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

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6

7 Abstract :

8 Biosecurity regulations and standards govern international agricultural inter-firm transactions.

9 Drawing mainly on new institutional economics, our study offers insights into the institutional

10 factors, at both the macro and meso levels, that influence the choice of inter-firm contracts for

11 Chilean apple exports. First and foremost, it examines the influence of the Sanitary and

12 Phytosanitary (SPS) provisions included in trade agreements signed by Chile with its trade

13 counterparts on the choice of alternative contracts displaying different degrees of

14 completeness. It also focuses on the institutions in the importing countries, the legal

15 institutions enforcing contracts, the efficiency of logistics and the effect of hidden informal

16 rules such as corruption, on the choice between free consignment, minimum guaranteed and

17 sale contracts. We also explore the private institutions, primarily linked to direct imports by

18 supermarkets. The results of our econometric analysis show that less complete contracts, i.e.

19 free consignment and minimum guaranteed arrangements, are chosen when exporting to

20 countries with safe business environments and higher number of SPS provision in

21 international trade agreements. On the contrary, when exporting to non-reliable countries,

22 exporters tend to protect themselves through more complete contracts, i.e. sale contracts. We

23 found evidence that direct exports to supermarkets are more prone to occur under sale

24 contracts which suggest the dual function of contracts, both as a safeguard and as a

25 coordination tool to adopt specific customers' requirements.

26

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*.,

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51　2005; Gereffi, Humphrey & Sturgeon, 2005; Reardon & Timmer, 2012; Swinnen & Maertens,

52　2007), the effect of institutional changes concerning quality and food safety on supply chain

53　governance (Berdegué *et al*., 2005; Fulponi, 2006), and on the inter-firm contract formalization

54　and design (Mazé, 2002). The contribution of our paper is twofold. First, to the academic

55　literature because the relationship between SPS institutions, as those negotiated through

56　international trade agreements, and the inter-firm transactions is, to the best of our knowledge,

57　absent from this literature. Second, our approach of SPS institutions is more systematic because

58　we take into consideration both sanitary institutions to protect human health, e.g. food safety,

59　and phytosanitary institutions related to plant health, eg. measures to avoid the spread of plant

60　pests through trade. This is important because it has management implications for growers,

61　exporters and other actors of the supply chains.

62　　　　In light of the topic studied, the main body of references explored here is that of the

63　New Institutional Economics (NEI). In the Northian tradition, institutions affect the adjustment

64　among alternative modes of the governance and formal institutions aim at reducing the

65　uncertainty surrounding the exchange of goods while minimizing transaction costs (North,

66　1990; Williamson, 1996; Ménard, 2017). Williamson's work on contractual governance, which

67　we also explore in this study, demonstrates the interaction between the institutional

68　environment, the governance of transactions, i.e contracts, and the individual level

69　(Williamson, 1996:223). If an institutional environment is deemed to be given, transaction costs

70　theory (Williamson, 1996) is most often called on. However, if the institutional environment

71　changes (over time or in space) and becomes a major source of risks for international

72　transactions, the institutional approaches implemented are more comparative (North, 1990,

73　1991). We also resort to agricultural and food systems literature on the relation between

74　institutions and the governance of economic actors. Recent studies explore the role of food

75　safety, quality, social and environmental standards in shaping the evolution of agri-food

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76   systems (Ericksen *et al*., 2010; Fulponi, 2006). The effect of power domestic and global food

77   chains on decision making and control over production and control decisions of firms' on food

78   quality at the stages of production, processing and trade (Waterlander *et al*., 2018; Stephens *et*

79   *al.*, 2018; Ericksen *et al.*, 2010).

80   Our study offers insights into the institutional factors, at both the macro and meso levels,

81   that influence the choice of inter-firm contracts for Chilean apple exports. First and foremost,

82   it examines the influence of the SPS provisions included in trade agreements signed by Chile

83   with trade counterparts, and the background institutions in the importing country, the

84   enforceability of contracts (Morrissey & Graves, 2008, Rodrik, 2000, North, 1981), the level

85   of corruption (Cuervo-Cazurra, 2016), the efficiency of the logistics services (Pirrong, 1993;

86   Masten, 2000) and official and private meso institutions (Ménard, 2012, 2017), primarily linked

87   to direct imports by supermarkets, on the choice of alternative contracts displaying different

88   degrees of completeness (Pavez & Codron, 2018). This case study is particularly interesting in

89   that long-distance exports of perishable products are characterized by a high level of price and

90   quality uncertainty and pose acute inter-firm coordination risks; and in that Chile, a major fruit

91   trade player, has developed one of the most dynamic trade agreement negotiating processes in

92   the world (Stallings, 2009; Fulponi & Engler, 2013).

93
94   Calling on non-declaratory micro-data, our paper provides a quantitative analysis

95   testing. This type of quantitative analysis is, to the best of our knowledge, rare in academic

96   literature. It has been made possible by i) access to a customs database providing contract data

97   for all apple transactions conducted by Chilean exporters around the world; and ii) access to

98   another transactions database identifying the name of the exporters' customers and, through in-

99   depth online research, the nature of these customers (supermarkets or conventional importers).

100   Our results show that a higher number of SPS provisions within trade agreements makes

101   the rules clearer and reduces uncertainty in the institutional environment, with firms

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102 consequently tending to resort to less complete contracts, i.e consignment contracts, in which

103 prices are not established ex-ante. In contrast, as the level of corruption in the importing country

104 increases, risks with regards to whether and how rules are interpreted and enforced increases

105 (Cuervo-Cazurra, 2016) and compliance with SPS institutions becomes more complex, firms

106 must protect themselves through more complete contracts by fixing the price before exporting,

107 i.e. sale contract. We also observe that firms exporting directly to supermarkets are also more

108 likely to call on more complete contracts, a fact which reveals the coordination function of

109 contracts (Schepker *et al.*, 2014; Williamson, 1996; Mazé, 2002).

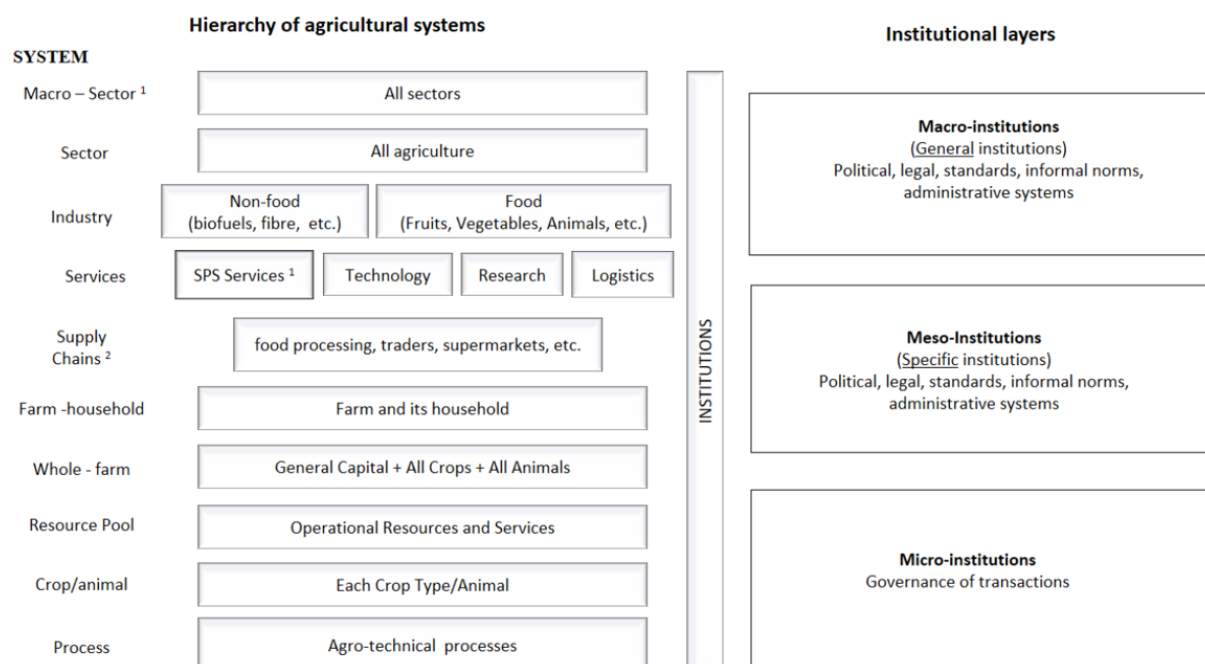110 **2. Conceptual background**

111
112 Within the agricultural research community that apply the NEI and Agricultural Systems

113 approaches, it is well acknowledged that the combination of natural, socioeconomic and

114 institutional factors, among others, is source of complexity affecting the governance within the

115 agrifood sector (Ericksen *et al.*, 2010; Fulponi, 2006; Jaffee, 1992; Masten, 2000; Ménard,

116 2018; Stephens *et al.*, 2018; Waterlander *et al.*, 2018). The effectiveness of an economic system

117 strongly depends on how actors conduct their activities and how the process of exchange is

118 governed (Coase,1937).

119 The NEI literature addresses the governance choice using mainly two complementary branches

120 of research: North's work on institutional analysis of the background conditions that provide

121 the framework for transactions, and the second branch, led by Williamson, is predominantly

122 concerned with, the governance of contractual relations (North, 1990; Williamson, 1979,1996).

123 Trade interactions are subject to transactions costs, e.g. searching, price discovering,

124 negotiation and enforcement costs, and as Coase (1937) asserts "when it is costly to transact,

125 institutions matter". The term institution is extensive used in several disciplines, as economics,

126 sociology, politics, geography, and there is no unanimity in the definition of the concept

127 (Hodgson, 2006). In this article we adhere to North's definition: "Institutions are the rules of

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128   the game in society or, more formally, are the humanly devised constraints that shape human

129   interaction. In consequence they structure incentives in human exchange, whether political,

130   social, or economic" (North, 1990, p. 3). Institutions can be formal, when enforceable by a third

131   legal party, as property rights, polity, judiciary and bureaucracy (North, 1981; North, 1990;

132   Anderson & Van Wincoop, 2004) or informal, such as customs, norms, beliefs, sanctions,

133   taboos, traditions, codes of conduct, traditions and religion (North, 1991; Williamson, 2000).

134   Although, NEI literature operates mostly at the level of governance and at the institutional

135   environment of formal institutions (Williamson, 2000). Williamson agrees with North (1991)

136   in that informal institutions have a persistent influence on economies, e.g. corruption can be

137   severely problematic and undermine the respect of formal rules and limit the effectiveness of

138   law enforcement (Williamson, 2000). As posed by Hodgson, the dividing line between formal

139   and informal institutions is difficult because formal institutions depend on the informal ones in

140   order to operate (Hodgson, 2006).

141   Williamson's work acknowledges that the governance of contractual relations does not occur

142   in isolation, it varies with the context defined by the institutional environment (Williamson,

143   1996). Williamson proposes an institutional layer scheme that shows the interaction at three

144   levels: (i) the institutional environment (the rules of the game); (ii) the governance (the play of

145   the game), and (iii) the individual level (Williamson, 1996, p. 223). Menard's work in

146   institutional analysis and governance applied to agricultural and other specific sectors is rich in

147   lessons (Ménard, 2018, 2017, 2012). Building mainly on North (1990, 1991), Williamson

148   (1996, 2000), the author apprehends the functioning of institutions, both formal or informal, as

149   a system constituted by layers. This is much in line with Williamson three-level institutional

150   layer schema (Williamson, 1996), and with Hodgson's definition of institutions as "integrated

151   systems of rules that structure social interactions" (Hodgson, 2015). Ménard (2017)

152   disentangles institutions in three levels: the macro-level, where general institutions are defined,

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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.

Figure 1. Hierarchy of agricultural systems and institutional layers.

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

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[1] "SPS Agreement" of the World Trade Organization (WTO), the bilateral trade agreements signed between countries or economic regions that include SPS

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[1] 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

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188 provisions or clauses; the country or product specific SPS regulations and private standards;

189 and, (c) the existence of multiple uses or users of the resources with potentially conflicting

190 goals. While sanitary institutions seek to protect human health, e.g. food safety, phytosanitary

191 institutions aim at protecting plant health, e.g. specific treatments to control plant diseases. Par

192 example. the use of plant protection pesticides at the farm level, may have detrimental effects

193 on human health and environment.

194

2.1 Research context
195
196

Chile case
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198   Some 94% of Chile's exports are governed by trade agreements (Direcon, 2015). The

199 country opened to international competition in the mid-70s. Structural reforms were

200 implemented such as the reduction of state intervention, e.g. the liberalization of land, labor and

201 transport markets, coupled with the empowerment of the private sector and policies promoting

202 exports (Stallings, 2009). Export logistics services were modernized and the performance of

203 the cargo handling capacity was improved. Furthermore, in addition to agricultural

204 improvements, the country opted to align the public-private capacities on SPS matters with the

205 very highest standards on a wide variety of markets (Engler *et al.*, 2012). Nowadays, Chile is

206 the southern hemisphere's largest exporter of fruit (USD 4,000 million). Apples and grapes are

207 the main products, accounting for over 59 percent of fresh fruit exports from the southern

208 hemisphere. Exports are shipped to more than 100 countries, the main markets being the US

209 (USD 1,472 million), China (USD 415 million), Netherlands (USD 415 million) and the United

210 Kingdom (USD 187 million) (Odepa, 2015). Interestingly, these main markets impose the most

211 stringent SPS measures. For example, the US has 90 restricted pests, 154 restricted diseases

212 and 95 restricted weeds, followed by China with 11 restricted pests. In terms of sanitary

213 protection rules, in particular relating to maximum residue limits, the most severe are the

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214   countries of the European Union. In these countries, official requirements and supermarkets'

215   private standards are both more stringent than the levels and numbers of regulated pesticides

216   established by the Codex standard of the World Trade Organization (WTO) (Engler *et al.*,

217   2012).

218   Price volatility and the resulting difficulty to anticipate the market prices, compounded

219   by environmental uncertainty and the difficulty in measuring and maintaining the quality of

220   perishable products throughout long-distance supply chains, play a key role in the design of

221   contracts in the fruit trade. Chilean fruit exports are governed by three main types of export

222   contracts: a) <u>sale with fixed price contract</u>, under which the importer takes possession of the

223   goods at the time of the sale, or at delivery when special conditions are required. The price of

224   the goods is fixed at the time of the sale which is concluded before the goods are shipped abroad;

225   b) <u>guaranteed minimum</u>, whereby the parties agree on a minimum price while maintaining the

226   possibility of improving the price after the sale on the destination market; and c) <u>free</u>

227   <u>consignment</u>, where the price of the good is left open and the exporter discovers the price after

228   the sale. The usual main clauses of these contracts are: product, quality, quantity, date and terms

229   of delivery, terms of payment. It is necessary to mention that the same importer, e.g. wholesaler,

230   product manager or supermarket, can alternatively use the three types of contracts as part of

231   their commercial strategy.

232   In accordance with transaction cost theory (TCT), The alternatives modes of governance

233   can be hierarchical, where transactions occur within the firm boundaries, or hybrids where

234   transactions occur between separate firms, e.g. inter-firm contracts, alliances, joint-ventures,

235   among others, or markets, in which the parties to a contract are independent, and identity does

236   not matter. The choice of governance depends on the transaction characteristics: asset

237   specificity arising when investments cannot be redeployed to alternative uses or users, the

238   frequency in which transactions occurs, and the uncertainty that may arise from the institutional

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239   environment or from the transacting parties' behavior (Williamson, 1996). The transaction

240   hazards increase with the assets specificity, whether physical, human, site-specific, dedicated

241   assets, brand, and temporal specificity.

242   In this study, our primary emphasis is to demonstrate the relation between the

243   institutional uncertainty on the inter-firm contract choice, we also show the effect of temporal

244   specificity where timely performance is critical to the transaction (Masten, 2000). Contracts

245   remain incomplete (Williamson, 1996; Rodrik, 2000) although to differing degrees (Crocker &

246   Masten, 1988; Crocker & Reynolds, 1993). A contract is more complete than another if it

247   provides a more detailed definition of the transaction (Saussier, 2000:192). For products highly

248   sensitive to changes in prices, and to technological and quality uncertainty, the parties tend to

249   leave pricing provisions incomplete (Williamson, 1996; Crocker & Reynolds, 1993; Crocker &

250   Masten, 1988). Crocker & Reynolds (1993) classified procurement contracts by their price

251   provision: firm-fixed price contract, where the price is specified ex-ante with no possibility of

252   ex-post adjustments to prices; and the least complete contract, the "fixed-price incentive

253   successive targets" which allows for ex-post negotiation of prices. Following these authors can

254   argue that a sale contract (fixed price) is more complete than a free consignment (open price)

255   or a guaranteed minimum that is situated between the other two agreements (Pavez & Codron,

256   2018).

257   Contracts have both a safeguarding and coordination function (Williamson, 1996;

258   Schepker *et al.,* 2014). In terms of safeguarding, contracts can be used to adapt to uncertain

259   environments through provisions involving to alternative pricing arrangements (Schepker *et al.*,

260   2014; Mazé, 2002; Crocker & Reynolds, 1993). In the case of fruit trade, a sale contract offers

261   the exporter more protection, because prices are established ex-ante without possibility of ex-

262   post negotiation. In the case of a free consignment, the transaction is done without a settled

263   price at time of shipment with a high degree of information asymmetry as the exporter has little

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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
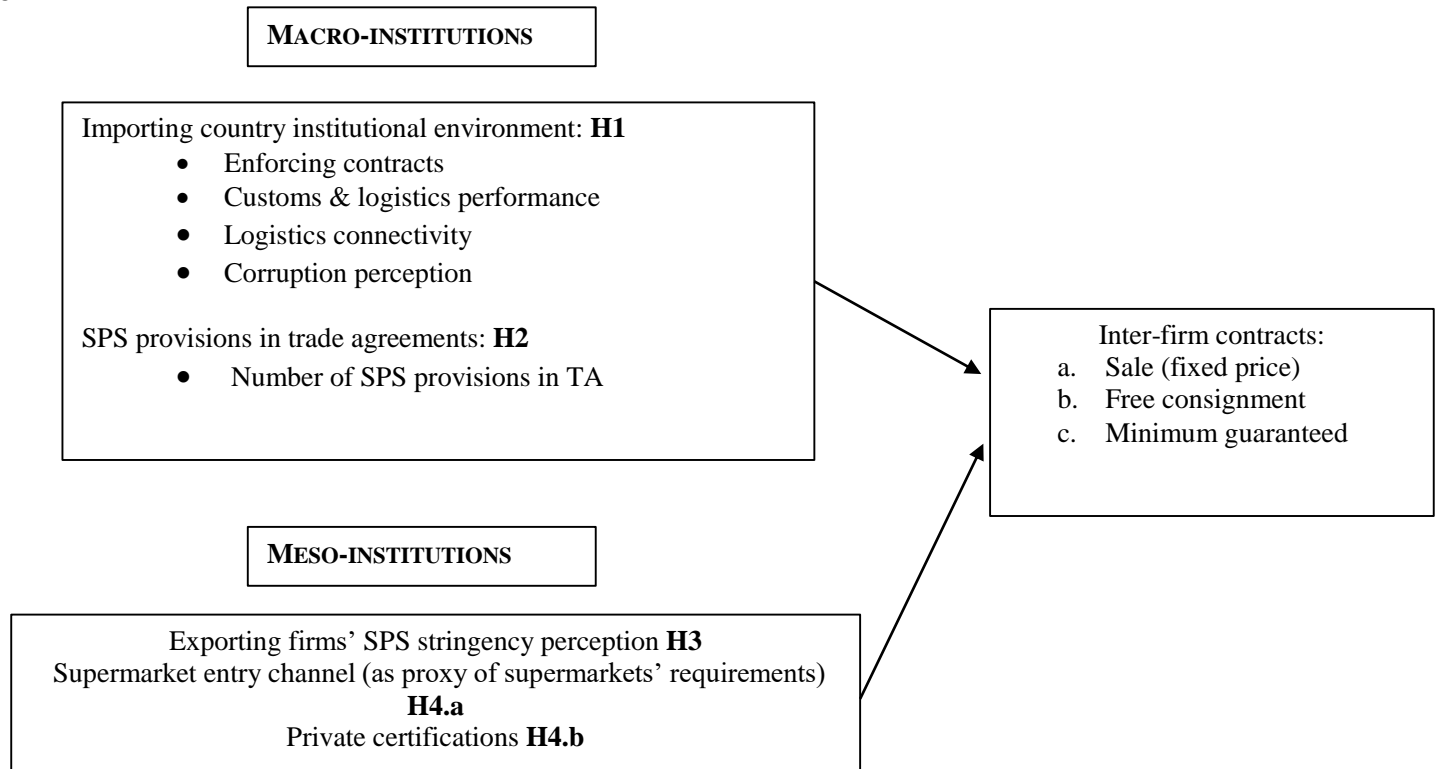
279　follows:

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MACRO-INSTITUTIONS

Importing country institutional environment: **H1**
- Enforcing contracts
- Customs & logistics performance
- Logistics connectivity
- Corruption perception

SPS provisions in trade agreements: **H2**
- Number of SPS provisions in TA

Inter-firm contracts:
a. Sale (fixed price)
b. Free consignment
c. Minimum guaranteed

MESO-INSTITUTIONS

Exporting firms' SPS stringency perception **H3**
Supermarket entry channel (as proxy of supermarkets' requirements) **H4.a**
Private certifications **H4.b**

282
283 **Figure 2**. Model of the determinants of export contracts
284

285 **3.1 Environmental uncertainty: weakness, incompleteness and enforceability**
286

287 From a NEI perspective, the quality of the institutional environment weighs heavily on

288 contract enforceability. All formal and informal institutions contribute to defining the

289 institutional environment, and international transactions are especially sensitive. This is

290 because differences between legal systems make arbitrations and judgments difficult

291 (Morrissey & Graves, 2008), and may affect the recognition of decisions in foreign jurisdictions

292 (Rodrik, 2000; Morrissey and Graves, 2008). According to Williamson (1996), variations in

293 the quality of the institutional environment push economic agents to choose alternative modes

294 of governance, in our case, different inter-firm contracts whereby "two or more partners pool

295 strategic decision rights as well as property rights, while simultaneously keeping distinct

296 ownership over key assets, so that they require specific devices to coordinate their joint

297 activities and arbitrate the allocation of payoffs" (Ménard, 2012:2).

13

298   The weakness of institutions makes contracts difficult to enforce. Non-verifiability by a

299   third-party authority, either in court or through arbitration, due to a lack of information

300   concerning the detailed terms agreed by the contracting parties, the bounded rationality of the

301   third-party or a lack of technical knowledge with respect to the transaction could generate acute

302   enforcement problems (Williamson, 1979).

303   In the same vein, Anderson & Van Wincoop (2004) state that trade costs heavily depend

304   on the efficiency of trade institutions, for instance the efficiency of customs in clearance

305   procedures, transportation and distribution, operational management and human resources

306   capabilities. Weaknesses in trade services expose supply chains to constraints and uncertainties

307   that impact their efficiency. This is especially critical for transactions relating to fresh produce

308   with high temporal specificity, because logistics failings translate into a loss of quality, loss of

309   product value and loss of customers (Pirrong, 1993; Masten, 2000).

310   Certain informal institutions, such as corruption and even the perception of corruption,

311   negatively affect the functioning of legal systems and, in general, the business context in which

312   transactions occur. Corruption generates substantial costs and creates barriers (Uhlenbruck et

313   al., 2006) or challenges (Cuervo-Cazurra, 2016) to the entry of foreign firms. Consequently,

314   increased environmental uncertainty makes contracts more difficult to enforce (Anderson &

315   Van Wincoop, 2004; Cuervo-Cazurra, 2016), "leaving international transactions hostage to an

316   increased risk of opportunistic behavior" (Rodrik, 2000:1979). On the contrary, when the

317   environment is able to define the sharing of property rights between economic agents precisely

318   and ensure compliance with both this principle of sharing and the conditions for the exchange

319   of these rights, uncertainty and opportunism diminish and trade increases (North, 1981).

320   The relationship between the degree of reliability of institutional environments and the

321   level of inter-firm contract completeness has been studied by a number of authors (Poppo &

322   Zenger, 2002; Zhou, Poppo & Yang, 2008). Anderson & Van Wincoop (2004) analyzed the

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323   impact of a number of indicators such as economic policies, impartiality, transparency, the

324   efficiency of legal systems in enforcing commercial contracts and tariff/non-tariff barriers on

325   the import flows. Berkowitz, Moenius & Pistor (2004) extended this analysis by including the

326   exporting countries and found that institutions such as property rights protection bodies, tax

327   collection agencies, courts and contract enforcement agencies provide suitable guarantees to

328   exporters and importers and thus increase mutually favorable trade. In their study of U.S.

329   exporters of food products, Antràs & Foley (2015) compare the use of alternative financing

330   terms in contracts, from cash in advance and letter of credit terms, which are more complete, to

331   open account terms, which are less complete. The authors' results show that transactions are

332   more likely to occur with less complete terms when the importer is located in a country

333   benefiting from strong contractual enforcement.

334   Therefore:

335   Hypothesis 1: the better the quality of the macro institutional environment at the

336   importing country, the lower the probability of resorting to sale contracts.

337

338   **3.2 Public SPS: macro- and meso-institutional layers**

339   Taking Ménard (2017) macro- and meso-institutional levels approach into consideration

340   facilitates an understanding of the complexity of the SPS institutions that govern international

341   fresh fruit transactions. International trade agreements, which have an important role in framing

342   cross-border transactions, include provisions related to the general mechanisms that outline the

343   implementation of SPS measures of the WTO. The complexity of SPS matters and the high

344   costs arising from negotiation make it impossible to cover all domestic regulations and to make

345   provision for every contingency. The SPS provisions included in trade agreements are mostly

346   general and apply to the entire agricultural sector (Rigod, 2013; Horn et al., 2010). This echoes

15

347   Ménard's assertion (2017) that general rules tend to remain abstract and specific guidelines are

348   required at a meso-institutional level to shape their implementation.

349   At the meso-institutional level, specific SPS rules are set by countries outside the trade

350   agreements which are, or might be, product-specific to sanitary matters, e.g. food additives,

351   pesticide residues, contaminants, good practices, among others (Codex, 2013); or phytosanitary

352   matters, e.g. pest management, surveillance, risk analysis, import regulations, among others

353   (IPPC, 2012).

354   The effect of SPS measures on trade has been extensively studied in recent years

355   (Disdier *et al.*, 2008; Jaffee & Henson, 2004; Melo *et al.*, 2014; Swinnen & Vandemoortele,

356   2011, among others). Empirical evidence for the Chilean case (Engler *et al*., 2012; Fulponi and

357   Engler, 2013) supports the argument of Jaffee and Henson (2004) that stricter SPS measures

358   are not necessarily an obstacle to trade. From the NIE standpoint, standards play a significant

359   role to facilitated exchanges by reducing the transaction and measurement costs (Mazé, 2017,

360   2002). Dür *et al.*, (2014) analyzed some 587 agreements in their exhaustive study on the design

361   of international trade agreements. Their findings showed that the more detailed the agreements

362   (e.g. provisions for technical cooperation, harmonization, information exchange on SPS

363   measures under the WTO SPS agreement, harmonization), the higher the rate of growth of

364   trade.

365   The degree of completeness of SPS provisions in trade agreements signed by Chile

366   varies. Many of them govern the mechanisms of coordination and cooperation between the

367   authorities of both parties to facilitate trade, thereby enhancing the quality of the institutional

368   framework (Fulponi & Engler, 2013). In their study on fruit Chilean exports, Engler *et al.*,

369   (2012) found that the stringency of regulations in SPS importing countries does not necessarily

370   match the stringency perceived by the exporters. For instance, Chilean exporters consider it

371   easier to export to the US rather than to Mexico, even though the US has imposed a higher

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372   number of SPS requirements. This fact is explained by the long-term institutional cooperation

373   and coordination between the US and Chilean authorities and private sector, making the export-

374   import procedures more expeditious and transparent (Engler *et al.*, 2012). This statement is at

375   the core of our analysis. We argue that a higher number of SPS provisions in the international

376   trade agreements signed by Chile does not necessary mean barriers to trade but allows for more

377   transparency concerning the rules of the game, which would thus reduce the level of

378   environmental uncertainty and facilitate contractual relationships between exporters and

379   importers, and reduce transaction costs. Therefore:

380   Hypothesis 2: The more exhaustive the macro SPS provisions within trade agreements,

381   the lower the probability of resorting to sale contracts.

382   In contrast, exporters' perceptions of the stringency of requirements imposed by

383   importing countries, which is fed by the associated complexity, reveals the weakness of import

384   procedures and the consequent difficulty in compliance (Engler *et al.*, 2012). We argue that

385   firms tend to protect themselves from this source of environmental uncertainty. Thus,

386   Hypothesis 3: The more stringent the exporter's perception of SPS meso-institutions at

387   the importing country, the greater the probability of resorting to sale contracts.

388

3.3 Private SPS: meso-institutional layers

390   Empirical studies have also analyzed the relationship between the distribution channels,

391   or entry channels, and the choice of contracting (John & Weitz, 1988; Buckley & Casson,

392   1998). In their study on the influence of uncertainty over the choice between direct or indirect

393   distribution channels, John & Weitz (1988) considered that the emergence of behavioral

394   uncertainty is related to the difficulty in assessing the performance of the parties to a contract.

395   The study confirmed econometrically that behavioral uncertainty due to the time-span from

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396   initial contact to order placement increased the probability of relying more on direct channels

397   in order to reduce opportunism.

398   Exporters normally deal with intermediaries in the importing countries while the direct

399   channel to supermarkets is still in development. Supermarkets have increased their participation

400   in global fresh and vegetable supply chains and their requirements are stricter than the official

401   regulations in terms of quality, labor, food safety and environmental standards (Codron *et al.*,

402   2005; Mazé, 2002). In order to meet these private standards, supermarkets have started to

403   develop close interactions with year-round domestic and international suppliers (Codron *et al.*,

404   2005; Berdegué *et al.*, 2005; Gereffi, Humphrey & Sturgeon, 2005; Reardon & Timmer, 2012).

405   Consequently, supermarkets tend to move from spot markets to preferred supplier lists allowing

406   for transaction cost savings in terms of searching (screening and selection of providers),

407   negotiating and coordinating (Reardon *et al.*, 2003; Codron *et al.*, 2005). This major change

408   has resulted in a shift in governance from market to relational governance through the use of

409   renewable annual contracts (Gereffi, Humphrey & Sturgeon, 2005). Therefore,

410
411   Hypothesis 4a: The higher the share of direct exports to supermarkets, the greater the

412   probability of resorting to sale contracts.

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

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415   **4. Methodology**

416   To test our models, we used two databases. The first database, called Eximfruit (a

417   private database), identifies both parties to the transaction; we used this database to construct a

418   variable to capture direct exports to supermarkets. The second database, obtained from Chilean

419   Customs, contains all shipments sent in 2013[2] by exporting firms and the type of contract used

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[2] 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.

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420   for each shipment, although the identity of the importer is not provided. In both databases, the

421   names of some firms have been erased or covered: transactions with no identification of the

422   importers were excluded (1,187 observations deleted). The discrepancies between the two

423   databases concerning the identifiers of the exporting firms were resolved manually. Our final

424   sample consists of 151 apple exporters (60% of the Customs database) and 54,387 observations.

425   We constructed three original indicators: i) the number of provisions related to SPS

426   matters that are included in trade agreements signed by Chile; ii) the channel type, whether the

427   importer is a supermarket or not; and iii) the number of the Chilean exporting firm's private

428   certifications.

429   4.1.1 **Dependent variable: the choice of contract**

430   In this study the dependent variable is the type of contract chosen by the exporting firm. It takes

431   the value "1" if the alternative chosen by the exporting firm is a sale contract, "2" for free

432   consignment contract and "3" for minimum guaranteed contract.

433   4.1.2 **Independent variables: environmental uncertainty**

434   We measure the quality of the institutional environment using the following indicators:

435   Enforcing contracts, Customs & logistics performance, Logistics connectivity and Corruption

436   perception. Although SPS institutions are also part of the institutional environment, in this

437   study, because of their particular nature, they are tested through separate hypotheses.

438   *Enforcing contracts* is an indicator taken from the World Bank Doing Business

439   Database, measuring the time and cost for resolving a commercial dispute through the courts

440   and the quality of judicial processes (court organization, case management, court automation

441   and alternative dispute resolution). This indicator is scaled from 0 (lowest performance) to 100

442   (highest performance). We used the index corresponding to year 2012.

443   *The customs & logistics performance index* is constructed by the World Bank. It

444   measures the perception of a country's logistics based on six components: i) the efficiency of

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445   customs and border clearance; ii) the quality of the trade and transport infrastructure; iii) the

446   ease of arranging competitively priced shipments; iv) the competence and quality of logistics

447   services; v) the ability to track and trace consignments; and vi) the frequency with which

448   shipments reach consignees within the scheduled or expected delivery times. These components

449   are aggregated to form a single score scaled from 1 (worst performance) to 5 (best

450   performance). We used the index corresponding to year 2012.

451   *Logistic connectivity* is an index constructed by the United Nations Conference on Trade

452   and Development (UNCTAD). Originally referred to as "liner shipping bilateral connectivity",

453   the index measures the efficiency of services, the level of competition on transportation

454   services, and connectivity between a dyad of countries A and B (in our case the connectivity

455   between Chile and 154 countries). The index is scaled from 0 (minimum connectivity) to 1

456   (maximum connectivity). We used the index corresponding to year 2012.

457   *Corruption perception* is an index constructed by Transparency International. It

458   measures the perception of corruption in the public sector in 176 countries. The score is scaled

459   from 0 to 100, 0 being a country perceived as highly corrupt and 100 a country perceived as

460   very clean. According to the criteria of Transparency International, a score below 50 indicates

461   a serious corruption problem. To facilitate the interpretation of results in our model, we reversed

462   the score so that 100 reflects a high level of corruption and 0 a very clean country and

463   dichotomized this variable to highlight whether the destination country presents a high level of

464   corruption (>=50) or a lower level of corruption (<=50). We used the index corresponding to

465   year 2012.

466   *Number of SPS provisions in trade agreements.* In our study, we fully reviewed each of

467   the 25 agreements signed by Chile until 2013. We counted the number of provisions concerning

468   SPS matters. Because the majority of the agreements signed by Chile establish a global

469   framework, we counted all SPS provisions, except where it was possible to exclude those that

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470   strictly refer to animal health, such as the EU-Chile Association Agreement which includes

471   detailed and clearly separated measures on animal and plant health. Since agreements are each

472   structured differently, we consider that a provision can be a clause, an article or a paragraph.

473   *Exporting firms' SPS stringency perception* is an index constructed by Engler *et al.*,

474   (2012) and Melo *et al*., (2014). It measures Chilean exporters' perceptions of the difficulty

475   encountered in fulfilling SPS specific measures with regard to apples, grapes cherries and kiwi

476   fruit in sixteen main importing countries[3]. Exporters from a random sample of firms were asked

477   to assess through a Likert scale the complexity, i.e. monetary and human efforts for complying

478   with the following SPS measures: 1) pest, diseases and weeds regulated, quarantine treatment

479   requirements; 2) tolerance limits for pesticide residues and contaminants; 3) microbiological

480   requirements; 4) labeling, marking and packaging; 5) good agricultural practice requirements,

481   quality standards; and 6) registration procedures (e.g. registration of production sites, export

482   firms). Stringency is scaled from 0 to 7 (7 being the highest level of stringency).

483   *Supermarket entry channel* measures direct exports to supermarkets. This is a proxy

484   variable because we cannot observe in our databases the private standards required by the

485   supermarkets for each transaction. We extracted the importers' names and identified the type

486   of importers using as reference specialized directories and checked the firms websites. In total,

487   857 unique importers were identified. Finally, we constructed a binary variable: 1 if the

488   importer was a supermarket and 0 if not. We then calculated the share of exports for each

489   exporter to a supermarket during 2013.

490   *Firms' SPS private certifications.* We counted the number of certifications that the firms

491   in our sample indicate either on their own website or on other websites. We created a database

492   with each certification by exporting firm then aggregated those related to SPS matters, e.g.

493   those related to food safety and phytosanitary management. GlobalGap and BRC were double-

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

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494   checked as information on certified firms is available online. Certifications that did not fall

495   within the scope of this study were excluded, e.g. Kosher or social certifications. Official

496   phytosanitary certifications are not included as these are compulsory for export.

497   **4.2. Estimation procedure**

498   In this study of contract choice where the outcome is nominal, i.e. the categories are assumed

499   to be unordered, we apply the multinomial logit model (MNL) which is the most frequently

500   used (Long & Freese, 2014). In our multinomial logit regression, the dependent variable is the

501   type of contract chosen by the exporting firm whether sale, free consignment and minimum

502   guaranteed contract. In our sample, apples were exported under sale contracts (57.52%), free

503   consignment agreements (28.16%) and minimum guaranteed agreements (14.32%). The model

504   computes the probability of each alternative (free consignment and minimum guaranteed)

505   compared to the reference outcome b (in our model a sale contract), which can be written as:

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

507   where β is the vector of independent variables.

508   Tables 1 and 2 present descriptive statistics and a correlation matrix for the variables comprising

509   our models. We excluded the customs & logistic performance variable from the models because

510   it is strongly correlated with the perception of corruption variable insofar as those countries

511   suffering from corruption are less efficient. The Collin Stata test for multi-collinearity showed

512   that dropping the customs & logistic performance variable allows for satisfactory variance

513   inflation factor. Model 3 introduces the indicator developed by Engler et al. (2012) measuring

514   Chilean exporting firms' perceptions of SPS stringency in a sub-sample of 17 destination

515   countries. We dropped variables logistic connectivity and corruption perception to keep a

516   satisfactory VIF.

517   **4.3 Independence of irrelevant alternatives and multinomial probit**

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

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529   **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)

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Table 2. Chilean apple exports within trade agreements by destination

Signatory country	Enforcing contracts	Customs & logistics performance	Logistic conectivity	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

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

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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	0.020	0.030	0.058	0.046	0.070
	(0.001)**	(0.001)**	(0.001)**	(0.001)**	(0.001)**	(0.002)**
Logistics connectivity	2.830	2.830	4.555	7.360		
	(0.189)**	(0.189)**	(0.274)**	(0.344)**		
Corruption perception (low)	1.052	1.052	1.146	0.407		
	(0.024)**	(0.024)**	(0.034)**	(0.041)**		
Number of SPS provisions in TA			0.055	0.027	0.114	0.041
			(0.002)**	(0.002)**	(0.002)**	(0.002)**
Exporting firms' SPS stringency perception					-0.502	-0.679
					(0.041)**	(0.050)**
Supermarket entry channel			-0.041	-0.007	-0.045	-0.005
			(0.001)**	(0.001)**	(0.001)**	(0.001)**
Exporting firms' private certifications			-0.685	-0.401	-0.487	-0.152
			(0.030)**	(0.038)**	(0.035)**	(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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Sale (base outcome)	Model 1		Model 2		Model 3	
	Free consignment	Min. guaranteed	Free consignment	Min. guaranteed	Free consignment	Min. guaranteed
Enforcing contracts	0.017	0.044	0.025	0.0405	0.0381	0.0516
	(0.001)**	(0.001)**	(0.001)**	(0.001)**	(0.001)**	(0.001)**
Logistics connectivity	2.276	5.615	3.573	4.773		
	(0.143)**	(0.143)**	(0.206)**	(0.001)**		
Corruption perception (low)	0.817	0.463	0.884	0.352		
	(0.184)**	(0.194)**	(0.027)**	(0.028)**		
Number of SPS provisions in trade agreements			0.041	0.0236	0.086	0.036
			(0.002)**	(0.002)**	(0.002)**	(0.002)**
Exporting firms' SPS stringency perception					-0.4704	-0.569
					(0.319)**	(0.035)**
Supermarket entry channel			-0.03	-0.005	-0.033	-0.004
			(0.001)**	(0.007)**	(0.001)**	(0.002)**
Exporting firms' private certifications			-0.568	-0.295	-0.402	-0.114
			(0.023)**	(0.023)**	(0.027)**	(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[4] 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,

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[4] 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.

572   Chile is not involved, neither as respondent nor as complainant, in any dispute concerning SPS

573   issues at the WTO. SPS problems has been solved bilaterally, for example, in 2015 Vietnam

574   suspended imports of Chilean table grapes, apples, cherries and kiwifruit due to fruit fly

575   outbreaks. The resolution of this crisis was achieved through technical and diplomatic actions

576   by the national authorities of both parties, i.e. on-site visits to evaluate the Chilean plant

577   protection system. Second, the corruption perceptions index (in its continuous form) and

578   logistics performance index are highly correlated, (Table 3). This is because countries with high

579   score of corruption tend to be the same with limited coordination on border procedures and

580   customs controls, and other logistics services.

581   Our estimates are reported in Table 4 and results among models are consistent. Model

582   1 displays the results for the entire sample (exports to 64 destination countries), introducing the

583   macro-level variables that create a good institutional environment in the importing country.

584   (Table 4). Model 2 is the most complete, testing the macro-environmental variables and the

585   meso-variables concerning SPS matters, both official and private. All independent variables are

586   significant at ($p < .0001$). The enforcing contracts variable is positive, meaning that when the

587   quality of the legal institutions in the importing country is better exporters are more likely to

588   choose a consignment or minimum guaranteed agreement rather than a sale contract. The

589   variable measuring logistic connectivity is positive and significant for free consignments

590   relative to sale contracts and for minimum guaranteed agreements relative to exporting by

591   means of sale contracts, this means that a better logistic connectivity reduces the risks linked to

592   the temporal specificity of perishable products. A low perception of corruption in the public

593   sector of the importing country is positive, meaning that exporters are more likely to choose

594   free consignments or minimum guaranteed agreements than sale contracts when exporting to

595   countries not affected by corruption, these results support the hypothesis 1, that the higher the

596   quality of the macro institutional environment, the lower the probability of resorting to more

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597   complete contracts. With regard to SPS institutions, the variable measuring the number of SPS

598   provisions within trade agreements signed by Chile is positive. This means that as the number

599   of provisions increases, apple shipments are more likely to be exported by means of free

600   consignment or minimum guaranteed agreements than by means of a sale contract, which

601   provides support for hypothesis 2, the more exhaustive the macro SPS provisions within trade

602   agreements, the lower the probability of resorting to more complete contracts.

603   Model 3 shows that the higher the exporters' perceptions of stringency by Engler et al.

604   (2012) with regard to SPS requirements at the importing country, the less likely they are to

605   resort to free consignment or minimum guaranteed arrangements than sale contracts. This

606   supports hypothesis 3, the more stringent the exporter's perception of SPS meso-institutions,

607   the greater the probability of resorting to more complete contracts.

608   Finally, models 2 and 3 consistently show that firms exporting directly to supermarkets

609   and firms with private certifications (mainly GlobalGap, HACCP, British Retail Consortium

610   (BRC), ISO, International Featured Standards (IFS), and supermarket certifications (Tesco,

611   Walmart, among others) are more likely to call on sale contracts, a fact which supports

612   hypotheses 4a and 4b stating that the higher the share of direct exports to supermarkets, the

613   greater the probability of resorting to more complete contracts. And in the same direction,

614   private certifications increase the odds of resorting to more complete contracts. Although not

615   reported in this paper, we also estimated a model including only exports to low-corruption

616   importing countries. The estimates corroborated our results, i.e. even in good environments,

617   exporting directly to supermarkets increases the probability of calling on more complete

618   contracts.

619   **6. Discussion**
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621   The effect of SPS institutions on trade has been extensively studied in recent years

622   (Disdier *et al.*, 2008; Jaffee & Henson, 2004; Melo *et al.,* 2014; Swinnen & Vandemoortele,

623   2011, among others). Empirical studies have led to alternative interpretations: non-tariff

624   measures are seen alternately as barriers to trade or trade catalysts. The main reasoning for

625   interpreting them as disguised barriers is that they would act as a new form of protectionism in

626   favor of domestic production over external competition (Swinnen & Vandemoortele, 2011).

627   The limit of this perspective is that a broad spectrum of non-tariff measures, especially

628   environmental and sanitary standards, seeks to protect consumers regardless of whether the

629   production is domestic or foreign. Consequently, these measures may hit domestic firms and

630   increase imports (Swinnen & Vandemoortele, 2011). On the other hand, standards can be

631   viewed as trade catalysts when develop capacities to comply with strict standards and achieved

632   the linkage with high-value global supply chains (Jaffee & Henson, 2004; Maertens, &

633   Swinnen, 2009).

634   This paper outlines the effect of SPS institutions on export-import contracts of Chilean

635   apples.   Chilean exporters consider easier to comply with countries with stricter SPS

636   requirements, such as the US, than other countries, e.g. Mexico (Engler *et al.*, 2012). Our

637   explanation is that the business environment is better in the US because of a lower perception

638   of corruption of the public services, better logistics performance and better enforceability of

639   contracts. Poor institutional environments in the importing countries weaken the enforceability

640   of inter-firm contracts and the efficacy of trade and SPS services. As supply chains for

641   perishable products are time-specific with an acute risk of the emergence of opportunistic

642   behavior, exporters protect themselves using more complete contracts that involve less risk for

643   them, echoing the findings of Anderson & Van Wincoop (2001), Antras & Foley (2015), Pavez

644   & Codron (2018). In these circumstances, the function of the contract is more that of a safeguard

645   device (Williamson, 1996). However, this raises another question: why are firms exporting

646   directly to supermarkets more likely to use more complete contracts? Our explanation is that

647   contracts also serve a coordinating function (Schepker *et al.*, 2014). Although exporters in the

648   Chilean case study deal mainly with traditional importers, such as wholesalers and brokers,

649   supermarkets have increased direct procurement and impose more complete contracts with

650   stricter and more detailed quality and sanitary requirements (Reardon, & Timmer, 2012; Pavez

651   & Codron, 2018). This can explain the higher probability of exporters dealing with

652   supermarkets calling on sale contracts, which is consistent with results by Mazé (2002), and

653   Fulponi (2006) on the changes in retailers' contract design including certifications and control

654   provisions over the quality specifications in response to sanitary crisis.

655   These findings have key implications: SPS issues are of high importance for developing

656   countries. Policy makers can improve institutions to facilitate trade and create a favorable

657   business environment. Institutions are embedded in multiple layers. On the one hand there is

658   the macro-level where rules and standards create a general environment surrounding all

659   transactions, i.e. the SPS chapters in international trade agreements in which the signatories

660   decide the institutional mechanisms for coordinating, monitoring and arbitrating in the

661   eventuality of phytosanitary and sanitary problems. On the other hand, there is also a meso-

662   level where more specific rules governing specific transactions of products, services or

663   resources are set (Ménard, 2017). In our case, these are specific SPS requirements that lead to

664   decisions being taken to adapt production and coordination within the supply chain (Stephens

665   et al., 2018). We agree with Jaffe and Henson (2005), Maertens & Swinnen (2009), Engler *et

666   al.*, (2012), and Berkowitz *et al.*, (2004) that SPS measures do not necessarily have a negative

667   impact on trade if exporting countries can develop their capacities to meet these requirements.

668   Finally, our findings show the dual function of inter-firm contracts both as a safeguard

669   mechanism to protect transactions against opportunism hazards coming out of opportunism in

670   uncertain institutional environments and as a means of coordination to foster adaptation (North,

671   1981; Williamson, 1979; Ménard, 2012; Schepker et al., 2014) to changing market demands

672   and the buyers' specific quality and sanitary requirements (Codron, et al., 2005; Berdegué et

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

674 2018).

7. Conclusion

676 Drawing on institutional economics, this paper tests the effect of biosecurity institutions,

677 i.e. SPS macro- and meso-institutions and their link with the inter-firm contractual choice. We

678 test our models using the Chilean case of fresh apple exports. The results of our econometric

679 analysis show that exporters resort to less complete and more flexible contracts, when exporting

680 to countries that have favorable and safe business environments. We found that the same

681 scenarios apply when the SPS provisions established in international trade agreements are more

682 exhaustive: this could mean that clear rules make an environment less uncertain. On the

683 contrary, when firms have a perception of corruption in the importing countries and a perception

684 of stringent SPS requirements because trade procedures are not clear and reliable, exporters

685 tend to protect themselves through more complete contracts. We consider that this demonstrates

686 that more complete SPS provisions in trade agreements should not necessarily be interpreted as

687 major obstacles to trade because they may signal stronger institutional frameworks that reduce

688 environmental uncertainty in the importing countries. In contrast, corruption constitute a more

689 important trade barrier than non-tariff measures. We also found evidence confirming the dual

690 function of contracts both as a safeguard and as a coordination tool to export to customers with

691 demanding sanitary and phytosanitary requirements as supermarkets.

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703 **REFERENCES**

704 Anderson, J. E., & Van Wincoop, E., 2004. Trade Costs. Journal of Economic literature, 42 (3):691-
705 751.

706 Antras, P., & Foley, C., 2015. Poultry in motion: a study of international trade finance practices. Journal
707 of Political Economy, 123(4), 853-901.

708 Berdegué, J., Balsevich, A. F., Flores, L., & Reardon, T., 2005. Central American supermarkets' private
709 standards of quality and safety in procurement of fresh fruits and vegetables. Food Policy, 30(3): 254-
710 269.

711 Berkowitz, D., Moenius, J., & Pistor, K., 2004. Legal institutions and international trade flows.
712 Michigan Journal of International Law, 26: 163.

713 Buckley, P. J., & Casson, M. C., 1998. Analyzing foreign market entry strategies: Extending the
714 internalization approach. Journal of international business studies, 29(3), 539-561.

715 Chen, M. X., & Mattoo, A., 2008. Regionalism in standards: good or bad for trade? Canadian Journal
716 of Economics, 41(3): 838-863.

717 Coase, R. H. (1937). The nature of the firm. *economica*, *4*(16), 386-405.

718 Codex, 2013. Codex Alimentarius Commission. Procedural Manual. Twenty-first edition. World Health
719 Organization Food and Agriculture Organization of the United Nations. Rome, 2013

720 Codron, J. M., Giraud-Héraud, E., & Soler, L. G., 2005. Minimum quality standards, premium private
721 labels, and European meat and fresh produce retailing. Food Policy, 30(3), 270-283.

722 Crocker, K. J., & Reynolds, K. J., 1993. The efficiency of incomplete contracts: an empirical analysis
723 of air force engine procurement. The RAND journal of economics, 1: 126-146.

724 Crocker, K. J, & Masten, S. E., 1988. Mitigating contractual hazards: Unilateral options and contract
725 length. The RAND journal of economics,1: 327-343.

726 Cuervo-Cazurra, A., 2016. Corruption in international business. Journal of World Business, 51(1), 35–
727 49.

728 Direcon, 2015. Catastro nacional de barreras no arancelarias. Dirección General de Relaciones
729 Económicas Internacionales. Ministerio de Relaciones Exteriores de Chile.
730 https://www.direcon.gob.cl. Accessed 7 January 2017.

731 Disdier, A. C., Fontagné, L., & Mimouni, M., 2008. The impact of regulations on agricultural trade:
732 evidence from the SPS and TBT agreements. American Journal of Agricultural Economics, 90(2): 336-
733 350.

734 Dür, A., Baccini, L., & Elsig, M., 2014. The design of international trade agreements: introducing a new
735 dataset. The Review of International Organizations, 9(3): 353-375.

736 Dow, J. K., & Endersby, J. W. 2004. Multinomial probit and multinomial logit: a comparison of choice
737 models for voting research. Electoral studies, 23(1), 107-122.

738 Engler, A., Nahuelhual, L., Cofré, G., & Barrena, J., 2012. How far from harmonization are sanitary,
739 phytosanitary and quality-related standards? An exporter's perception approach. Food Policy, 37(2):
740 162-170.

741 Ericksen, P.J., Stewart, B., Barling, D., Loring, P., Anderson, M., Ingram, J., 2010. The Value of a Food
742 System Approach. Food Secur. Glob. Environ. Chang. 25, 25–45.

743 Fulponi, L., 2006. Private voluntary standards in the food system: The perspective of major food retailers
744 in OECD countries. Food policy, 31(1), 1-13.

745   Fulponi, L., & Engler, A., 2013. The Impact of Regional Trade Agreements on Chilean Fruit Exports,
746   64, OECD Publishing.

747   Gereffi, G., Humphrey, J., & Sturgeon, T., 2005. The governance of global value chains. Review of
748   international political economy, 12(1): 78-104.

749   Hodgson, G.M., 2015. On defining institutions: rules versus equilibria. Journal of Institutional
750   Economics, 11(3), 497-505.

751   Horn, H., Maggi, G., & Staiger, R. W., 2010. Trade agreements as endogenously incomplete contracts.
752   The American Economic Review, 100(1): 394-419.

753   IPPC, 2012. Protecting the world's plant resources from pests: An International Framework for
754   Cooperation. International Plant Protection Convention, FAO.

755   Jaffee, S.M., 1992. How private enterprise organized agricultural markets in Kenya (Vol. 823).
756   Agriculture and Rural Development Department, the World Bank

757   Jaffee, S., & Henson, S., 2004. Standards and agro-food exports from developing countries: rebalancing
758   the debate, 3348, Washington DC., USA: World Bank Publications.

759   John, G., & Weitz, B. A., 1988. Forward integration into distribution: an empirical test of transaction
760   cost analysis. Journal of Law, Economics, & Organization, 4(2): 337-355.

761   Long, S. J. & Freese J., 2014. Regression models for categorical dependent variables using Stata. Stata
762   press.

763   Maertens M., & Swinnen J. F., 2009. Trade, standards, and poverty: Evidence from Senegal. World
764   development, 37(1):161-78.

765   Masten, S., E., 2000. "Transaction-Cost Economics and the organization of agricultural transactions,"
766   Industrial Organization, 9: 173-195.

767   Mazé, A., 2002. Retailers' branding strategies: Contract design, organisational change and learning. J.
768   Chain Netw. Sci. 2, 33–45.

769   Mazé, A., 2017. Standard-setting activities and new institutional economics. Journal of Institutional
770   Economics, 13(3): 599-621.

771   McConnell, D. J., & Dillon, J., 1997. Farm management for Asia: a systems approach (No. 13). Food &
772   Agriculture Org.

773   Melo, O., Engler, A., Nahuehual, L., Cofre, G., & Barrena, J., 2014. Do sanitary, phytosanitary, and
774   quality-related standards affect international trade? Evidence from Chilean fruit exports. World
775   Development, 54:350-359.

776   Ménard, C., 2012. Hybrid Modes of Organization. Alliances, Joint Ventures, Networks, and Other
777   'Strange' Animals. In R. Gibbons & J. Roberts (Ed.): The Handbook of Organizational Economics:
778   1066-1108. Princeton, NY: Princeton University Press.

779   Ménard, C., 2017. Meso-institutions: The variety of regulatory arrangements in the water sector.
780   Utilities Policy, 49: 6-19.

781   Ménard, C., 2018. Organization and governance in the agrifood sector: How can we capture their
782   variety? Agribusiness 34, 142–160.

783   Morrissey, J. F. & Graves, J. M., 2008. International sales law and arbitration: problems, cases and
784   commentary. The Netherlands: Kluwer Law International.

785   North, D. C., 1981. Structure and Change in Economic History, New York: Norton and Co.

786   North, D.C., 1990. Institution, Institutional Change and Economic Performance, Cambridge University
787   Press.

788   North, D. C., 1991. "Institutions." Journal of Economic Perspectives, 5(1): 97-112.

789 Odepa, 2015. Agriculture Overview. Office of Agricultural Policies, Trade and Information. Ministry
790 of Agriculture -Chile. http://www.odepa.gob.cl/. Accessed 18 December, 2016.

791 Pavez I. & Codron J. M., 2018. Contractual price provisions and their determinants in uncertainty
792 conditions: The case of Chilean fruit exports. International Management, 22 (4), in press.

793 Pirrong, C., 1993. "Contracting practices in bulk shipping markets: a transaction cost explanation,"
794 Journal of Law and Economics, Vol.36: 937-76.

795 Poppo L., Zenger T., 2002. Do formal contracts and relational governance function as substitutes or
796 complements?. Strategic management journal, 23(8): 707-725.

797 Reardon, T., Timmer, C. P., Barrett, C. B., & Berdegue, J., 2003. The rise of supermarkets in Africa,
798 Asia, and Latin America. American Journal of Agricultural Economics, 85(5): 1140-1146.

799 Reardon, T., & Timmer, C. P., 2012. The economics of the food system revolution. Annual Review of
800 Resource Economics, 4(1): 225-264.

801 Rigod, B., 2013. The purpose of the WTO agreement on the application of sanitary and phytosanitary
802 measures. European journal of international law, 1, 24(2): 503-532.

803 Rodrik, D., 2000. How far will international economic integration go? The Journal of Economic
804 Perspectives, 14.1: 177-186.

805 Saussier, S., 2000. Transaction costs and contractual incompleteness: the case of Électricité de France.
806 Journal of Economic Behavior & Organization, 42(2): 189-206.

807 Schepker, D. J., Oh, W. Y., Martynov, A., & Poppo, L., 2014. The many futures of contracts: Moving
808 beyond structure and safeguarding to coordination and adaptation. Journal of Management, 40(1): 193-
809 225.

810 Stallings, B., 2009. Chile: A Pioneer in Trade Policy. In: Solís M., Stallings B., Katada S.N. (eds)
811 Competitive Regionalism. International Political Economy Series. London: Palgrave Macmillan.

812 Stephens, E.C., Jones, A.D., Parsons, D., 2018. Agricultural systems research and global food
813 security in the 21st century: An overview and roadmap for future opportunities. Agric. Syst.
814 163, 1–6.

815 Swinnen, J. F., & Maertens, M., 2007. Globalization, privatization, and vertical coordination in food
816 value chains in developing and transition countries. Agricultural economics. 37 (s1): 89-102.

817 Swinnen, J. F., & Vandemoortele, T., 2011. Trade and the political economy of food standards. Journal
818 of Agricultural Economics, 62(2): 259-280.

819 Uhlenbruck, K., Rodriguez, P., Doh, J., & Eden, L., 2006. The impact of corruption on entry strategy:
820 Evidence from telecommunication projects in emerging economies. Organization Science, 17(3): 402-
821 414.
822 Waterlander, W.E., Ni Mhurchu, C., Eyles, H., Vandevijvere, S., Cleghorn, C., Scarborough,
823 P., Swinburn, B., Seidell, J., 2018. Food Futures: Developing effective food systems
824 interventions to improve public health nutrition. Agric. Syst. 160, 124–131.

825 Williamson, O. E., 1979. Transaction-cost economics: the governance of contractual relations. The
826 journal of Law and Economics, 22 (2): 233-261.

827 Williamson, O. E., 1996. The mechanisms of governance. New York: Oxford University Press.

828 Williamson, O.E., 2000. The New Institutional Economics: Taking Stock, Looking Ahead. J.
829 Econ. Lit. 38, 595–613.

830 Zhou, K. Z., Poppo, L., & Yang, Z., 2008. Relational ties or customized contracts? An examination of
831 alternative governance choices in China. Journal of International Business Studies, 39(3): 526-534.
832

833 **Online database references**

834   Transparency International,   Corruption Perceptions Index, 2012, https://www.transparency.org,
835   accessed 6 June 2017.

836   United Nations Conference on Trade and Development (Unctad), Liner Shipping Bilateral Connectivity
837   Index, 2012, http://unctadstat.unctad.org, accessed 27 April 2017.

838   World Bank, Logistics Performance Index, 2012, https://lpi.worldbank.org, accessed 11 June 2017.

839   Dirección General de Relaciones Económicas Internacionales (Direcon), Ministerio de Relaciones
840   Exteriores de Chile, Acuerdos Comerciales Vigentes, https://www.direcon.gob.cl/, accessed 10 January
841   2017.