saliola, 2007, p. 18), and relationship length. Higher asset specificity is related to higher bilateral dependency and possibilities of (re)using assets providing the same value to products is not likely. Higher concentration of

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<sup>4</sup> PRs were not used as variable due to the fact that all companies are complying with them completely, hence no comparison bases exist for this type of regulation.

<sup>5</sup> Food safety certification are considered as security related regulations as the intention is to minimize risks of food containing any biological agent that could ill or kill consumers. Hence, the safer the supply chain, the lower the risk of delivering a threatening biological agent. Nowadays food safety certifications include, and are increasingly incorporating in their standards operations to prevent intentional introduction of dangerous biological agents into the food supply system; therefore, the more certifications related to food safety, the more compliant with countering bioterrorism regulations.

product exclusively designed or exclusive sales (in case of commodities) increase again the bilateral dependency. Finally, the longer the experience and expected relationship between the partners, the higher (path)dependency (lock-in). Governance structures with high indications of asset specificity, concentration of sales and relationship length, can be related to more “Captive Governance Structures”. Hence, “supplier dependency” occurs when asset specificity, exclusivity of sales and length of relationships are perceived higher in the supplier than in the distributor (in relative terms, compared with the industry standards).

The variable power asymmetry was captured by three indicators: Enforced standards/regulations (Pietrobelli & Saliola, 2007, p. 18), and accumulation of roles, activities and responsibilities<sup>6</sup> (Dahlstrom, McNeilly & Speh, 1996, pp. 120-122). The origin of the enforcement is the indication of ‘who’ holds the power along the supply chain. Concentration of roles, responsibilities and activities can be associated with governing the supply chain by that partner. Governance structures with high indications of enforced standards/regulations by one partner, and roles/responsibilities and activities concentrating in one partner, can be associated to “Asymmetric Governance Structures”. Hence, following the assumption that international food supply chains experience buyer-driven governance structures, more “symmetric power” occurs when standards and regulations are not enforced, but more mutually enforced by the supplier and distributor than the industry standards, and when roles/responsibilities are being transferred from the distributor to the supplier.

#### *Hypotheses testing*

Distinguishing between two different regulatory regimes, allows testing for the validity of the following Value Chain Governance Theory underlying assumptions (UAs).

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<sup>6</sup> Although Dahlstrom, McNeilly and Speh (1996:120-122) consider definition of roles and responsibilities from a formal or informal control mechanism, we considered more relevant to capture changes in responsibilities along the chain, as well as roles and activities accumulated by each partner of the chain, modifying the sense of the measurement from formal control mechanisms to accumulation of power, giving the possibility to capture how asymmetric if distributed along the supply chain.

UA<sub>1</sub>. If any regulation is introduced, it would be the interest of the lead firm to hold their control over the supply chain, governing it in a way that evolution of capabilities does not affect their efficiency, profitability, and ultimately their competitive position. That implies that compliance capability building along the chain, governed by lead firms (SR), would not change VCG structure, at least not negatively for the lead firm, the underlying assumption is that regulations do not affect whatsoever VCG structures.

H0<sub>1</sub>: Governance structure shows same captivity levels of buyers on the supplier to different SR compliance levels, meaning that in both cases the suppliers present the same level of dependency to the buyer (lead firm) to remain in business.

Arguably, the former hypothesis follows a conventional theory on regulations and impacts on competitive position of the industry. However, if SRs in fact impact governance structures, we would expect this to favour the lead firms (buyer, distributors).

Ha<sub>1</sub>: Supply chains with higher compliance capabilities for SR are associated to higher captive governance structures.

UA<sub>2</sub>. On the other hand, the theory acknowledges that regulations can influence greatly VCG dynamics (Gereffi, Humphrey & Sturgeon, 2005, p. 99), implying that Regulatory regimes not driven by lead firms (e.g. PR and PPPs) increase complexity of the resources required for operating in a changed environment; codifiability and capabilities building along the supply chain evolves out of control of the lead firm (distributor). The underlying assumption here is different than the first one, that is, regulations affect VCG power asymmetries by giving higher power to the suppliers.

H0<sub>2</sub>: Governance structure shows same power asymmetry between the buyer and the supplier, meaning that in both cases the decision making power distribution along the chain should be the same to cases with different compliance levels.

Alternatively,

Ha<sub>2</sub>: Different governance structures evolve according to the power distribution along the chain; higher compliance levels to PPPs regulations are associated with more symmetric power along the chain.

*Research Method*

Questionnaires were applied to indentify the dynamics of the supply chain governance structures. If chains should differ in their structures and governance dynamics according to compliance levels, the best methodology to conduct the research is “comparative case studies”.

Although, the study was carried on 17 companies (6 case studies). Selection of cases did not follow statistical reasons, but theoretical, therefore cases are rather exemplary/selective, to favour robustness and generalisability of research. For this reason, one case was dropped out for not adding any exemplary power for the analysis. And for this particular paper, only 4 cases are in scrutiny.

The contact with the companies followed a snowball technique, first with the focal-lead firm (Distributor in the US), followed by their main supplier (Mexican grower) in terms of compliance level, and finally with the main transport provider between grower and distributor.

There are a number of potentially comparisons with these cases; however we will focus on those that matter for the paper research questions and hypotheses. To test for the hypothesis  $H_{01}$ , the cases to compare are SC3 and SC4, while for the hypothesis  $H_{02}$ , the cases are SC2 and SC5.

**Figure 1: Exemplary cases by Regulatory Regimes**



#### 4) Empirical Results

**Table 2: Comparing Captivity of Governance Structures at Supply Chains and Firms**

| Compliance             | Low SR compliance level |             |          |              | High SR compliance level |             |             |             |
|------------------------|-------------------------|-------------|----------|--------------|--------------------------|-------------|-------------|-------------|
|                        | D                       | G           | T        | SC3          | D                        | G           | T           | SC4         |
| Supply Chain Echelon   |                         |             |          |              |                          |             |             |             |
| ZAssetspecificity      | 0.11                    | 0.54        | 0.11     | <b>0.77</b>  | 0.11                     | 2.27        | 1.41        | <b>3.68</b> |
| ZRelationshiplength    | -0.84                   | 0.67        | -        | <b>-2.72</b> | -0.08                    | 1.43        | 0.48        | <b>1.91</b> |
| ZConcentration         | -1.47                   | 0.72        | -        | <b>-2.28</b> | -0.21                    | 1.04        | 0.57        | <b>1.61</b> |
| <b>Captivity Index</b> | <b>-2.21</b>            | <b>1.95</b> | <b>-</b> | <b>-4.24</b> | <b>-0.19</b>             | <b>4.75</b> | <b>2.47</b> | <b>7.22</b> |

Source: COMCAP 2007-2008. Note: Values in Z-Scores, represent standards deviations from the industry average (Zero=0). D: Distributor; G: Grower/Packer/Shipper; T: Transport Provider.

Captive types of governance structures of supply chains imply that distributors (lead firms) enforcing standards/regulations, could substitute suppliers whenever other supplier with higher compliance capabilities is identified. That would not be a problem if the substituted supplier could redirect their operations to other distributor.

However, a first point to discuss is; suppliers with high asset specificity may find difficult to develop a relationship with the same resources with other distributor. Comparing the two supply chains, it can be said that Supply Chain 4 (SC4) would face more difficulties to develop a relationship with the same resources with other distributor, due to having developed higher asset specificity than Supply Chain 3 (SC3).

A second point is; the length of the relationships creates path dependence (lock-in) between the companies, reducing the chances of substituting one another, acting as a counter process for substitutability, however, increases the captivity. Therefore, expected relationship length higher than the industry average is associated to higher captivity of the supplier to the distributor. Although distributor in SC4 shows lower relationship length than distributor in SC3, the overall SC4 show higher relationship length than the industry average, compared to that of the SC3 that

expect lower relationship length. This implies that SC4 is more path dependent (lock-in) than, and that supplier substitutability in SC4 is more difficult to take place, or less likely to happen before than in SC3.

A third point is; this is not a very straightforward process when the share of produce is highly concentrated in the distributor that is terminating the relationship in the first place. The supplier would need to become compliant to SRs required by the new main distributor, and this takes time. Produce volume of exports with security and quality standards, must be planned well in advance between the grower and the distributor. From the results it is clear that SC3 has lower share of exports compared to the industry average, while the SC4 experienced higher sales concentration, this makes more difficult to the supplier to turn into a new distributor to move their produce than SC3 and then the rest of the industry.

In general, captivity is higher in case of growers than in case of distributors, which means that it is easier for a distributor to substitute suppliers, however comparing the situation between the two growers, it is clear that captivity level is higher in the SC4 than in SC3. In summary, by all means, asset specificity, relationship length, and volume of business (sales) concentrated between them; it can be argued that captivity levels are significantly higher in SC4 than in SC3.

*Power asymmetry of governance structures*

Governance structures with asymmetric power along supply chains imply that distributors (lead firms) would hold their power and responsibilities for the supply chain, even though suppliers are required to comply with regulations not enforced by the distributor. Due to the fact that distributors benefit from the suppliers compliance to PPPs they allow building compliance capabilities along the supply chain.

**Table 3: Comparing Power Asymmetry of Governance Structures at Supply Chains and Firms**

| Compliance | Low PPP compliance level |      |       |       | High PPP compliance level |      |       |       |
|------------|--------------------------|------|-------|-------|---------------------------|------|-------|-------|
|            | D                        | G    | T     | SC2   | D                         | G    | T     | SC5   |
| ZSetReg    | -0.25                    | 0.92 | -0.84 | -0.17 | -0.25                     | 0.03 | -0.84 | -1.06 |

| Responsibilities                 | g,t,d | g,t  | T     |       | g,t,d,tc | G    | T     |       |
|----------------------------------|-------|------|-------|-------|----------|------|-------|-------|
| Roles and activities experienced | ↔     | ↔    | ↔     | ↔     | ↑        | ↑    | ↔     | ↑     |
| Roles and activities planned     | ↔     | ↔    | ↔     | ↔     | ↓        | ↑    | ↔     | ↻     |
| <b>PowerAsymmetry Index</b>      | -0.25 | 0.92 | -0.84 | -0.17 | -0.25    | 0.03 | -0.84 | -1.06 |
|                                  | ↔     | ↔    | ↔     | ↔     | ↻        | ↑    | ↔     | ↓     |

Source: COMCAP 2007-2008. Note: Values in Z-Scores, represent standards deviations from the industry average (Zero=0). D: Distributor; G: Grower/Packer/Shipper; T: Transport Provider. g: packing facilities; t: transit between shipper and distributor; d: distributor warehouse; transit between distributor warehouse and client in the US. ↔:no change, ↑:increase, ↓:decrease, ↻:transfer to the supplier, ↻: increasing followed by decreasing period.

Nevertheless, supply chains complying with PPPs may experience more symmetric power for the fact that capabilities are not just located in the lead firm, but across more supply chain partners. An indication of concentration of capabilities is who sets the standards. Apparently complying with PPPs, build up not just compliance capabilities to the regulation, but as well allows balancing the distribution of power along the chain, by perceiving less imposing standards and regulations by the distributor on the supplier. Positive asymmetric levels indicate higher concentration of power on the distributor, while negative asymmetric levels mean higher concentration on the supplier, or the transporter, in that order.

The Supply chain 5 (SC5), presents less power asymmetry of the governance structure than Supply chain 2 (SC2). SC2 perceives power asymmetry levels close to the industry average, while SC5 perception is clearly below the industry average. Even comparing between partners from different supply chains, the supplier in the SC5 perceives power asymmetry not far from the industry average, meanwhile the supplier in the SC2 perceives almost one point more of asymmetric power (in Z-scores, or number of standards deviations).

Moreover, PPPs require capability building along the whole supply chain, and when this happens based upon shared responsibilities among partners, the rewards systems in forms of competitiveness, bargaining and decision making power, is more symmetrically distributed along

the chain. Furthermore, the governance structure dynamics is associated to changes in roles and responsibilities of each of the partner of the supply chain, hence, increasing concentration of roles and responsibilities in one of the partner implies power asymmetry towards that particular one.

An interesting feature of SC5 is that the distributor has perception of responsibility most of the supply chain, going from packing facilities of the grower until the transit between the distributor and the US client (supermarket, retailers chains, food chains, so on); with lower responsibility by the supplier and the transport provider. On the other hand, in the SC2 s the distributor is liable for the packing facilities, transport and distribution centre facilities, while the supplier feels liable for the packing and transport to the US distribution centre. This accounts for more shared responsibilities in SC2 than in SC5.

Conversely, the former responsibility distribution along the chains, have been unchanged in SC2 as a response to complying with the new regulations, as opposed to SC5 that expressed it increased as a result of the new regulations, and this perception of increasing responsibilities to meet regulations is shared by the supplier. Notwithstanding, the distributor and the supplier in the SC5 are setting the systems to redistribute responsibilities from the distributors to the suppliers and transport providers. This sum, shows that although SC2 shows more even distribution of responsibilities, it has been the case since before the new regulations came into place, and the level of compliance nowadays attained has not been enough trigger changes in this respect. On the other hand, the distributor of SC5 felt liable for the whole supply chain, and initiating a commonly understanding phase of redistribution of responsibilities and tasks to the supplier and transport provider, the last one not yet aware of the future consequences of this power redistribution.

Finally, according to the results, the supply chain with higher PPPs compliance triggered periods of higher responsibilities and tasks accumulation that is later on transferred from the distributor to the supplier, all within a context of more evenly distributed power for enforcement of standards and regulations along the chain; while in the supply chain with low PPP compliance, no transformation or redistribution of responsibilities occurred, and even more responsibilities,

roles and activities were shared along the chain, the regulations and standards are more enforced by the distributor to the supplier. More Asymmetric power of governance structures are registered in supply chain with lower PPPs compliance levels than in the one with higher PPPs compliance level.

##### **5) Conclusion: Jeopardised dynamics of global supply chain governance structures**

Although in this paper did not analyse the process by which technological capabilities are built to meet new regulations, it can be argued that higher SRs compliance are associated with adapting and creating technological capabilities leading the supply chain towards higher asset specificity, requiring longer relationships, and joining a compliance trajectory or path dependence, that can even be associated as well with higher difficulty to divert trade to other partners. In sum, not all firms are able to build up compliance capabilities at the same rate, and those that build them following SRs develop more captive type of governance structures, this is closer to the alternative hypothesis 1 ( $Ha_1$ ).

On the other side, when technological capabilities are adopted, adapted or created to meet PPPs, enforcement comes from all the parties building up compliance along the chain, redistributing responsibilities, roles and activities, driving governance structures towards more symmetric power distribution in favour of the supplier; closer to the alternative hypothesis 2 ( $Ha_2$ ).

Regulatory regimes characterised by high compliance to SRs, have less capacity to substitute suppliers, cause they have become compliant. Regulatory regimes characterised by high compliance to PPPs, have more enforcement capacity by the supplier, and more responsibilities, hence, the distributors in high compliant chains will be more dependent on cooperation and coordination with the rest of the partners of the chain; features not easily achievable in a relationship recently established with more formal control mechanisms.

If captivity is associated to more rigid governance structure, and more symmetric power of governance structures is a feature not easily achievable by newly established business; it can be

argued that these two non statutory regulations (SRs and PPPs) had stabilized the dynamics of governance structures by reducing substitutability of suppliers by the lead firms (distributors), raising market entry barriers for new suppliers: jeopardizing the dynamics of global supply chain governance structures.

Achieving a fair game among firms by implementing new regulatory regimes is not a straightforward process, especially when even from a normative approach what is important for some regulators may not necessarily be so for others. Assuming that for US regulatory agencies, captivity would be the main issue to consider during the regulatory design process, while for the Mexican counterparts, power asymmetry would be the case, what is a fair game lays behind balancing both normative approaches for raising captivity or power asymmetry controls by promoting either SRs or PPPs.

### **Annex (Indexes and variables construction)**

#### Self Regulation Compliance Levels

There are 8 different standards or certifications that growers comply with, and even though most of them are safety and quality related, some of their modules include security issues: Scientific certification systems, Primus Lab, Hazardous residuals, Good Agricultural practices, Good Manufacturing practices, Security program, SENASICA, NORMEX.

SR compliance level is =  $\frac{\sum(SR_d+SR_g+SR_t)}{3}$  where,

SR: Regulations, certifications and standards met by the firm  
d: Distributor  
g: Grower/Packer/Shipper (Supplier)  
t: Transport provider

By averaging SRs compliance levels, two distinctive aspects should be acknowledge: first is that within is capturing the measure of central tendency, but it is not showing how much the individual cases divert from the mean. A second aspect is that, although at individual cases,

compliance levels are scales, they are discrete numbers, and by averaging the compliance levels by the supply chains the numbers changes its characteristic and become continuous.

By applying rank cases into three tiles using automatic ranking by SPSS 15, the SCs are re-coded into low, middle and high compliance levels.

**Recoding results for SR Compliance levels**

| Low SR Compliance levels | Middle SR Compliance levels | High SR Compliance levels |
|--------------------------|-----------------------------|---------------------------|
| SC1<br>SC3               | SC2<br>SC5                  | SC4                       |

Captivity

This variable constructed based on three indicators asset specificity, share of business concentrated in the partner, and contract length. It is relevant to note that this indicator aggregates three type of information: .The indicators are ordinal variables, but by transforming them into Z-scores they become interval data and it is then possible to make comparisons and to add them up in the same scale, at firm and supply chain level. Z-score is a measure of distance of variables in standard deviations from the mean. The properties of this type of data are that has mean 0, and standard deviation of 1.

$$Z = \frac{X - \mu}{\sigma}$$

With  $\mu$  being the mean and  $\sigma$  being the standard deviation of the variable  $X$

Having a negative z-score does not imply absolute negatives, but it represents the distance in standards deviation below the sample mean, no matter the sign (+/-) of the mean.

Asset specificity

This indicator is integrated by taking each of the 5 possible factors subject to specificity, the interviewed was questioned if they have what is considered highly specific asset, and then they are asked if they can reuse or resell that specific asset. The indicator for each factor will have three possible values depending on the combinations of responses to the previous questions.

| Answered to the first question<br>for factor x | Answer to the second question<br>for factor x | Value of<br>factor x |
|--|---|----------------------|
| No=0   |   | 0                    |
| Yes=1  | Yes=1   | 0                    |
| Yes=1  | No=0  | 1                    |

For each firm the asset specificity will be  $\sum_{f=1}^5 \text{Value of factor}$ ; while for the supply chain is the sum of the asset specificities (in Z-scores) of the three echelons (Distributor, Grower/Packer/Shipper, and the transport provider).

#### Relationship length

This indicator estimates expected total length of the relationship between Distributor and Supplier, Supplier and Distributor, and Supplier and Transport Provider (it is the supplier, not the distributor, who hires the transport services).

The indicator takes the duration of the relationship since they started business together until now, and adds it up to the expected duration of the relationship for the future. However, scale was restricted to 15 years, in order to prevent outlying data. Respondent between 11 and 15 years were averaged in 13 years, while more than that was brought back to 15 years. Later, the scale was transformed from years to Z-scores, and added up to obtain the SC indicator.

#### Concentration

This indicator measures the share of sales/business that the partner represents for the firm. Value for the distributor represents how much their business with the specific supplier represents out of the total distribution business; the Value for the Supplier represent how much of the total sales is made through the specific distributor; and finally the value of the transport provider represent share of the total services provided to the specific supplier (grower) compare to the total

provided by the firm. Later, the scale was transformed from years to Z-scores, and added up to obtain the SC indicator.

Public Private Partnership Regulations Compliance Levels

There is only one regulation for this regulatory regime, that is CTPAT (guidelines and certification for firms) and FAST (guidelines and certification for transport providers). There are four possible measures for firms according to their implementation stage of the security measures and certification process status:

| Security status  | Compliance value assigned |
|--|---------------------------|
| No implementation, or pending implementation                                 | 0                         |
| Implementation process, or pending application acceptance                    | 33%                       |
| Accepted application for certification, or audited but pending certification | 66%                       |
| CTPAT or FAST Certified  | 100%                      |

$$PPP \text{ compliance level is } = \frac{\sum(PPP_d+PPP_g+PPP_t)}{3} \text{ where,}$$

- PPP: Public Private Partnership Regulations compliance level
- d: Distributor
- g: Grower/Packer/Shipper (Supplier)
- t: Transport provider

By averaging PPPs compliance levels, two distinctive aspects should be acknowledge: first is that within is capturing the measure of central tendency, but it is not showing how much the individual cases divert from the mean. A second aspect is that, although at individual cases, compliance levels are ordinal scales, they are discrete and ordinal variables, and by transforming them into Z-scores (standardising) they are able to be compared across firms and averaged in at SC level, due to numbers change their characteristics and become continuous and interval data.

By applying rank cases into three tiles using automatic ranking by SPSS 15, the SCs are re-coded into low, middle and high compliance levels.

**Recoding results for PPP Compliance levels**

| Low PPP Compliance levels | Middle PPP Compliance levels | High PPP Compliance levels |
|---------------------------|------------------------------|----------------------------|
| SC1                       | SC3                          | SC5                        |
| SC2                       | SC4                          |                            |

Power asymmetry

This variable is built by combining quantitative and qualitative data. It aggregates the variable regulatory enforcement (quantitative), Responsibilities distribution, and performed and planned roles and activities (qualitative). The index is mainly constructed with the indicator enforced standards/regulations by the distributor (SetReg), but should be read altogether with the overall effect of experienced and planned changes in security roles and activities.

SetReg

This is an indicator that measures who enforces regulations and standards along the chain. Using a 10 Likert scale, 1 representing the supplier enforces standards and regulations along the chain, 5 means that enforcement is share between the supplier and the distributor, and 10 means that the distributor enforces regulations and standards along the chain. The indicator is then transformed into Z-scores. Note that the above discussion about transformation from ordinal to interval data applies here.

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