EUCHINASAFE
中欧食品安全

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Delivering an Effective, Resilient and Sustainable EU-China Food Safety Partnership

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EU-China-Safe aims at reducing food fraud and improving food safety through focusing on improving food legislation, food inspection and increasing access to information across Europe and China. State-of-the-art technologies including a virtual laboratory will create a unique space to share and demonstrate best practice. The use of innovative technologies will result in improved detection of adulteration of food products as well as increased traceability and transparency of global supply chains.

The project runs from September 2017 to August 2021. It involves 33 partners and is coordinated by QUB (The Queen's University of Belfast, UK).

More information on the project can be found at www.euchinasafe.eu (website in construction)
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Nature of the deliverable		
ORDP	Open Research Data Pilot	
R	Document, report (excluding the periodic and final reports)	R
DEM	Demonstrator, pilot, prototype, plan designs	
DEC	Websites, patents filing, press & media actions, videos, etc.	
E	Ethics	
OTHER	Software, technical diagram, etc.	

Dissemination Level		
PU	Public, fully open, e.g. web	
CO	Confidential, restricted under conditions set out in Model Grant Agreement	CO
CI	Classified, information as referred to in Commission Decision 2001/844/EC	

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1. SUMMARY OF DELIVERABLE 5.1.

Food safety standards and regulations have become increasingly important elements in international trade negotiations. Currently, however, limited knowledge on the particular trade effects of divergent food standards exist. While higher food safety standards in the importing country may reduce trade, the enhanced safety and quality of the traded food products may lead to increased consumer confidence and trust and thus nurture trade. The objective of deliverable 5.1 is twofold. First (section 2 below), to examine impediments to agri-food trade between the EU and China that may be attributed to discrepancies in food safety standards between both jurisdictions (via a desk-based review and engagement with industry and government stakeholders within two supply chains of interest). Second (section 3 below), to examine EU consumer perceptions, trust and purchase intentions towards food products made in China (via a consumer survey and engagement with industry and government stakeholders).

In pursuing these objectives, the deliverable reviewed food recalls and border rejection incidents associated with food commodities recently traded between the EU and China that may be attributed to divergent food safety standards between both jurisdictions. It combined a review of the available literature/datasets with new analyses to identify both an EU and Chinese commodity of interest and further investigated these from the perspective of relevant industry and government stakeholders within those supply chains. As food safety standards may influence consumer trust and confidence, we also explore (via a consumer survey and engagement with industry and government stakeholders) current EU consumer perceptions and purchase intentions towards food products made in China and possible ways these can be improved.

2. IMPEDIMENTS IN EU-CHINA AGRI-FOOD TRADE THAT MAY BE ATTRIBUTED TO DIVERGENT FOOD SAFETY STANDARDS

2.1. ABSTRACT

Chinese/EU exports have been the subject of food recalls and border rejection incidents because of their non-compliance with EU/Chinese product standards. We therefore investigate the cause of these recalls/rejections and explore whether impediments in EU-China agri-food trade may be attributed to divergent food safety standards.

Focussing on EU-China agri-food trade, we content analysed EU RASFF notifications (in Excel) and Chinese border rejection reports to identify two food products (Chinese peanuts and EU infant milk formula). We then engaged with key industry and government stakeholders to explore whether impediments in trade may be attributed to divergent food safety standards. The method chosen for qualitative data collection was adapted for each stakeholder. Methods included free text paper based questionnaires and semi-structured face-to-face/phone interviews.

We found that Chinese peanuts commonly face significant rejections at EU border inspection posts due to Aflatoxin B_1. Stakeholders identified a number of deficiencies in the Chinese control of aflatoxin contamination in peanuts intended for EU import. In particular, good hygiene control did not apply along the entire supply chain and weaknesses were found in peanut sampling and analyses. In order to help

tackle aflatoxin contamination in peanuts and the above noted deficiencies, a number of future development/advancement solutions were proposed. For example, the further advancement and application of innovative, real-time post-harvest monitoring systems for temperature, moisture and CO_2 levels in peanuts.

While the quality and safety of food imported into China (2016-2018) was steady without any systematic food safety problems, it was noted that the rejection of foods from the EU were mainly caused by the incompliant quality of dairy products and by the incompliant labels of alcoholic beverages. Within the dairy product category, stakeholders acknowledged that the current registration of EU infant milk formula in China could be made easier and quicker (akin to USA export of infant milk formula to China) and that improving the traceability platform of infant milk formula might become more important for future sales in China.

2.2. INTRODUCTION

Too often, trade impediments associated with food and agri-food commodities are caused by divergent food safety standards or unpredictable change in these standards. Different standards may be observed for foods traded between the People's Republic of China (PRC) and the EU at the point of entry of these jurisdictions for a number of reasons: the absence of a Codex standard and the decision by one party to set its own domestic requirement, the decision pursued by a point of entry to apply a sentinel level as a food safety measure, which can vary depending on the point of entry (operational standard) etc. These changes and the unpredictable environment they may lead to are costly to food producers and consumers in both jurisdictions. The aim of this study is twofold. First, to identify what causes recalls/rejections incidents associated with commodities traded between the EU and China and second, to explore whether recalls/rejections are associated with divergent food safety standards between both jurisdictions.

2.3. MATERIALS AND METHODS

2.3.1. EU Food recalls and border rejections associated with Chinese products

RASFF notifications were exported from the RASFF portal (European Commission, 2018) into an Excel spreadsheet to create descriptive statistics (with filtering). Search criteria concerning food originating in or consigned from China were "Notified from: 01/09/2015", "Notified till: 31/08/2018", "Product type: food" and "Country: China" (query from September 2018). Border rejections, alert notifications and information notifications were included.

Additional columns were added to the Excel spreadsheet based on information taken from the "subject" column. These new columns further categorised the data and facilitated the analysis. Data were parsed into additional columns for:

- Product categories, i.e. "nut and nut products"; "seafood and seafood-based convenience foods"; "non-alcoholic beverages"; "rice, rice-flour products, liquid rice-based products, rice-based convenience foods and red yeast rice"; "fruits and vegetables (whole and processed)"; "spices"; "meat, meat products and natural casings"; "sweets"; "honey"; "algae (including seaweed) and algae food supplements"; "eggs"; "seeds and seed products"; "bakery"; and "other food product or

supplement/mixed". Each notification has been assigned to a single product category. These food categories were implemented to better characterise the products they contain. They do not match the European Commission in its annual RASFF reports. For example, we created the category "rice, rice-flour products, rice-based convenience foods and red yeast rice" (as opposed to "cereals and bakery products") as many of the alerts concerned rice.

- Specific products for the above product categories. Please note this often included name changes, for example: "groundnuts" to "peanuts", "rice spaghetti" to "rice noodles" and "barramundi" to "seabass".
- Hazard categories, i.e. "chemical"; "mycotoxins"; "fraud"; "microbiological"; "biological"; "hygiene", "labelling"; "quality"; "chemical"; "defective packaging"; and "physical". Please note that the term "biological" constitutes hazards beyond microbiological ones, such as insects and parasites present in food. Although officially a "chemical hazard", "mycotoxins" have been assigned their own hazard category given the large number of notifications and low number of specific substances in this grouping. "Fraud" constitutes adulteration of the product, plus issues relating to import documentation (e.g. improper health certificates and analytical reports). As each notification may contain multiple hazards, each hazard within the notification has been assigned to the relevant hazard category.
- Specific hazards for the above hazard categories.
- Product/hazard tally. In order to allow for counting the frequency with which each product/hazard occurred (with filtering).
- Origin category. In order to filter out food not originating in or consigned from China (i.e. those that were only exported from RASFF because they were distributed in China).

Notifications have been analysed for the following attributes:

- Products (including specific products in the notifications).
- Hazards (including specific hazards) versus product categories, i.e. which hazards occur in which products.

2.3.2. Chinese food recalls and border rejections associated with foreign (including EU) products

An internet search was conducted (query from September 2018) by both an EU and Chinese researcher for information pertaining to the quality and safety of imported food in China in 2016-2018. Two English reports were found: (1) the China customs quality and safety report for imported food in China during 2017 (available at: http://www.cirs-reach.com/news-and-articles/China-Customs-Issued-Imported-Food-Quality-and-Safety-Report-of-2017.html) and (2) the AQSIQ quality and safety report for imported food in China during 2016 (available at: http://www.cirs-reach.com/news-and-articles/AQSIQ-Issued-the-Quality-and-Safety-Report-of-Imported-Food-in-China-in-the-year-of-2016.html). Each report stems from a White paper which provides statistics on China's growing and diverse food imports, summarises the main causes for rejected shipments, and lists the Ministry's programs and oversight process for imported foods. A more detailed unofficial translation (GAIN report) of the 2016 White paper was also found (available at: https://gain.fas.usda.gov/#/). Information pertinent to EU product non-compliance (with national standards of food safety and regulatory requirements in China) was extracted and content analysed.

2.3.3. Engagement with industry/university/government stakeholders

Stakeholders were recruited via convenience and snowball sampling with purposive acceptance. Recruitment techniques involved leveraging the existing social networks and personal contacts of the research team and of the initial participants. The method chosen for qualitative data collection was adapted for each stakeholder. Methods included free text paper based questionnaires and semi-structured face-to-face/phone interviews. Topics in relation to Chinese peanuts/EU infant baby milk included: (1) exports to the EU/China; and (2) export barriers and enablers. Responses to each topic were content analysed. This study of stakeholder views was approved (08/19/SpenceM) by the Queen's University Belfast Ethical Committee.

2.4. RESULTS

2.4.1. EU food recalls and border rejections associated with Chinese products

2.4.1.1. EU RASFF notifications concerning food originating or consigned from China

In total, the data included n=556 notifications consisting of n=378 border rejections, n=78 alert notifications and n=90 information notifications. The majority of notifications (84%) concerned food solely originating and consigned from China. In the remaining 16% of notifications, other countries were involved (i.e. from China, via Belgium; from China, packaged in Denmark; from Czech Republic, with raw material from China).

2.4.1.2. Affected Chinese product categories/specific products in RASFF

The results in Table 1 show that the notifications are not evenly distributed over the 14 product categories. With regard to the product categories, the top six categories (ignoring "other food product or supplement/mixed") are "nuts and nut products" which covers 37% of the notifications, followed by "seafood and seafood based convenience foods" (11%), "fruits and vegetables (whole and processed)" (10%), "non-alcoholic beverages (8%), "rice, rice-flour products, liquid rice-based products, rice-based convenience foods and red yeast rice" (7%) and "spices" (4%). With regard to specific food products, the main product is "peanuts", which covers 36% of the notifications, followed by "tea" (7%), "goji berries" (4%), "squid" (3%), "dried pepper/paprika powder" (3%) and "rice noodles" (3%).

2.4.1.3. Specific hazards concerning Chinese products in RASFF

The total amount of hazards within the notifications amounted to n=653. The results in Table 2 show how specific hazards are distributed in the top six frequently reported product categories. Aflatoxin B_1 is the most dominant specific hazard within "nuts and nut products" (n=172); 96.2% of all aflatoxin hazards are found within this product category group. Poor temperature control (hygiene) is the most dominant specific hazard within "seafood and seafood-based convenience foods" (n=23); 82.1% of all temperature control hazards are found within this product category. Propargite is the most dominant specific hazard within "fruit and vegetables (whole and processed)" (n=13); 100% of all propargite hazards are found within this product category. Anthraquinone is the most dominant within "non-alcoholic beverages" (n=15); 100% of all Anthraquinone hazards are found within this product category. GMO is the most dominant specific hazard within "rice, rice-flour products, liquid rice-based products, rice-based convenience foods and red yeast rice" (n=22); 95.7% of all GMO hazards are found within this product

category. Salmonella is the most dominant specific hazard within “spices” (n=9); 60% of a salmonella hazards are found within this product category.

2.4.2. Chinese food recalls and border rejections associated with foreign (including EU) products

2.4.2.1. Notifications concerning food imports in China

In 2016 and 2017, China rejected foods from a total of 82 and 94 countries, respectively. In 2017, this amounted to 6631 batches (49,000 tons, 69.537 million dollars) of imported food. In terms of origin, the EU had the second (2016) and first highest (2017) number of rejected batches. Figure 1 shows origins of the rejected food in 2017.

2.4.2.2. Affected EU product categories and specific hazards

Overall, the quality and safety of food imported to into China (2016-2018) was steady without any systematic food safety problems. Rejection of foods from the EU were mainly caused by: incompliant quality of dairy products and incompliant labels of alcoholic beverages.

Within the dairy product category, a total of 9 (Table 3) and 35 batches (Figure 2) of foreign infant milk formula were returned or destroyed at China’s port of entry in 2016 and 2017, respectively. In 2017, 2 batches concerned France. In recent years, the Chinese government has attempted to improve its infant milk formula safety record in the wake of the notorious 2008 Chinese milk scandal melamine crisis through stricter quality control and supervision. While trade in infant imported formula milk powder is increasing each year (Figure 3), recent plans made by China may change the requirement for imported infant milk formula. These plans include improving the quality and safety traceability platform of baby formula in a bid to maintain a self-sufficiency ratio above 60%.

2.4.3. Engagement with industry/university/government stakeholders

2.4.3.1. Chinese peanuts

According to the latest FAO statistics (2018), the production of peanuts in China is the highest in the world with a yield of 17.39 million tons, accounting for a world share of 37.85%. Although China’s production area (4.641 million ha) ranks number two in the world it has the highest yield rate of 3,748 kilograms per ha. Compared to this, India, with a larger area of 4.940 million ha, is behind China production-wise, recording only 6.695 million tons due to a low yield rate of 1,355 kilograms per ha.

According to data (2013-2017) from the Ministry of Agriculture of China, Henan Province and Shandong Province are the two largest peanut harvesting areas in China, accounting for nearly 40% of the harvest area in China, followed by Hebei Province, Guangdong Province, Anhui Province, Jilin Province, Hubei Province, Liaoning Province, Sichuan Province and Guangxi Province (in total, these 10 provinces account for 86.56% of the peanut harvesting area in China). In terms of peanut output, Henan Province and Shandong province account for half of China's production (and all of the aforementioned provinces together account for 89.9% of peanut production in China).

The three largest EU importers of peanuts are the Netherlands, Germany and the UK. Overall, China is the second largest EU supplier of peanuts from the developing world after Argentina. Shelled, unprocessed peanuts have the highest value of imports, followed by roasted peanuts. EU peanut imports are expected to increase owing to rising EU demand for vegetable protein instead of meat and an increasing interest in

healthy eating.

Regulations on the allowable levels of aflatoxins have been established in the EU and China (Table 4) but they are not harmonized. Specifically, the maximum limits for aflatoxin B_1 are much higher in China (comparable to animal feed materials in the EU) and no limits have been set for the sum of B_1, B2, G1 and G2. Chinese limits are guided by risk assessment and the knowledge that aflatoxins are a widespread hazard. Adoption of stricter standards in China (similar to the EU) would severely reduce the amount of product sold on the market, alongside farmer profits. Recently (2018), the European Food Safety Authority stated that an increase in aflatoxin total from 4 to 10 µg/kg would further increase the cancer risk by a factor of 1.6-1.8.

Although China has no fully integrated peanut supply chain from farm to export, it selectively exports the highest-quality peanuts to meet the EU's strict aflatoxin standards. Within this policy, farmers do not know whether their produce is destined for foreign or domestic markets.

Currently, the level of aflatoxin contamination and RASFF rejection notifications remains high (>5% of consignments from China are non-compliant). As a consequence of previous non-compliances at the EU border, the percentage frequency of physical and identity checks at the designated point of entry into the EU is currently 20% (as issued by Regulation (EU) No 884/2014 of 13th August 2014). The Chinese authority are also required to carry out consignment analysis for aflatoxins.

When peanut consignments are recorded as 'rejected' in RASFF, the option to destroy the consignment is very rarely chosen owing to the high costs that may be incurred. Instead, the preference is either to clean the consignment, divert it to animal feed, or send it back to China. If consignments are rejected in the Netherlands, the majority of food business operators in China choose to have the consignment cleaned (sorted) in the Netherlands and then re-tested for human consumption (approximately 99% of consignments rejected in the Netherlands are cleaned). Chemical cleaning and retesting for animal feed (as opposed to human food) is also possible.

While official aflatoxin control systems have improved in China within recent years, stakeholders identified a number of deficiencies in the Chinese control of aflatoxin contamination in peanuts intended for EU import:

- Storage and transport conditions of peanuts do not always respect good hygiene practices as requested by the Codex. E.g. limits for the storage temperatures of peanuts are 5°C higher than that established by the Codex code of practice and processors do not always have equipment to regulate temperature and humidity.
- Official controls of peanuts are not always carried out at all stages of production, processing and export in line with the requirement set out in the Codex. E.g. farms are not subject to mandatory registration, and traders are not subject to supervision.
- National regulations do not require all processors exporting peanuts to have a fully implemented HACCP plan validated by the competent authority.
- Sampling and analyses of peanuts are not always performed in line with the EU requirement. E.g. competent authority inspectors do not always have the proper equipment to perform representative sampling of peanuts.

- Laboratories do not always comply with Codex guidelines on food inspections. E.g., proficiency tests on aflatoxins in peanuts are not adequate and precision of the measurement is not monitored.

In order to help tackle aflatoxin contamination in peanuts and the above noted deficiencies, a number of future development/advancement solutions were proposed:

- The development of big data approaches for forecasting aflatoxin levels in peanuts using satellite images and ground truth data. This would allow for mapping and control of risk zones of *Aspergillus flavus* infection within large agricultural sites.
- Further advancement and application of innovative, real-time post-harvest monitoring systems for temperature, moisture and CO_2 levels in peanuts.
- Further advancement and application of rapid, cost-effective testing platforms for the analytical measurement of aflatoxins at all stages of production. This will provide the basis for quicker and better decisions. E.g. innovative portable spectroscopic approaches show get potential.
- Further exploration of biocontrol for aflatoxins across China, including new field trials.
- The development of vertically integrated supply chains from farm to export with enhanced controls. (Price incentives may encourage actors to adopt better practices to mitigate the risk of aflatoxins).

2.4.3.2. Infant milk formula market in China

The global baby infant formula market is extremely profitable and highly concentrated in the hands of the major players: Nestle S.A., Danone SA, Abbott, Arla Foods amba, Yili Group, The Kraft Heinz Company, Bellamy's Organic, Perrigo Company plc, Reckitt Benckiser Group plc. and Royal FrieslandCampina N.V. Of these, Nestle S.A., Danone SA, and Abbott are market leaders due to their product portfolio. Other smaller players also exist e.g. Kendal Nutricare. In terms of price, infant formula is much more expensive in China than Europe (£16-30 vs £8-14 in Europe).

As of 1st January 2018, Infant formula products cannot be distributed or sold in China without formula registration and, at most, only 3 series and 9 kinds of formulas can be registered by one manufacturer. In practice, products that belong to the same enterprise can be registered by different factories. The top ten enterprises obtaining registration certificates are shown in Figure 4. Registration is valid for four years and should be renewed upon expiration.

Up until May 2019, approximately 420 infant formula products were registered at each of the three age groups in China (0-6 months, 6-12 months and 12 -36 months). The number of registered domestic products amounted to 949 (from 112 domestic manufacturers), while the number of registered imported products amounts to 304 (from 15 overseas countries) (Figure 5). Of these, New Zealand, Netherlands, South Korea, Australia, France, Denmark and Ireland are the leading countries in product registration.

In June 2019, China laid out plans to be 60% self-sufficient in baby formula (no timeframe given) and to further increase the quality of domestic brands. Currently, domestic dairy producers have acquired or set-up overseas bases for their milk supply (e.g. through their Chinese controlled companies in New Zealand, Australia, Holland, and recently, Ireland) and the government has supported (approximately 10) domestic companies in improving their production practices (with new labs and modern facilities). The State Administration for Market Regulation (SAMR) continues to strengthen the supervision of infant formula

milk powder, conducting monthly sampling inspection of registered domestic infant formula powder in Beijing, and disclosing the inspection results to the public. This was described as a 'good system' for domestic production and despite the above plans aiming for at least 60% self-sufficiency in infant milk formula, some stakeholders felt that China's actual figure currently exceeded this (about 70%). Overall, stakeholders were of the opinion that the number of Infant milk formula players in mainland China had been reduced while the quality had greatly increased and compared favourably with foreign brands.

Key trends in China are the gaining popularity of goat milk infant formula (including 243 domestic products and 33 imported products Goat milk powder products) and organic cow milk infant formula (including 24 domestic products and 27 imported products). There has also been a trend for EU brands (new to the Chinese market) and sub-brands of premium EU brands (already present in China) to target lower-tier cities (vs higher-tier cities such as Beijing, Shanghai, Guangzhou and Shenzhen) in a bid to increase/gain a share of the market.

While the notorious 2008 Chinese milk scandal resulted in Chinese consumer demand for EU infant milk formula, it was acknowledged that the current registration of EU infant milk formula in China could be made easier and quicker. Indeed, a newly signed (15th January, 2020) economic and trade agreement between the USA and China makes USA exports to China much easier. The following difficulties were associated with EU infant milk formula product registration:

- EU infant milk manufacturers need to have their facility registered before they can apply for product registration.
- It takes a long time to register EU infant milk formula products in China and there is a restriction on the number of products that can be registered.
- There is a requirement to renew registrations of EU infant milk formula every 4/5 years.
- There is a requirement that EU facilities must be inspected before product registration or re-registration and little consideration is given to EU regulations and previous audits.
- There is no procedure for updating the recipes of approved EU formulas in China. Recipes can only be changed upon expiration of the existing registration. E.g., while docosahexaenoic acid (DHA) can now (Feb 2020) be added to some EU organic infant milk formulas, there is no procedure for updating the formula in China.

Despite the above challenges, an EU infant milk producer acknowledged that it was actually harder for them to access other markets (e.g. America). Some EU manufacturers also noted that certain procedures within their home country did not help them to access key market trends in China e.g. gaining approval for the use of goats' milk protein in the manufacture of infant milk formula has been slow. Marketing in China was also viewed as being 'as expensive as western Europe' and gaining Chinese consumer purchase of a new brand was viewed as being a lengthy process, dependent on the success of the product in its home country and a continued market presence in China.

When asked specifically about key drivers and enablers of market access and sales in China, EU infant milk formula manufacturers acknowledged that:

- EU infant milk formula had a premium image in the Chinese market owing to credentials around food safety and outdoor food production systems (characterised by clean air and water). Indeed, some manufacturers emphasised that their country of origin was a positive selling point.

- Selecting an importer (with appropriate licences and knowledge of the law) and a well-connected distributor (with teams across many provinces) in lower-tier cities are key in establishing a new brand. In addition, a thorough insight into how infant formula products are being merchandised in Chinese mother-and-baby stores has proven to be of benefit.
- Higher future product scrutiny on the Chinese market may advantage some EU brands. Specifically, better traceability/transparency of the ingredients and country of origin would be welcomed by some manufacturers. Indeed, manufacturers already felt that traceability platforms for Chinese infant milk formula were already being improved e.g. ORITAIN (https://oritain.com/industries/dairy/) works with Synlait (https://www.synlait.com/) to ensure traceability back to farms.

2.5. CONCLUSIONS

Chinese peanuts commonly face significant rejections at EU border inspection posts due to Aflatoxin B_1. Stakeholders identified a number of deficiencies in the Chinese control of aflatoxin contamination in peanuts intended for EU import. In particular, good hygiene control did not apply along the entire supply chain and weaknesses were found in peanut sampling and analyses. In order to help tackle aflatoxin contamination in peanuts and the above noted deficiencies, a number future development/advancement solutions were proposed. For example, the further advancement and application of innovative, real-time post-harvest monitoring systems for temperature, moisture and CO_2 levels in peanuts.

While the quality and safety of food imported to into China (2016-2018) was steady without any systematic food safety problems, it was noted that the rejection of foods from the EU were mainly caused by the incompliant quality of dairy products and by the incompliant labels of alcoholic beverages. Within the dairy product category, stakeholders acknowledged that the current registration of EU infant milk formula in China could be made easier and quicker (akin to USA export of infant milk formula to China) and that improving the traceability platform of infant milk formula might become more important for future sales in China.

2.6. TABLES AND FIGURES

Table 1: Food products originating or consigned from the People's Republic of China (PRC) and counted in RASFF notifications (September 2015-August 2018)

Product category Specific product[a]	Total notifications[b] (n=556)	Borders rejection (n=388)	Alert (n=78)	Information for attention (n=53)	Information for follow-up (n=37)
Nuts and nut products	**206**	**200**	**2**	**4**	**0**
Peanuts	200	195	1	4	0
Peanut butter	3	3	0	0	0
Other	3	2	1	0	0
Seafood and seafood-based convenience foods	**62**	**50**	**3**	**7**	**2**
Squid	18	17	0	1	0
Salmon	8	6	1	1	0
Haddock	3	3	0	0	0
Shrimp	3	3	0	0	0

Pollock	4	2	0	1	1
Tilapia	4	1	0	2	1
Other	22	18	2	2	0
Non-alcoholic beverages	**44**	**38**	**2**	**1**	**3**
Tea	38	34	1	1	2
Coconut drink/juice	3	2	1	0	0
Other	3	2	0	0	1
Rice, rice-flour products, liquid rice-based products, rice-based convenience foods and red yeast rice	**38** 14	**37** 13	**0** 0	**1** 1	**0** 0
Rice noodles	10	10	0	0	0
Red yeast rice	4	4	0	0	0
Rice	10	10	0	0	0
Other					
Fruits and vegetables (whole and processed)	**56**	**9**	**23**	**15**	**9**
Peppers	3	3	0	0	0
Goji berries	22	1	13	4	4
Ginger (not dried)	3	0	3	0	0
Mushrooms	6	2	3	0	1
Pomelos	7	0	1	3	3
Other	15	3	3	8	1
Spices	**22**	**12**	**8**	**0**	**2**
Dried pepper/paprika powder	17	11	5	0	1
Other	5	1	3	0	1
Meat, meat products and natural casings	**14**	**9**	**0**	**4**	**1**
Rabbit meat	4	3	0	0	**1**
Pork casings	4	2	0	2	0
Ovine casings	3	2	0	1	0
Other	3	2	0	1	0
Sweets (various types)	**16**	**9**	**5**	**1**	**1**
Honey	**5**	**0**	**0**	**5**	**0**
Algae (including seaweed) and algae food supplements	**21**	**0**	**16**	**4**	**1**
Algae/seaweed	8	0	5	3	0
Chlorella supplement	7	0	7	0	0
Spirulina supplement	4	0	2	1	1
Other	2	0	2	0	0
Eggs	**3**	**3**	0	0	0
Seeds and seed products	**14**	**4**	**4**	**2**	**4**
Pumpkin	6	**0**	**1**	**1**	**4**
Other	8	**4**	**3**	**1**	**0**
Bakery	**4**	**0**	**3**	**1**	**0**
Other food product or supplement/mixed	**51**	12	**4**	**4**	**14**
Unspecified food supplement	28	9	4	0	9
Tofu/bean curd	3	0	0	0	0
Other food product	13	2	0	4	3
Other food supplement	7	1	0	0	2

[a] Specific products that amounted to three or more notifications are featured in the table.

[b] Each notification has been assigned to a single product category/specific product.

Table 2: RASFF notification hazards counted in the top six frequently reported product categories originating or consigned from the People's Republic of China (September 2015-August 2018)

Product category (n=number of products in category)	Hazards	Total hazards per product category (number)	Border rejection hazards (number)	Alert hazards (number)	Information for attention hazards (number)	Information for follow-up hazards (number)
Nuts and nut products (n=206; 97.1% peanuts)	*Total hazards*	210	204	2	4	
	Hazard categories					
	(Substance categories)					
	Mycotoxins	178	174	1	3	
	Fraud	18	18			
	Microbiological:	6	5	1		
	Moulds	5	5			
	Bacteria	1		1		
	Biological	3	3			
	Hygiene	2	2			
	Labelling	1	1			
	Quality	1	1			
	Chemical	1				
	Allergen	1			1	
	Specific hazard/issues of non-compliance[a]					
	Mycotoxins					
	Aflatoxin B_1[b]	172	168	1	3	
	Fraud					
	Absent, fraudulent, improper or expired health certificates	17	17			
	Microbiological:					
	Mould (not specified)	5	5			
	Other	10	8	1	1	
Seafood and seafood-based convenience foods (n=62; 29.0% squid)	*Total hazards*	79	67	3	7	2
	Hazard categories					
	(Substance categories)					
	Fraud	26	26			
	Hygiene	23	23			
	Labelling	10	9		1	
	Quality	3	3			
	Chemical:	10	2	2	4	2
	Heavy metals	3		2	1	
	Food additive	3	1		1	1
	Residues of veterinary medicinal products	3	1		1	1
	Nitrite	1			1	
	Defective packaging	2	2			
	Physical	1	1			
	Microbiological	2	1	1		
	Bacteria	1		1		
	Biological	2			2	

	Specific hazard/issues of non-compliance[a]					
	Fraud					
	Absent, fraudulent, improper or expired health certificates	3	3			
	Unauthorised operator	13	13			
	Illegal import	10	10			
	Chemical: food additives					
	Phosphates	3	1		1	1
	Chemical: residue of vet med prod					
	Sulfonamide	2			1	1
	Hygiene					
	Poor temperature control[c]	23	23			
	Labeling					
	Undeclared colours	5	5			
	Absent health mark	2	2			
	Quality					
	Spoilage	2	2			
	Defective packaging					
	Damaged packaging	2	2			
	Biological					
	Parasite larvae	2			2	
	Other	12	6	3	3	
Fruits and vegetables (whole and processed) (n=56; 39.3% goji berries)	*Total hazards*	74	9	34	19	12
	Hazard categories *(Substance categories)*					
	Chemical:	54	4	24	16	10
	Food additives	2			1	1
	GMO	1			1	
	Pesticides	51	4	24	14	9
	Labeling	7		5	2	
	Microbiological:	8	3	3	1	1
	Bacteria	6	2	3		1
	Moulds	1	1			
	Viruses	1			1	
	Mycotoxins	1	1			
	Physical	2		2		
	Quality	2	1			1
	Specific hazard/issues of non-compliance[a]					
	Chemical: food additive					
	E 124 - Ponceau 4R / cochineal red A	2			1	1
	Chemical: pesticide residues	12		7	3	2
	Carbofuran	2		1	1	
	Chlorpyrifos	3	1	1		1
	Hexaconazole	6		1	2	3
	Isocarbophos	3		3		

	Nicotine	2	2			
	Procymidone	13		7	4	2
	Propargite[d]					
	Labeling	4		4		
	Undeclared sulphite					
	Microbiological: bacteria	2	2			
	Clostridium sulphite reducer	2		2		
	Salmonella					
	Physical	2		2		
	Glass					
	Quality	2	1			1
	Spoilage					
	Other	19	3	6	8	2
Non-alcoholic beverages (n=44; 86.4% tea)	*Total hazards*	74	67	2	1	4
	Hazard categories					
	(Substance categories)					
	Chemical:	72	67	2	1	2
	Pesticide	63	60	1		2
	Medicinal substance	1	1			
	Food additives	2	2			
	Allergens	3	2	1		
	Novel food	2	2			
	Heavy metals	1			1	
	Fraud	1				1
	Labelling	1				1
	Specific hazard/issues of non-compliance[a]					
	Chemical: pesticides					
	Anthraquinone[e]	15	14	1		
	Tolfenpyrad	12	12			
	Acetamiprid	6	6			
	Dinotefuran	5	5			
	Imidacloprid	5	5			
	Carbendazim	3	3			
	Triazophos	3	3			
	Pyridaben	3	2			1
	Isocarbophos	2	2			
	Buprofezin	2	2			
	Allergens					
	Lactoprotein	3	2	1		
	Other	15	11		1	3
Rice, rice-flour products, liquid rice-based products, rice-based convenience foods and	*Total hazards*	42	41		1	
	Hazard categories					
	(Substance categories)					
	Chemical:	25	25			
	GMO	22	22			
	Irradiation	3	3			
	Fraud	16	15		1	
	Mycotoxin	1	1			

red yeast rice (n=38; 36.8% rice noodles)	***Specific hazard/issues of non-compliance***[a] Chemical: GMO[f] Irradiation Fraud: Absent, fraudulent, improper or expired health certificates Improper, expired or fraudulent common entry document (CED), import declaration, or analytical report Illegal importation Tampering Mycotoxin Citrinin	 22 3 10 4 1 1 1	 22 3 10 4 1 1		 1	
Spices (n=22; 77.3% dried peppers/paprika powder)	*Total hazards* ***Hazard categories*** *(Substance categories)* Microbiological: Bacteria Moulds Mycotoxins ***Specific hazard/issues of non-compliance***[a] Microbiological: Salmonella[g] Moulds Mycotoxins Aflatoxin Ochratoxin A	22 12 9 3 10 9 3 5 5	12 9 7 2 3 7 2 2 1	8 2 2 6 2 2 4		2 1 1 1 1 1

[a] Specific hazards that amounted to 2% or more in each food product category are featured in the table.

[b] Aflatoxin B_1 is a dominant specific hazard within nuts and nut products; 96.2% of all aflatoxin hazards are found within this product category group.

[c] Poor temperature control is a dominant specific hazard within seafood and seafood-based convenience foods; 82.1% of all temperature control hazards are found within this product category.

[d] Propargite is a dominant specific hazard within fruit and vegetables (whole and processed); 100% of all propargite hazards are found within this product category.

[e] Anthraquinone is a dominant specific hazard within non-alcoholic beverages; 100% of all Anthraquinone hazards are found within this product category.

[f] GMO is a dominant specific hazard within rice, rice-flour products, liquid rice-based products, rice-based convenience foods and red yeast rice; 95.7% of all GMO hazards are found within this product category.

[g] Salmonella is a dominant specific hazard within spices; 60% of a salmonella hazards are found within this product category.

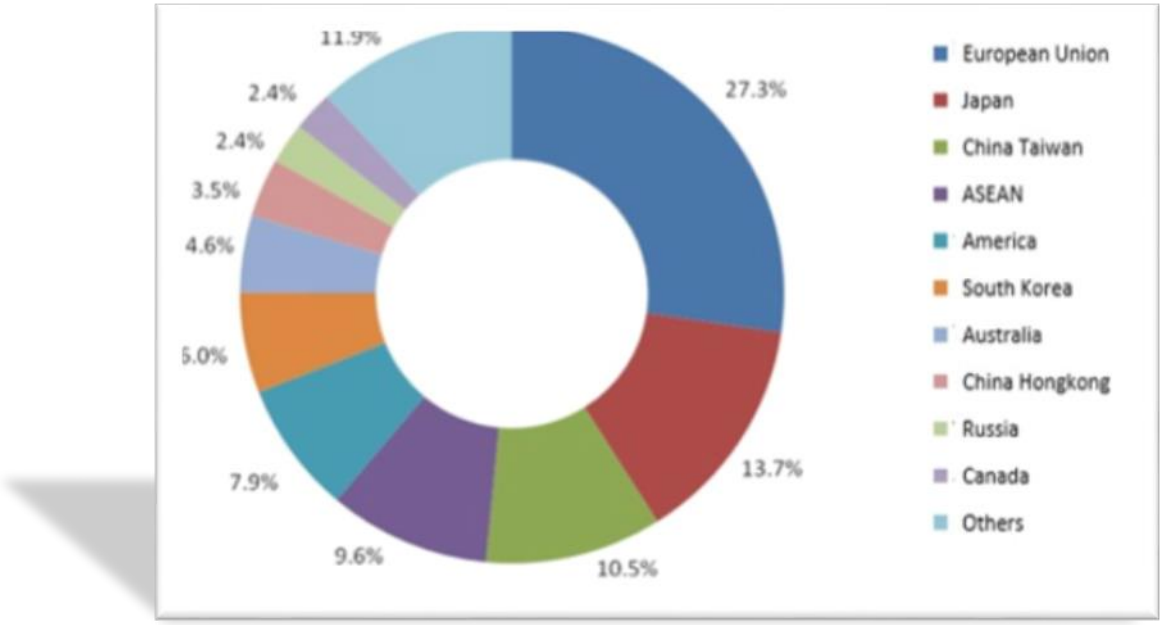

Figure 1: Origins of the rejected foods from China in 2017. (Retrieved from http://www.cirs-reach.com/news-and-articles/China-Customs-Issued-Imported-Food-Quality-and-Safety-Report-of-2017.html).

Table 3: The quality and safety of dairy products (from all countries) rejected from China in 2016. (Retrieved from http://www.cirs-reach.com/news-and-articles/AQSIQ-Issued-the-Quality-and-Safety-Report-of-Imported-Food-in-China-in-the-year-of-2016.html)

Food category	Quality and safety information
Dairy product	• Total 154 batches were unqualified in 2016 • Unqualified character, unqualified package, unqualified microorganism, and in-compliant food additives were the main in-compliant reasons, accounting for around 80% of total. • For the infant formula milk powder, there were totally 9 batches unqualified from 5 countries or regions. In-compliant label, unqualified character, and food additives exceeded or use overrun were the main unqualified reasons.

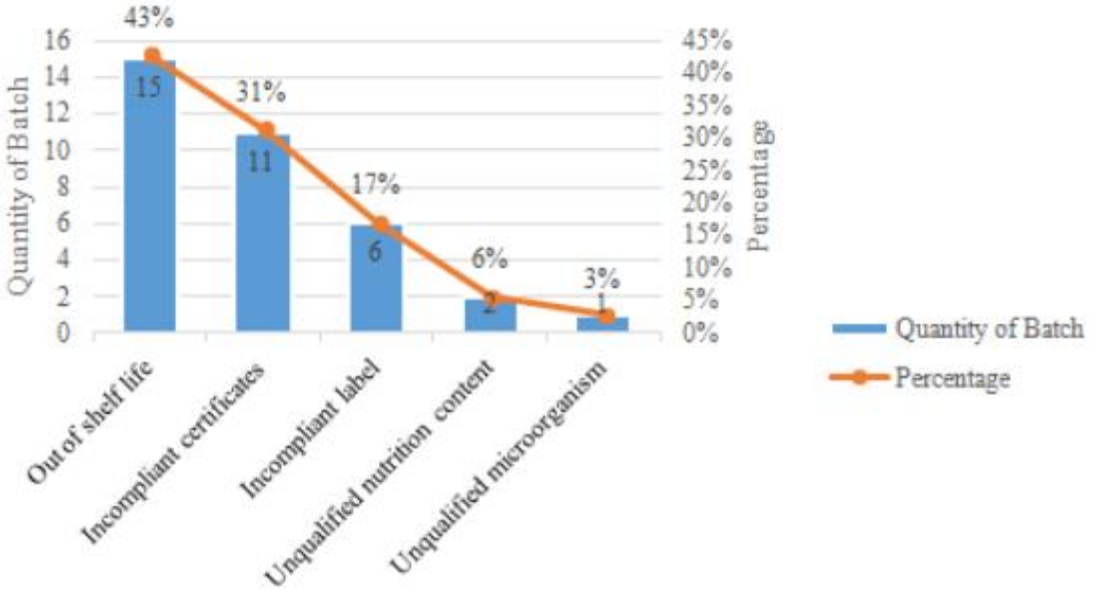

Figure 2: The quality and safety of imported infant milk formula (from all countries) rejected from China in 2017. (Retrieved from http://www.cirs-reach.com/news-and-articles/Domestic-Infant-Formula-Milk-Powder-Inspection-Result-and-Imported-Infant-Formula-Milk-Powder-Inspection-Result-at-the-Port-in-2017.html).

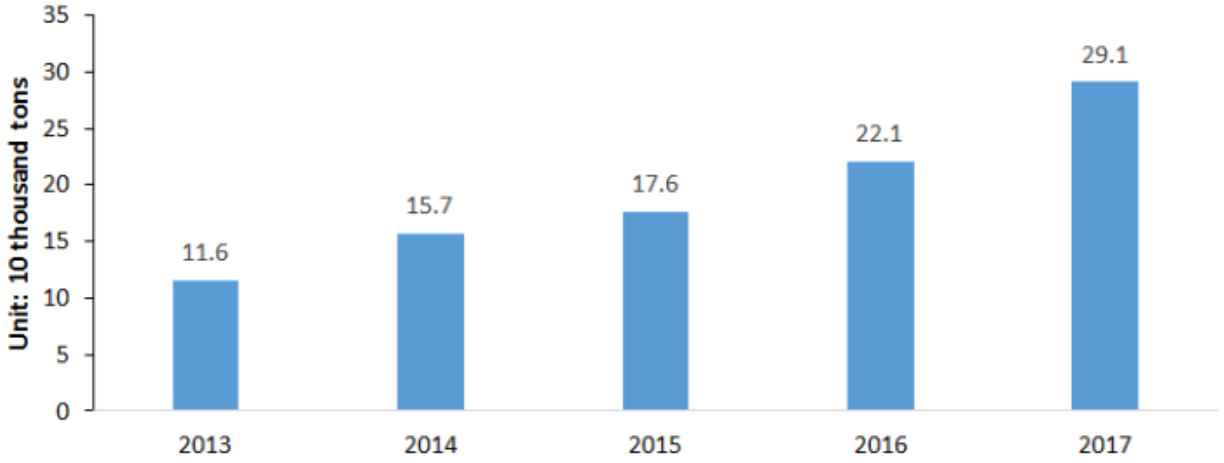

Figure 3: Imported amount of infant milk formula powder from 2013-2017. (Retrieved from http://www.cirs-reach.com/news-and-articles/China-Customs-Issued-Imported-Food-Quality-and-Safety-Report-of-2017.html).

Table 4: EU/Chinese regulation concerning aflatoxins.

EU legislation	Chinese legislation
-Regulation **(EU) No 1881/2006** sets mycotoxin maximum limits for aflatoxin B_1 and the sum of aflatoxins (B_1, B_2, G_1 and G_2) for groundnuts (peanuts): **Aflatoxin B_1 Limits:** 2.0 µg/kg – Peanuts for direct consumption or use as an ingredient in foodstuffs. 8.0 µg/kg – Peanuts to be subject to sorting, or other physical treatment before consumption or use as a food ingredient. **Aflatoxin sum of B_1, B_2, G_1, G_2 Limits:** 4.0 µg/kg – Peanuts for direct consumption or use as an ingredient in foodstuffs. 15.0 µg/kg – Peanuts to be subject to sorting, or other physical treatment before consumption or use as a food ingredient. -Following repeated detections of aflatoxin contamination in peanuts from China, Regulation **(EU) No 884/2014** of 13th August was adopted which imposed special conditions governing the import of certain peanuts from China. These peanuts may only be imported into the EU in accordance with procedures laid down in this regulation, including mandatory consignment analysis by Chinese authorities and issuance of a health certificate by the State Administration for Entry-Exit inspection and quarantine of the people's republic of China. -Currently, regulation (EU) No 884/2014 applies to groundnuts (peanuts) in shell and shelled, peanut butter, and groundnuts otherwise prepared or preserved (feed and food). The percentage frequency of physical and identity checks at the designated point of entry into the EU is currently 20% (as issued by Regulation **(EU) No 884/2014** of 13th August 2014).	The national standards of China, **GB 2761-2011**, sets the standards for aflatoxin B_1 in peanuts and their products for local consumption at 20.0 µg/kg. Exported products should meet the standards or contract requirements of the importing country.

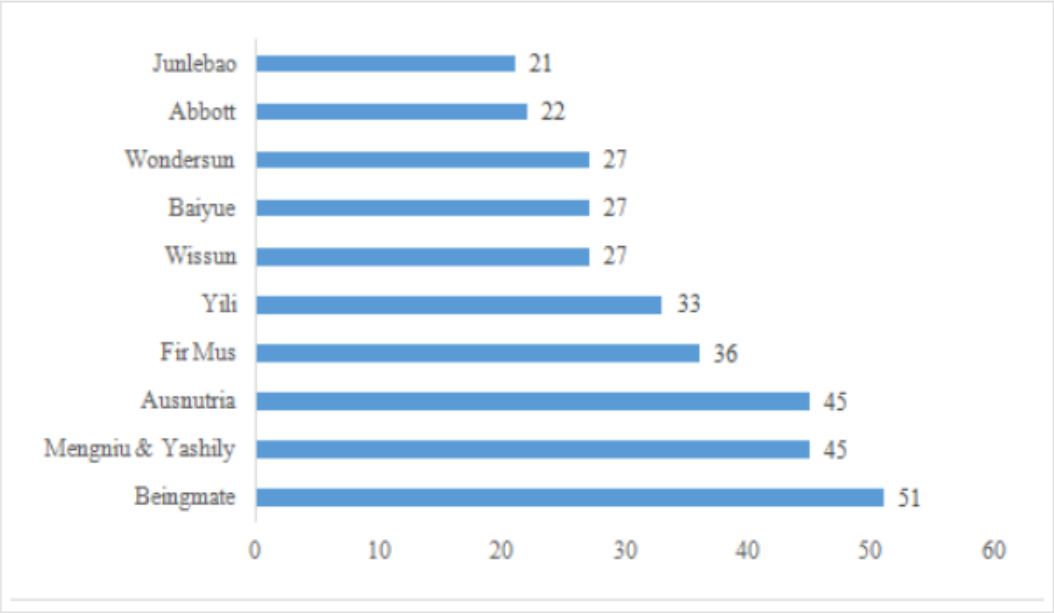

Figure 4. The top ten enterprises that have obtained product registration in China (2019). (Retrieved from http://www.cirs-reach.com/news-and-articles/Data-Delivery-Status-of-Infant-Formula-Milk-Powder-Registration-in-China.html).

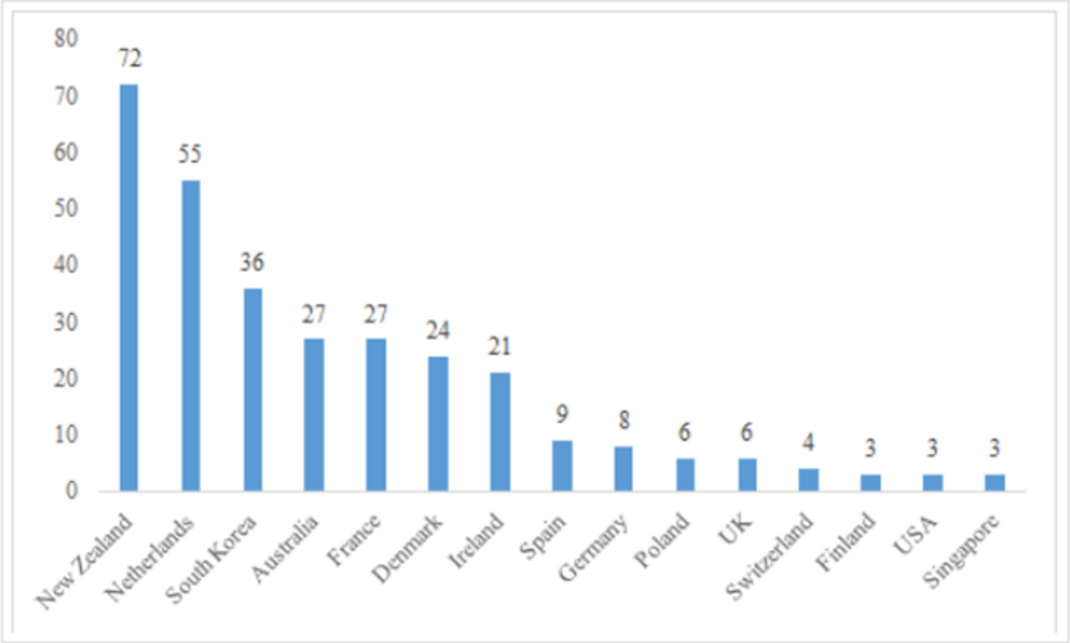

Figure 5. The number of registered imported products in 2019 in China per country. (Retrieved from http://www.cirs-reach.com/news-and-articles/Data-Delivery-Status-of-Infant-Formula-Milk-Powder-Registration-in-China.html**).**

3. MADE IN CHINA, BOUGHT IN EUROPE? EXPLORING EU CONSUMER PRODUCT PERCEPTION AND PURCHASE INTENTION TOWARDS CHINESE FOOD PRODUCTS

3.1. ABSTRACT

In light of the constantly increasing scope of mandatory country of origin labeling in the EU which has taken place against a backdrop of numerous Chinese food scandals and a renewed commitment to further strengthen trade and business ties between the EU and China, section 3 explores EU consumer perceptions and purchase intentions towards products made in China.

Data were collected by means of an online survey in six European countries (France, Germany, Italy, Netherlands, Spain, United Kingdom) to explore consumer (n=2993) perceptions and purchase intentions towards one of two categories of food products made in China (processed meat products (PMP) and processed fruit and vegetable products (PFVP)). We examined demographics, quality cues and constructs used in the Theory of Reasoned Action (TRA) to characterize consumers with a low- vs higher-intention to purchase PMP/PFVP made in China. Subsequently, we explored our results with key industry, university and government stakeholders (n=7 per product group) and obtained insights to guide future marketing strategies, commercial actions and communication campaigns in relation to processed products made in China. The method chosen for qualitative data collection was semi-structured face-to-face interviews.

EU Consumers held unfavorable attitudes and beliefs, and relatively low purchase intentions towards PMP/PFVP made in China. Chinese products were regarded as being lower in quality (compared to PMP/PFVP made in seven EU countries) and price (compared to an EU product), and relevant Chinese chain actors (i.e. farmers/growers, processors/manufacturers, and the national authority in charge of food quality) were rated as less trustworthy than relevant EU chain actors (the national authority in charge of food quality and supermarkets). Consistent with the TRA, consumer attitudes and subjective norms had a significant positive influence on behavioral intentions to purchase PMP/PFVP made in China. Key industry and government stakeholders (based in the EU and China) were unsurprised that food made in China was regarded by consumers as being 'somewhat low product quality'. They suggested a number of creative solutions to counteract the negative publicity about China and the food it produces. This included emphasizing that Chinese products (sold in the EU) meet strict EU standards.

EU consumers perceive that PMP/PFVP from China have a "somewhat low product quality". The relatively low purchase intentions suggest that, in addition to continually improving product safety and quality, those wishing to promote Chinese PMP/PFVP in the EU should design promotional campaigns (using a multitude of channels) to increase consumer trust in Chinese PMP/PFVP that have the same qualities as EU PMP/PFVP. In addition to emphasizing how the quality and safety of Chinese products matches the EU product, beliefs about its healthfulness, tastefulness, traceability, authenticity, label accuracy, and environmental friendliness may also be incorporated into any campaigns. Furthermore, it may be worth targeting the Netherlands, the UK, and Germany first, as consumers in these countries appear to be more willing to purchase Chinese PMP/PFVP. At a wider level, public communication campaigns should also emphasize the positives about China as a country and the positive links between China and the EU.

Abbreviations: COO, Country of Origin; COOL, Country of Origin Labeling; PFVP, Processed Fruit and Vegetable Products; PMP, Processed Meat Products; PI, Purchase Intender; TRA, Theory of Reasoned Action; and WTP, Willingness to Pay.

3.2. INTRODUCTION

China (5.9 EUR billion) is the fourth major supplier of agri-food to the EU, after the USA (12.9), Brazil (11.7) and Ukraine (6.3) (European Commission, 2019); with the following top four product categories having the highest percentage share in all 2018 EU agri-food imports from China (descending order): (1) offal, animal fats and other meats, fresh, chilled and frozen (2) vegetables, fresh, chilled and dried (3) pet food and (4) tropical fruit, fresh or dried, nuts and spices (European Commission DG-AGRI, 2019). Despite this, exports from China to the EU account for only a small percentage of China's total exports. There is, therefore, great potential to increase China's trade with the EU. Indeed, the EU and China have agreed to further strengthen trade ties (European Council, 2019) and numerous experts in both jurisdictions are currently working together on issues of mutual concern and interest in the area of bilateral agri-food trade (e.g. food safety and authenticity (EU-China-Safe, 2018)).

In the EU, mandatory Country of Origin Labeling (COOL) has continued to increase in scope and significance since 2000. COOL is currently mandatory for honey, fresh fruit and vegetables, olive oil, fishery products, eggs, beef and beef products and the unprocessed meat of swine, sheep, goat and poultry (EPRS, 2018). Special labeling requirements (known as protected designation of origin (PDO), protected geographical indication (PGI), and traditional specialities guaranteed (TSG)) are also in place for foodstuffs that have unique characteristics linked to their geographic origin and/or traditional know-how (EU, 2012). Recently, some EU member states have adopted additional measures concerning the mandatory labeling of certain foods, mainly for milk as well as milk and meat as an ingredient (EPRS, 2018). While mandatory labeling has been welcomed by consumer groups, opponents of the legislation see it as a protective measure intended to promote EU food products over imported products (EPRS, 2018).

Developments in mandatory COOL within the EU have occurred concurrently with numerous Chinese food scandals (Qiao, Guo, & Klein, 2012) which have affected domestic consumer confidence and world trade (Custance, Walley, & Jiang, 2012; Kendall et al., 2019; Kendall et al., 2018). To develop effective strategies to promote Chinese agricultural products in the EU market, producers, processors and traders in China need a better understanding of EU consumer perceptions and purchase intentions towards food products made in China. Further, in light of the constantly increasing scope of mandatory COOL in the EU (EPRS, 2018), this understanding would also be of special interest for importers, wholesalers and retailers in the EU.

Dichter's original proposition that a product's country of origin might have a "tremendous influence on the acceptance and success of products" (Dichter 1962, p.116) has been followed by well over 1000+ publications (Usunier, 2006) and a number of comprehensive reviews on the effects of country of origin on consumer decision making (see for example, Bilkey & Nes, 1982; Dinnie, 2004; Newman, Turri, Howlett & Stokes, 2014; Pharr, 2005; Phau & Prendergast, 2000; Thogersen, Pedersen, Paternoga, Schwendel, Aschemann-Witzel, 2017; Usunier, 2006; Verlegh & Steenkamp, 1999). Until 1996, most of the research focused on non-food items (Skaggs, Falk, Almonte, & Cárdenas, 1996) such as electronic products and cars. The most recent review of the existing literature concludes that "the COO (Country of Origin) effect is complex, explained by the underlying processes of cue utilization and halo effects, contingent on a number of antecedents (e.g. ethnocentrism, cultural orientation, economic development, geographical closeness and familiarity, product-country fit) and moderated by both individual-based and product factors" (Thogersen et al., 2017). Further, COO is mostly found to have an indirect relationship to purchase intention via product evaluations (Thogersen et al., 2017).

Empirical research specifically in the context of food and country of origin has gained strong interest from academia and industry since the introduction of mandatory labeling initiatives. Consumer attitudes, evaluations, perceptions, preferences and/or Willingness to Pay (WTP) for products such as meat (Bernués, Olaizola, & Corcoran, 2003; Schnettler, Ruiz, Sepúlveda, & Sepúlveda, 2008; Spence, Stancu, Elliott, & Dean, 2018; Verbeke, & Ward, 2006), olive oil (Dekhili, Sirieix, & Cohen, 2011), cheese (Pecher, A & Tregear, 2001), and fruit and beer (Profeta, A., Balling, & Roosen, 2012; Yeh, Chen, Sher, 2010) have indeed been linked to country of origin and there is a great deal of evidence to suggest that consumers prefer domestic food products because they wish to support home producers (Umberger, Feuz, Calkins, & Sitz, 2003). Other studies, however, have shown no relationship between food origin and consumer perceptions (Grunert, 1997; Verbeke & Ward, 2006) and preferences (Van der Lans, van Ittersum, De Cicco, & Loseby, 2001). The under-researched impact of food origin on consumers' purchase intentions and purchase behavior in the literature also shows mixed results (Newman et al., 2014). Overall, a recent review of twenty years of country of origin food labeling research concludes "little generalizable knowledge about COO food labeling effect exists" (Newman et al., 2014). Grunert (2005) reasons that origin information has no effect on quality evaluations when the consumer is unknowledgeable about the region of origin, when product quality is not desired, and/or when new purchases are being considered.

Although some research has investigated the impact of COO on consumer perceptions and purchase intentions towards agricultural products, relatively few of these studies have explored how consumers in economically developed countries perceive agricultural products originating from developing and transition countries (see for example, Gao, Wong, House, & Spreen, 2014; Otter, Prechtel, & Theuvsen, 2018; Thogersen, Pedersen, & Aschemann-Witzel, 2019; Wang, Gao, & Heng, 2018; Xie, Gao, Swisher, & Zhao, 2016). In particular, little is known about EU consumers' perceptions and purchase intentions towards food emanating from China (in general terms and in relation to specific products) or influencers of these intentions. Therefore, the purpose of this present study is to examine the interrelationships between EU consumer demographics and perceptions on purchase intentions towards two categories of food products made in China; (1) processed meat and (2) processed fruit and vegetables. Such research provides critical information to the Chinese agricultural industry (Chinese producers, processors and traders) to inform future efforts to improve market penetration in economically developed countries and for EU stakeholders (i.e. importers, wholesalers and retailers) that source, or are interested in sourcing, products and ingredients from China.

We chose meat vs fruit and vegetables as societal concerns about their need for traceability tend to differ in magnitude (Van Rijswijk & Frewer, 2012), as does the universal promotion of these foods as healthy/unhealthy. Of note, processed meat, compared to processed fruit and vegetables, is also less likely to be imported into the EU from China (European Commission DG-AGRI, 2019). Given this, and past research which shows that attitudes towards products from a country vary by product (Schnettler et al., 2008), there may be differences in the parameters of interest between product categories.

We used the Theory of Reasoned Action (TRA) (see Ajzen & Fishbein, 1980) to investigate differential influences towards purchase intention for processed meat products (PMP)/processed fruit and vegetable products (PFVP) made in China between low- and higher-Purchase Intenders (PI's). This framework has proved to be successful in predicting and explaining dietary behaviors (Grogan, Bell, & Conner, 1997; Shepherd & Towler, 1992; Stafleu, van Staveren, de Graaf, Burema, & Hautvast, 1995). The TRA postulates

that attitudes (positive, negative or neutral evaluations of the behavior) and subjective norms (the influence of the thoughts and attitudes of others towards the behavior) lead to the formation of a behavioral intention, which is a precursor of behavior. Attitude in turn is influenced by the beliefs that people hold about the outcome of the behavior and the evaluation of the outcome. Therefore, consistent with the theory, we suggest that the more favorable the attitude and subjective norm, the stronger the intention to purchase PMP/PFVP made in China. As all of our EU survey participants had some responsibility for buying PMP/PFVP for their household, we focused solely on the TRA and chose not to introduce Ajzen's third construct, perceived behavioral control (the confidence in one's ability to perform the behavior), as a further determinant of intention.

The present study attempts to extend limited existing research on the impact of COO for agricultural products from economically developing and transition countries. The four specific research objectives were to: (1) understand how EU consumers' perceive PMP and PFVP emanating from China, (2) characterize consumers with low versus higher purchasing intentions, (3) investigate how attitude and subjective norm as per the TRA influence EU consumer purchase intentions within each product category and (4) explore consumer survey results with key industry/university/ government stakeholders and obtain insights to guide future marketing strategies, commercial actions and communication campaigns in relation to processed products made in China.

3.3. MATERIALS AND METHODS

3.3.1. EU consumer survey data collection and sample description

Data were collected by means of an online survey in six European countries (France, Germany, Italy, Netherlands, Spain, United Kingdom) between October to December 2018 by an online panel provider (Dynata™). These countries were chosen on the basis of them being the six largest (EUR million) importers of goods from China in the EU (Eurostat, 2018).

The master questionnaire was first developed in English and then translated into the five other languages (French, German, Italian, Dutch, and Spanish) by bilingual researchers. Target sample sizes were 500 respondents from each country, sampled for representativeness with regard to gender, age group, region and social class (France, Germany, Netherlands, United Kingdom)/income (Italy and Spain). To qualify for the survey, participants had to be 18 years old or older and have some responsibility for buying PMP/PFVP for their household. Those who were working or had household members working in food advertising/the media/the food industry/food safety were excluded. Approximately half of the respondents in each country answered questions related to PMP made in China, and the other half answered questions related to PFVP made in China. 'Speeders' (those who had abnormally fast completion times) were removed by the online panel provider. The survey took approximately 20 minutes to complete and was approved (08/18/SpenceM) by the Queen's University Belfast Ethical Committee.

Demographic details and characteristics of the participants in the total sample are detailed in Table 1. As planned, the sample had equal representation from each country (Table 1), however, there were a few notable deviations in terms of some country comparisons to national statistics (data not shown). Specifically, the chief deviation in terms of population representativeness was that the low socio-economic grouping in the German sample was over represented (49% in the sample vs 38% in the population), while

the participants between 25-34 years old in both France and the Netherlands were slightly less represented in the sample compared to national statistics (13% in the sample vs 16% in the population and 12% in the sample vs 15% in the population, for each respective country), and those 65-75+ years were slightly less represented in Italy (20% in the sample vs 24% in the population). In the Netherlands, participants from the region Utrecht were also slightly less represented compared to national data (5% in the sample vs 7% in the population). Table 2 compares participant demographics between and within PMP/PFVP categories

3.3.2. Questionnaire design and outline

Adhering to guidelines (Azjen, 2006; Francis et al., 2004), the questionnaire items were defined after a review of previous research investigating the impact of COO on consumer perceptions and purchase intentions. The survey contained closed-ended questions and was initially piloted among 10 individuals in order to test the content, structure, comprehensibility and acceptability of the programmed questionnaire. At the outset, we defined the term "processed meat products"/"processed fruit and vegetable products" before obtaining socio-demographic characteristics (gender, age, education, occupation status, household size, number of children in household, and past purchase experience regarding PMP/PFVP from China). We then examined how participants assess the quality of PMP/PFVP (based upon packaging cues and multiple countries of origin). Following this, and specific to PMP/PFVP of Chinese origin, we captured trust in different chain actors to provide accurate information about product quality and measured behavioral beliefs, attitude, subjective norm, and purchasing intention. Finally, expectations regarding the price of the Chinese PMP/PFVP were recorded.

3.3.3. Definition of processed meat products (PMP)/processed fruit and vegetable products (PFVP)

PMP were defined as those "that have been transformed through salting, curing, fermentation and other processes to enhance flavor or improve preservation (so things like bacon, sausages, burgers, salami, and chicken nuggets etc.)". PFVP were defined as "including frozen, canned and dried forms, as well as 100% juice".

3.3.4. Measures

The below items detailed in Table 3 and 4 were scored on a 7-point Likert-type scale (1 = "strongly disagree", 7 = "strongly agree", unless otherwise indicated).

Packaging cues as an indicator of product quality (Table 3): The importance of ten packaging cues as an indicator of PMP/PFVP quality was measured on a scale anchored by "not at all important" and "extremely important".

Country of origin as an indicator of product quality (Table 3): To measure perceptions of product quality by country of origin, participants rated the quality of PMP/PFVP made in eight countries (China, France, Germany, Ireland, Italy, Netherlands, Spain, UK) on a labeled response scale (1 = "extremely low product quality", 2 = "low product quality", 3 = "somewhat low product quality", 4 = "medium product quality", 5 = "somewhat high product quality", 6 = "high product quality", 7 = "extremely high product quality").

Trust in chain actors to provide accurate information about the quality of PMP/PFVP made in China (Table 3): Participants rated the extent to which they agreed/disagreed that five relevant chain actors

(three from China and two from the EU) could be trusted to provide accurate information about the quality of PMP/PFVP made in China.

Behavioral beliefs (Table 4): To measure behavioral beliefs, participants responded to nine statements about the Chinese-made product (e.g., PMP/PFVP made in China would be: healthy, tasty, cheap, safe, of good quality, fully traceable back to the farm of origin/place where they were grown, authentic, environmentally friendly, accurately labeled).

Attitude (Table 4): Attitude towards purchasing PMP/PFVP made in China was measured by four semantic differential scales: two which tapped the affective (bad-good, displeased-pleased) aspect of attitude and two which tapped the cognitive (foolish-wise, unsafe-safe) aspect of attitude.

Subjective norm (Table 4): The perceived social pressure towards buying PMP/PFVP made in China was assessed as five social norms among family and friends, doctors and nutritionists, the media, the food industry, and other important people.

Purchase intention (Table 4): Intention to purchase PMP/PFVP made in China was assessed by three items: "I would consider buying PMP/PFVP made in China if they are available", "It is likely that I would buy PMP/PFVP made in China if they are available", and "I am willing to buy PMP/PFVP made in China if they are available".

Price expectations: Respondents indicated whether they expected to pay more/less/the same for PMP/PFVP made in China versus made in Europe. For those participants who expected to pay more/less, they specified 'how much more/less?' by choosing one of the following response options: 5%, 10%, 15%, 20%, 30% 40%, 50%, 60%, 70%, 80%, 90%, 100%, other (please specify).

3.3.5. Data analysis

All analyses were conducted using IBM SPSS Statistics for Windows version 25.0 (IBM Corporation, Armonk, NY, USA).

Factor and descriptive analysis: To examine the three-factor structure of the 12 direct TRA items (attitudes, subjective norms and intention), a maximum likelihood factor analysis with Direct Oblimin rotation was conducted for each product category (Table 5). Each item loaded cleanly and strongly unto the expected factor within each product category and Cronbach's alpha coefficients demonstrated that each sub-scale had a high internal consistency (Table 5). Participants who had a mean score of four or higher on the three intention items were classified as higher-PI's with respect to their product category (i.e. PMP higher-PI's or PFVP higher-PI's), whereas the other participants were classified as low-PI's with respect to their product category (i.e. PMP low-PI's or PFVP low-PI's). This theoretically meaningful cut-off point was selected because we wished to characterize participants who were open (rated 4-7 on the intention scale) vs closed to the prospect of buying food made in China (1-3 on the intention scale), and explore how best negative buying intentions could be changed. Percentages or medians (interquartile ranges) were then computed for all measures and differences between (PMP vs PFVP) and within (low-PI's vs higher-PI's) product categories were compared (Mann-Whitney U Test for ordinal/continuous variables or Pearson's chi-square tests for categorical variables). Spearman Rank Order Correlations (rho) explored not only the strength of the relationship between regression variables (attitude, subjective norm and purchase intention), but also the relationship between behavioral beliefs with attitude and purchase intention.

Regression analysis: A binary logistic regression examined the association between independent variables (attitude and subjective norm) and intention (low and higher) within each product category. In both regressions, multicollinearity between predictor variables was not a concern (i.e., correlation coefficients were less than 0.70, tolerance statistics were above 0.5).

3.3.6. Engagement with industry/university/government stakeholders

Stakeholders were recruited (n=7 per product group; 43% Chinese; 57% European) via convenience and snowball sampling with purposive acceptance. Recruitment techniques involved leveraging the existing social networks and personal contacts of the research team and of the initial participants. The method chosen for qualitative data collection was semi-structured face-to face interviews. Topics included: (1) EU consumer perceptions of the quality of food originating from China; (2) EU consumer perceptions of country of origin as an indicator of quality; and (3) how best to communicate with EU consumers to build trust and confidence in food originating from China. Responses to each topic were content analysed. This study of stakeholder views was approved (08/19/SpenceM) by the Queen's University Belfast Ethical Committee.

3.4. RESULTS

3.4.1. Descriptive summary of participants in the EU consumer survey

Demographic variables: Demographic details and characteristics of the participants between and within product categories are compared in Table 2. Participants in each product category had a median age of 48 and were equally divided in terms of their country of origin and gender. Demographics were similar between product categories and those who answered questions on PFVP (vs PMP) were significantly more likely to state that they had previously purchased processed products (from their product grouping) made in China. Higher PI's within each product category were most likely to be from the Netherlands, followed by the UK and Germany and least likely to be from Italy and France. Higher PI's within each product category were also significantly younger. There were also significant associations between purchase intentions (higher vs low) within each group and (a) occupation status and (b) whether or not they had previously purchased PMP/PFVP made in China.

Packaging cues as an indicator of product quality (Table 3): Participants rated that price was the most important cue when making judgments about the quality of PMP/PFVP (median = 6). With the exception of 'farm of origin in specific country' and 'the retailer', whose median score for PFVP was 4, all other packaging cues had a median of 5. In the product category comparison, packaging cues (excluding price and kind of packaging) were significantly ($p < 0.05$) more important when making judgments about the quality of PMP vs PFVP. While price was rated to be equally important for higher- vs low-PI's within each group, all other packaging cues were significantly ($p < 0.01$) less important for higher-PI's (vs low PI's) within each product category.

Country of origin as an indicator of product quality (Table 3): Products made in China were perceived as being of 'somewhat low product quality' in each product category (median = 3), while products made in other countries (i.e. Germany, UK, France, Ireland, Netherlands, Spain, Italy) were perceived of being of 'somewhat high product quality' (median = 5). In the product category comparison, the quality of PFVP (vs

PMP) was significantly more favorable if the product originated from China, UK, France, Spain or Italy whereas PMP and PFVP originating from Germany, Ireland and the Netherlands were of comparable quality. Higher-PI's (vs low- PI's) within each product category viewed that the quality of the product from China, Germany, UK, Ireland, Netherlands and Spain was higher, while product quality of the product from France and Italy was the same.

Trust in chain actors to provide accurate information about Chinese product quality (Table 3): With the exception of the 'Chinese authority in charge of PFVP quality (including safety)' who had a median score of 4 (neutral), participants disagreed that Chinese chain actors (i.e. farmers/growers, processors and manufacturers, and the Chinese authority in charge of PMP quality (including safety)) could be trusted to provide consumers with accurate information about the quality of the Chinese product. Participants had neutral views in relation to European supermarkets for PMP and expressed agreement that other actors (EU authority in charge of food quality and European supermarkets for PFVP) could be trusted. In the product category comparison, scores were significantly more positive for Chinese actors in the PFVP chain vs the PMP chain ($p < 0.001$), while higher-PI's (vs low-PI's) within each product category had significantly greater trust in both Chinese and EU actors.

Theory of reasoned action variables (Table 4): Participants reported a general unfavorable attitude with negative beliefs towards PMP made in China. Participants viewed that PMP made in China would be foolish/unsafe and make them feel bad/displeased. Specifically, participants disagreed that the Chinese product would healthy, safe, of good quality, fully traceable, authentic, environmentally friendly and accurately labeled (median = 3), and, they expressed a rather neutral opinion in regards to taste. Although attitudes and beliefs towards PFVP were significantly more favorable, median scores for attitude items were neutral (median =4) and beliefs were mostly neutral (healthy, tasty, safe, of good quality) or negative (authentic, fully traceable, environmentally friendly and accurately labeled). The only positive belief within each product category was that the Chinese product would be cheap (5 (4 to 6) for PMP and PFVP, p = 0.002 between product categories). All attitude and belief items were significantly more favorable for higher-PI's (vs low-PI's) within each group.

Participants in each product group also reported (Table 4) low subjective norms and purchasing intentions towards PMP made in China (i.e., the means for each construct were below below the neutral mid-point, 4). All items in relation to subjective norm and purchasing intention were significantly more favorable for PFVP (vs PMP) and higher-PI's (vs low-PI's) within each group.

Price expectations (data not shown in Table): While the overwhelming majority of participants (77.8%) in the PMP product category expected that the price of the Chinese origin product would be less than an EU product, 11.8% expected that the price would be more and 10.4% expected the price would be the same. In the PFVP sub-group, 77.2% of the sample indicated that they expected to pay less for the Chinese product (vs an EU product), while 14.7% expected that the price would be more and 8.2% expected the price would be the same. For those who expected to pay less (majority of the sample), the mean percentage price reduction below the EU price was significantly greater for PMP vs PFVP (median = 20; P25 = 15; P75 = 40 vs median = 20; P25 = 10; P75 = 30, respectively; p = 0.005) and low-PI's (vs higher PI's) expected to pay significantly less ($p < 0.001$) for PMP (median = 30; P25 = 15; P75 = 40 vs median = 20; P15 = 10; P75 = 30, respectively) and PFVP (median = 20; P25 = 15; P75 = 40 vs median = 20; P25 = 10; P75 = 30, respectively).

3.4.2. Predicting intentions within the EU consumer survey

Correlations between the TRA constructs for each sub-group are shown in Table 6. Both attitude and subjective norm correlated strongly and positively with intention to purchase PMP/PFVP made in China.

The full PMP model containing all predictors was statistically significant, X^2 (2, = 1485) = 1051.08, p <0.001, indicating that the model was able to distinguish between respondents who had low and higher purchase intentions. The model as a whole explained between 50.7% (Cox and Snell R square) and 69.6 (Nagelkerke R squared) of the variance in intention to purchase, and correctly classified 86.7% of cases. As shown in Table 7, both attitude and subject norm made a uniquely statistically significant contribution to the model. The strongest predictor of purchase intentions was attitude, recording an odds ratio of 3.90. This indicates that respondents with a more favorable attitude towards the Chinese product were almost four times more likely to have high purchase intentions than those who had more negative attitudes. The odds ratio of 2.65 for subjective norm indicated that for every additional unit of norm supportive of purchase respondents were 2.64 times more likely to report high purchase intentions, controlling for attitude.

The full PFVP model containing all predictors was also statistically significant, X^2 (2, = 1508) = 1012.86, p < 0.001, indicating that the model was able to distinguish between respondents who had low and higher purchase intentions. The model as a whole explained between 48.9% (Cox and Snell R square) and 65.2 (Nagelkerke R squared) of the variance in intention to purchase, and correctly classified 84.9% of cases. As shown in Table 7, both attitude and subject norm made a uniquely statistically significant contribution to the model. The strongest predictor of purchase intentions was attitude, recording an odds ratio of 3.66. This indicates that respondents with a more favorable attitude towards the Chinese product were over three and a half times more likely to have high purchase intentions than those who had more negative attitudes. The odds ratio of 2.68 for subjective norm indicated that for every additional unit of norm supportive of purchase respondents were 2.68 times more likely to report high purchase intentions, controlling for attitude.

3.4.3. Explaining intentions within the EU consumer survey

To gain further understanding of the reasons influencing the intention to purchase PMP/PFVP made in China, the behavioral beliefs were correlated with attitude and intention within each product category. Table 8 shows that, with the exception of the belief that Chinese products would be 'cheap', there were moderate to strong positive correlations with high statistical significance (p < 0.001) between beliefs and attitude and beliefs and intention within both the PMP and PFVP group. The weak positive correlation between 'cheap' and attitude, and 'cheap' and intention was only significant within the PFVP group (p < 0.01).

3.4.4. Engagement with key industry/university/government stakeholders

3.4.4.1. Quality of food originating from China

Stakeholders felt that food produced by China had received widespread negative publicity and that many of these high profile incidents (such as melamine adulterated milk and clenbuterol-tainted pork) had highlighted the dangers of China's food sector to EU consumers. Consequently, they expected EU

consumers to have low quality perceptions stemming from food exported from China. Regardless of the negative publicity, some stakeholders highlighted that they had high trust in the food exported from China into the EU. Indeed, they regarded Chinese food exports into the EU as being of a superior quality/safety to food available on China's domestic market.

3.4.4.2. Country of origin as an indicator of quality

Stakeholders felt that consumers were not always aware, or interested, where their purchased food products originated (especially ultra-processed foods) and were of the opinion that a COO effect did not exist for all products. Stakeholders felt that many Chinese ingredients were incorporated into EU products but the origin of these ingredients was hidden. With the exception of tea and spices (products thought to be perceived by EU consumers to have originated from China), stakeholders were of the viewpoint that the identification of a food product with China would detract from positive consumer attitudes towards that product. They were unsurprised by the survey results, which revealed that PMP/PFVP of Chinese origin were regarded by EU consumers as being lower in quality (compared to PMP/PFVP made in seven EU countries). Stakeholders thought it would be interesting to see how EU consumers viewed different non-EU countries in terms of food quality.

3.4.4.3. Communication strategies to build EU consumer trust and confidence

Stakeholders acknowledged that the special import conditions connected with Chinese food were largely due to their number of past noncompliance's notified under the EU Rapid Alert System for Food and Feed (RASFF). Something that needs to improve in order to build consumer trust and confidence.

With regard to consumer communication, stakeholders were of the opinion that we need creative solutions to counteract negative publicity about China and the food it produces. There was unanimous agreement that more communication with EU consumers is required (e.g. possibly a presence on social media channels such as YouTube). Stakeholders suggested that strategies for building EU consumer trust in Chinese food should emphasise the:

- positives about China as a country (e.g. China, a populous and emerging country, is a leader in greening the land through the planting of trees).
- positive links that China has with the EU and its pledge to make these links stronger. These links could include, but are not limited to food production (e.g. in 2019, a ceremony to mark the completion of the construction of the infant formula production factory by a Chinese company was held in Ireland).
- Chinese government investment in food safety oversight.
- positives about China's food industry (e.g. the implementation of innovations in food safety, authenticity and traceability).
- collaborations, synergies and trust between the EU and China in terms of food safety, authenticity and traceability.
- strict EU standards which Chinese products (sold in the EU) meet.

Strategies should also 'localise' Chinese products in the EU market (e.g. by using distributors that are well established) and involve trusted EU stakeholders in Chinese food production firms. The possible

benefit of a method of influencing consumer preferences through experience e.g. blind taste test, promotions etc. was also mentioned.

3.5. DISCUSSION

Agri-food exports from China to the EU have the potential to play an even more important role in generating income for the Chinese agricultural industry, especially with the increasing focus on improving bilateral market access opportunities (EU-China, 2013). However, Chinese-produced food products have been beset by a number of high-profile food safety and health scares which have affected domestic consumer confidence and world trade (Custance et al., 2012; Kendall et al., 2019; Kendall et al., 2018). To enable Chinese agricultural products to be competitive in the EU market, there is a critical need for a better understanding of EU consumer perceptions and purchase intentions towards agri-food made in China.

In our online survey of EU consumers, purchase intentions toward PMP/PFVP made in China were relatively unfavorable. Specifically, 64% of PMP respondents and 51% of PFVP respondents were classified as low-PI's. On comparison with different jurisdictions, we also found that PMP/PFVP from China were regarded as being lowest in quality (compared to PMP/PFVP made in seven other countries) and price (compared to PMP/PFVP made in the EU) and that participants trusted the Chinese authority in charge of food quality (including safety) less than the EU authority.

These results are comparable with a previous survey study (Gao et al., 2014) which demonstrates that French consumers perceive Chinese fruit to be both lower in quality and cheaper than fruit from various other countries (i.e. France, Spain, the US, Israel, Brazil and Turkey). Indeed, in what appears to be the same survey, 50% of French consumers were either 'very unlikely' or 'unlikely' to purchase fresh fruit from China (Wang et al., 2018). Other studies have also confirmed that COO is important for shaping consumer beliefs and WTP for a food product (Lobb & Mazzocchi, 2007; Umberger, Feuz, Calkins, & Killinger-Mann, 2002; Wirth, Love, & Palma, 2007). In general, studies conducted in developed countries reveal that consumers have more positive beliefs (in terms of quality perceptions and safety) (Lobb, & Mazzocchi, 2007; Umberger et al., 2002; Wirth et al., 2007) and a higher WTP for domestic food vs foreign food (Dransfield, 2005). In some cases, it has been suggested that lower WTP for foreign food vs domestic food is driven by taste (Umberger et al., 2002). Perceived improvements in food quality/safety have also been associated with higher WTP (Spence et al., 2018).

Consistent with the TRA (Ajzen & Fishbein, 1980), attitudes and subjective norms had a significant positive influence on behavioral intentions to purchase PMP/PFVP made in China. The strongest predictor of purchase intention was attitude, recording an odds ratio of 3.90 and 3.66 for PMP and PFVP, respectively. In addition, with the exception of the belief that the Chinese products would be 'cheap', there were moderate to strong positive correlations between beliefs and attitude, and beliefs and intention, within both the PMP and PFVP group. Beliefs relating to the quality and safety of the Chinese product were most important.

The influence of attitudes/beliefs on purchase intentions is similar to other studies that have shown that consumers' purchase intentions are guided by product evaluations that are linked to the country of origin of the product (Lorenz, Hartmann, & Simons, 2015; Wang et al., 2018). Comparably, within a theory of

planned behavior-based model, Lorenz and colleagues demonstrate that personal norms/affective attitudes had the strongest direct impact on German consumer purchasing intention towards regional pork (Lorenz et al., 2015). Comparable to our research focus (EU consumer preference for food from China), a regression analysis has also shown that quality perceptions have a significant positive impact on the purchase of Chinese fruit in a French population (Wang et al., 2018). Given the results of our study, marketing campaigns should aim to cognitively reframe beliefs for Chinese PMP/PFVP so that they are comparable to those for EU products. With trust and quality perceptions being higher for EU actors and products, respectively, marketing efforts might consider highlighting positive collaborations between key actors within the EU and China to reframe beliefs. For example, the EU-China-Safe project (EU-China-Safe, 2018) aims to improve food safety systems and practices and facilitate growth in agri-food trade between the two jurisdictions. As stated by Juric & Worsley (1998), minimising the effects of unfavorable attitudes/beliefs could also be done by 'localising' PMP/PFVP in the EU market (e.g. by using distributors that are well established). At a wider level, public communication campaigns should also emphasize the positives about China as a country and the positive links between China and the EU.

Similar to Lorenz and colleagues (Lorenz et al., 2015), our study demonstrated that subjective norm was also an important positive antecedent of purchase intentions towards Chinese PMP/PFVP. Specially, the opinion of others (family, doctors and nutritionists, the media, the food industry/food supermarkets, and other important people) significantly predicted intention to buy PMP/PFVP made in China. Marketing must, therefore, also target these people of influence.

Sociodemographic characteristics are also of great importance since they represent the basis to identify and profile potential customers, and inform targeting and positioning strategies. Our study has shown that higher-PI's (vs low-PI's) are comparatively younger (which is reflected in the occupational structure i.e. higher percentage employed and a lower percentage retired) and are more likely to be from the Netherlands, the UK, and Germany. These findings are in line with previous sociodemographic research (Juric & Worsley, 1998) which shows that older consumers rate foreign products less favorably, and with Eurostat data (Eurostat, 2018) that shows the percentage of China in extra-EU imports is highest in these three countries.

Whilst this study is one of few to explore EU consumer perceptions and purchase intentions towards products made in China, potential limitations do exist. Specifically, respondents were biased towards people who use the internet and who complete web based survey. Like other survey modes, the resultant data quality has also been questioned (Gao, House, & Xie, 2016). Furthermore, we employed a single cue (i.e. 'made in China') survey far removed from real life purchasing conditions. Though this design facilitated the achievement of our objectives, it did not shed any light on the importance of COO, specifically 'made in China', in a realistic multi-cue situation with a specific tangible food product. Future studies could explore this using a variety of study designs (including, for example, field experiments in grocery stores) and products. Indeed, it would be interesting to see if a trusted brand or positive collaboration with key EU actors could minimize unfavorable attitudes and increase purchase intentions towards food products made in China. As higher-PI's (vs low-PI's) were comparatively younger in our study, future studies may seek to explore whether people in newer generations (vs older generations) become more willing to buy food products made in China.

3.6. CONCLUSIONS

EU consumers perceive that PMP/PFVP from China have a "somewhat low product quality". The relatively low purchase intentions suggest that, in addition to continually improving product safety and quality, those wishing to promote Chinese PMP/PFVP in the EU should design promotional campaigns (using a multitude of channels) to increase consumer trust in Chinese PMP/PFVP that have the same qualities as EU PMP/PFVP. In addition to emphasizing how the quality and safety of Chinese products matches the EU product, beliefs about its healthfulness, tastefulness, traceability, authenticity, label accuracy, and environmental friendliness may also be incorporated into any campaigns. Furthermore, it may be worth targeting the Netherlands, the UK, and Germany first, as consumers in these countries appear to be more willing to purchase Chinese PMP/PFVP.

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3.8.TABLES 1-8

Table 1
Demographic characteristics of the total study sample.

	Total sample (n = 2993) %
Country	
Germany	16.7
UK	17.3
France	16.5
Netherlands	16.4
Spain	16.7
Italy	16.4
Gender	
Male	48.6
Female	51.4
Age	
18-24 yrs	10.2
25-34 yrs	14.9
35-44 yrs	18.6
45-54 yrs	18.4
55-64 yrs	16.2
65-75+ yrs	21.7
Highest education level	
No qualifications or compulsory level	30.7
Secondary/further education (e.g., NVQ)	36.8
University level	32.5
Occupation status	
Employed full-time (>30h per week)	44.6
Employed part-time (≤29h per week)	14.6
Full-time homemaker	6.5
Unemployed	7.9
Student	5.5
Retired	21.0
Household size	
1	20
2	32.8
3	19.8
4	20.0
5+	7.3
Number of children in household	
0	69.1
1	17.1
2	11.1
3+	2.6
Previously purchased processed meat products/processed fruit and vegetable products made in China	
Yes	21.3
No/not sure	78.7

Table 2

Comparison of demographic items between and within PMP/PFVP categories. Data are median (interquartile range), unless otherwise indicated.

	Total PMP (n = 1485)	Total PFVP (n = 1508)	p^a	PMP low-PI's (n = 951)	PMP higher-PI's (n = 534)	p^a	PFVP low-PI's (n = 767)	PFVP higher-PI's (n = 741)	p^a
Country (%)			0.945			**<0.001**			**<0.001**
Germany	16.6	16.8		15.7	18.4		15.4	18.2	
UK	17.2	17.4		15.4	20.6		14.3	20.6	
France	16.8	16.2		18.9	12.9		20.6	11.6	
Netherlands	16.7	16.0		12.5	24.2		9.8	22.5	
Spain	16.9	16.5		17.1	16.5		16.4	16.6	
Italy	15.8	17.0		20.4	7.5		23.5	10.4	
Gender (%)			0.435			0.733			**0.045**
Male	47.9	49.3		47.6	48.5		46.8	52.0	
Female	52.1	50.7		52.4	51.5		53.2	48.0	
Age (in years)	48 (35-63)	48 (34-62)	0.797	51 (37 to 65)	43 (31 to 56.3)	**<0.001**	51 (37 to 64)	45 (33 to 59.5)	**<0.001**
Highest education level (%)			0.885			0.630			0.063
No qualifications or compulsory level	30.3	31.0		31.1	28.8		33.2	28.7	
Secondary/further education (e.g., NVQ)	36.8	36.8		36.2	38.0		34.2	39.5	
University level	32.9	32.2		32.7	33.1		32.6	31.7	
Occupation status (%)			0.370			**<0.001**			**0.004**
Employed full-time (>30h per week)	43.4	45.8		41.1	47.6		43.2	48.6	
Employed part-time (≤29h per week)	13.9	15.4		12.9	15.5		13.9	17.1	
Retired	22.1	19.9		25.4	16.1		23.7	15.9	
Student	5.5	5.2		5.8	5.1		5.2	5.1	
Unemployed	8.5	7.3		7.4	10.5		7.3	7.3	
Full-time homemaker	6.6	6.4		7.4	5.2		6.9	5.9	
Household size	2 (2-4)	2 (2-4)	0.280	2 (2 to 4)	3 (2 to 4)	**0.001**	2 (2 to 4)	2 (2 to 4)	0.693
Previously purchased processed meat products/processed fruit and vegetable products made in China (%)			**<0.001**			**<0.001**			**<0.001**
Yes	18	24.7		12.5	27.7		15.6	21.3	

No/not sure	82	75.3	87.5	72.3	84.4	78.7

PMP = Processed meat products; PFVP = processed fruit and vegetable products; PI's = purchase intenders.

[a]Value obtained using the Mann-Whitney U Test for ordinal/continuous variables or Pearson's chi-square tests for categorical variables to test for differences between (PMP vs PFVP) and within (low-PI's vs higher-PI's) product categories.

Table 3

The influence of packaging cues (including country of origin) on perceived product quality and trust in chain actors to provide accurate information about the quality of Chinese origin products sold in the EU. Data are median (interquartile range).

Variables (number of items) *Items*	Total PMP (n = 1485)	Total PFVP (n = 1508)	p^a	PMP low-PI's (n = 951)	PMP higher-PI's (n = 534)	p^a	PFVP low-PI's (n = 767)	PFVP higher-PI's (n = 741)	p^a
Importance of package cues when making judgements about the quality of processed meat products/processed fruit and vegetable products[b]									
Price	6 (5 to 6)	6 (5 to 6)	0.439	6 (5 to 6)	6 (4 to 6)	0.350	5 (5 to 6)	6 (4 to 6)	0.717
Product traceability	5 (4 to 6)	5 (4 to 6)	**0.006**	6 (4 to 6)	5 (4 to 6)	**<0.001**	5 (4 to 6)	5 (4 to 6)	**<0.001**
Food assurance schemes that aim to meet consumer demands such as higher welfare, environmental or organic standards	5 (4 to 6)	5 (4 to 6)	**0.015**	5 (4 to 6)	5 (3 to 6)	**<0.001**	5 (4 to 6)	5 (3 to 6)	**<0.001**
Protected designation of origin (PDO) label or a protected geographical indication (PGI) label which guarantees that the product is from a specific region and follows a particular traditional production process	5 (4 to 6)	5 (4 to 6)	**<0.001**	5 (4 to 6)	5 (4 to 6)	**<0.001**	5 (4 to 6)	5 (3 to 6)	**<0.001**
Traditional speciality guaranteed (TSG) label which highlights traditional aspects such as the way the product is made or its composition, without being linked to a specific geographic area	5 (4 to 6)	5 (4 to 6)	**<0.001**	5 (4 to 6)	4 (3 to 6)	**<0.001**	5 (4 to 6)	5 (3 to 6)	**<0.001**
Country of origin	5 (3 to 6)	5 (3 to 6)	**<0.001**	6 (3 to 6)	4 (3 to 6)	**<0.001**	5 (3 to 6)	4 (3 to 5)	**<0.001**
The brand	5 (4 to 6)	5 (3 to 6)	**<0.001**	5 (4 to 6)	5 (3 to 6)	**0.001**	5 (4 to 6)	4 (3 to 5)	**0.001**
Farm of origin in specific country	5 (3 to 6)	4 (3 to 6)	**<0.001**	5 (4 to 6)	4 (3 to 6)	**<0.001**	5 (3 to 6)	4 (3 to 5)	**<0.001**
The retailer	5 (4 to 6)	4 (3 to 5)	**<0.001**	5 (4 to 6)	4.5 (3 to 6)	**0.004**	5 (3 to 6)	4 (3 to 5)	**0.001**
The kind of packaging	5 (4 to 6)	5 (3 to 6)	0.316	5 (4 to 6)	5 (3 to 6)	**<0.001**	5 (4 to 6)	5 (3 to 6)	**0.001**
Quality perceptions of processed meat products/processed fruit and vegetable products by their country of origin[c]									
China	3 (1 to 4)	3 (2 to 4)	**<0.001**	2 (1 to 3)	4 (3 to 4)	**<0.001**	2 (1 to 3)	4 (3 to 4)	**<0.001**
Germany	5 (4 to 6)	5 (4 to 6)	0.213	5 (4 to 6)	5 (4 to 6)	**0.001**	5 (4 to 6)	5 (5 to 6)	**<0.001**
UK	5 (4 to 6)	5 (4 to 6)	**0.001**	5 (4 to 6)	5 (4 to 6)	**<0.001**	5 (4 to 6)	5 (4 to 6)	**<0.001**
France	5 (4 to 6)	5 (4 to 6)	**0.010**	5 (4 to 6)	5 (4 to 6)	0.338	5 (4 to 6)	5 (4 to 6)	0.054
Ireland	5 (4 to 6)	5 (4 to 6)	0.482	5 (4 to 6)	5 (4 to 6)	**0.015**	5 (4 to 6)	5 (4 to 6)	**<0.001**
Netherlands	5 (4 to 6)	5 (4 to 6)	0.163	5 (4 to 6)	5 (4 to 6)	**<0.001**	5 (4 to 6)	5 (4 to 6)	**0.001**
Spain	5 (4 to 5)	5 (4 to 6)	**0.002**	5 (4 to 5)	5 (4 to 6)	**<0.001**	5 (4 to 5)	5 (4 to 6)	**<0.001**
Italy	5 (4 to 6)	5 (4 to 6)	**0.037**	5 (4 to 6)	5 (4 to 6)	0.542	5 (4 to 6)	5 (4 to 6)	0.713
Agreement that each actor can be trusted to provide consumers with accurate information about the quality of processed meat products/processed fruit and vegetable products made in China[d]									

Chinese farmers/growers	3 (1 to 4)	3 (2 to 4)	**<0.001**	2 (1 to 3)	4 (3 to 5)	**<0.001**	3 (1 to 4)	4 (3 to 5)	**<0.001**
Chinese processors and manufacturers	3 (1 to 4)	3 (2 to 4)	**<0.001**	2 (1 to 3)	4 (3 to 5)	**<0.001**	2 (1 to 3)	4 (3 to 5)	**<0.001**
Chinese authority in charge of food quality (including safety)	3 (2 to 4)	4 (2 to 4)	**<0.001**	3 (1 to 4)	4 (4 to 5)	**<0.001**	3 (1 to 4)	4 (4 to 5)	**<0.001**
European authority in charge of food quality (including safety)	5 (4 to 6)	5 (4 to 6)	0.119	5 (4 to 6)	5 (4 to 6)	**0.047**	5 (4 to 6)	5 (4 to 6)	**<0.001**
European supermarkets	4 (3 to 5)	5 (4 to 5)	0.054	4 (3 to 5)	4 (4 to 5)	**<0.001**	4 (3 to 5)	5 (4 to 5)	**<0.001**

PMP = Processed meat products; PFVP = processed fruit and vegetable products; PI's = purchase intenders.

[a]Value obtained using the Mann-Whitney U Test to test for differences between (PMP vs PFVP) and within (low-PI's vs higher-PI's) product categories.

[b]Importance of quality cues was measured on a 7-point Likert-type scale (1 = "not at all important", 7 = "extremely important".

[c]Product quality was measured on a 7-point Likert-type scale (1 = "extremely low product quality", 2 = "low product quality", 3 = "somewhat low product quality", 4 = "medium product quality", 5 = "somewhat high product quality", 6 = "high product quality", 7 = "extremely high product quality").

[d]Agreement that actor can be trusted was measured on a 7-point Likert-type scale (1 = "strongly disagree", 7 = "strongly agree").

Table 4

Comparison of TRA items between and within PMP/PFVP categories. Items scored on a 7-point Likert-type scale (1 = "strongly disagree", 7 = "strongly agree", unless otherwise indicated). Data are median (interquartile range).

Variables (number of items) *Items*	Total PMP (n = 1485)	Total PFVP (n = 1508)	p^a	PMP low-PI's (n = 951)	PMP higher-PI's (n = 534)	p^a	PFVP low-PI's (n = 767)	PFVP higher-PI's (n = 741)	p^a
Attitude (4 items)	3 .00 (1.50-4.00)	3.5 (2.00 to 4.00)	**<0.001**	1.00 (1.00 to 3.00)	4.00 (4.00 to 4.75)	**<0.001**	2.25 (1.25 to 3.25)	4.00 (4.00 to 4.75)	**<0.001**
Buying processed meat products/processed fruit and vegetable products made in China would make me feel:			**<0.001**						
Scale: bad (1) - good (7)	3 (1 to 4)	4 (2 to 4)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**
Scale: displeased (1) - pleased (7)	3 (1 to 4)	4 (2 to 4)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 4)	4 (4 to 5)	**<0.001**
I think that buying processed meat products/processed fruit and vegetable products made in China is:			**<0.001**						
Scale: foolish (1) - wise (7)	3 (1 to 4)	4 (2 to 4)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**
Scale: unsafe (1) - safe (7)	3 (1 to 4)	4 (2 to 4)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**
Subjective Norm (5 items)	2.80 (1.40 to 4.00)	3.40 (2.00 to 4.00)	**<0.001**	2.00 (1.00 to 3.00)	4.00 (3.80 to 4.80)	**<0.001**	2.20 (1.00 to 3.00)	4.00 (3.80 to 4.80)	**<0.001**
I would buy processed meat products/processed fruit and vegetable products made in China because:									
my family, partner and friends approve	3 (1 to 4)	3 (1 to 4)	**<0.001**	1 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**
doctors and nutritionists are in favor of it	3 (1 to 4)	4 (2 to 5)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**
the media (TV, radio) are in favor of it	3 (1 to 4)	3 (2 to 4)	**<0.001**	2 (1 to 3)	4 (3 to 5)	**<0.001**	2 (1 to 3)	4 (3 to 5)	**<0.001**
the food industry and/or food supermarkets promote it	3 (1 to 4)	3 (2 to 4)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**
people important to me approve	3 (1 to 4)	3 (2 to 4)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**
Intention (3 items)	3.00 (1.00 to 4.00)	3.67 (2.00 to 4.33)	**<0.001**	1.67 (1.00 to 2.67)	4.33 (4.00 to 5.00)	**<0.001**	2.00 (1.00 to 3.00)	4.33 (4.00 to 5.00)	**0.001**
If available:									
I would consider buying processed meat products/processed fruit and vegetable products made in China	3 (1 to 4)	4 (2 to 4)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**
It is likely that I would buy processed meat products/processed fruit and vegetable products made in China	3 (1 to 4)	4 (2 to 5)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**
I would be willing to buy processed meat products/processed fruit and vegetable products made in China	3 (1 to 4)	4 (2 to 5)	**<0.001**	1 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 3)	5 (4 to 5)	**<0.001**
Behavioral beliefs (9 items)	3.22 (2.33 to 4.00)	3.67 (2.78 to 4.22)	**<0.001**	2.56 (1.78 to 3.22)	4.00 (3.89 to 4.78)	**<0.001**	2.89 (2.00 to 3.56)	4.00 (3.78 to 4.78)	**<0.001**

Processed meat products/processed fruit and vegetable products made in China would be:									
healthy	3 (2 to 4)	4 (3 to 4)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	3 (2 to 4)	4 (4 to 5)	**<0.001**
tasty	4 (2 to 5)	4 (3 to 5)	**<0.001**	3 (2 to 4)	4 (4 to 5)	**<0.001**	3 (2 to 4)	5 (4 to 5)	**<0.001**
cheap	5 (4 to 6)	5 (4 to 6)	**0.002**	5 (3 to 6)	5 (4 to 6)	**<0.001**	5 (4 to 6)	5 (4 to 6)	**<0.001**
safe	3 (2 to 4)	4 (2 to 4)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	3 (1 to 3)	4 (4 to 5)	**<0.001**
of good quality	3 (2 to 4)	4 (3 to 4)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	3 (2 to 4)	4 (4 to 5)	**<0.001**
fully traceable back to the farm of origin/place where they were grown	3 (1 to 4)	3 (2 to 4)	**<0.001**	2 (1 to 3)	4 (3 to 5)	**<0.001**	2 (1 to 3)	4 (3 to 5)	**<0.001**
authentic which means that they have not been tampered with in any way and they are what they say	3 (1.5 to 4)	3 (2 to 4)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 3)	4 (3 to 5)	**<0.001**
environmentally friendly	3 (1 to 4)	3 (2 to 4)	**<0.001**	2 (1 to 3)	4 (3 to 5)	**<0.001**	2 (1 to 3)	4 (3 to 5)	**<0.001**
accurately labeled	3 (2 to 4)	3 (2 to 4)	**<0.001**	2 (1 to 3)	4 (4 to 5)	**<0.001**	2 (1 to 3)	4 (3 to 5)	**<0.001**

PMP = Processed meat products; PFVP = processed fruit and vegetable products; PI's = purchase intenders.

[a]Value obtained using the Mann-Whitney U Test to test for differences between (PMP vs PFVP) and within (low-PI's vs higher-PI's) product categories.

Table 5

Standardized factor loadings and Cronbach's alpha.

Item code[a]	PMP		PFVP	
	Alpha	Factor loadings	Alpha	Factor loadings
Attitude	0.96		0.96	
att 1		-1.02		-1.00
att 2		-0.98		-0.97
att 3		-0.81		-0.84
att 4		-0.82		-0.82
Subjective Norm	0.94		0.93	
sn 1		0.79		0.68
sn 2		0.80		0.77
sn 3		0.92		0.99
sn 4		0.85		0.84
sn 5		0.94		0.80
Intention	0.97		0.98	
int 1		-0.94		0.94
int 2		-0.98		0.96
int 3		-0.95		0.92

PMP = Processed meat products; PFVP = processed fruit and vegetable products.

[a]Items are listed in the order they appear in Table 4.

Table 6

Spearman correlation between intention, attitude and subjective norm within the processed meat products/processed fruit and vegetable products TRA model.

PMP (n=1485)	1	2	3
1. Intention[a]	-		
2. Attitude[b]	0.69***	-	
3. Subjective norm[b]	0.65***	0.69***	-
PFVP			
1. Intention[a]	-		
2. Attitude[b]	0.68***	-	
3. Subjective norm[b]	0.66***	0.67***	-

PMP = Processed meat products; PFVP = processed fruit and vegetable products.

[a] Measured as low- (0) and higher- (1) purchase intenders.

[b] Mean of variable items measured on a 7-point Likert scale; higher scores indicative of stronger (i.e., more positive) levels of the construct.

$p < 0.001$***.

Table 7

Binary logistic regression predicting intention of purchasing[a] processed meat products/processed fruit and vegetable products made in China.

PMP	B	S.E.	Wald	df	p	Odds Ratio	95% C.I. for odds ratio	
							Lower	Higher
Attitude[b]	1.36	0.09	211.90	1	<0.001	3.90	3.25	4.69
Subjective norm[b]	0.98	0.08	153.34	1	<0.001	2.65	2.27	3.09
Constant	-8.15	0.44	3.42	1	<0.001	0.00		
PFVP								
Attitude[b]	1.30	0.09	196.34	1	<0.001	3.66	3.05	4.39
Subjective norm[b]	0.98	0.08	159.52	1	<0.001	2.68	2.30	3.12
Constant	-7.72	0.43	329.57	1	<0.001	0.00		

PMP = Processed meat products; PFVP = processed fruit and vegetable products.

[a] Measured as low- (0) and higher- (1) purchase intenders.

[b] Mean of variable items measured on a 7-point Likert scale; higher scores indicative of stronger (i.e., more positive) levels of the construct.

Table 8

Spearman correlation coefficients of behavioral beliefs with attitude and intention for processed meat products/processed fruit and vegetable products (italic).

Behavioral beliefs	Spearman's Rho with attitude[a]	Spearman's Rho with intention[b]
PMP/PFVP made in China would be:		
healthy[c]	0.69***/*0.65***	0.59***/*0.57***
tasty[c]	0.64***/*0.64***	0.55***/*0.55***
cheap[c]	0.04/*0.07***	0.04/*0.08***
safe[c]	0.72***/*0.69***	0.62***/*0.59***
of good quality[c]	0.72***/*0.70***	0.63***/*0.59***
fully traceable back to the farm of origin/place of origin where they were grown[c]	0.65***/*0.61***	0.59***/*0.51***
authentic which means that they have not been tampered with in any way and they are what they say they are[c]	0.71***/*0.66***	0.62***/*0.55***
environmentally friendly[c]	0.69***/*0.63***	0.61***/*0.54***
accurately labeled[c]	0.69***/*0.65***	0.61***/*0.56***

p <0.001***; p <0.01**.

[a] Mean of four variable items measured on a 7-point Likert scale; higher scores indicative of stronger (i.e., more positive) levels of the construct

[b] Measured as low- (0) and higher- (1) purchase intenders.

[c] Item measured on a 7-point Likert scale; higher scores indicative of stronger (i.e., more positive) levels of the construct.