Information flow in the Sino-Brazilian beef trade

RESEARCH ARTICLE

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Abstract

Considering the opportunities offered by the Chinese beef market and the fragilies in the Sino-Brazilian beef trade supply chain, this study aims to identify the main sources and channels used by Brazilian beef packers to obtain information on the Chinese market. The results reveal that the Brazilian beef packers and institutions within the export sector have little knowledge regarding the Chinese market. Neither the size nor the export experience of the beef packing firms and the foreign direct investment seem to significantly influence the quality of the knowledge they hold on the Chinese beef market. The sector has neither an integrated database containing the essential information on the Chinese market nor a unified traceability system in place that could facilitate the information flow among the agents within the beef supply chain. Consequently, firms need to dedicate substantial management resources (time, financial and human) to collect information from various sources.

Keywords: Sino-Brazilian beef trade, Chinese beef market, Brazilian beef packers, market information, market knowledge
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1. Introduction

Since the 1990s, food safety has become an important factor for an increasingly urbanized and socially diversified China. Food safety scandals have become the unwanted consequences of a highly fragmented food production and supply chain (Lam *et al.*, 2013). Despite government efforts to minimize such events (Waldron *et al.*, 2010), the Chinese food safety regulatory framework and state operated certification and controlling bodies have proven to be of limited effect (Linhai *et al.*, 2013). In many cases, Chinese consumers trust foreign food safety controlling bodies more than the Chinese inspection systems, which are perceived as less reliable (Bloomberg Businessweek, 2016, 2017a,b; Sun *et al.*, 2014). Consequently, imported beef is an attractive alternative for Chinese consumers, not only due to the diversification the new products offer and the prestige related to their consumption, but also because they are perceived as a healthier alternative to pork (Longworth *et al.*, 2001). The need to meet an estimated demand of 4.5 kg/per capita/ year in China (Youyang8, 2015) has led to a strong dependence on imported beef (legally or illegally), due to the impossibility of China attaining production self-sufficiency (Waldron *et al.*, 2015). In 2017, Chinese beef imports are expected to reach 950 thousand metric tons, up 17% from 2016. The major beef suppliers to China in 2016 were Brazil (29%); Uruguay (27%); Australia (19%); New Zealand (12%) and Argentina (9%) (MICA, 2017).

It is worth presenting a picture of the meat smuggling activity in the mainland Chines market. China is the world's third largest meat consumer but demand has outstripped domestic production, creating an opportunity for smugglers (Reuters, 2015). Although the import of beef into Hong Kong is legal, its transfer to mainland China is considered illegal by the Chinese authorities. In addition, a considerable amount of beef imported by Vietnam find its way across the border into China (Global Times, 2015). Up to two million tons of beef were smuggled into China in 2012 and 2013 (South China Morning Post, 2015). In June 2015, Chinese authorities seized 100,000 tons of frozen US meat from smugglers (Business Insider, 2015). Smuggling has a detrimental effect on the legitimate export traders from countries such as Brazil, Uruguay, Australia, New Zealand and Argentina. Due to the import duties in mainland China, smuggled beef can be sold 30 to 60% cheaper that legitimately imported beef (Reuters, 2015).

Despite the problem of smuggling, the Chinese beef market presents considerable opportunities for big beef exporting countries, such as Brazil, to expand their markets and revenues. In 2016 Brazil exported 165,619 tons of beef to China (Beefcentral, 2017). The trade between Brazil and China is expected to grow in line with their respective gross domestic products (GDPs) (Squartini and Garlaschelli, 2013). Nevertheless, as shown by Tinbergen (1962) in his 'gravity model', although the trade flow between two countries is proportional their GDPs, as in the case for China and Brazil, it is inversely proportional to the distance between them (almost 17,000 km) and the cultural and linguistic differences (The Economist, 2016). The gravity model is currently considered a good predictor of trade relationships (Dhingra, 2013; Ghemawat, 2001; Goh *et al.*, 2013). This means that Brazil will face strong competition from Australia and New Zealand, which are geographically closer to China and are strongly associated with beef safety, quality and taste (MLA, 2016). Thus, Brazilian producers face the dual challenge of meeting the high demand presented by the Chinese beef market at a competitive cost and, simultaneously, ensuring quality and product safety levels that conform to the specific preferences of Chinese consumers.

To highlight the huge market potential for the of Brazilian beef, it is worth noting that the 165,619 tons Brazil exported to Mainland China represent approximately 30% of China's total beef imports in 2016 (Beefcentral, 2017; MDIC, 2016). Notably, although this trade only started in June 2015, this volume is already among the largest international beef flows. After conducting systemic mapping of the Sino-Brazilian beef supply chain, and its shortcomings, Knoll *et al.* (2017) found that the Brazilian traceability system is based on fiscal/ commercial documents, rather than product follow-up, the information flow between the stakeholders is dysfunctional, and that opportunistic business behavior dominate the whole supply chain. Research also reveals that aligning the information flow and the production and trade practices among the different members is a basic necessity for a supply chain to be effective and competitive (Cooper *et al.*, 1997; Jie *et al.*, 2013). A well

organized and well managed supply chain encourages cooperation and trust-based relationships among its members and improves the effectiveness of the whole supply chain in identifying and responding to market opportunities (Ding *et al.*, 2014; Jie *et al.*, 2013; Lambert *et al.*, 1998; Simatupang *et al.*, 2002). Considering these aspects, the present research focuses on the specific case of what defines information availability and actual market knowledge of the Brazilian beef packers regarding the Chinese market. Furthermore, considering the opportunities offered by the Chinese beef market and the fragility identified in the Sino-Brazilian beef trade supply chain (Knoll *et al.*, 2017), this research explores the experience of Brazilian beef packers that export or are applying for accreditation to export to Mainland China. This research aims to identify their information sources and channels employed in organizing, governing and managing their supply chain. The in-depth analysis of the information flow and its peculiarities provided by this research represents a first step towards improving chain coordination and governance, which, in turn, contributes to ensure a safer, healthier and more attractive business environment for all the stakeholders within the chain, including the Chinese consumer. By evaluating the information sources, content and flow, it is possible to assess the extent to which the absence of a unified traceability system (Knoll *et al.*, 2017) impacts the current availability of information in the chain. Based on this assessment, more specific suggestions regarding the construction of an information sharing and processing system can be made, which may be adapted to the Sino-Brazilian situation.

The article is organized as follows: Section 2 presents a description of the theoretical framework used to support the methodology; Section 3 describes the methodological approach adopted; Section 4 includes a detailed discussion of the results obtained from the applied questionnaire and interviews; Section 5 contains the concluding remarks and highlights the theoretical and managerial implications, while section 6 points out the study limitations.

2. Theoretical framework

In building the theoretical foundation for this research, firstly, the role of information and knowledge sharing on supply chain organization and management is discussed and analyzed. Then, the relationship between firm size and exporting experience is explored. The aim is to identify and evaluate the different information sources and the knowledge currently held by the Brazilian beef exporters regarding the Chinese beef market.

2.1 Supply chain management and information flow

An efficient supply chain requires the integration of organizational units involved in the flow of products, information and finance in order to attend consumer demands and add value to the chain shareholders (Lambert *et al.*, 1998; Stadtler, 2005). This is particularly challenging when dealing with food supply chains, considering the associated product and process specificities (perishability, contamination, food safety and security, shelf life, etc. (Van Donk *et al.*, 2008)). Food supply chain structuring and management analysis has grown in importance due to its ability to track vulnerabilities and risks that endanger food safety (Ding *et al.*, 2014; Van der Vorst and Beulens, 2002) and interdependence in business transactions, which can affect every stakeholder in the chain (Gereffi *et al.*, 1994). Certain practices, namely, strategic partnerships with suppliers, continuous process flow, outsourcing, cycle time compression, quality certification, customer relationships and the use of inter-organizational systems such as electronic data interchange and the internet can help prevent pitfalls in the supply chain, leading to more effective chain management (Alvarado and Kotzab, 2001; Lambert *et al.*, 1998; Tan, 2001). A considerable amount of literature highlights the importance of information accessibility, quality and sharing between the different stakeholders in a supply chain (Ding *et al.*, 2014; Jie, *et al.*, 2013; Min and Mentzer, 2004; Prajogo and Olhager, 2012; Tan *et al.*, 2002). Information sharing is essential for company success, especially when it comes to transnational operations (Bartlett and Ghoshal, 1989) and positively impacts a firm's operational performance (Frohlich and Westbrook, 2001; Jie *et al.*, 2013; Prajogo and Olhager, 2012; Zhou, 2007). On the other hand, from a supply chain point of view, a lack of coordination between stakeholders can yield negative consequences such as higher inventory and transportation costs, longer delivery times, higher levels of product loss, customer service inefficiency,

and imbalance between supply and demand forecasting, etc. (Akerlof, 1970; Lambert *et al.*, 1998; Lee *et al.*, 1997; Simatupang *et al.*, 2002).

Information is a strategic and often costly asset. Thus it is crucial for firms to decide whether or not to acquire expensive information and, if so, what kind of information is needed (Fu and Zhu, 2010). Nowadays, internet and other web-based technologies have a positive impact on the maximization of such demands (Gimenez and Sierra, 2013). When no integrated electronic information exchange mechanism is available, one of the most essential knowledge exchange mechanisms between firms is partnering among employees. However, this is less likely to happen among geographically distant firms since, generally, distance has a negative impact on information flow (Morosini *et al.*, 1998). Also, information exchange among geographically distant places presents additional hurdles such as different time zones and long transmission channels, which, altogether, have a negative impact on the amount and quality of information exchanged. However, distance can be a motivator for the development of new solutions to solve information transfer issues. Thus, distance does not always inhibit the smooth flow of knowledge. Nevertheless, it certainly impacts the effectiveness of certain information transfer mechanisms (Ambos and Ambos, 2009; Tihanyi *et al.*, 2005).

2.2 Firm size, industry structure and internationalization

Several studies have indicated the existence of a positive relationship between firm size and internationalization (Baird *et al.*, 1994; Calof, 1993). According to Bonaccorsi (1992), larger firms have a competitive advantage when it comes to dealing with foreign markets, mainly due to their greater managerial and financial resources and access to information. Small companies tend to perform less well when it comes to internationalization, mainly due to the insufficiency of financial and human resources to proceed with the internationalization process or to acquire knowledge and understand the targeted foreign market (Etemad, 2004; Knight and Kim, 2009; Pangarkar, 2008). Additionally, Julien and Ramangalahy (2003) found that small firms seem to have difficulty with some core competences, such as distribution, pricing, and monitoring foreign markets, etc. On the other hand, the structure of small and medium-sized companies allows for greater flexibility and speedier decision making (Cretoiu, 2010), due to the absence of internal bureaucratic hurdles, processes and protocols (Knight and Kim, 2009). This can be seen as a competitive advantage in the context of rapidly changing market conditions, like those found in China.

Another element that can influence the internationalization process is the industry structure (Fernhaber *et al.*, 2007; Gao *et al.*, 2010), which is characterized by the number and concentration of firms producing close substitute products in a certain market, the level of product differentiation and the intensity of competition among those firms (Porter, 1980). Industry concentration is measured by calculating the sales volumes or employment accounted for by the largest four or eight firms in the industry. Firm concentration ratio is an indicator of the relative power of firms in an industry (Fernhaber *et al.*, 2007). In a concentrated industry, dominant firms are able to compete based on advantages achieved through high economies of scale (Besanko *et al.*, 1996). Oviatt and McDougall (1994) found that the industrial structure influences (1) the organization of international transactions; (2) the reliance on alternative or hybrid governance structures (mode of internationalization (Bucley and Casson, 1998)); (3) the creation of foreign location advantages (industry concentration and industry evolution not only allow for the formation of new international ventures, but also add to their foreign location advantage (Fernhaber *et al.*, 2007)); and (4) the control over unique resources (knowledge appropriability, for example (Hoenen and Hansen, 2009)).

The mode of internationalization can vary from direct exporting, licensing, joint venture to equity investment (Foreign Direct Investment – FDI (Buckerly and Casson, 1998)). Direct exporting is the quickest for firms to enter foreign markets and involves the least risk. Licensing and FDI require more organizational resources (equity and marketing the product abroad) and involve higher risks than other modes of entering foreign markets (Gao *et al.*, 2010; Yuan *et al.*, 2016). Emerging economies are important destinations of outward FDI (Bandeira-de-Mello *et al.*, 2016; Goh *et al.*, 2013; Yuan *et al.*, 2016). Lu *et al.* (2010) studied the internationalization of firms in an emerging economy (China) and identified that a firm's ability to coordinate,

recombine, and allocate organizational resources to meet the different requirements of foreign markets influences its international performance. Firms that made direct investment in China increased their export to that country (Liu *et al.*, 2001). These findings corroborate those reported by Pfaffermayr (1994), who studied the internationalization process of firms in rich countries. Large enterprises have the organizational and financial resources to explore opportunities in foreign markets. The ability of a firm to collect, absorb, and integrate information to understand customer needs, market opportunities and regulatory requirements in a foreign economy is fundamental to achieving superior international performance and building a sustainable competitive advantage. The development of managerial ties through FDI can also help firms in emerging economies overcome the liabilities associated with foreignness and newness in host countries (Lu *et al.*, 2010; Powel and Rhee, 2016).

2.3 Internationalization and information flow

The market itself is a network of relationships wherein firms are linked to each other in a variety of ways (Johanson and Vahlne, 2009). Thus, being part of a relevant network opens possibilities, through the development of knowledge and trust among the different network partners, which can provide the basis for a solid partnership in operations involving a sustainable flow of business. Internationalization generally has a positive effect on a firm's performance and its access to information (Barkema *et al.*, 1996; Li, 1995). Cunningham and Homse (1986) argue that during a firm's internationalization process, managers in both home and foreign markets develop valuable contacts based on social relations and routine communication, which promotes fruitful information flows. This not only allows for the construction of knowledge regarding their respective markets and processes, but also promotes trust, a valuable asset that may lead to greater commitment among the partners (Hunt and Morgan, 1994). Common ties can increase a firm's performance and productivity while facilitating closer cooperation within a partnership network. The closer the relations a firm maintains with its foreign business partners (suppliers, customers, distributors), the more likely it is that the firm will have stable relations with them (Lu *et al.*, 2010). The stakeholders may eventually develop a certain type of mutual knowledge that would present opportunities unavailable to those who do not cooperate to the same extent (Zajac and Olsen, 1993).

Direct networking may not be the only option though. Intermediaries can also facilitate the flow of goods and information (Root, 1987). Often such intermediaries are specialized service providers, which, for the exporter company, serve as an outsourced export department and information source regarding a foreign market (Peng *et al.*, 2008). The literature also discusses how smaller firms, in particular, tend to employ third party market intelligence to facilitate access to a foreign market (Hessels and Terjesen, 2010; Terjesen *et al.*, 2008). The situations in which a firm contracts an export intermediary mostly depend on the firm's ability to handle the foreign market's size, the expected financial risk and the cultural difference assessed by the local firm's management (Felbermayr and Jung, 2011). It is also relevant to note that, although intermediaries can facilitate trade, employing them may lead the exporter to lose control over its exportation processes (Blomstermo *et al.*, 2006).

Finally, enterprises can count on government agencies to support them to get information and knowledge about foreign market conditions, customer needs and regulatory requirements. It is a challenge for firms in an emerging economy to obtain information related to foreign markets. Government can have an important role in the provision of information concerning foreign markets. 'By engaging in government export programs, firms can construct and build appropriate skills, routines, knowledge, and procedures in scanning and identifying useful information, thereby enhancing their information acquisition capability' (Lu *et al.*, 2010). To support the Brazilian enterprises in their internationalization process, the Federal Government created the National Export Promotion Agency (APEX in Portuguese).

3. Research goals and method

In this research it is assumed that knowledge of the targeted foreign market improves the export supply chain performance and leads to a more effective attendance of the foreign customer's requirements (Katsikeas, 1994; Lu *et al.*, 2010; Pfaffermayr, 1994). Thus, as stated in the paper´s introduction (Section 1), the research aims are to identify the information sources most commonly used by the Brazilian beef exporters to China (direct, network, intermediary-based or FDI), to explore the relationship between firm size and the kind of information sources, and to assess the extent to which it affects the firm's market knowledge.

Therefore, the following questions are pertinent:
- How do Brazilian beef packers obtain information regarding the Chinese beef market?
- To what extent are Brazilian beef packers aware of the recent tendencies in the Chinese market related to choice of cuts, market segmentation and business behavior?
- Is the level of knowledge held by Brazilian beef packers related to company size or the level of internationalization?

3.1 Methodological design and its justification

Firstly, the choice of a specific sample to answer the research questions is explained. After, the methodological approach applied to obtain the answers from the interviewees is described. Interviewees directly involved in the Sino-Brazilian beef trade with knowledge of specific consumer needs and the legal requirements of the Chinese market were sought (Knoll *et al.*, 2017). Thus, in Brazil, the beef supply chain stakeholders interviewed can be assumed to be those most directly affected by tendencies within the Chinese beef market. Consequently, within the Brazilian section of the supply chain, the Brazilian beef packers are expected to have the broadest and most in-depth information and knowledge regarding the Chinese market.

Although well-known for the decentralized nature of its cattle raising and beef processing sector (Jank *et al.*, 2001), the scale, productive capacity and the degree of centralization in the Brazilian agro-export sector has grown in the recent years. The ongoing centralization is reflected in the fact that only four firms detain more than 60% of the whole beef slaughtering, processing and exporting business in Brazil (Vieira and Traill, 2008). Hence, although Brazil is a large beef exporter, only a few firms, owning several meat-packing plants, are relevant in the export sector. Market and export related decisions are not made at the level of the individual meat-packing plant, but at the central headquarters and within the export departments of the holding firms. Thus, we focus on getting information from the central headquarters of the holding firms instead of contacting individual meat-packing plants.

The aim of the interviews was to get evidence from a specific target group of beef processing firms, namely, those with experience of exporting directly to Mainland China or to Hong Kong (which serves as an entrance to the Mainland Chinese market (Knoll *et al.*, 2017; MLA, 2016; MICA, 2017; U.S. Meat Export Federation, 2014; Waldron *et al.*, 2015)), those that are accredited, or applying for accreditation, to export to Mainland China. To get the largest possible sample of such firms, we sought the support of the Brazilian Beef Processors and Exporters Association (*Associação Brasileira das Indústrias Exportadoras de Carnes* (ABIEC; http://www.abiec.com.br)). The approach adopted in the data collection is illustrated in Figure 1.

ABIEC is currently the most widely recognized export association within the Brazilian beef sector, consisting of 26 member companies and representing around 96 (or 39%) of the total number of Brazilian beef slaughterhouses certified by the Brazilian Federal Inspection (*Serviço de Inspeção Federal* (SIF) – Brazilian Ministry of Agriculture Livestock and Supply). SIF certification is mandatory for every slaughterhouse seeking to distribute its products throughout the Brazilian territory, or to export to destinations with basic requirements such as China, Hong Kong, Uruguay, Argentina, Vietnam, Peru, Venezuela, Israel, Egypt, etc. However, besides the SIF certification, accreditation for export to Mainland China requires an additional set of requirements, part of an agreement between Brazilian and Chinese State authorities (Knoll *et al.*, 2017).
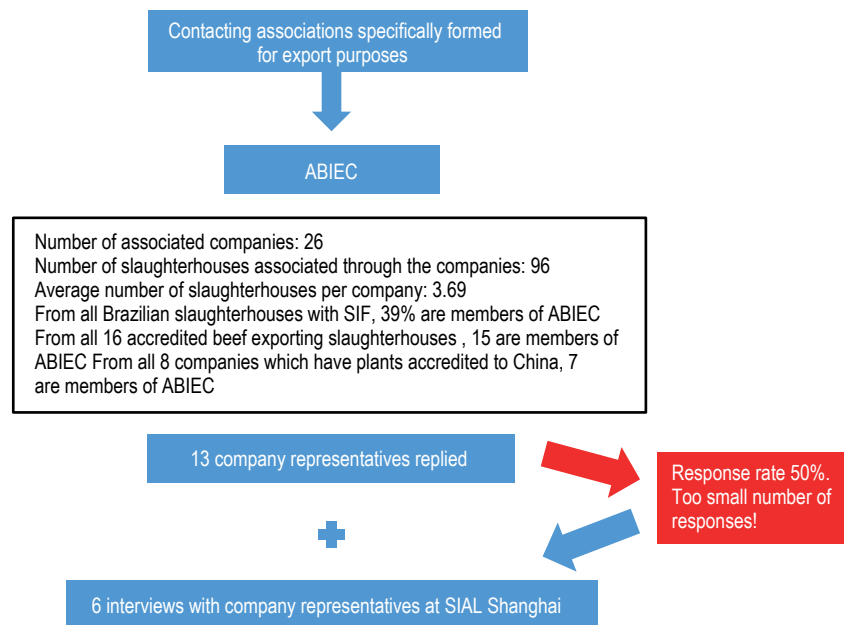
Figure 1. Methodological design. ABIEC = Brazilian Beef Processors and Exporters Association (*Associação Brasileira das Indústrias Exportadoras de Carnes*); SIF = Brazilian Federal Inspection (*Serviço de Inspeção Federal*); SIAL = *Salon International de l'alimentation.*

Of the 96 slaughterhouses associated to the ABIEC, only 15 are accredited to export to Mainland China, while only one such slaughterhouse is not a member of the ABIEC. Currently, all the slaughterhouses associated to the ABIEC are accredited to export to Hong Kong, since accreditation only requires SIF certification, and at least 23 are in the process of applying for accreditation to supply Mainland China.

To provide the most complete and accurate picture of the research object, and considering the nature of the sector under analysis, this study is based on exploratory and descriptive data analysis (Miles *et al.*, 2013). Firstly, a questionnaire was prepared and delivered to the target group of Brazilian beef processing firms. As only a small number of responses were received from that group, interviews were held to achieve a workable response rate and a more holistic understanding of the subject.

3.2 Development of the questionnaire

The questionnaire was designed to provide analyzable data regarding the research goal (Miles *et al.*, 2013). The questions were reviewed and discussed by our team of researchers and five international industry professionals (with at least five years of experience in beef trading with China). The questions were chosen so that the responses could be used as proxies to achieve the research goals. The questionnaire was designed to take no longer than ten minutes to answer and was distributed and filled by an online survey tool (Surveymonkey; https://www.surveymonkey.com). The link to the online platform, with the research explanation, was forwarded by ABIEC to all its members, with a special request for cooperation. Responses were expected to come from either the export or administrative department, or from the chief executive officer's office of the 26 firms associated to ABIEC. It was hoped to achieve a statistically analyzable census (response rate over 80%) due to the direct involvement of ABIEC in forwarding the questionnaires. However, only 13 companies responded to the questionnaire. Of the respondents, 10 had at least one slaughterhouse in the process of applying for accreditation to export to China and only one company had a single slaughterhouses accredited to export to Mainland China. Two companies had not applied for accreditation to export to mainland China, but exported to Hong Kong. Responses were received between April 3rd and May 11th, 2016.

The questionnaire consisted of three main parts, labeled Part A, B and C. Part A seeks to collect information regarding the firm's size and export profile; Part B seeks to assess the information held by the Brazilian firms regarding the Chinese beef industry; Part C aims to measure the firm's current knowledge regarding the Chinese beef market (Questionnaire is attached as Supplementary methods S1 (in Portuguese) and Supplementary methods S2 (Part C – in English).

3.3 Development of interviews

Due to the small number of responses to the questionnaire (13), it was decided to boost the data by conducting short interviews with slaughterhouse representatives that had not answered the questionnaire. To ensure the right population of respondents, members of the research team attended the *Salon International de l'alimentation*, or SIAL, in Shanghai 2016 (May 5th-7th, 2016), the biggest networking event and food trade show in Asia. Fourteen companies that are members of ABIEC attended the SIAL Shanghai 2016. When contacting each one of them, a general introduction to the research was given, and the representatives were asked whether the company had answered the questionnaire sent through ABIEC. If the answer was negative, the representative was invited to participate in an interview. In the end, six interviews were conducted. Due to the business nature of the event, and the busy schedules of the representatives, the time available was very limited and, on average, the interviews (conducted in Portuguese) lasted five minutes per company.

Initially, applying the Delphi method (Dalkey and Helmer, 1963) was considered, however, due to the limited time available and the business setting, it was thought unfeasible. Instead, a less than ideal, but nonetheless meaningful approach was adopted, whereby the interviews were prepared based on the research goal (Denzin and Lincoln, 2011) and the dynamic circumstances in which they were conducted. The semi-structured interviews were open-ended, which allowed the interviewers to ask follow-up questions. Out of respect for specific requests made by some interviewees and the trade fair's sensitive business environment, the interviews were not recorded, but rather notes were taken during the conversations. The interviewees represent the largest Brazilian slaughterhouses and beef exporters, as shown in Table 2. When interpreting the interviews, the approach proposed by Livesey (2006) was adopted.

Two questions were asked regarding part B of the questionnaire (in free translation):
- A. What do you know about the Chinese market that makes it a desirable choice for your firm?
- B. What are your main source of information regarding the Chinese market?

Based on the information contained on their business cards and the company homepage, company profiles were elaborated (corresponding to part A of the questionnaire). However, there was no opportunity to assess the level of knowledge held regarding the Chinese market (corresponding to part C of the questionnaire), due to the time limitation and the sensitive nature of the situation.

4. Results and discussion

Altogether, of the 26 firms associated to ABIEC, 13 completed the questionnaires and 6 accepted to be interviewed. The profile of the questionnaire respondents and their firms is presented in Table 1.

The profile of the interviewees and their firms is presented in Table 2.

4.1 General profile of the companies

In Brazil, particularly in sectors where natural resources are dominant, larger firms are more likely to be involved in exportation than small and medium-sized companies (Fleury *et al.*, 2007), as suggested by Besanko *et al.* (1996), Fernhaber *et al.* (2007), Gao *et al.* (2010) and Oviatt and McDougall (1994). No standard definition of firm size was found regarding the slaughterhouse sector in Brazil. For the purposes of the present research, firms with a capacity to slaughter between 500 and 800 animals per day were considered

Table 1. Profile of respondents to the questionnaire (position/company size/accreditation).

	Responsibility in company	Number of packers	Size of biggest packer (animal per day)	Joint investments/ headquarters outside of Brazil?	Number of export destinations	Accredited and/or in process
Quest 1	Federal agricultural inspector	2	Between 500 and 800	No	4	In process
Quest 2	Financial and office administrator	1	Between 500 and 800	No	0	Accredited
Quest 3	Quality guarantee manager	1	Between 500 and 800	No	0	-
Quest 4	Quality guarantee manager	4 or more	Between 800 and 2,000	Yes	6	In process
Quest 5	Export manager	1	Between 500 and 800	No	3	In process
Quest 6	Export manager	3	Between 800 and 2,000	Yes	2	In process
Quest 7	Export manager	4 or more	More than 2,000	No	2	In process
Quest 8	Export manager	1	Between 500 and 800	No	5	In process
Quest 9	Production manager	2	Between 500 and 800	Yes	3	In process
Quest 10	General manager	3	Between 500 and 800	No	4	In process
Quest 11	Export manager	4 or more	Between 800 and 2,000	Yes	5	Accredited and in process
Quest 12	Export manager	4 or more	Between 800 and 2,000	Yes	1	In process
Quest 13	Financial and office administrator	4 or more	More than 2,000	Yes	5	No

Table 2. Profile of the interviewees (position/company size/accreditation).

	Responsibility in company	Number of packers	Size of biggest packer (animal per day)	Joint investments/ headquarters outside of Brazil?	Number of export destinations	Accredited and/or in process
Int 1	Export manager	4 or more	Over 2,000	Yes	7	Accredited and in process
Int 2	Exportation manager	2	Over 2,000	No	4	Accredited and in process
Int 3	Chief executive officer	3	Between 500 and 800	No	4	Accredited and in process
Int 4	Export manager	3	Over 2,000	No	5	Accredited and in process
Int 5	Director of international businesses	3	Between 800 and 2,000	Yes	2	In process
Int 6	Export manager	2	Over 2,000	No	5	In process

large and those able to slaughter over 800, very large. The four biggest slaughterhouses presented in Table 1 and 2 were among the 32 biggest Brazilian exporters in 2015 (Exame, 2016). All the companies in the research can be regarded as either large or very large (Table 1 and 2), and most companies own more than one packer. The sector is quite centralized, with only four firms detaining more than 60% of the total beef

slaughtering, processing and exporting business in Brazil (Vieira and Traill, 2008). Hence, although Brazil is a major beef exporter, only a few firms, each owning several packers, are relevant in the export sector. About half of the companies have international joint ventures. This seems to be a high percentage of FDI, given that in Brazil FDI represents only 1% of the gross fixed capital formation, whereas the world average is 8.3% (United Nations Conference on Trade and Development, 2016). FDI is also one of the most commonly adopted ways for US food-processing companies to enter foreign markets, the strategy being to acquire a maximum share of 10% in the external markets of business partners (Bolling and Somwaru, 2001). This is a particularly advantageous and opportune way of overcoming trade barriers and to obtain first-hand information from the external market (Lu *et al.*, 2010; Pfafermayr, 1994). This research reveals that among the Brazilian beef packing companies that have international joint ventures, the average number of countries to which the companies export is 3.7, while among the companies that do not have joint ventures, the number is 2.6. Thus, internationalization via FDI seems to be an efficient gate opener for the general internationalization of Brazilian beef packers, as suggested by Barkema *et al.* (1996) and Li (1995). However, it is important to note that different slaughterhouses might have different roles in relation to exportation, depending on the overall strategy of the holding company.

4.2 Information sources

The research revealed that Brazilian slaughterhouses have various means for gathering information on the Chinese market. The diversity of information sources may be due to the absence of a clear and unified traceability system (Knoll *et al.*, 2017). Thus, stakeholders in the meat packing sector need to be resourceful to obtain valuable and current information on the Chinese markets, making it a crucial competitive factor.

The results from the questionnaires (Supplementary methods S2– questionnaire responses) show that for the slaughterhouses, traders (also known as intermediaries) are the primary source information. Although such sources may provide the most up-to-date information, there is also a greater likelihood of opportunism, especially when the Brazilian slaughterhouse does not possess sufficient and trustworthy background information on the foreign market. This can be a problem, as reflected in the comments from Int. 3, who states: 'we receive a lot of information from traders, much more than we can process and verify its trustworthiness.' Int. 4 adds, 'we receive a lot of requests via email from Chinese. We never know exactly who we are dealing with, but we take the risk'. Thus, it seems information from the channels most used by Brazilian beef packing firms might not be completely reliable. However, the lack of reliable information from other sources (or the lack of investment to obtain it) induces firms to take the information from potentially unreliable sources into consideration, even when it presents risk.

Information is a strategic and often costly asset. Thus, it is crucial for firms to decide whether to acquire information, what kind of information is needed and what costs are related to its query (Fu and Zhu, 2010). The present research reveals how the Brazilian beef packers tend to invest in the acquisition of information. According to the survey results, private consultants are the second largest source of market information. Interestingly, the biggest beef packing firms decided to leave this option blank. As suggested by Besanko *et al.* (1996) and Fernhaber *et al.* (2007), it was assumed that some companies, especially the larger ones, consider it a strategically relevant issue and prefer not to share it with competitors. Similarly, the interviewees opted not to answer questions on this issue. This behavior highlights the competitive importance given to information on the Chinese market by the Brazilian beef packing firms and reveals the phenomenon known as 'follow-the-leader' (Hoenen and Hansen, 2009), which is commonly seen among companies operating in a concentrated industry. This concurs with the findings reported by Thomé and Vieira (2012), who found that, in the case of Brazilian beef packers' knowledge on the Russian market, any flow of information between the firms is generally perceived as being against the interest of the company.

The third most important source of information on the Chinese market is the trade associations and government and state information communication, as suggested by Lu *et al.* (2010). Int. 3 agrees with Int. 2 who states that 'we constantly receive information from the ABIEC and sometimes from the Agricultural attaché'.

Since 2001, the ABIEC together with the APEX have undertaken an aggressive marketing plan to establish a common brand: Brazilian Beef on a global level (Steiger, 2006). Their goal is to improve horizontal partnership in the processing and slaughtering sector to decrease opportunistic behavior and increase the competitiveness of industrial exports. However, one of the biggest challenges ABIEC faces is to prepare its members to develop supply chain sustainability through improved information sharing (Vieira and Traill, 2008). The Agricultural attaché's responsibility, on the other hand, is more of a technical nature, focusing on safety matters and the plant accreditation process. Thus, by being a member of ABIEC, the Brazilian packing firms receive reports focused on market movements and tendencies, whereas they receive more technical-related information from the Official Federal Government database. Although the questionnaire respondents and interviewees consider both information sources trustworthy, the information quality regarding volume and timeliness is perceived as quite low.

Interviewees also mentioned the importance of the FDI regarding their acquisition of market knowledge, as observed by Gao *et al.* (2010), Lu *et al.* (2010) and Pfafermayr (1994). Int. 6 states, 'I am open to capital investments from Chinese companies to get better access to information on Chinese demand, and I am also looking forward to investing in their brands or companies'. The importance of investing in networking as a market strategy regarding information sourcing is also mentioned by Int. 5: 'I help Chinese from different areas to do business in Brazil. Then they help me in China...I also propose cooperative product development to the Chinese.' Thus, such collaboration between firms, either through direct investment or the exchange of favors, can create an essential knowledge exchange mechanism between firms (Cunningham and Homse, 1986). This kind of information sourcing is a managerial decision involving long-term planning and considerable resource investment that will probably pay off through the acquisition of unique first-hand information, which can ultimately provide unique opportunities. As suggested by Lu *et al.* (2010), the development of managerial ties through FDI can help firms overcome the liabilities of foreignness and newness in host countries.

Experience also proves to be a valuable tool for foreign market information sourcing (Reuber and Fischer, 1997), as mentioned by Int. 1.: 'we have precise information regarding the specificity of the Chinese market since we have one packer which is accredited to China and dedicates almost 100% of their production to the Chinese market.' Barigozzi and Garlaschelli (2010) and Lu *et al.* (2010) state that the information flow on a specific market (in our case China) becomes more specific and broader if the firm has a wider international network and experience in the market. Thus, knowledge sharing processes can also be used from inside the organization (Becerra-Fernandez and Sabherwal, 2001; Hakanson and Nobel, 2001). However, according to the research findings, solid and reliable inside information seems to be the least frequent source of knowledge. This might be because the Chinese market still represents a new challenge for the Brazilian beef processors, thus only few firms (such as Int. 1), have first-hand, inside experience of the Chinese market.

Last, but not least, according to the interviewees and the questionnaire respondents, news and media sources seem to have the least impact when it comes to reliable information on the Chinese market. This might be related to the generally poor perception of the trustworthiness of the media, but it might also indicate the need for the media to adopt a more unified media channel regarding exports, free from the influence from group interests and sensationalist approaches. In March 2017, the 'Operation Weak Flesh', led by the Brazilian Federal Police, revealed inspectors in the Brazilian beef-sanitation control system were being bribed. This event was intensively communicated by the Brazilian and international media and sparked trade bans ranging from China to Europe. Some of the biggest Brazilian meat exporters were among dozens of firms targeted by 'Operation Weak Flesh' (Reuters, 2017a). Meat industry representatives and the Brazilian government proved to the international beef importers that there were only a few isolated cases of wrongdoing and China and other importers lifted the restrictions and bans (Reuters, 2017b). This event provoked a review of the Brazilian beef traceability and sanitary control systems. On the other hand, the Chinese media and consumers are very critical of the sanitary control system in China (Bloomberg Businessweek, 2016, 2017a,b). Chinese consumers consider the control systems used by foreign exporters more reliable than those adopted by the domestic companies. This situation could be seen as an opportunity for Brazilian beef exporters to communicate to the Chinese consumers the reliability of the Brazilian sanitary control and product traceability

systems, which can ensure the quality and safety of the products in accordance with the specific preferences of the Chinese consumer.

4.3 Testing the knowledge about the Chinese market

The knowledge of the Brazilian packing firms regarding the Chinese beef market was assessed using a 'knowledge test'. At the same time, the existence of a possible relation between the level of knowledge, the firm's size and the information sourcing was investigated. Eleven questions were formulated to cover the most relevant information expected to be known by companies aiming to export to the Chinese market. Five international industry professionals aided in the process of formulating and choosing the questions. Eriksson *et al.* (1997) highlight the importance of institutional knowledge as taxation, consumer channels and their particular features, rules, laws and business practices. Closs *et al.* (1997) and Moberg *et al.* (2002) emphasize the relevance of the accuracy and timeliness of knowledge. Berg's (2001) suggestion regarding the value of listening to the opinion of experts was followed. Questions related to Chinese general beef import volumes, the most desired product types at the research moment and the ports most frequently used to enter Mainland China beef market.

Multiple choice questions were applied (Questionnaire Part C – Supplementary methods S1), usually containing five alternatives from which the respondent was expected to mark only one. The alternatives usually consisted of two of absurd answers (out of context), two very likely answers and one 'I do not know'.

Responses are classified according to the following criteria:
- 80-100% of correctly answered questions: very well informed firm;
- 60-79% of correctly answered questions: well informed firm;
- 40-59% of correctly answered questions: reasonably informed firm;
- 20-39% of correctly answered questions: somewhat informed firm;
- 0-19% of correctly answered questions: poorly informed firm.

These results represent the majority of Brazilian beef companies currently exporting or seeking to export to Mainland/mainland China.

Overall, the highest rate of correct answers was six out of eleven (54.5% of the correct response rate), which correlates to a company that would be 'reasonably informed' on the Chinese market, obtained by Quest 5 (Where do the Chinese consumers buy beef?). Interestingly, this score was obtained by a company that only owns one medium-size beef-packer, with only three different export destinations, and no foreign investment. Although the firm exports to Hong Kong, which could serve as a proxy for greater in-depth knowledge of the Chinese market, its export share to Hong Kong is not outstanding. However, in relation to the other companies, their export departments use inside information on the Chinese market from all the sources listed in the questionnaire, namely, government and state information communication channels, trade associations, traders, private consultants, colleagues/friends and the media. Thus, it can be said that in the specific case of the Chinese market, the knowledge held by Brazilian firms and the whole Brazilian slaughterhouse sector is so limited that none has or wants to share valuable market information. This suggests that almost any kind of knowledge on the Chinese beef market is given strategic value by Brazilian companies, which regard such information as an important asset to increase their competitiveness in the Chinese beef market. As suggested by Fernaber *et al.* 2007, Lu *et al.* 2010, Luo *et al.* (2011), Powel and Rhee (2016), this point of view can be expected given the size of the Chinese market, its recent opening to Brazilian firms and the fast-changing market environment encountered in China.

No clear evidence was found on a possible relation between foreign headquarters (FDI), number of export destinations and difference between firm sizes. However, it is interesting to note the companies that scored the highest in the knowledge test used the maximum or nearly the maximum number of information sources available to them. But, it should be noted that the firms that scored five points did not, in general, mention

whether they obtained information through private consultancy, and two out of three did not state the amount of information they receive from government organizations. Due to the small number of responses, it is not possible to confirm the extent to which private consultancy and government information sources are of strategic importance to firms.

It is also interesting to note that, upon dividing the questionnaires according to processing capacity, the average number of correctly answered questions among the larger and very large companies (slaughter capacity over 800 animals per day) is 38.2%, while among smaller companies, the average is only 21.6%. Although they seem somewhat distant from each other, we cannot consider this proportion statistically different at any reasonable significance level, due to the small sample size and consequent low power of a two sample test.

The number of joint ventures outside of Brazil (FDI) does not seem to influence the company scores in Part C of the questionnaire. The average percentage of correctly answered questions among companies that have international joint ventures is 28.8% against 27.3% for those that do not. The internationalization competences of firms tend to increase with the existence of a foreign headquarters, but may later stagnate if they fail to accompany developments in the foreign markets (Sull and Escobari, 2004). This might be the situation in the case of Brazilian slaughterhouses. Thus, it might be inferred that, while the foreign headquarters of company Nr. 2 are reasonably well-informed regarding the latest events in the Chinese market, the processing and communication of that information to the Brazilian headquarters, or perhaps the learning and knowledge transforming process in the Brazilian headquarters, has weak points.

Similarly, the number of countries to which the company exports does not seem to affect the score: the average percentage of correctly answered questions among the companies that export to four or more different countries is 30.3%, while for those who export to less than four countries it is 26%. In contrast to the results found by Bandeira-de-Mello *et al.* (2016), Lu *et al.* (2010) and Powell and Rhee (2016), experience with export destinations does not radically improve the knowledge levels of these firms.

The question most often answered correctly was the one regarding typical meat cuts sold in China (Quest 1), correctly answered by 69% of the respondents. According to specialists, shoulder steak, flank, bottom round are the beef cuts used for hot pot, barbeque and the increasingly popular Korean dishes (Brown *et al.*, 2013). Surprisingly, the research team found no reliable public information on this question, thus it can be inferred this information is exchanged among business networks in China and Brazil (Johanson and Vahlne, 2009).

The second question most frequently correctly answered was related to the Chinese regions with the current highest and greatest potential for future consumption expansion (Quest 9), correctly answered by 53.8% of the respondents. The correct answer is that all major cities in China have high rates of beef consumption and potential for growth. As suggested by Lu *et al.* (2010), this kind of information can be widely available through government agencies (APEX-Brazil) and the major export associations (ABIEC) and (Association of Brazilian Slaughterhouses (ABRAFRIGO) – *Associação Brasileira dos Frigoríficos*). These agencies have access to this information and can forward it to their members (Frischtak *et al.*, 2015). Any urban hotspot is an attractive market for beef sales, especially those of imported beef, because, in general, the Chinese are more likely to trust international food safety regulations than their own production and certification systems (Bloomberg Businessweek, 2016, 2017a,b; Whitehead, 2014). Additionally, it is important to note that consumption in Northern China, especially those regions with a large Muslim population, also plays a relevant role, as commented by the interviewees.

Questions 7 and 8, related to the import quantity and import peaks, were both correctly answered by five companies. This information has been reported in several sector specific media (for example Canal Rural, 2016; Dinheiro Rural, 2016; Sistema Faep, 2015).

Questions related to bureaucracy, logistics and business culture (Quest 2, 3, 10 and 11) also present low correct response rates (three, three and four, respectively), showing that few companies would be able to act

efficiently without well-informed traders. The questions related to import duties were correctly answered by only one company representative, although this information is publicly available at http://tariffdata.wto.org and is fundamental when calculating revenues from a business transaction. Weakness on the part of the company export departments would seem to be the most plausible explanation for this result, which might reflect the high turnover of employees in Brazilian companies.

Information on marketing channels and the size of the premium market is only available to Chinese market insiders and, accordingly, only one respondent correctly answered the related question. Such information is only available to those with firsthand experience of the market, or with an extremely well-established business networks in a highly-trusted environment, as suggested by Hunt and Morgan (1994), Knoll *et al.* (2017) and Lu *et al.* (2010).

Surprisingly, none of the respondents seemed to know that there is no long-standing tradition of cooking beef in China (except among the Muslim minorities), thus the Chinese rarely cook it at home and consequently the percentage of sales through supermarkets is small. This information seems to be a well-published in several Brazilian magazines and organizations that have highlighted the importance of the Chinese catering sector (BeefPoint, 2013; Bloomberg Brasil, 2016; GloboRural, 2015). This would suggest that firms do not trust the information available in the Brazilian media.

5. Concluding remarks and managerial and policy implications

The research results reveal that the interviewees, who are in leading positions in the headquarters of Brazilian beef packing companies or institutions operating in the export sector, have a low level of knowledge about the Chinese market. The findings show that neither firm size nor experience of beef exporting seem to influence the level of knowledge regarding the Chinese beef market. Similarly, no evidence was found to support the assumption that big multinationals have greater knowledge on the subject than smaller companies These findings appear to contradict the literature, which for the most part, finds that big companies with more experience in the international market have more access to information and knowledge about their importing markets (Fernhaber *et al.*, 2007; Hoenen and Hansen, 2009; Lu *et al.,* 2010).

Regarding the possible sources of information and knowledge, the Brazilian beef export sector has neither an integrated data base containing essential information on the Chinese market, nor a unified traceability system in place that could facilitate the flow of information among the agents across the beef supply chain (Knoll *et al.*, 2017). Thus, firms need to dedicate substantial management resources (time, financial, human) to collecting information and knowledge from several sources. Considering that information and knowledge about the Chinese market are a competitive factor, a fact firms seem to be well-aware of, leading firms that have the resources to invest in information gathering activities can obtain a competitive edge in the Chinese market. Due to the 'follow-the-leader' behavior (Hoenen and Hansen, 2009), whereby competitors adopt the strategy of the leader or first company to move into the new foreign market, a typical behavior of firms operating in a concentrated industry (four firms detain more than 60% of the total beef slaughtering, processing and exporting industry in Brazil), the leader firms try to protect this strategic resource.

Unfortunately, although the situation presented above might benefit individual companies with the resources to tackle the challenges related to information gathering, organizing and learning, it inhibits the successful promotion of Brazilian Beef as a brand on the Chinese market. Based on previous research conducted by this research team (Knoll *et al.*, 2017), companies that have been successful in the emerging Chinese beef market are known to promote and exploit the country of origin (Uruguay, New Zealand, Australia, etc.) as one of their strong points in marketing communication strategies. For Chinese consumers, it is much easier to relate the quality of beef to the country of origin than to an unknown company or brand name. In China, Australian beef is strongly associated with safety, quality and taste (MLA, 2016). In countries such as Uruguay, New Zealand and Australia, farmers and packers recognized the importance of the geographic indication, and are now, together with government support and the private sector, positioning themselves

accordingly. Additionally, these countries transfer a lot of information on their products to the Chinese consumers (Bloomberg Businessweek, 2016; Ortega *et al.*, 2016), which makes their products even more desirable due to the consumer trust in them. Brazilian exporters could do well to make greater use of the APEX structure and information systems to communicate the quality of 'Brazilian beef' to the Chinese consumers.

It was found that firms only partially penetrate the Chinese market, even with the supposed benefits of FDI, experience with exports or traders and third parties. Instead, crucial knowledge seems to be acquired from multiple sources which, according to Sull and Escobari (2004), is another means of obtaining valuable information on a foreign market (customer needs, market opportunities and strategic partners, for example). There might be several reasons for this. One of which is time (Johanson and Vahlne, 2009), since the Chinese beef market has only recently re-opened, factors such as experience and foreign investment have not yet paid off, and might need at least five years to do so (Hohenthal, 2006). Cultural differences in dealing with business networks might prolong that period, as suggested by Dhingra (2013). On the other hand, the mere fact of having the company headquarters located abroad does not ensure that Brazilian beef packers acquire quality and timely information, since, in order to do so, the team must do its job adequately. Because Brazilian beef is essentially a commodity product, with no specification for the Chinese market, Chinese buyers only pass on the information that is absolutely necessary, such as quantity needed, price, and delivery time, without signaling any further information regarding the market tendencies (Knoll *et al.*, 2017).

When it comes to inside information about the Chinese market, the beef packers rarely develop their sources and scarcely consider such information. This might be because they do not have well-equipped specialists with reliable and valuable knowledge. Therefore, it can be assumed that even in the largest and leading export companies, the managers do not have the whole picture on the specific foreign market. Another explanation could be the high staff turnover in the Brazilian work force, which inhibits employees from focusing on consolidating their expertise on the Chinese beef market. This situation obliges companies to use specialist traders and special exporting channels, thus reducing the role of the export manager to managing the in-firm or out-firm networks and partnerships.

The research results highlight the need for the Brazilian beef export sector to develop and implement information systems capable of ensuring the traceability of the beef from the farm to the Chinese consumer and that provide every segment within the supply chain with the framework to access at least the most basic information needed to ensure sustainable supply chain management (Buhr, 2003). Efficacy and efficiency in generating and delivering information across the supply chain is a big issue for the food system in emerging countries (Cunningham and Homse, 1986; Dhingra, 2013; Hunt and Morgan, 1994; Lu *et al.*, 2010). Accordingly, more coordinated efforts on the part of the Brazilian Federal System of Quality Control (SIF), the APEX, the ABIEC and the ABRAFRIGO to homogenize and integrate information to a certain extent regarding the Chinese market and import requirements might be called for.

Depending on the cuts exported, Brazilian beef products to China are up to 50% cheaper than those supplied from Australia and Uruguay. Brazil is considered one of the cheapest geographical origins, while it has less direct access to Mainland China. To add value and reach the middle-class Chinese consumer, a traceability system is recommended with the technological, institutional and informational infrastructure capable of producing and delivering weekly reports by the Brazilian and Chinese governments, export and import agents and sectorial associations to ensure and communicate food safety and supply and demand needs at a relatively low cost. Thus, a system is suggested in which the supply chain agents (both governmental and those private institutions already existing and active in the chain) and stakeholders should report, at least weekly, to an online database, to which every registered chain member would have access. Such a database would contain the origin, production and processing and storage capacity of the enterprises. It could signal demand and supply quantity and quality on weekly, monthly and half-yearly bases. By accessing such information and knowledge the supply chain member would know exactly who to contact and which stakeholder to network with. Such a platform could become a reliable traceability system based on agreements or contracts among the agents involved.

Finally, it is relevant to point out that the conclusions and suggestion regarding how to improve the export and traceability systems reported above are based on the results obtained from the analysis of the questionnaires and interviews, as well as the theoretical foundations of a traceability system debated in the theoretical background (Section 2) (Buhr, 2003; Cooper *et al.*, 1997; Cunningham and Homse, 1986; Dhingra, 2013; Hunt and Morgan, 1994; Jie *et al.*, 2013; Knoll *et al.* 2017; Lu *et al.*, 2010).

6. Limitations

One of the research limitations is the low number of respondents to the questionnaire (13), although they represent a relatively high percentage of the total volume of beef exported from Brazil to China in 2016. To enrich the research, interviews were conducted with Brazilian and Chinese traders and export/import agents. It should be noted, however, that there were limitations on time, contacts and resources when conducting the interviews. Besides the brief nature of the interviews, it is important to acknowledge that only one person from each firm was interviewed, so the responses carry this limitation. The same is true for the case of the questionnaires. The position of the particular respondent in the firm should also be taken into account, as one would expect an export manager to know more about the Chinese market than a general manager, for instance.

The questions in part C of the questionnaire are related to basic knowledge of the Chinese market. However, it would be an exaggeration to claim that someone has or does not have a complete overview of the Chinese market because they correctly or incorrectly answered 11 questions. Hence, while the data collected offer valuable insights into the knowledge held by the Brazilian beef industry regarding the Chinese market, those insights should be taken as evidence rather than statistical conclusions, since, due to the small sample size, it was not pertinent to apply any statistical test to check any hypothesis. In the future, a census in the sector could produce richer and statistically representative knowledge about the information flow in the Sino-Brazilian beef supply chain.

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Supplementary material

Supplementary material can be found online at https://doi.org/10.22434/IFAMR2017.0018.
Methods S1. Questionnaire (in Portuguese).
Methods S2. Questionnaire responses (in English).

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