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Pork consumption in Brazil: challenges and opportunities for the Brazilian pork production chain

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Abstract

In spite of being the world's most consumed meat, pork ranks only third in Brazil, with a consumption level much lower than that of poultry and beef. Although consumption of fresh pork meat has been increasing in recent years, 67.9% of the Brazilian pork consumption is based on processed pork products. Despite the chain's many technological improvements in recent years, producers and industry are not yet focused on innovation nor on informing and captivating the new millennium's consumer. Brazil is a country of continental dimensions and recent changes in the economic status of the population have created a favourable environment for the development of new pork products. This study investigates consumers' eating habits, preferences and satisfaction using data collected from a survey among 482 consumers as part of the Q-PorkChains project in Brazil. Results indicate that consumers prefer fresh (not frozen) products and the supermarket is their preferred distribution channel. Pork products are consumed mostly at home, with family, on any day of the week. Consumers are generally satisfied with the products available in the market, although health aspects, convenience and price could be improved. Overall, the interviewed pork consumers in Brazil signal opportunities for the pork chain in terms of innovation and new product development.

Keywords: Brazil, pork chain, product innovation, consumer behaviour

1. Introduction

Agri-food chains and networks play an increasingly important role in providing access to markets for producers in developing countries (Ruben *et al.*, 2006). The agri-food system is generally composed of agents, their relationships, the sectors, the supporting organisations and the institutional environment (Batalha, 2001; Zylberstajn and Neves, 2000). A supply chain is therefore defined as a set of three or more agents directly involved in input and output flows of products, services, financial resources and information from the origin to the end consumer (Mentzer *et al.*, 2001).

The rapid pace of change in the environment in which food chains operate increases the importance of integrated chain analysis. The growth of demand in Asia and other emerging nations is putting increasing pressure on the planet's limited resources. In this new era industries must learn to 'produce more with less' and only integrated supply chains can successfully address this consumer demand (Neves *et al.*, 2010).

From an agri-food chain perspective, food products can be classified as either value added or commodities (Roth *et al.*, 2008). Value-added foods are those for which the specific nature of the food is of central importance to customers. Certain meats and seafood typically fall into this category, as do 'credence attribute' foods[1]. For these types of products, value has traditionally been derived from close relationships with the supply chain members and the presence of trust, transparency and traceability (e.g. assurances of expected quality through close identification of producer, branding or certification). In most cases, these food items enjoy higher margins throughout the supply chain because consumers are willing to pay more for the guarantee of certain quality or

[1] Credence attributes are content or process attributes that are difficult for the consumer to detect during or after food consumption (e.g. calcium-added, country-of-origin, organic or preferred processing techniques). Instead, consumers have to trust the information and information sources that claim or certify the credence character of the good.

growing/production practices (Roth *et al.*, 2008; Saltmarsh and Wakeman, 2004).

Hence, in agri-food markets, it is important to analyse consumer perceptions of product value. This is especially true for those products still considered as commodities, such as unbranded fresh pork meat in many cases. In that sense, chain orientation towards the end-consumer is fundamental for the organisation of all agents, since a food supply chain will only be competitive if it is in tune with consumers' needs, wants and demands (Vieira *et al.*, 2010).

The aim of this study is therefore to investigate Brazilian pork consumers' purchasing and eating habits, as well as their satisfaction level with the pork products available in the Brazilian market. To succeed in this dynamic food industry environment, it is proposed that pork chain managers need to better understand consumer behaviour. The main challenges and opportunities for the chain, in bringing consumer interest back to pork meat, were also addressed. In the 1970s, pork represented 26.2% of total meat consumption in Brazil, while poultry represented 17.3% and beef 56.5% (Tramontini, 2000). By 2010, the situation had changed: poultry represented 46.8% of total meat consumption, while beef represented 37.4% and pork only 15.8%. For 2020, the Brazilian Ministry of Agriculture, Livestock and Food Supply (2010) forecasts that pork will lose a further 1.2%, beef will lose 2.1% and poultry will increase 3.3% in the total meat market share, corresponding to half of total meat consumption in Brazil.

The structure of this paper is as follows: Section 2 provides the main theoretical and empirical considerations for this study, and addresses supply chain management, the pork production chain and Brazilian pork consumers in particular. Section 3 elaborates on the methodological approach, including the research strategy employed, sampling methods and questionnaire content. Section 4 presents the results of the survey performed in eight Brazilian cities. Section 5 discusses the results and presents the major conclusions of this study. Finally, Section 6 points out the main implications of the study for public policy, industry and stakeholders; and further research is also suggested.

2. Theoretical background and study domain

Supply chain management in the pork production sector

Supply chain management (SCM) is a cross-function that includes the bidirectional flow of products (materials and services) and information, and the associated managerial and operational activities from producer to consumer (Cooper *et al.*, 1997). It is the systemic and strategic coordination of tasks among different companies that are part of a supply chain, aiming to improve each company's performance as well as that of the overall supply chain (Mentzer *et al.*, 2001). The ultimate goal of SCM is to deliver superior consumer value at less cost to the supply chain as a whole, while satisfying variable requirements of other stakeholders in the supply chain (e.g. government and non-governmental organisations) (Van der Vorst, 2000, Van der Vorst *et al.*, 2005).

The supply chain spans the value delivery cycles of the manufacturer, its suppliers, and its downstream channel members. SCM seeks to enhance competitive performance by closely integrating a company's internal functions (e.g. marketing, product development and design, manufacturing) and effectively linking them with the external operations of suppliers and channel members (Shawnee *et al.*, 1999). The concept of SCM has ultimately changed the competitive paradigm, since scholars consider competition to be no longer between companies, but between supply chains.

Shawnee *et al.* (1999) presented flexibility as an important dimension in supply chain performance. Flexibility is often seen as a reaction to environmental uncertainty, reflecting an organisation's ability to effectively adapt or respond to change. While there are many ways to characterise such an ability (for example, manufacturing flexibility, marketing flexibility), the authors proposed that flexibility should be viewed from the perspective of the entire value-adding system, i.e. from an integrative, customer-oriented perspective.

Supply chain competition and flexibility are therefore key concepts in agri-food systems, which have recently become more concentrated and responsive to changing demand. Nevertheless, applying these concepts is difficult in some sectors due to opportunistic relationships amongst agents, implying that coordination is also a key issue in food SCM (Vieira *et al.*, 2010).

The progressive reversal of food supply chains from being supply driven to demand (consumer) driven has made an enormous difference to their structure and mode of operation (Boselie *et al.*, 2003). However, SCM does not come without its difficulties. The clear identification of demand and demand trends and the ability to communicate these (information transfer) backwards through the chain, which would result in determining both product and processes standards, are still encumbered by important constraints (Vieira *et al.*, 2010).

In the case of the pork chain in Brazil, there are no official statistics, but estimates suggest that 88% of the technologically advanced pig farms are vertically integrated

through contracts or farm promotion programmes from agri-food industries and cooperatives. Vertical integration dominates in the south of Brazil, but it is also growing in the southeast and central-west regions, which have recently developed as pig production regions (Miele, 2007). In that sense, agri-food industries are the chain leaders and mainly responsible for SCM, including product innovation and the realisation of consumer satisfaction.

Innovation in the food industry is an important source of differentiation and a value-adding opportunity for managers. Hence, innovation constitutes a competitive advantage in the globalised agri-food scenario (De Barcellos *et al.*, 2009). Costa and Jongen (2006) stated that product innovation may help to maintain a firm's growth (thereby protecting the interests of investors, employees and food chain actors), reduce the market risk, enhance the company's stock market value and increase competitiveness. While focusing on the European food and beverage industry, the authors stated that this industry is quite conservative in the type of innovations it introduces to the market, displaying much lower research and development (R&D) investments than industries in other sectors. One possible explanation, according to studies by Cooper (1994) and Costa and Jongen (2006), is that many food product introductions fail. Around 40% to 50% of new product introductions are gone from retailers' shelves within a year, according to Ernst & Young Global Client Consulting (1999). As a consequence of such negative product introduction results, the food sector strategy is characterised by a parsimonious development of innovations. Much of the innovation is based on brand extensions of the same product line, which is a less risky strategy (Grime *et al.*, 2002).

In Brazil, despite recent increases in land and labour prices, taxes and energy costs, and the lack of an adequate logistics infra-structure, agri-food chain competitiveness is still based on production cost advantages and abundant natural resources (Neves, 2011). Nevertheless, product innovation is rising as a new competitiveness element in this scenario in order to guarantee better market access (De Barcellos *et al.*, 2008). According to Omta and Folstar (2005) consumers expect continuous improvements in the agri-food products offered.

In such a context, it is paramount to identify how consumers behave with respect to consumption, and why they do so. This information will create a better understanding of their preferences and can drive chain marketing activities (Grunert, 2006).

The pork production chain in Brazil

In spite of being the world's most consumed meat (15.0 kg/person/year), pork ranks only third in Brazil. Reported annual pork consumption in 2010 was only 14.3 kg/person/year (Desouzart, 2011), which is very low compared to the country's poultry and beef consumption (36 and 37 kg/person/year, respectively). Nevertheless, since Brazil is a country of continental dimensions and has an estimated (growing) population of 190.73 million (IBGE, 2010), it can be seen as an important market for pork products. In 2010, 3.3 million tonnes of pork were consumed in Brazil (Desouzart, 2011).

Pork consumption has in fact increased in Brazil in recent years. From 1990 to 2006 the average annual growth was 4.9% (USDA-2007, in Saab and Neves, 2009). Yet, consumption projections show increasing preference of the Brazilian consumers for poultry meat, whose projected growth is 3.2% per year in the period 2009/2010 to 2019/2020. This amounts to a domestic consumption of 10.9 million tonnes 11 years from now. Beef occupies the second place in the increase of consumption with a projected annual growth rate of 1.9% from 2009/2010 to 2019/2020. The growth rate for pork consumption is projected at no more than 1.8% per year for the coming years (Brazilian Ministry of Agriculture, Livestock and Food Supply, 2010).

Interestingly, about 67.9% of the Brazilian pork consumption is based on processed products like sausages (Miele, 2011). Lower preference for fresh cuts can be explained by cultural and historical aspects related to the image consumers have of the first pork production systems that existed in Brazil. Pork production is still perceived by most consumers as an activity in which an extremely fat animal, living in a 'dirty and smelly pen', is fed leftovers (Miele, 2007). Until the mid-20th century, animal fat was a common ingredient in the Brazilian diet. At that time, pork fat was as important as the loin or fresh ham. Pigs had only 40 to 45% of carcass lean meat and 5-6 centimetres of external fat. With the development of vegetal fats, such as margarines, pork fat was no longer used. New pig breeds were then selected to produce leaner meat. The outcome was a revolutionary change in the Brazilian pork production chain, leading to the modern pig type found today: an animal with 58 to 62% carcass lean meat, and only 0.8 to 1.2 centimetres of external fat (Roppa, 2006). High-quality, industrial pig production (as opposed to subsistence pig production, mostly destined for the farm's own consumption) increased 1.5% in 2010 and accounts for 90% of overall Brazilian pig production. Subsistence production has in fact been decreasing, accounting for only 10% of pork production in 2010, while it accounted for 29% in 2002.

In order to face the new 'produce more with less' concept, pork production chains in Brazil and worldwide

are demanding innovations, e.g. research for better understanding of pig nutritional requirements, technologies to increase productivity of raw materials such as feed, alternative programmes for disease control, identification of cost-efficient alternatives to antibiotics, micro-encapsulation for controlled release of nutrition, and improved animal welfare management (Neves, 2011).

In spite of technological improvements and animal genetic developments in Brazil (especially in regard to quality assurance, feed conversion efficiency and production of lean pork), producers and industry are not yet able to innovate nor inform and captivate consumers. At the retail level, several studies report a lack of variety as well as high product prices (Altmann, 1997; De Barcellos *et al.*, 2009; Miele, 2006; Miele and Waquil, 2007; Saab, 2011; Weydmann, 2004).

Pork consumers in Brazil

Like Europeans, Brazilian consumers are a heterogeneous group. Considering the country's size (850 million hectares) and large variety of cultures, one can expect significant variability in food consumption behaviours. Regional differences are strongly marked in the Brazilian food context. People from the tropical and less wealthy north-eastern part of the country have very different eating habits than those from the wealthier and less tropical southern states. In the 19th century, the southern region received the first strong wave of immigrants from Europe, and many of the eating habits in that region were influenced by these colonists.

Pork consumption is higher in the southern and south-eastern regions than in the northern, north-eastern and central-western regions (Schlindwein and Kassouf, 2006). Recent data shows that pork consumption is highest in the state of Minas Gerais (ABIPECS, 2011), reaching 21 kg/person/year. Pork consumption in the rural areas of Brazil is also reported to be higher than in urban areas (Schlindwein and Kassouf, 2006). According to Brazilian statistical data, around 85% of national households are situated in urban areas and only 15% in rural areas (IBGE, 2005). Overall, pork is readily available in Brazil, since domestic consumption accounts for 83% of overall production. The excess 17% is exported, mainly to Russia and Asian countries (ABIPECS, 2011).

In terms of socio-demographics, previous studies have indicated that family income has a highly positive and significant effect on the probability of pork consumption in Brazil, i.e. increases in family income increase the probability of pork consumption at household level. Furthermore, as income increases, processed products become substituted with fresh meat (Miele, 2011). Finally, a gender effect in regard to pork consumption has been reported. There is a higher probability of pork consumption in households headed by men than in households where the responsible person is a woman.

3. Materials and methods

Research approach and sampling

To reflect the range of cultural differences stated above, the Q-PorkChains survey was applied in four different states of Brazil (Rio Grande do Sul, Paraná, Mato Grosso and Goiás), representing two very different regions of the country (south and central-west) as well as different pig production systems. The southern region (Rio Grande do Sul and Paraná) is characterised by traditional pork production, and its population is made up largely of descendants of European immigrants, mainly from Germany, Italy and the Netherlands. In contrast, the central-western region (Mato Grosso and Goiás) represents a new pork production area with highly industrial, larger and more professionalised rural properties. This region accounts for most of the 176% growth in pork production from 1998 to 2004 (Miele and Girotto, 2006). Located in the heart of the Brazilian grain production area, this region has a significant advantage in terms of production costs (Miele, 2007; Silveira and Talamini, 2007). It is less populated, but rapidly expanding, since new cities are being created as industry follows agriculture, pork and poultry production expansion. People migrate from other states to the central-western region, and there is a wider variety of cultures and habits among the population.

Quantitative descriptive data were collected by means of a consumer survey in eight Brazilian cities located in the four selected states. These cities were selected based on the following criteria: (1) one big city, i.e. the capital, in each state, and per state also (2) a small city with medium to high pork production levels. This led to the selection of the following cities:

- Curitiba and Ponta Grossa, in the state of Paraná;
- Porto Alegre and Santa Rosa, in the state of Rio Grande do Sul;
- Cuiabá and Campo Verde, in the state of Mato Grosso;
- Goiânia and Rio Verde, in the state of Goiás.

Statistical differences between regions or cities detected during analysis are presented in the text. One way ANOVA was applied using the Scheffe *post-hoc* test. This tests all pairs for differences between means and all possible combinations of means. The Scheffe *post-hoc* test is known to be conservative, which helps to compensate for spurious significant results that occur with multiple comparisons (Kockars and Hanckok, 2000; Shutler, 2002). The main

socio-demographic determinants of pork consumption were modelled using regression methods.

Sample characteristics

Participants were randomly selected by the professional market research agency TNS-Interscience in line with predetermined quotas pertaining to age and region. The sample was equally distributed in all eight cities (12.5% in each). The target population was intentionally divided into three different age groups (18-30 years, 31-50 years, and more than 50 years).

A total number of 482 consumers completed the survey. Female participants represented 50.2% of the total sample. In accordance with the quota design, 50% of the participants lived in urban areas, while 50% lived in small cities with a high density of pork production. 75% of the participants were not living alone (50% married, 25% not married but living with a partner), while the rest were single (10%), widowed (6%) or divorced (9%). Most of the participants had an upper-secondary school education (44.5%), followed by lower-secondary school (29.1%), elementary (14.8%) and university or post-graduate education (only 11.6%).

Questionnaire content

Participants were asked to participate in a personal interview based on a structured questionnaire, originally developed for the Q-PorkChains study conducted in Europe (Verbeke *et al.*, 2010). The master questionnaire was developed in English and translated for this study into the national language (Portuguese) using the procedure of back-translation. Researchers in Brazil carefully tested the questionnaire through personal interviews with 15-20 respondents in each of the cities in order to identify and eliminate potential problems and to ensure linguistic equivalence. Following the Q-PorkChains Module I (consumer/market analysis) theoretical model[2], the questionnaire consisted of seven sections: (1) socio-demographic and anthropometric (self-reported height and weight) characteristics of the respondents; (2) food-related lifestyle questions; (3) Schwartz Pictorial Value Questionnaire; (4) attitudes towards environment and nature, industrial food production and technological progress; (5) ethnocentrism; (6) conjoint study measuring citizen attitude towards pig production systems; and (7) a questionnaire on respondents' consumption habits of pork-based food products.

Sections 2, 3, 4, 5 and 6 included the so-called 'attitudinal' domains, analysed and reported elsewhere (see De Barcellos *et al.*, 2011a; Krystallis *et al.*, 2009; Pérez-Cueto *et al.*, 2010; Resano *et al.*, 2010, 2011a,b; Verbeke *et al.*, 2010).

Section 7 covered the 'consumption' domain, which is analysed in the present study owing to its originality and main contributions from a pork production chain perspective. In this section respondents were asked how often they consume pork (assessed for 11 different pork-based products), whether they buy fresh or frozen pork, where they purchase pork (supermarket, butcher), when they consume it (working day, any day, weekend, special occasions), with whom (alone, with family, with friends, with others) and where (at home, out-of-home). For the purpose of analysis, the 11 pork products were aggregated and further classified into five categories according to their processing level: fresh pork, fresh minimally processed pork, fresh further processed pork, pork-based dishes and processed pork products, as presented in Table 1.

The fieldwork for data collection was performed during the second half of March 2008. All interviews were conducted by TNS-Interscience researchers at the place of purchase of pork meat, basically supermarkets and local butchers. Participants were randomly intercepted, and the duration of the interviews ranged from 45 to 60 minutes.

The questionnaire was implemented through personal (face-to-face) interviews, because the application of self-

Table 1. Pork product aggregation according to processing level.

Product name	Category
Pork ribs	fresh first cut
Loins and chops	fresh first cut
Fresh ham	fresh first cut
Others (entrails, fat, tail, ear)	fresh first cut
Sausages, minced pork meat, brochette, dry meat	fresh minimally processed
Stuffed meat, escalope, roasted meat	fresh further processed
Lasagne, pizza, spaghetti, feijoada	pork-based dishes
Ham, salami, mortadella	processed pork products
Bacon	processed pork products
Sausages	processed pork products
Paté	processed pork products

[2] For a detailed description of the theoretical model followed in Module I (consumer/market analysis), please see: http://www.q-porkchains.org/news/newsletters/no_5/~/media/Qpork/docs/pdf/Consumer%20and%20Market%20Analysis_Klaus%20Grunert.ashx and the papers by De Barcellos *et al.* (2011a), Krystallis *et al.* (2009), Pérez-Cueto *et al.* (2010), Resano *et al.* (2010, 2011a,b) and Verbeke *et al.* (2010).

administered electronic questionnaires could seriously restrict the sample, given the characteristics of the population. Less than half of Brazil's population, or around 78 million people, have access to the internet (Ibope/Nielsen, 2011).

4. Results

Pork consumption in Brazil

Table 2 shows the frequency of consumption of the listed pork products in Brazil. Official statistical data indicates that pork consumption in Brazil is mainly based on processed pork products (67.9%). The present study confirms this: pork products, such as salami, ham and mortadella are the only ones that are consumed daily (19% of the participants eat these products *every day*), which is a relatively small share compared to some European countries.

A large proportion of participants reported a very low frequency of consumption, particularly of pâté (52% never and 28% seldom), but also of other fresh items like entrails, fat, tail or ear (with 29% of respondents reporting never). Seventy-two percent of respondents never or seldom eat fresh further processed pork. Pork-based dishes are also seldom consumed, which might indicate a lack of available ready-to-eat products containing pork on the market. A high percentage of the people in this sample of Brazilians also reported that they seldom eat most fresh products: fresh ham (68%), sausages, minced, brochette (50%), loins and chops (54%) and pork ribs (54%).

The results indicate very few statistical differences between the two regions studied. For fresh products, entrails are consumed most frequently in the central-western region and pork ribs in the city of Santa Rosa. Fresh further processed products (stuffed meat, escalope, roasted meat) are more frequently consumed in the capital cities (Porto Alegre, Cuiabá and Curiba) and Santa Rosa. Processed pork products are more frequently consumed in the central-western capital cities (Cuiabá and Campo Verde), as well as in Santa Rosa.

Furthermore, a series of regressions were run in order to identify the main socio-demographic determinants of pork meat consumption. The results show that the higher the education of Brazilian consumers, the more frequent is their intake of processed pork. Similarly, women consume processed pork products (salami, ham, mortadella) more frequently than men. When comparisons were performed by occupational categories, the study found that in general unskilled workers eat less processed meat than students, retired individuals and other workers (skilled, self-employed, employees in general). Students showed the higher consumption frequency of processed pork products when compared to the other occupational categories.

Table 2. Consumption frequency of pork meat and derived pork products (n=482, %).

	Never	Seldom	Less than once per week	At least once per week	Daily
Fresh first cut					
Pork ribs	5.6	**53.6**[a]	27.6	12.2	1.0
Loins and chops	5.8	**54.1**	25.6	12.7	1.9
Fresh ham	4.4	**68.2**	18	7.7	1.7
Others (entrails, fat, tail, ear)	29.0	**47.3**	14.3	8.9	0.4
Fresh minimally processed					
Sausages, minced pork meat, brochette, dry meat	15.5	**49.8**	23.8	9.6	1.0
Fresh further processed					
Stuffed meat, escalope,. roasted meat, saté	24.3	**48.1**	19.7	6.8	1.0
Pork-based dishes					
Lasagne, pizza, spaghetti, feijoada	7.1	**39.4**	36.3	16.6	0.6
Processed pork products					
Salami, ham, mortadella	4.8	19.5	24.0	**33.0**	18.7
Bacon	15.8	**36.8**	25.8	18.6	3.1
Sausages	6.6	**28.0**	27.8	33.0	4.6
Pâté	**51.5**	28.2	9.6	8.7	2.1

[a] Higher consumption frequency per product in bold.

Fresh vs. frozen and place of purchase

From the total sample, 89.1% purchase their pork and pork products fresh (Table 3). The share of frozen purchases is highest in the pork-based dishes category (20.1%), versus 15.1% in the category of fresh further processed products (minced pork meat, escalope), and only 3.6% in the processed pork products category (ham, salami, mortadella). When comparing amongst cities, differences are not marked, with the exception of Porto Alegre, where consumers reported higher shares of frozen purchases in the categories fresh minimally processed, fresh further processed and pork-based dishes.

A vast majority of consumers (72.7%) buy the listed pork products in supermarkets. Only 23% purchase them at butcher shops, but this varies considerably by product: only 3.8% buy pâtés and 5.2% buy processed meat products like ham, salami and mortadella from a butcher. The majority of consumers reported that the products they buy via butchers are mostly fresh products.

Cuiabá is the only city where most fresh, fresh minimally processed and fresh further processed pork products are bought preferably in a butcher shop. This result reflects a fact that can be easily seen in Brazil, which is that butchers are losing their market shares to supermarkets. For the sake of convenience, consumers want to buy all their food at the same place (Dallari, 2007): so the concept of 'one stop shop' is broadly spread throughout the country. The number of butcher shops is steadily declining, and supermarkets are occupying their space (Honda, 2008; Milan, 2008). Butchers were not able to adapt to the tendency towards convenience, unlike the bakeries, for example, that started to sell a lot of other products together with bread in order to keep consumers coming every day.

Fresh further processed products and pork-based dishes are the only ones that are purchased elsewhere (rotisseries, patisseries or even restaurants) by a considerable percentage of consumers (18.9% for dishes and 14.1% for fresh further processed products).

Occasions: when consumers eat pork

Table 4 shows that Brazilians eat most pork meat and derived pork products on *any day* or occasion, suggesting that an increase in the variety and convenience of such products could positively impact consumption (as has been the case with poultry in the last few years).

Table 3. Consumer purchasing behaviour related to freshness and distribution channel of pork meat and derived pork products (n=482, %).

	Freshness			Distribution channel		
	fresh	frozen	both	at the butcher	at the supermarket	somewhere else
Fresh first cuts						
Pork ribs	**88.7**[a]	10.3	1.0	41.2	**57.6**	1.3
Loins and chops	**89.5**	10.5	0	45.7	**52.6**	1.6
Fresh ham	**84.0**	13.9	2.2	32.5	**65.4**	2.2
Others (entrails, fat, tail, ear)	**88.3**	11.1	0.6	37.8	**58.3**	3.9
Fresh minimally processed						
Sausages, minced pork meat, brochette, dry meat	**88.8**	10.8	0.4	19.6	**78.8**	1.7
Fresh further processed						
Stuffed meat, escalope, roasted meat, saté	**84.9**	15.1	0	20.3	**65.6**	14.1
Pork-based dishes						
Lasagne, pizza, spaghetti, feijoada	**79.9**	20.1	0	5.2	**75.9**	18.9
Processed pork products						
Salami, ham, mortadella	**96.4**	3.6	0	8.1	**89.8**	2.1
Bacon	**93.8**	6.2	0	20.0	**79.3**	0.7
Sausages	**92.7**	7.3	0	19.0	**80.3**	0.8
Pâté	**93.1**	6.9	0	3.8	**96.2**	0

[a] Higher frequency per product marked in bold.

Table 4. When Brazilian consumers eat pork meat and derived pork products (n=482, %).

	On working days	Any day	During weekends	Only on special occasions
Fresh first cuts				
Pork ribs	17.0	**57.2**[a]	20.9	4.8
Loins and chops	11.5	**67.1**	15.1	6.3
Fresh ham	9.1	**50.2**	23.4	17.3
Others (entrails, fat, tail, ear)	10.0	**75.6**	13.9	0.6
Fresh minimally processed				
Sausages, minced pork meat, brochette, dry meat	10.0	**65.4**	21.3	3.3
Fresh further processed				
Stuffed meat, escalope, roasted meat, saté	8.9	**46.9**	32.3	12.0
Pork-based dishes				
Lasagne, pizza, spaghetti, feijoada	8.1	40.4	**48.3**	3.2
Processed pork products				
Salami, ham, mortadella	6.4	**87.9**	4.7	0.9
Bacon	7.2	**80.0**	11.0	1.7
Sausages	6.5	**85.2**	7.3	1.0
Pâté	11.5	**77.1**	11.5	0

[a] Higher frequency per product marked in bold.

Pork-based dishes are the only type of pork meat for which a higher percentage of respondents reported eating it *during weekends* than on *any day* (48.3% versus 40.4%). This difference was especially pronounced in central-western cities. The second highest in this category was fresh further processed meat (stuffed, escalope, roasted meat), with 32.3% of consumers reporting that they eat this *during weekends*. In Porto Alegre, further processed meats are mainly consumed during the weekend. 17.3% of consumers indicated that they eat fresh ham *only on special occasions*, which can be associated with Christmas and New Years' celebrations. Statistical differences point out that consumers from the southern (more traditional) region consider fresh ham as a product more suited for special occasions.

When comparing consumption *on working days* with consumption *during weekends*, only processed meat products (ham, salami, mortadella) are consumed more often *on working days*; the fact that they are usually consumed as snacks on sandwiches or at breakfast contributes to this finding. All the other items are preferably consumed *during weekends*, indicating that those types of meat might require more preparation time. It may also indicate that these products are available in larger pieces, and so can only be consumed in one day by an entire family (assuming that a meal with a united family is something that happens mostly on weekends).

Company: with whom consumers eat pork

In Brazil, pork products are mostly consumed with *family*. Further processed products such as stuffed meat, escalope and roasted meat (18.8%), and especially pork-based dishes (lasagne, pizza, spaghetti or feijoada), with a share of 31.1%, are the only items that substantial percentages of consumers eat together with *friends* (particularly in Cuiabá). More than 10% of respondents (11.3%) also report eating fresh minimally processed products (sausages, minced pork meat, brochette, dry meat) together with *friends*. Of the products consumed by respondents *alone,* processed pork products (ham, salami, mortadella) are highest on the list, followed by pâtés (16%), sausages (12.5%) and bacon (11.7%), as indicated in Table 5.

Places: where pork is eaten

Pork products in Brazil are mostly consumed *at home*. Products like pâté (98.5%) or bacon (95.9%) are almost exclusively consumed at home. Only four categories have noticeable shares of consumption *at a restaurant*: further processed meat (stuffed meat, escalope, roasted meat), with 21.4%; pork-based dishes (18.9%); minimally processed products (sausages, minced pork meat, brochette, dry meat) with 12.9%; and others (entrails, fat, tail, ear), with 12.2%. Statistical differences were found only in Cuiabá, where *at*

Table 5. With whom Brazilian consumers eat pork meat and derived pork products (n=482, %).

	Alone	With family	With friends	In other company
Fresh first cuts				
Pork ribs	6.4	**89.4**[a]	4.2	0
Loins and chops	5.9	**87.2**	6.9	0
Fresh ham	5.6	**84.8**	9.1	0.4
Others (entrails, fat, tail, ear)	6.7	**85.0**	7.8	0.6
Fresh minimally processed				
Sausages, minced pork meat, brochette, dry meat	5.8	**82.9**	11.3	0
Fresh further processed				
Stuffed meat, escalope, roasted meat, saté	7.8	**73.4**	18.8	0
Pork-based dishes				
Lasagne, pizza, spaghetti, feijoada	4.1	**64.2**	31.1	0.6
Processed pork products				
Salami, ham, mortadella	18.0	**78.7**	3.3	0
Bacon	11.7	**85.2**	2.8	0.3
Sausages	12.5	**84.9**	2.6	0
Pâté	16.0	**82.4**	1.5	0

[a] Higher frequency per product marked in bold.

a restaurant is the preferred place to eat fresh minimally processed, fresh further processed and pork-based dishes. No item has a share of consumption above 10% for either *on the go* or *somewhere else*, but pork-based dishes have equal shares in both places (9.6%) (Table 6).

In general, these results confirm the notion that pork products are poorly diffused in restaurants and other food service locations, such as snack bars and convenience stores, which represent a new marketing opportunity. It is very usual to find at restaurants a wide variety of dishes prepared with beef and chicken, but very few with pork as the main protein component. So, promotional activities like culinary courses or contests with restaurant chefs would be advisable. Strategically, diffusing the use of pork products to snack bars, convenience stores and restaurants could not only increase consumption, but also create the habit of ordering pork products when eating out.

Evaluation of pork products

Table 7 reports the quality perception scores for pork meat and products provided by the Brazilian consumer sample. Brazilians are generally satisfied with the selected pork meat and products, all of which received mean scores of 5.8 and above (out of 7). Consumers from Porto Alegre and Santa Rosa (in the southern region) are the most satisfied with all evaluated aspects of pork and pork products.

Specifically, Brazilian consumers are very satisfied with the taste of pork products, since mean scores for this are quite high (at least 5.9). Yet, standard deviations in the range of 1.0-1.2 indicate a moderate variability in the degree of agreement among consumers.

Health concerns related to pork consumption are reflected in lower scores for this aspect for all the items, especially *others* (e.g. fat and entrails) and bacon. Regarding convenience aspects, the mean of the questioned items ranged from 5.5 (further processed meat) to 6.3 (pâté), with lower scores for pork ribs, loins and chops, and fresh ham (fresh products). As expected, price received the lowest evaluation, with means ranging from 3.9 for fresh ham to 5.2 for pâté. Standard deviations on this item are high, which suggests a substantial amount of disagreement in terms of price perception among Brazilian consumers.

Although most consumers are generally satisfied with the products, consumers in Cuiabá and Campo Verde are an exception. Consumers here indicated lower levels of satisfaction with most pork products. They are unsatisfied especially in regard to health aspects and the taste of pork products. Price is also a strong motive for their dissatisfaction. In terms of convenience, consumers in Cuiabá and Campo Verde are neither satisfied nor unsatisfied.

Table 6. Where Brazilian consumers eat pork meat and derived pork products (n=482, %).

	At home	At a restaurant	On the go	Somewhere else
Fresh first cuts				
Pork ribs	**91.3**[a]	7.1	0.6	1.0
Loins and chops	**91.4**	6.3	0	2.3
Fresh ham	**87.4**	7.8	0.4	4.3
Others (entrails, fat, tail, ear)	**85.6**	12.2	0.6	1.7
Fresh minimally processed				
Sausages, minced pork meat, brochette, dry meat	**82.9**	12.9	2.9	1.3
Fresh further processed				
Stuffed meat, escalope, roasted meat, saté	**68.2**	21.4	7.3	3.1
Pork-based dishes				
Lasagne, pizza, spaghetti, feijoada	**61.9**	18.9	9.6	9.6
Processed pork products				
Salami, ham, mortadella	**94.5**	4.7	0	0.7
Bacon	**95.9**	3.4	0	0.7
Sausages	**93.8**	5.2	0.3	0.8
Pâté	**98.5**	1.5	0	0

[a] Higher frequency per product marked in bold.

Table 7. Satisfaction levels by pork product in terms of taste, health, convenience and price (means and standard deviations on seven-point scales).

	Overall		Taste		Health		Convenience		Price	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Fresh first cuts										
Pork ribs	6.0	1.1	6.2	1.0	5.1	2.0	5.6	1.4	4.1	1.9
Loins and chops	5.9	1.1	6.2	1.1	5.1	1.9	5.7	1.4	4.1	2.0
Fresh ham	6.0	1.1	6.2	1.1	5.1	2.0	5.7	1.6	3.9	2.1
Others (entrails, fat, tail, ear)	5.8	1.2	6.1	1.1	4.5	2.3	5.5	1.5	4.2	2.2
Fresh minimally processed										
Sausages, minced pork meat, brochette, dry meat	5.9	1.1	5.9	1.2	5.3	1.8	5.8	1.3	4.3	1.8
Fresh further processed										
Stuffed meat, escalope, roasted meat, saté	6.0	1.2	6.1	1.1	5.3	1.7	5.5	1.6	4.0	1.9
Pork-based dishes										
Lasagne, pizza, spaghetti, feijoada	6.0	1.1	6.4	1.0	5.4	1.7	5.9	1.4	4.4	2.0
Processed pork products										
Salami, ham, mortadella	6.0	1.1	6.1	1.1	5.2	1.9	6.1	1.2	4.4	2.0
Bacon	5.9	1.2	6.0	1.2	4.9	2.1	6.0	1.2	4.2	2.2
Sausages	6.0	1.2	6.1	1.1	5.1	2.0	6.1	1.2	4.6	2.0
Pâté	6.1	1.0	6.1	1.1	5.7	1.4	6.3	1.0	5.2	1.7

Finally, we also verified the existence of statistical differences in consumer satisfaction as a function of the place of purchase. To this end, the satisfaction indicators (overall, taste, health, convenience, and price) were grouped into a single measurement calculated by their average. The t-test presented significant differences on almost all products, showing consistently higher satisfaction with pork purchased at the supermarket. Table 8 shows the test results for mean difference scores.

5. Discussion and conclusions

Previous research has found that one of the main reasons for the low consumption of pork meat and pork products in Brazil is their low adaptation to the attributes consumers want, like a larger variety of cuts, smaller cut size and more convenience, as there are very few ready-to-eat products on the Brazilian market (De Barcellos *et al.*, 2008). Consumers are also very concerned about health issues and body shape, and consequently they are increasingly looking for products with lower fat and caloric content, but higher quality and food safety characteristics (Dallari, 2007; Milan, 2008). The image of pigs as fatty animals, raised under precarious hygiene conditions and inadequately fed is beginning to change. Small and unspecialised producers who engage in pig production as a secondary activity are being confronted with the development of industrial and professional pig production. This has led to a major change, as industries have started to demand a constant supply, with very well-defined production methods and systems (Miele, 2007). Producers are therefore challenged to adapt in order to satisfy industry, and consequently, consumer needs.

In the Brazilian business context, the strong governance of the big food industries created the possibility of significant changes. These began at the animal genetics level, generating at the end of the production chain a product which had the same attributes consumers would like to have and for which they would be willing to pay. Supply chains managed to reduce the fattening period (from the animal's birth to slaughter), the fat content of meat and also to create better sanitary conditions at production, transport, storage and commercialisation levels (Miele, 2007). In Brazil the slaughter/industrial sector is very much concentrated, and the three biggest industries are responsible for 44.1% of total pig slaughter in the country. This concentration, with strong and very well-known brands, changed the traditional character of local commercialisation into nationally commercialised products. Such brands have a positive image in terms of consumer trust and food safety, both in fresh and in processed meat products, although not much innovation has been seen yet (De Barcellos *et al.*, 2008).

Results in our survey confirm this scenario, since most of the interviewed consumers are satisfied with the standardised, large industrial-scale products found at supermarkets. Brazilian consumers seem to be satisfied with convenience attributes of pork products, although those could also be improved, especially for fresh minimally processed and fresh further processed pork products. Yet, the study of the

Table 8. Mean differences of overall satisfaction levels per product and distribution channel.

	Butcher[1]			Supermarket			Difference		
	N	Mean	SD	N	Mean	SD	t	df	*P*-value
Fresh first cuts									
Pork ribs	128	5.06	1.29	179	5.62	0.80	-4.35	196.39	<0.001
Loins and chops	115	5.07	1.24	132	5.55	0.82	-3.53	192.75	0.001
Fresh ham	65	5.21	1.14	128	5.50	0.95	-1.86	191.00	0.064
Others (entrails, fat, tail, ear)	60	4.73	1.34	88	5.52	0.85	-4.03	91.32	<0.001
Fresh minimally processed									
Sausages, minced pork meat, brochette, dry meat	38	4.72	1.19	147	5.59	0.90	-4.18	48.44	<0.001
Fresh further processed									
Stuffed meat, escalope, Roasted meat, saté	28	4.60	1.24	105	5.52	0.94	-3.66	35.81	0.001
Processed meat products									
Bacon	42	4.56	1.07	161	5.49	1.00	-5.29	201.00	<0.001
Sausages	49	4.45	1.06	208	5.63	0.90	-7.21	65.22	<0.001

[1] Salami, ham, mortadela, pork-based dishes and pâté were not tested because of a too small number of observations for 'butcher'.

Brazilian sample found lower levels of satisfaction with pork prices, as well as with health characteristics of pork, particularly in products such as fat, entrails and bacon, but also in sausages and fresh first cuts such as pork ribs, loins and chops and fresh ham.

Our results indicate that Brazilians buy mostly fresh pork meat and pork-based products. Supermarkets represent the major channel for food purchases in general and for fresh meat specifically (De Barcellos, 2011b), reaching nearly 60% for all fresh pork products and almost 90% for processed products like ham or salami in this study. At the butchers, fresh products also have a larger proportion of acquisitions compared to all the other categories. The meat retailing environment is largely dominated by supermarkets in Brazil and consumers are also more satisfied with this distribution channel, as the results point out. Butchers seem to be losing market share and opportunities to capture value through the offering of differentiated and convenient products.

Although pork is generally consumed on any day or occasion, fresh first cuts and pork-based dishes are consumed more often on weekends than working days. In general, consumers are willing to spend more time and money on food products on weekends, which might represent an interesting opportunity for the Brazilian pork chain to develop new products. The only products that have been reported to be consumed more on working days than on weekends are meat products like ham, salami and mortadella, which are traditionally consumed at breakfast or as a snack in the evening, normally accompanied by bread.

In terms of regional differences, consumers in Rio Grande do Sul (Porto Alegre and Santa Rosa) are particularly satisfied with pork products, whilst consumers in Mato Grosso (Cuiabá and Campo Verde) are not. Such results can be interpreted as a 'warning light' to the pork supply chain in Mato Grosso state, since the dissatisfaction seems to be related to the population's purchasing and consumption habits (butcher as the main channel and restaurant as a more regular place for eating pork), as described above. Regional differences might also be explained by the more traditional market found in the south, where pork products are already part of the culinary culture. Pork meat industries were established in the south in the early 1970s, while only recently in Mato Grosso. In addition, most of the pig meat produced in Mato Grosso state is destined for export markets, such as China and Russia (93% of the state's production, according to Lessa, 2011), which possibly means that the best-quality pork goes to these markets, which are prioritised over the domestic one. Findings of our study indicate that such commercialisation strategies might have a detrimental impact on local markets.

Overall, opportunities for pork supply chains pertain to providing better-quality pork (either to local butchers or supermarkets) and supplying convenient, healthy and good value-for-money pork products. The development of retail stores as a qualified distribution channel for pork is also a necessity, especially in Mato Grosso state. Finally, educating consumers on how to prepare pork dishes might also be advantageous, as well as training restaurant staff to prepare tasty and nutritious pork-based meals. The out-of-home pork consumption experience can be improved, as eating out is a modern trend among consumers.

Regarding gender, female consumers reported more frequent consumption of processed meat than male consumers. Although marginally significant, higher education also corresponds with a more frequent consumption of processed meat. The overall picture is of a socio-economic gradient in the frequency of pork meat consumption. Mostly the wealthier and younger segments (highly educated, skilled workers), as well as female consumers, eat processed pork products, suggesting that purchasing power and convenience orientation influence the choice of specific products and the segmentation of the Brazilian pork market.

As indicated by the Q-PorkChains survey results in Europe[3], the less processed the meat is, the more likely it is to be prepared and consumed at home. This can be caused by the poor availability of ready-to-eat pork products at retail level, and of pork-based dishes at restaurants and other out-of-home places to eat in Brazil. In this study, Brazilian pork consumers are signalling opportunities for the pork chain in terms of innovation. The development of innovative pork products (tasty, healthy, convenient and with more affordable prices) could lead to a significant increase in consumption, or at least prevent a further loss of market share for pork relative to beef and poultry.

It is important to state that Brazil is one of the emerging countries that has experienced economic growth during the last decade and was not significantly affected by the 2008 world economic crisis. The country has very optimistic expectations for the new decade, and some economists point to this as being 'Brazil's decade'. Purchasing power of the population is increasing, as 36 million people are expected to move up to social classes A, B and C by 2020. Meat products are amongst those expected to grow, as demand for high-value protein products increases with increasing income. In addition, global market demands increasingly impose pressure on supply chains in terms of quality, safety and innovation. Both challenges and opportunities are therefore foreseen for the pork chain in Brazil and elsewhere.

[3] See suggested peer-reviewed project papers on footnote 2.

6. Implications of the study

For public policy purposes

Because of its high nutritional value, pork is a very important food item for Brazil. However, consumption of pork is still very low in Brazil, especially considering the country's large and growing pig production sector and the fact that Brazilian pork products have good quality standards and are well accepted nationally and internationally. Initiatives like introducing pork as an ingredient on school menus or reducing the very high tax rates on the entire production chain to lower the prices to end users could be quickly implemented to increase demand and also to improve the nutritional status of the Brazilian population. Moreover, policy makers should be aware of the current scientific evidence linking specific processed meat products with certain types of disease (Harvard School of Public Health, 2010; World Cancer Research Fund, 2011). Therefore, the development of guidelines for innovative and safe processing that responds to the consumer's expectations is paramount. Information campaigns should clearly address the contradictory messages favouring consumption of fresh pork meat on the one hand and limited consumption or avoidance of processed products on the other.

For industry

Overall, Brazilian consumers are satisfied with the pork products listed in the study. In terms of product positioning and the development of new products, the pork chain should take into account concerns about the perceived aspects of production, cultural habits of consumption and the overall availability of the products at the supermarkets and butcheries (higher adaptation to the demands of the consumer, like more variety of cuts, smaller portions of cuts, more convenience, healthier products). The inclusion of more options at restaurants and snack bars is also recommended. Attention should be given to research to reduce the salt and fat level of processed products in order to improve consumer perceptions related to the health aspects of pork. Also more information about industrial animal production (traceability, transparency) is desirable to counter possible misperceptions about pig production.

For all stakeholders

Correct information about the entire pork chain should be provided: on the inputs to pig production all the way through to industrialisation of processing, on the health benefits of pork meat consumption, on better ways to prepare pork and even on the possible risks associated with its consumption. Improved pricing, healthiness and convenience of fresh pork meat and pork products could improve overall consumer satisfaction.

For research

Further studies are recommended involving a wider consumer sample to explore different localities of the country, such as the biggest cities of São Paulo and Rio de Janeiro, where a different kind of consumer can probably be found. Also, other characteristics of the meat consumer in those important consumption centres, such as attitudes, beliefs and values, should be studied. The inclusion of other determinants of pork consumption, like cultural and consumption habits or family influences, and also the effect of income and its impact on meat consumption is recommended. How Brazilian food industries are *de facto* incorporating technology, consumers' demands and regulatory drivers into their internal processes is yet an issue to be studied. How these aspects can be transmitted and incorporated into the Brazilian pork supply chain is an important question to be resolved. Finally, after a greater understanding of the Brazilian pork consumer has been gained, other chain studies can be conducted, mostly related to marketing channels (retail, wholesale, food service), pork communication strategies, chain coordination aspects (contracts, transaction costs) and pork institutions (associations, syndicates and other representatives).

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