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### ► To cite this version:

Iciar Pavez, Jean-Marie Codron, Pasquale Lubello, Maria Cecilia Florêncio. Biosecurity institutions and the choice of contracts in international fruit supply chains. *Agricultural Systems*, 2019, 176, pp.online first. 10.1016/j.agry.2019.102668 . hal-02622435

**HAL Id: hal-02622435**

**<https://hal.inrae.fr/hal-02622435v1>**

Submitted on 26 May 2020

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# Biosecurity institutions and the choice of contracts in international fruit supply chains

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## Abstract :

Biosecurity regulations and standards govern international agricultural inter-firm transactions. Drawing mainly on new institutional economics, our study offers insights into the institutional factors, at both the macro and meso levels, that influence the choice of inter-firm contracts for Chilean apple exports. First and foremost, it examines the influence of the Sanitary and Phytosanitary (SPS) provisions included in trade agreements signed by Chile with its trade counterparts on the choice of alternative contracts displaying different degrees of completeness. It also focuses on the institutions in the importing countries, the legal institutions enforcing contracts, the efficiency of logistics and the effect of hidden informal rules such as corruption, on the choice between free consignment, minimum guaranteed and sale contracts. We also explore the private institutions, primarily linked to direct imports by supermarkets. The results of our econometric analysis show that less complete contracts, i.e. free consignment and minimum guaranteed arrangements, are chosen when exporting to countries with safe business environments and higher number of SPS provision in international trade agreements. On the contrary, when exporting to non-reliable countries, exporters tend to protect themselves through more complete contracts, i.e. sale contracts. We found evidence that direct exports to supermarkets are more prone to occur under sale contracts which suggest the dual function of contracts, both as a safeguard and as a coordination tool to adopt specific customers' requirements.

Version  
post-print

Pavez, I., Codron, J. M., Lubello, P., Florêncio, M. C. (2019). Biosecurity institutions and the choice of contracts in international fruit supply chains. *Agricultural Systems*, 176, DOI : [10.1016/j.agsy.2019.102668](https://doi.org/10.1016/j.agsy.2019.102668)

## 1. Introduction

Driven by the proliferation of free-trade agreements, trade has grown substantially in recent decades (Swinnen & Maertens, 2007; Swinnen & Vandemoortele, 2011). This development has been made possible through the reduction of tariff barriers on goods and services, together with the development of a more suitable institutional framework for trade (Chen & Mattoo, 2008; Dür, Baccini & Elsig, 2014; Reardon & Timmer, 2012). However, the expansion of commerce increased the biosecurity risks jeopardizing human, animal and plant health, i.e. the introduction of contaminated food, or a plant pest, which might damage a particular crop. Consequently, both public and private actors have adopted severe regulations and standards concerning biosecurity as sanitary and phytosanitary (SPS) institutions to prevent, control and manage these risks (Swinnen & Maertens, 2007; Codron, Giraud-Héraud & Soler, 2005; Reardon & Timmer, 2012; Fulponi, 2006).

Problems of market access may arise at distinctive institutional levels. At a macro level, at which rules such as trade policy, international agreements and import conditions are defined (Anderson & Van Wincoop, 2004; Horn, Maggi, & Staiger, 2010), and at a meso level with rules affecting particular sectors, industries or products (Ménard, 2018; Ménard, 2017; Swinnen & Maertens, 2007; Engler, Nahuelhual, Cofré & Barrena, 2012; Rigod, 2013). Economic actors carrying out transactions at the micro level are influenced by the general rules of the macro-institutional level and by the specific rules of the meso-institutional level (Ménard, 2017).

A large panel of studies has focused on the impact of trade agreements, and more particularly non-tariff measures, on aggregate trade flows (Anderson & Van Wincoop, 2004; Disdier, Fontagné & Mimouni, 2008; Fulponi & Engler, 2013). Studies following in the tradition of transactional economics have studied the new organization of procurement systems through the centralization of retailers' purchases and dedicated wholesalers (Berdegué *et al.*,

2005; Gereffi, Humphrey & Sturgeon, 2005; Reardon & Timmer, 2012; Swinnen & Maertens, 2007), the effect of institutional changes concerning quality and food safety on supply chain governance (Berdegué *et al.*, 2005; Fulponi, 2006), and on the inter-firm contract formalization and design (Mazé, 2002). The contribution of our paper is twofold. First, to the academic literature because the relationship between SPS institutions, as those negotiated through international trade agreements, and the inter-firm transactions is, to the best of our knowledge, absent from this literature. Second, our approach of SPS institutions is more systematic because we take into consideration both sanitary institutions to protect human health, e.g. food safety, and phytosanitary institutions related to plant health, eg. measures to avoid the spread of plant pests through trade. This is important because it has management implications for growers, exporters and other actors of the supply chains.

In light of the topic studied, the main body of references explored here is that of the New Institutional Economics (NEI). In the Northian tradition, institutions affect the adjustment among alternative modes of the governance and formal institutions aim at reducing the uncertainty surrounding the exchange of goods while minimizing transaction costs (North, 1990; Williamson, 1996; Ménard, 2017). Williamson's work on contractual governance, which we also explore in this study, demonstrates the interaction between the institutional environment, the governance of transactions, i.e contracts, and the individual level (Williamson, 1996:223). If an institutional environment is deemed to be given, transaction costs theory (Williamson, 1996) is most often called on. However, if the institutional environment changes (over time or in space) and becomes a major source of risks for international transactions, the institutional approaches implemented are more comparative (North, 1990, 1991). We also resort to agricultural and food systems literature on the relation between institutions and the governance of economic actors. Recent studies explore the role of food safety, quality, social and environmental standards in shaping the evolution of agri-food

systems (Ericksen *et al.*, 2010; Fulponi, 2006). The effect of power domestic and global food chains on decision making and control over production and control decisions of firms' on food quality at the stages of production, processing and trade (Waterlander *et al.*, 2018; Stephens *et al.*, 2018; Ericksen *et al.*, 2010).

Our study offers insights into the institutional factors, at both the macro and meso levels, that influence the choice of inter-firm contracts for Chilean apple exports. First and foremost, it examines the influence of the SPS provisions included in trade agreements signed by Chile with trade counterparts, and the background institutions in the importing country, the enforceability of contracts (Morrissey & Graves, 2008, Rodrik, 2000, North, 1981), the level of corruption (Cuervo-Cazurra, 2016), the efficiency of the logistics services (Pirrong, 1993; Masten, 2000) and official and private meso institutions (Ménard, 2012, 2017), primarily linked to direct imports by supermarkets, on the choice of alternative contracts displaying different degrees of completeness (Pavez & Codron, 2018). This case study is particularly interesting in that long-distance exports of perishable products are characterized by a high level of price and quality uncertainty and pose acute inter-firm coordination risks; and in that Chile, a major fruit trade player, has developed one of the most dynamic trade agreement negotiating processes in the world (Stallings, 2009; Fulponi & Engler, 2013).

Calling on non-declaratory micro-data, our paper provides a quantitative analysis testing. This type of quantitative analysis is, to the best of our knowledge, rare in academic literature. It has been made possible by i) access to a customs database providing contract data for all apple transactions conducted by Chilean exporters around the world; and ii) access to another transactions database identifying the name of the exporters' customers and, through in-depth online research, the nature of these customers (supermarkets or conventional importers).

Our results show that a higher number of SPS provisions within trade agreements makes the rules clearer and reduces uncertainty in the institutional environment, with firms

consequently tending to resort to less complete contracts, i.e consignment contracts, in which prices are not established ex-ante. In contrast, as the level of corruption in the importing country increases, risks with regards to whether and how rules are interpreted and enforced increases (Cuervo-Cazurra, 2016) and compliance with SPS institutions becomes more complex, firms must protect themselves through more complete contracts by fixing the price before exporting, i.e. sale contract. We also observe that firms exporting directly to supermarkets are also more likely to call on more complete contracts, a fact which reveals the coordination function of contracts (Schepker *et al.*, 2014; Williamson, 1996; Mazé, 2002).

## 2. Conceptual background

Within the agricultural research community that apply the NEI and Agricultural Systems approaches, it is well acknowledged that the combination of natural, socioeconomic and institutional factors, among others, is source of complexity affecting the governance within the agrifood sector (Ericksen *et al.*, 2010; Fulponi, 2006; Jaffee, 1992; Masten, 2000; Ménard, 2018; Stephens *et al.*, 2018; Waterlander *et al.*, 2018). The effectiveness of an economic system strongly depends on how actors conduct their activities and how the process of exchange is governed (Coase, 1937).

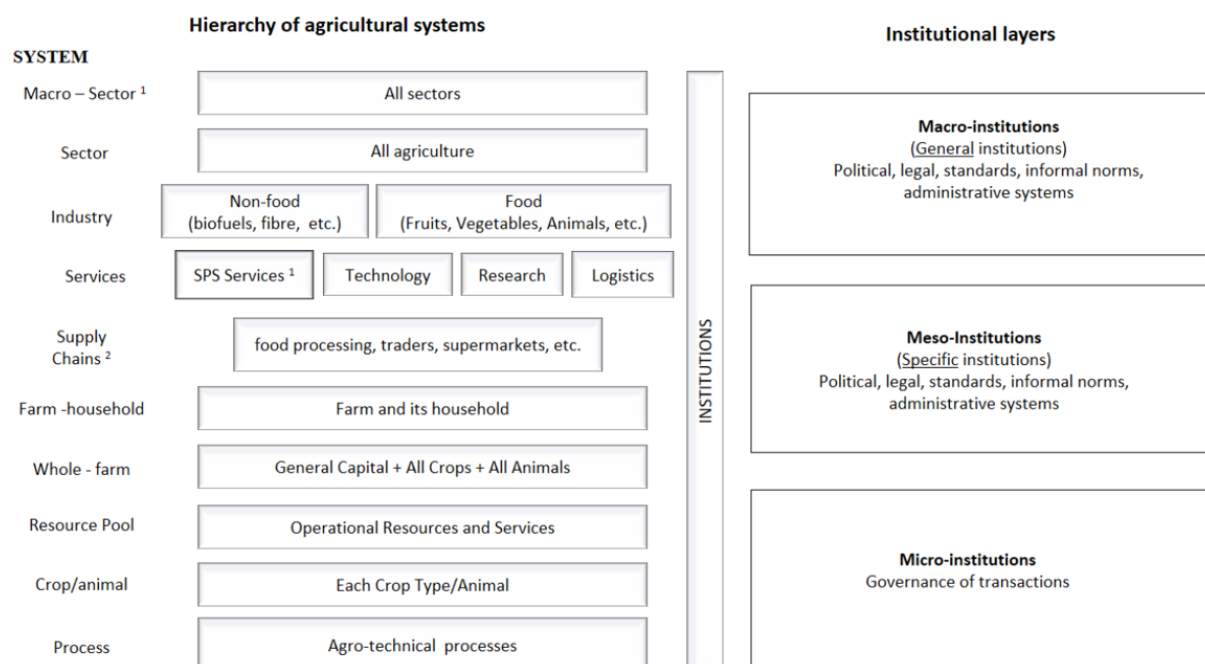
The NEI literature addresses the governance choice using mainly two complementary branches of research: North's work on institutional analysis of the background conditions that provide the framework for transactions, and the second branch, led by Williamson, is predominantly concerned with, the governance of contractual relations (North, 1990; Williamson, 1979, 1996). Trade interactions are subject to transactions costs, e.g. searching, price discovering, negotiation and enforcement costs, and as Coase (1937) asserts "when it is costly to transact, institutions matter". The term institution is extensively used in several disciplines, as economics, sociology, politics, geography, and there is no unanimity in the definition of the concept (Hodgson, 2006). In this article we adhere to North's definition: "Institutions are the rules of

the game in society or, more formally, are the humanly devised constraints that shape human interaction. In consequence they structure incentives in human exchange, whether political, social, or economic” (North, 1990, p. 3). Institutions can be formal, when enforceable by a third legal party, as property rights, polity, judiciary and bureaucracy (North, 1981; North, 1990; Anderson & Van Wincoop, 2004) or informal, such as customs, norms, beliefs, sanctions, taboos, traditions, codes of conduct, traditions and religion (North, 1991; Williamson, 2000). Although, NEI literature operates mostly at the level of governance and at the institutional environment of formal institutions (Williamson, 2000). Williamson agrees with North (1991) in that informal institutions have a persistent influence on economies, e.g. corruption can be severely problematic and undermine the respect of formal rules and limit the effectiveness of law enforcement (Williamson, 2000). As posed by Hodgson, the dividing line between formal and informal institutions is difficult because formal institutions depend on the informal ones in order to operate (Hodgson, 2006).

Williamson’s work acknowledges that the governance of contractual relations does not occur in isolation, it varies with the context defined by the institutional environment (Williamson, 1996). Williamson proposes an institutional layer scheme that shows the interaction at three levels: (i) the institutional environment (the rules of the game); (ii) the governance (the play of the game), and (iii) the individual level (Williamson, 1996, p. 223). Ménard’s work in institutional analysis and governance applied to agricultural and other specific sectors is rich in lessons (Ménard, 2018, 2017, 2012). Building mainly on North (1990, 1991), Williamson (1996, 2000), the author apprehends the functioning of institutions, both formal or informal, as a system constituted by layers. This is much in line with Williamson three-level institutional layer schema (Williamson, 1996), and with Hodgson’s definition of institutions as “integrated systems of rules that structure social interactions” (Hodgson, 2015). Ménard (2017) disentangles institutions in three levels: the macro-level, where general institutions are defined,

153 the meso-level where the general rules are translated into specific guidelines and to mechanisms  
 154 that shape their implementation; and the micro-level, where the economic actors take decisions  
 155 on the institutions of governance, e.g. contracts (Fig.1).  
 156 (Ericksen *et al.*, 2010). Complexity of agricultural systems further increases because of the  
 157 multilevel interactions with feedback loops between the farm the economic and natural  
 158 resources, and the enterprises relations within supply chains (Stephens *et al.*, 2018). As  
 159 Stephens *et al.* (2018) assert, agricultural systems approach often considers the relationships  
 160 within and between hierarchical levels using as basis the analytical frame proposed by  
 161 McConnell & Dillon (1997). This analytical frame (Fig. 1) is built using a hierarchical  
 162 classification within a sectoral system. At the highest level is what the authors call “all  
 163 agriculture” with subordinate subsystems or subsectors, i.e. services for agriculture,  
 164 commodity-based industry and individual farm-household subsystems. The lower level systems  
 165 relate to farms enterprises and to the agro-technical activities at the plot, farm or landscape  
 166 level. In figure 1, we added a level related to supply chains to take into consideration the new  
 167 developments of researches on agricultural systems that show the increasing importance of  
 168 processing enterprises, traders, supermarkets in food systems (Stephens *et al.*, 2018), we also  
 169 added a macro sector level because agriculture is not isolated from other sectors, financial,  
 170 health, education, research, among others.





Note: Hierarchy of agricultural systems by McConnell and Dillon (1997); <sup>1</sup> Macro sector and SPS services added by this study; <sup>2</sup> Supply chains level added according to Stephens et al. (2018); Institutional layers (Ménard, 2017)

**Figure 1.** Hierarchy of agricultural systems and institutional layers.

Although McConnell & Dillon (1997) do not highlight the role of institutions in shaping the agricultural systems, it is at the farm level where growers and exporters take decisions about the production practices to comply with the diversity of SPS requirements by the official authorities and by the downstream actors in the supply chain. Ménard's (2017: 6) approach facilitates an understanding of the complexity of adhering to the SPS institutions that govern international fresh fruit transactions. A number of characteristics generate this complexity: (a) the diversity of institutions embedded in SPS management, cover a large spectrum of technological, economic, environmental, and health issues; (b) the multi-level institutional and decision-making systems involved (e.g. the Agreement on the Application of Sanitary and Phytosanitary Measures<sup>1</sup> "SPS Agreement" of the World Trade Organization (WTO), the bilateral trade agreements signed between countries or economic regions that include SPS

<sup>1</sup> The terms measures in the SPS Agreement they refer to any legislation, decrees or official procedures and international standards. [https://www.wto.org/english/tratop\\_e/sps\\_e/sps\\_handbook\\_cbt\\_e/c2s2p1\\_e.htm#txt1](https://www.wto.org/english/tratop_e/sps_e/sps_handbook_cbt_e/c2s2p1_e.htm#txt1)

provisions or clauses; the country or product specific SPS regulations and private standards; and, (c) the existence of multiple uses or users of the resources with potentially conflicting goals. While sanitary institutions seek to protect human health, e.g. food safety, phytosanitary institutions aim at protecting plant health, e.g. specific treatments to control plant diseases. Par example. the use of plant protection pesticides at the farm level, may have detrimental effects on human health and environment.

## 2.1 Research context

### Chile case

Some 94% of Chile's exports are governed by trade agreements (Direcon, 2015). The country opened to international competition in the mid-70s. Structural reforms were implemented such as the reduction of state intervention, e.g. the liberalization of land, labor and transport markets, coupled with the empowerment of the private sector and policies promoting exports (Stallings, 2009). Export logistics services were modernized and the performance of the cargo handling capacity was improved. Furthermore, in addition to agricultural improvements, the country opted to align the public-private capacities on SPS matters with the very highest standards on a wide variety of markets (Engler *et al.*, 2012). Nowadays, Chile is the southern hemisphere's largest exporter of fruit (USD 4,000 million). Apples and grapes are the main products, accounting for over 59 percent of fresh fruit exports from the southern hemisphere. Exports are shipped to more than 100 countries, the main markets being the US (USD 1,472 million), China (USD 415 million), Netherlands (USD 415 million) and the United Kingdom (USD 187 million) (Odepa, 2015). Interestingly, these main markets impose the most stringent SPS measures. For example, the US has 90 restricted pests, 154 restricted diseases and 95 restricted weeds, followed by China with 11 restricted pests. In terms of sanitary protection rules, in particular relating to maximum residue limits, the most severe are the

countries of the European Union. In these countries, official requirements and supermarkets' private standards are both more stringent than the levels and numbers of regulated pesticides established by the Codex standard of the World Trade Organization (WTO) (Engler *et al.*, 2012).

Price volatility and the resulting difficulty to anticipate the market prices, compounded by environmental uncertainty and the difficulty in measuring and maintaining the quality of perishable products throughout long-distance supply chains, play a key role in the design of contracts in the fruit trade. Chilean fruit exports are governed by three main types of export contracts: a) sale with fixed price contract, under which the importer takes possession of the goods at the time of the sale, or at delivery when special conditions are required. The price of the goods is fixed at the time of the sale which is concluded before the goods are shipped abroad; b) guaranteed minimum, whereby the parties agree on a minimum price while maintaining the possibility of improving the price after the sale on the destination market; and c) free consignment, where the price of the good is left open and the exporter discovers the price after the sale. The usual main clauses of these contracts are: product, quality, quantity, date and terms of delivery, terms of payment. It is necessary to mention that the same importer, e.g. wholesaler, product manager or supermarket, can alternatively use the three types of contracts as part of their commercial strategy.

In accordance with transaction cost theory (TCT), The alternatives modes of governance can be hierarchical, where transactions occur within the firm boundaries, or hybrids where transactions occur between separate firms, e.g. inter-firm contracts, alliances, joint-ventures, among others, or markets, in which the parties to a contract are independent, and identity does not matter. The choice of governance depends on the transaction characteristics: asset specificity arising when investments cannot be redeployed to alternative uses or users, the frequency in which transactions occurs, and the uncertainty that may arise from the institutional

environment or from the transacting parties' behavior (Williamson, 1996). The transaction hazards increase with the assets specificity, whether physical, human, site-specific, dedicated assets, brand, and temporal specificity.

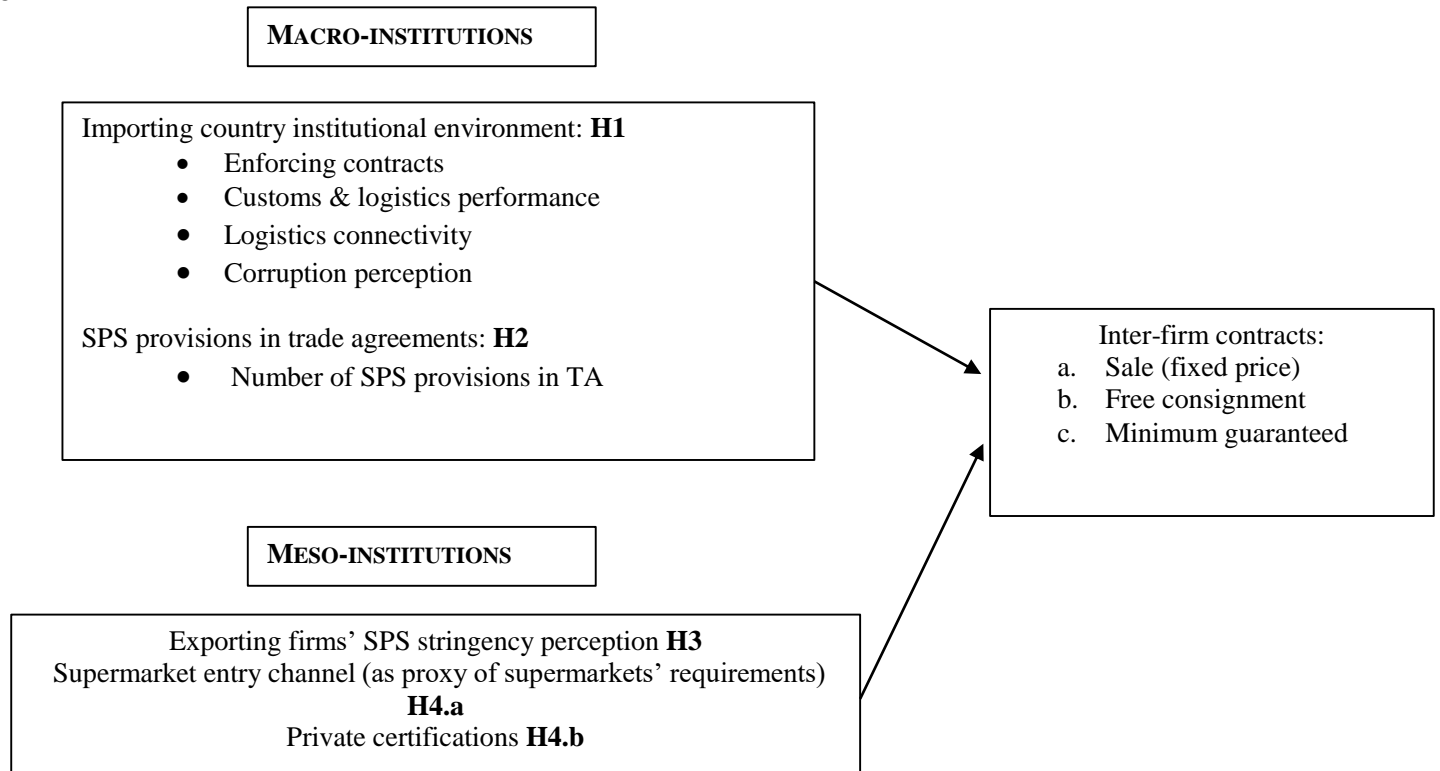
In this study, our primary emphasis is to demonstrate the relation between the institutional uncertainty on the inter-firm contract choice, we also show the effect of temporal specificity where timely performance is critical to the transaction (Masten, 2000). Contracts remain incomplete (Williamson, 1996; Rodrik, 2000) although to differing degrees (Crocker & Masten, 1988; Crocker & Reynolds, 1993). A contract is more complete than another if it provides a more detailed definition of the transaction (Saussier, 2000:192). For products highly sensitive to changes in prices, and to technological and quality uncertainty, the parties tend to leave pricing provisions incomplete (Williamson, 1996; Crocker & Reynolds, 1993; Crocker & Masten, 1988). Crocker & Reynolds (1993) classified procurement contracts by their price provision: firm-fixed price contract, where the price is specified ex-ante with no possibility of ex-post adjustments to prices; and the least complete contract, the "fixed-price incentive successive targets" which allows for ex-post negotiation of prices. Following these authors can argue that a sale contract (fixed price) is more complete than a free consignment (open price) or a guaranteed minimum that is situated between the other two agreements (Pavez & Codron, 2018).

Contracts have both a safeguarding and coordination function (Williamson, 1996; Schepker *et al.*, 2014). In terms of safeguarding, contracts can be used to adapt to uncertain environments through provisions involving to alternative pricing arrangements (Schepker *et al.*, 2014; Mazé, 2002; Crocker & Reynolds, 1993). In the case of fruit trade, a sale contract offers the exporter more protection, because prices are established ex-ante without possibility of ex-post negotiation. In the case of a free consignment, the transaction is done without a settled price at time of shipment with a high degree of information asymmetry as the exporter has little

264 means of verifying the true price at which the product is sold at the destination market, this type  
265 of contract offers the exporters less protection, because when market conditions are  
266 unfavorable, they can find themselves in a situation of liquidation with prices lower than  
267 production costs. A guaranteed minimum price balances the risks between both parties. In terms  
268 of coordination, when transactions are highly uncertain and complex, inter-firm contracts  
269 require higher coordination and control provisions for monitoring whether process or outcomes.  
270 SPS institutions structure the organization of production and supply chain management,  
271 because when suppliers choose, or are chosen by buyers, to serve a market or a customer with  
272 specific SPS requirements, a range of coordination schemes are put into operation:  
273 communication, controls, inspections, certifications. The degree of coordination will depend on  
274 the specificity of the SPS requirements (Codron, et al., 2018).

275         This raises one question: if sale contracts are more complete and offer more ex-ante  
276 protection, why would exporters choose to export by means of free consignments or guaranteed  
277 minimums? In the next section, we try to answer to this question, focusing on the institutional  
278 factors that influence this contractual choice. The model we propose can be summarized as  
279 follows:

280



**Figure 2.** Model of the determinants of export contracts

### 3.1 Environmental uncertainty: weakness, incompleteness and enforceability

From a NEI perspective, the quality of the institutional environment weighs heavily on contract enforceability. All formal and informal institutions contribute to defining the institutional environment, and international transactions are especially sensitive. This is because differences between legal systems make arbitrations and judgments difficult (Morrissey & Graves, 2008), and may affect the recognition of decisions in foreign jurisdictions (Rodrik, 2000; Morrissey and Graves, 2008). According to Williamson (1996), variations in the quality of the institutional environment push economic agents to choose alternative modes of governance, in our case, different inter-firm contracts whereby “two or more partners pool strategic decision rights as well as property rights, while simultaneously keeping distinct ownership over key assets, so that they require specific devices to coordinate their joint activities and arbitrate the allocation of payoffs” (Ménard, 2012:2).

The weakness of institutions makes contracts difficult to enforce. Non-verifiability by a third-party authority, either in court or through arbitration, due to a lack of information concerning the detailed terms agreed by the contracting parties, the bounded rationality of the third-party or a lack of technical knowledge with respect to the transaction could generate acute enforcement problems (Williamson, 1979).

In the same vein, Anderson & Van Wincoop (2004) state that trade costs heavily depend on the efficiency of trade institutions, for instance the efficiency of customs in clearance procedures, transportation and distribution, operational management and human resources capabilities. Weaknesses in trade services expose supply chains to constraints and uncertainties that impact their efficiency. This is especially critical for transactions relating to fresh produce with high temporal specificity, because logistics failings translate into a loss of quality, loss of product value and loss of customers (Pirrong, 1993; Masten, 2000).

Certain informal institutions, such as corruption and even the perception of corruption, negatively affect the functioning of legal systems and, in general, the business context in which transactions occur. Corruption generates substantial costs and creates barriers (Uhlenbruck et al., 2006) or challenges (Cuervo-Cazurra, 2016) to the entry of foreign firms. Consequently, increased environmental uncertainty makes contracts more difficult to enforce (Anderson & Van Wincoop, 2004; Cuervo-Cazurra, 2016), “leaving international transactions hostage to an increased risk of opportunistic behavior” (Rodrik, 2000:1979). On the contrary, when the environment is able to define the sharing of property rights between economic agents precisely and ensure compliance with both this principle of sharing and the conditions for the exchange of these rights, uncertainty and opportunism diminish and trade increases (North, 1981).

The relationship between the degree of reliability of institutional environments and the level of inter-firm contract completeness has been studied by a number of authors (Poppo & Zenger, 2002; Zhou, Poppo & Yang, 2008). Anderson & Van Wincoop (2004) analyzed the

impact of a number of indicators such as economic policies, impartiality, transparency, the efficiency of legal systems in enforcing commercial contracts and tariff/non-tariff barriers on the import flows. Berkowitz, Moenius & Pistor (2004) extended this analysis by including the exporting countries and found that institutions such as property rights protection bodies, tax collection agencies, courts and contract enforcement agencies provide suitable guarantees to exporters and importers and thus increase mutually favorable trade. In their study of U.S. exporters of food products, Antràs & Foley (2015) compare the use of alternative financing terms in contracts, from cash in advance and letter of credit terms, which are more complete, to open account terms, which are less complete. The authors' results show that transactions are more likely to occur with less complete terms when the importer is located in a country benefiting from strong contractual enforcement.

Therefore:

Hypothesis 1: the better the quality of the macro institutional environment at the importing country, the lower the probability of resorting to sale contracts.

### **3.2 Public SPS: macro- and meso-institutional layers**

Taking Ménard (2017) macro- and meso-institutional levels approach into consideration facilitates an understanding of the complexity of the SPS institutions that govern international fresh fruit transactions. International trade agreements, which have an important role in framing cross-border transactions, include provisions related to the general mechanisms that outline the implementation of SPS measures of the WTO. The complexity of SPS matters and the high costs arising from negotiation make it impossible to cover all domestic regulations and to make provision for every contingency. The SPS provisions included in trade agreements are mostly general and apply to the entire agricultural sector (Rigod, 2013; Horn et al., 2010). This echoes



Ménard's assertion (2017) that general rules tend to remain abstract and specific guidelines are required at a meso-institutional level to shape their implementation.

At the meso-institutional level, specific SPS rules are set by countries outside the trade agreements which are, or might be, product-specific to sanitary matters, e.g. food additives, pesticide residues, contaminants, good practices, among others (Codex, 2013); or phytosanitary matters, e.g. pest management, surveillance, risk analysis, import regulations, among others (IPPC, 2012).

The effect of SPS measures on trade has been extensively studied in recent years (Disdier *et al.*, 2008; Jaffee & Henson, 2004; Melo *et al.*, 2014; Swinnen & Vandemoortele, 2011, among others). Empirical evidence for the Chilean case (Engler *et al.*, 2012; Fulponi and Engler, 2013) supports the argument of Jaffee and Henson (2004) that stricter SPS measures are not necessarily an obstacle to trade. From the NIE standpoint, standards play a significant role to facilitated exchanges by reducing the transaction and measurement costs (Mazé, 2017, 2002). Dür *et al.*, (2014) analyzed some 587 agreements in their exhaustive study on the design of international trade agreements. Their findings showed that the more detailed the agreements (e.g. provisions for technical cooperation, harmonization, information exchange on SPS measures under the WTO SPS agreement, harmonization), the higher the rate of growth of trade.

The degree of completeness of SPS provisions in trade agreements signed by Chile varies. Many of them govern the mechanisms of coordination and cooperation between the authorities of both parties to facilitate trade, thereby enhancing the quality of the institutional framework (Fulponi & Engler, 2013). In their study on fruit Chilean exports, Engler *et al.*, (2012) found that the stringency of regulations in SPS importing countries does not necessarily match the stringency perceived by the exporters. For instance, Chilean exporters consider it easier to export to the US rather than to Mexico, even though the US has imposed a higher

number of SPS requirements. This fact is explained by the long-term institutional cooperation and coordination between the US and Chilean authorities and private sector, making the export-import procedures more expeditious and transparent (Engler *et al.*, 2012). This statement is at the core of our analysis. We argue that a higher number of SPS provisions in the international trade agreements signed by Chile does not necessary mean barriers to trade but allows for more transparency concerning the rules of the game, which would thus reduce the level of environmental uncertainty and facilitate contractual relationships between exporters and importers, and reduce transaction costs. Therefore:

Hypothesis 2: The more exhaustive the macro SPS provisions within trade agreements, the lower the probability of resorting to sale contracts.

In contrast, exporters' perceptions of the stringency of requirements imposed by importing countries, which is fed by the associated complexity, reveals the weakness of import procedures and the consequent difficulty in compliance (Engler *et al.*, 2012). We argue that firms tend to protect themselves from this source of environmental uncertainty. Thus,

Hypothesis 3: The more stringent the exporter's perception of SPS meso-institutions at the importing country, the greater the probability of resorting to sale contracts.

### 3.3 Private SPS: meso-institutional layers

Empirical studies have also analyzed the relationship between the distribution channels, or entry channels, and the choice of contracting (John & Weitz, 1988; Buckley & Casson, 1998). In their study on the influence of uncertainty over the choice between direct or indirect distribution channels, John & Weitz (1988) considered that the emergence of behavioral uncertainty is related to the difficulty in assessing the performance of the parties to a contract. The study confirmed econometrically that behavioral uncertainty due to the time-span from

initial contact to order placement increased the probability of relying more on direct channels in order to reduce opportunism.

Exporters normally deal with intermediaries in the importing countries while the direct channel to supermarkets is still in development. Supermarkets have increased their participation in global fresh and vegetable supply chains and their requirements are stricter than the official regulations in terms of quality, labor, food safety and environmental standards (Codron *et al.*, 2005; Mazé, 2002). In order to meet these private standards, supermarkets have started to develop close interactions with year-round domestic and international suppliers (Codron *et al.*, 2005; Berdegué *et al.*, 2005; Gereffi, Humphrey & Sturgeon, 2005; Reardon & Timmer, 2012). Consequently, supermarkets tend to move from spot markets to preferred supplier lists allowing for transaction cost savings in terms of searching (screening and selection of providers), negotiating and coordinating (Reardon *et al.*, 2003; Codron *et al.*, 2005). This major change has resulted in a shift in governance from market to relational governance through the use of renewable annual contracts (Gereffi, Humphrey & Sturgeon, 2005). Therefore,

Hypothesis 4a: The higher the share of direct exports to supermarkets, the greater the probability of resorting to sale contracts.

Hypothesis 4b: Private certifications increase the odds of resorting to sale contracts.

#### 4. Methodology

To test our models, we used two databases. The first database, called Eximfruit (a private database), identifies both parties to the transaction; we used this database to construct a variable to capture direct exports to supermarkets. The second database, obtained from Chilean Customs, contains all shipments sent in 2013<sup>2</sup> by exporting firms and the type of contract used

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<sup>2</sup> We have retained this year because in subsequent years, the number of firms requesting that, for reasons of confidentiality, their identity or that of the customers be replaced by an x or by “To order” has increased.

for each shipment, although the identity of the importer is not provided. In both databases, the names of some firms have been erased or covered: transactions with no identification of the importers were excluded (1,187 observations deleted). The discrepancies between the two databases concerning the identifiers of the exporting firms were resolved manually. Our final sample consists of 151 apple exporters (60% of the Customs database) and 54,387 observations.

We constructed three original indicators: i) the number of provisions related to SPS matters that are included in trade agreements signed by Chile; ii) the channel type, whether the importer is a supermarket or not; and iii) the number of the Chilean exporting firm's private certifications.

#### 4.1.1 **Dependent variable: the choice of contract**

In this study the dependent variable is the type of contract chosen by the exporting firm. It takes the value "1" if the alternative chosen by the exporting firm is a sale contract, "2" for free consignment contract and "3" for minimum guaranteed contract.

#### 4.1.2 **Independent variables: environmental uncertainty**

We measure the quality of the institutional environment using the following indicators: Enforcing contracts, Customs & logistics performance, Logistics connectivity and Corruption perception. Although SPS institutions are also part of the institutional environment, in this study, because of their particular nature, they are tested through separate hypotheses.

*Enforcing contracts* is an indicator taken from the World Bank Doing Business Database, measuring the time and cost for resolving a commercial dispute through the courts and the quality of judicial processes (court organization, case management, court automation and alternative dispute resolution). This indicator is scaled from 0 (lowest performance) to 100 (highest performance). We used the index corresponding to year 2012.

*The customs & logistics performance index* is constructed by the World Bank. It measures the perception of a country's logistics based on six components: i) the efficiency of

customs and border clearance; ii) the quality of the trade and transport infrastructure; iii) the ease of arranging competitively priced shipments; iv) the competence and quality of logistics services; v) the ability to track and trace consignments; and vi) the frequency with which shipments reach consignees within the scheduled or expected delivery times. These components are aggregated to form a single score scaled from 1 (worst performance) to 5 (best performance). We used the index corresponding to year 2012.

*Logistic connectivity* is an index constructed by the United Nations Conference on Trade and Development (UNCTAD). Originally referred to as “liner shipping bilateral connectivity”, the index measures the efficiency of services, the level of competition on transportation services, and connectivity between a dyad of countries A and B (in our case the connectivity between Chile and 154 countries). The index is scaled from 0 (minimum connectivity) to 1 (maximum connectivity). We used the index corresponding to year 2012.

*Corruption perception* is an index constructed by Transparency International. It measures the perception of corruption in the public sector in 176 countries. The score is scaled from 0 to 100, 0 being a country perceived as highly corrupt and 100 a country perceived as very clean. According to the criteria of Transparency International, a score below 50 indicates a serious corruption problem. To facilitate the interpretation of results in our model, we reversed the score so that 100 reflects a high level of corruption and 0 a very clean country and dichotomized this variable to highlight whether the destination country presents a high level of corruption ( $\geq 50$ ) or a lower level of corruption ( $\leq 50$ ). We used the index corresponding to year 2012.

*Number of SPS provisions in trade agreements.* In our study, we fully reviewed each of the 25 agreements signed by Chile until 2013. We counted the number of provisions concerning SPS matters. Because the majority of the agreements signed by Chile establish a global framework, we counted all SPS provisions, except where it was possible to exclude those that

strictly refer to animal health, such as the EU-Chile Association Agreement which includes detailed and clearly separated measures on animal and plant health. Since agreements are each structured differently, we consider that a provision can be a clause, an article or a paragraph.

*Exporting firms' SPS stringency perception* is an index constructed by Engler *et al.*, (2012) and Melo *et al.*, (2014). It measures Chilean exporters' perceptions of the difficulty encountered in fulfilling SPS specific measures with regard to apples, grapes cherries and kiwi fruit in sixteen main importing countries<sup>3</sup>. Exporters from a random sample of firms were asked to assess through a Likert scale the complexity, i.e. monetary and human efforts for complying with the following SPS measures: 1) pest, diseases and weeds regulated, quarantine treatment requirements; 2) tolerance limits for pesticide residues and contaminants; 3) microbiological requirements; 4) labeling, marking and packaging; 5) good agricultural practice requirements, quality standards; and 6) registration procedures (e.g. registration of production sites, export firms). Stringency is scaled from 0 to 7 (7 being the highest level of stringency).

*Supermarket entry channel* measures direct exports to supermarkets. This is a proxy variable because we cannot observe in our databases the private standards required by the supermarkets for each transaction. We extracted the importers' names and identified the type of importers using as reference specialized directories and checked the firms websites. In total, 857 unique importers were identified. Finally, we constructed a binary variable: 1 if the importer was a supermarket and 0 if not. We then calculated the share of exports for each exporter to a supermarket during 2013.

*Firms' SPS private certifications.* We counted the number of certifications that the firms in our sample indicate either on their own website or on other websites. We created a database with each certification by exporting firm then aggregated those related to SPS matters, e.g. those related to food safety and phytosanitary management. GlobalGap and BRC were double-

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<sup>3</sup> USA, Canada, Mexico, Colombia, Brazil, United Kingdom, Netherlands, Spain, Russia, Taiwan, Hong Kong, Japan, China, India, United Arab Emirates and Saudi Arabia.

checked as information on certified firms is available online. Certifications that did not fall within the scope of this study were excluded, e.g. Kosher or social certifications. Official phytosanitary certifications are not included as these are compulsory for export.

## 4.2. Estimation procedure

In this study of contract choice where the outcome is nominal, i.e. the categories are assumed to be unordered, we apply the multinomial logit model (MNL) which is the most frequently used (Long & Freese, 2014). In our multinomial logit regression, the dependent variable is the type of contract chosen by the exporting firm whether sale, free consignment and minimum guaranteed contract. In our sample, apples were exported under sale contracts (57.52%), free consignment agreements (28.16%) and minimum guaranteed agreements (14.32%). The model computes the probability of each alternative (free consignment and minimum guaranteed) compared to the reference outcome  $b$  (in our model a sale contract), which can be written as:

$$\Pr(y = m|x) = \frac{\exp(x\beta_{m|b})}{\sum_{j=1}^J \exp(x\beta_{j|b})}$$

where  $\beta$  is the vector of independent variables.

Tables 1 and 2 present descriptive statistics and a correlation matrix for the variables comprising our models. We excluded the customs & logistic performance variable from the models because it is strongly correlated with the perception of corruption variable insofar as those countries suffering from corruption are less efficient. The Collin Stata test for multi-collinearity showed that dropping the customs & logistic performance variable allows for satisfactory variance inflation factor. Model 3 introduces the indicator developed by Engler et al. (2012) measuring Chilean exporting firms' perceptions of SPS stringency in a sub-sample of 17 destination countries. We dropped variables logistic connectivity and corruption perception to keep a satisfactory VIF.

## 4.3 Independence of irrelevant alternatives and multinomial probit

Multinomial logit models rely on the assumption of independence of irrelevant alternatives (IIA), which states that the odds of one outcome versus another is not influenced by other available options. We tested this assumption with the Hausman-McFadden test and the Small-Hsiao test. The results revealed that the IIA assumption in our multinomial logit models is violated. Although for much of applied settings the IIA property is not particularly relevant (Dow & Endersby, 2004), we re-estimate the MNL models in the previous section with a multinomial probit (MNP) procedure. Probit offers an advantage over MNL in that the MNP relax the IIA assumption. Results in Table 4 show our MNP estimations produce nearly identical results as MNL, with the same signs and the same number of statistically significant coefficients which confirms our results.

**Table 1.** Summary Statistics

Variable	Obs	Mean	Std. dev.	Min	Max	Interpretation
Enforcing contracts	79948	61.65	13.43	34.29	83.61	1 to 100 (best quality)
Customs & logistics performance	68873	3.34	0.53	2.03	4.13	1 to 5 (best performance)
Logistics connectivity	78232	0.40	0.06	0.11	0.48	0 to 1 (maximum connectivity)
Corruption perception	79965	54.47	18.92	13	90	>=50 high; <=50 low corruption
SPS provisions in trade agreements	58749	14.69	7.28	1	24	Higher number-> more complete
Firms' SPS stringency perception	49383	4.52	0.45	3.5	5.8	0 to 7 (highest stringency)
Supermarket entry channel	78588	10.12	12.90	0	84.68	Mean per exporter (%)
Firms' SPS private certifications	80470			0	1	Private certifications (yes/no)



**Table 2.** Chilean apple exports within trade agreements by destination

Signatory country	Enforcing contracts	Customs & logistics performance	Logistic connectivity	Corruption perception	SPS provisions in TA	SPS stringency perception	Apple exports (000 T)	Share of total apple exports (%)
European Union					23		172.2	20.7
- Netherlands	59.9	4.0	0.4	Low		3.4	77.2	9.3
- UK	68.7	3.9	0.4	Low		4.0	26.4	3.2
- Spain	70.0	3.7	0.4	Low		3.6	19.1	2.3
USA	72.6	3.93	0.44	Low	20	3.8	133.5	16.0
Colombia	34.3	2.87	0.42	High	13	4.2	86.1	10.3
Mercosur					6		39.4	4.8
- Brazil	66.0	3.1	0.34	High			35.4	4.7
Peru	60.7	2.94	0.46	High	24		36.4	4.4
Canada	54.4	3.85	0.37	Low	1	3.5	26.0	3.1
China	78.2	3.52	0.48	High	7	4.7	17.1	2.1
India	40.8	3.08	0.35	High	6	2.9	16.5	2.0
Mexico	67.0	3.1	0.5	High	14	5.2	4.4	0.5
Hong Kong	69.1	4.12	0.48	Low	11	3.4	2.9	0.4
Other apple exports within trade agreements							13.4	2.7
Apple exports without trade agreements							116.9	14.1
Total apple exports							823	100

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**Table 3.** Determinants of apple export contracts. Estimates using multinomial logit model

Sale (base outcome)	Model 1		Model 2		Model 3	
	Free consignment	Min. guaranteed	Free consignment	Min. guaranteed	Free consignment	Min. guaranteed
Enforcing contracts	0.020 (0.001)**	0.020 (0.001)**	0.030 (0.001)**	0.058 (0.001)**	0.046 (0.001)**	0.070 (0.002)**
Logistics connectivity	2.830 (0.189)**	2.830 (0.189)**	4.555 (0.274)**	7.360 (0.344)**		
Corruption perception (low)	1.052 (0.024)**	1.052 (0.024)**	1.146 (0.034)**	0.407 (0.041)**		
Number of SPS provisions in TA			0.055 (0.002)**	0.027 (0.002)**	0.114 (0.002)**	0.041 (0.002)**
Exporting firms' SPS stringency perception					-0.502 (0.041)**	-0.679 (0.050)**
Supermarket entry channel			-0.041 (0.001)**	-0.007 (0.001)**	-0.045 (0.001)**	-0.005 (0.001)**
Exporting firms' private certifications			-0.685 (0.030)**	-0.401 (0.038)**	-0.487 (0.035)**	-0.152 (0.044)**
Number of observations		78,196		55191		40609
Model chi-square		14447.00		15118.52		11196.02
Prob > chi2		0.000		0.000		0.000
Pseudo R-squared		0.101		0.154		0.147
Nagelkerke		0.201		0.289		0.285
VIF		1.43		1.43		1.15

Standard errors in parentheses, \*  $p < 0.05$ ; \*\*  $p < 0.01$

544 **Table 4.** Determinants of apple export contracts. Estimates using multinomial probit model

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	<b>Model 1</b>		<b>Model 2</b>		<b>Model 3</b>	
<b>Sale</b> (base outcome)	Free consignment	Min. guaranteed	Free consignment	Min. guaranteed	Free consignment	Min. guaranteed
Enforcing contracts	0.017 (0.001)**	0.044 (0.001)**	0.025 (0.001)**	0.0405 (0.001)**	0.0381 (0.001)**	0.0516 (0.001)**
Logistics connectivity	2.276 (0.143)**	5.615 (0.143)**	3.573 (0.206)**	4.773 (0.001)**		
Corruption perception (low)	0.817 (0.184)**	0.463 (0.194)**	0.884 (0.027)**	0.352 (0.028)**		
Number of SPS provisions in trade agreements			0.041 (0.002)**	0.0236 (0.002)**	0.086 (0.002)**	0.036 (0.002)**
Exporting firms' SPS stringency perception					-0.4704 (0.319)**	-0.569 (0.035)**
Supermarket entry channel			-0.03 (0.001)**	-0.005 (0.007)**	-0.033 (0.001)**	-0.004 (0.002)**
Exporting firms' private certifications			-0.568 (0.023)**	-0.295 (0.023)**	-0.402 (0.027)**	-0.114 (0.004)**
Number of observations		78,196		55,191		40,609
Wald chi-square		12350.3		12765.7		9146.61
Prob > chi2		0.000		0.000		0.000

Standard errors in parentheses, \*  $p < 0.05$ ; \*\*  $p < 0.01$

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## 5. Results

Table 1 shows that the standard deviations and ranges of the enforcing contract index, the corruption perception, the SPS stringency perception imply the large variability across the importing countries in terms of institutional quality. Direct exports to supermarkets had a mean of 10.12 and standard deviation of 12.90 ranged from 0 to 85 which also indicates a large variation. Concerning the SPS private certifications, 79% of the shipments in our sample were sent by certified firms.

Furthermore, there are two salient aspects to highlight. First, the number of SPS provisions included in trade agreements signed by Chile range from 1 to 24 (table 1 and 2). Agreements with Peru, the European Union and US include higher numbers of SPS provisions, while agreements with Bolivia, Venezuela and Canada<sup>4</sup> include only one provision. Trade agreements with higher number of provisions, e.g. Peru, USA and EU, establish more detailed procedural provisions to improve transparency and efficiency, e.g. enquiry and notification points for information exchange, export-import checks and inspections processes, statutory certifications attesting to the agreed standards and requirements, among others. Also, coordination mechanisms, like bilateral committees on SPS matters to enhance mutual understanding on measures and regulatory processes. These committees coordinate technical cooperation programs and establish ad hoc working groups to deal with specific issues. They are comprised by official representatives from regulatory agencies or ministries with responsibility for the development, implementation and enforcement of SPS measures. The parties agree on the dispute settlement mechanisms within the frame of the WTO's system, and bilateral procedures to resolve through friendly consultations and negotiations on the basis of technical evidence, any controversy arising under the agreement. As of the date of this study,

<sup>4</sup> The agreement with Canada has been renegotiated. In 2015, an amendment included a chapter on sanitary and phytosanitary measures, as well as technical measures. These modifications, scheduled for implementation during 2016, had not been made public by the time of this study and do not fall within the time period of analysis.

Chile is not involved, neither as respondent nor as complainant, in any dispute concerning SPS issues at the WTO. SPS problems has been solved bilaterally, for example, in 2015 Vietnam suspended imports of Chilean table grapes, apples, cherries and kiwifruit due to fruit fly outbreaks. The resolution of this crisis was achieved through technical and diplomatic actions by the national authorities of both parties, i.e. on-site visits to evaluate the Chilean plant protection system. Second, the corruption perceptions index (in its continuous form) and logistics performance index are highly correlated, (Table 3). This is because countries with high score of corruption tend to be the same with limited coordination on border procedures and customs controls, and other logistics services.

Our estimates are reported in Table 4 and results among models are consistent. Model 1 displays the results for the entire sample (exports to 64 destination countries), introducing the macro-level variables that create a good institutional environment in the importing country. (Table 4). Model 2 is the most complete, testing the macro-environmental variables and the meso-variables concerning SPS matters, both official and private. All independent variables are significant at ( $p < .0001$ ). The enforcing contracts variable is positive, meaning that when the quality of the legal institutions in the importing country is better exporters are more likely to choose a consignment or minimum guaranteed agreement rather than a sale contract. The variable measuring logistic connectivity is positive and significant for free consignments relative to sale contracts and for minimum guaranteed agreements relative to exporting by means of sale contracts, this means that a better logistic connectivity reduces the risks linked to the temporal specificity of perishable products. A low perception of corruption in the public sector of the importing country is positive, meaning that exporters are more likely to choose free consignments or minimum guaranteed agreements than sale contracts when exporting to countries not affected by corruption, these results support the hypothesis 1, that the higher the quality of the macro institutional environment, the lower the probability of resorting to more

complete contracts. With regard to SPS institutions, the variable measuring the number of SPS provisions within trade agreements signed by Chile is positive. This means that as the number of provisions increases, apple shipments are more likely to be exported by means of free consignment or minimum guaranteed agreements than by means of a sale contract, which provides support for hypothesis 2, the more exhaustive the macro SPS provisions within trade agreements, the lower the probability of resorting to more complete contracts.

Model 3 shows that the higher the exporters' perceptions of stringency by Engler et al. (2012) with regard to SPS requirements at the importing country, the less likely they are to resort to free consignment or minimum guaranteed arrangements than sale contracts. This supports hypothesis 3, the more stringent the exporter's perception of SPS meso-institutions, the greater the probability of resorting to more complete contracts.

Finally, models 2 and 3 consistently show that firms exporting directly to supermarkets and firms with private certifications (mainly GlobalGap, HACCP, British Retail Consortium (BRC), ISO, International Featured Standards (IFS), and supermarket certifications (Tesco, Walmart, among others) are more likely to call on sale contracts, a fact which supports hypotheses 4a and 4b stating that the higher the share of direct exports to supermarkets, the greater the probability of resorting to more complete contracts. And in the same direction, private certifications increase the odds of resorting to more complete contracts. Although not reported in this paper, we also estimated a model including only exports to low-corruption importing countries. The estimates corroborated our results, i.e. even in good environments, exporting directly to supermarkets increases the probability of calling on more complete contracts.

## 6. Discussion

The effect of SPS institutions on trade has been extensively studied in recent years (Disdier *et al.*, 2008; Jaffee & Henson, 2004; Melo *et al.*, 2014; Swinnen & Vandemoortele,

2011, among others). Empirical studies have led to alternative interpretations: non-tariff measures are seen alternately as barriers to trade or trade catalysts. The main reasoning for interpreting them as disguised barriers is that they would act as a new form of protectionism in favor of domestic production over external competition (Swinnen & Vandemoortele, 2011). The limit of this perspective is that a broad spectrum of non-tariff measures, especially environmental and sanitary standards, seeks to protect consumers regardless of whether the production is domestic or foreign. Consequently, these measures may hit domestic firms and increase imports (Swinnen & Vandemoortele, 2011). On the other hand, standards can be viewed as trade catalysts when develop capacities to comply with strict standards and achieved the linkage with high-value global supply chains (Jaffee & Henson, 2004; Maertens, & Swinnen, 2009).

This paper outlines the effect of SPS institutions on export-import contracts of Chilean apples. Chilean exporters consider easier to comply with countries with stricter SPS requirements, such as the US, than other countries, e.g. Mexico (Engler *et al.*, 2012). Our explanation is that the business environment is better in the US because of a lower perception of corruption of the public services, better logistics performance and better enforceability of contracts. Poor institutional environments in the importing countries weaken the enforceability of inter-firm contracts and the efficacy of trade and SPS services. As supply chains for perishable products are time-specific with an acute risk of the emergence of opportunistic behavior, exporters protect themselves using more complete contracts that involve less risk for them, echoing the findings of Anderson & Van Wincoop (2001), Antras & Foley (2015), Pavez & Codron (2018). In these circumstances, the function of the contract is more that of a safeguard device (Williamson, 1996). However, this raises another question: why are firms exporting directly to supermarkets more likely to use more complete contracts? Our explanation is that contracts also serve a coordinating function (Schepker *et al.*, 2014). Although exporters in the

Chilean case study deal mainly with traditional importers, such as wholesalers and brokers, supermarkets have increased direct procurement and impose more complete contracts with stricter and more detailed quality and sanitary requirements (Reardon, & Timmer, 2012; Pavez & Codron, 2018). This can explain the higher probability of exporters dealing with supermarkets calling on sale contracts, which is consistent with results by Mazé (2002), and Fulponi (2006) on the changes in retailers' contract design including certifications and control provisions over the quality specifications in response to sanitary crisis.

These findings have key implications: SPS issues are of high importance for developing countries. Policy makers can improve institutions to facilitate trade and create a favorable business environment. Institutions are embedded in multiple layers. On the one hand there is the macro-level where rules and standards create a general environment surrounding all transactions, i.e. the SPS chapters in international trade agreements in which the signatories decide the institutional mechanisms for coordinating, monitoring and arbitrating in the eventuality of phytosanitary and sanitary problems. On the other hand, there is also a meso-level where more specific rules governing specific transactions of products, services or resources are set (Ménard, 2017). In our case, these are specific SPS requirements that lead to decisions being taken to adapt production and coordination within the supply chain (Stephens *et al.*, 2018). We agree with Jaffe and Henson (2005), Maertens & Swinnen (2009), Engler *et al.*, (2012), and Berkowitz *et al.*, (2004) that SPS measures do not necessarily have a negative impact on trade if exporting countries can develop their capacities to meet these requirements. Finally, our findings show the dual function of inter-firm contracts both as a safeguard mechanism to protect transactions against opportunism hazards coming out of opportunism in uncertain institutional environments and as a means of coordination to foster adaptation (North, 1981; Williamson, 1979; Ménard, 2012; Schepker *et al.*, 2014) to changing market demands and the buyers' specific quality and sanitary requirements (Codron, *et al.*, 2005; Berdegué *et*



al., 2005; Gereffi, Humphrey & Sturgeon, 2005; Reardon & Timmer, 2012; Pavez & Codron, 2018).

## 7. Conclusion

Drawing on institutional economics, this paper tests the effect of biosecurity institutions, i.e. SPS macro- and meso-institutions and their link with the inter-firm contractual choice. We test our models using the Chilean case of fresh apple exports. The results of our econometric analysis show that exporters resort to less complete and more flexible contracts, when exporting to countries that have favorable and safe business environments. We found that the same scenarios apply when the SPS provisions established in international trade agreements are more exhaustive: this could mean that clear rules make an environment less uncertain. On the contrary, when firms have a perception of corruption in the importing countries and a perception of stringent SPS requirements because trade procedures are not clear and reliable, exporters tend to protect themselves through more complete contracts. We consider that this demonstrates that more complete SPS provisions in trade agreements should not necessarily be interpreted as major obstacles to trade because they may signal stronger institutional frameworks that reduce environmental uncertainty in the importing countries. In contrast, corruption constitute a more important trade barrier than non-tariff measures. We also found evidence confirming the dual function of contracts both as a safeguard and as a coordination tool to export to customers with demanding sanitary and phytosanitary requirements as supermarkets.

**Acknowledgements:** The research leading to this paper has received funding from the French National Research Agency (ANR) under the project Sustain'Apple (2014-2018). We are grateful for comments from presentations at the 2018 conferences: "Coping with risks in agriculture: What challenges and prospects?" in Paris (France); and "8th Annual Academy of International Business-Latin America Chapter Conference", Buenos Aires, Argentina. We are grateful to Claude Ménard, Liesbeth Dries and Anthony Langlais for their comments and suggestions. We are also grateful to the reviewers whose comments and criticisms helped us further refine our paper.

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