Review: International trade in animal products and the place of the European Union: main trends over the last 20 years

Vincent Chatellier

Review: International trade in animal products and the place of the European Union: main trends over the last 20 years

V. Chatellier[1]

[1] *INRAE, UMR SMART-LERECO, Rue de la Géraudière, 44300 Nantes, France*

Corresponding author: Vincent Chatellier. Email: vincent.chatellier@inrae.fr

Abstract

This article presents an analysis of the evolution of international trade in animal products over the period 2000 to 2018, using customs data from the "BACI" database. Firstly, this article presents the evolution of global trade in animal products for the top five exporting countries (in decreasing order: the European Union (EU), the United States, New Zealand, Brazil and Australia) and then for the two largest importers (China and Japan). It then looks at the world trade situation for four major animal products: poultry meat, pigmeat, beef and dairy products. Animal products account for 16% of world agro-food trade; this rate has remained fairly stable throughout the period. The growing imbalance between supply and demand for animal products in Asian countries, particularly in China, is stimulating international trade to the benefit of the major exporting countries. The EU is the world's leading exporter of animal products (with 21% of the total in 2018) and the fourth importer (with 6% of the total). It is in surplus in dairy products and pigmeat, but in deficit (in value) in beef and poultry meat. Dairy products, which are exported by very few countries (mainly the EU, New Zealand and the United States), account for almost a third of all trade in animal

products. They are thus ahead of beef (23%), pork (12%) and poultry meat (12%). Trade in live animals remains low (5%).

Keywords: Globalisation, Competitiveness, Trade agreements, Dairy products, meat

Implications

World trade in animal products is growing, mainly due to an increase in the consumption of animal proteins in Asian countries and their difficulties to develop their domestic supply. This situation opens trade opportunities for the major exporting countries, including the European Union (EU), in dairy products and pigmeat. There are also opportunities for EU beef exports, especially to Asia for niche markets (high quality cuts) and also offals (due to high sanitary standards). The EU has little or no success in exporting meat (beef, poultry), especially from quality chains. In many importing countries, particularly developing countries (including Asia and Africa), the search for low-cost products remains the preferred strategy.

Introduction

International trade in agri-food goods has grown significantly in the past fifty years, both in volume and value (Pouch, 2015; World Trade Organization, 2020). Technological innovations, the dissemination of knowledge and the considerable progress made in terms of infrastructure, logistics and storage conditions have favoured this development, in a context characterised by the increasing openness of economies (Thompson-Lipponen and Greenville, 2019), the development of transnational firms and a demographic boom (Centre d'Etudes et de Prospective, 2017 ; United Nations, 2019). While world trade in agro-food goods is developing over

the long term, there have been periods when trade has declined, such as during the 2009 financial crisis or the more recent Covid19 crisis. In 2020, World Trade Organization experts estimate that world trade in goods could drop from 13% (most optimistic scenario) to 32% (most pessimistic scenario), while the decline should be smaller for agri-food goods, which are basic necessities.

In 2018, agricultural and agri-food products will account for 8% of world merchandise trade. This relative share has fallen sharply over the decades due to a more rapid development of trade in other sectors. In constant currency, world exports of agro-food products have increased sevenfold in 50 years, corresponding to an average annual growth rate of 3.8% (Claquin, 2017). The increase in agri-food trade allowed to provide ever more consumers with more abundant, more varied and often less expensive food. Over time, trade has evolved towards more elaborate, more processed products whose prices are higher than the corresponding raw products.

The objective of this article is to look at the main trends at work in the international trade of animal products, in terms of imports, exports and balance of trade. The term "animal products" here covers all animal species and all products (raw and processed) derived from them (meat, milk and all other animal products). This analysis is based on statistical data from customs. More precisely, these data issue from the "BACI" database developed by the CEPII (*Centre français d'étude et de recherche en économie internationale - CEPII*), based on primary data from the COMTRADE database produced by the United Nations Statistics Division (Centre français d'étude et de recherche en économie internationale, 2010). The data cover the period 2000 to 2018 (a long-term trajectories). As the last available year is 2018, they do not, however, allow to analyse the effects of the current coronavirus crisis.

This article is structured in two parts. The first part presents the evolution of international trade in animal products, focusing on the case of the top five exporting countries (European Union – EU -, the United States, New Zealand, Brazil, Australia) and the top two importing countries (China and Japan). Statistical elements are provided in the tables and figures for other countries, but due to lack of space, these cannot be analysed specifically. The seven selected countries account for 67% of world exports of animal products and 44% of world imports. The second part presents a synthetic analysis of the main trade trajectories in four sectors, namely poultry meat, pigmeat, beef and dairy products.

The main countries contributing to world trade in animal products

At the international level, and in a fairly stable manner throughout the period studied (2000 to 2018), animal products accounted for 16% of total agri-food trade. In the following analysis, trade with all countries is considered, excluding intra-EU trade. This weight varies from one country to another depending mainly on the characteristics of the natural environment (cultivable or not) and the productive orientation of the territories. It reaches particularly high levels in New Zealand (69%), Uruguay (68%) and Australia (44%). Closer to the world average in the EU (23%), Brazil (19%) and the United States (19%), it is much lower in other countries such as China (10%), Russia (4%) and Africa (3%).

International trade in animal products has risen from €56 billion in 2000 to €152 billion in 2018 (in current currency), with an acceleration since 2009. To facilitate the appropriation of the results and limit the amount of information, the data for the period 2010 to 2018 are presented in three aggregates in the following analysis: the annual average for the period 2000 to 2009; the annual average for the period 2010-2017 (i.e.

just after the financial crisis of 2009); the latest available data for 2018. Thus, between the average of 2000-09 and 2018, world trade in animal products has increased 2.4 times. This coefficient is close for dairy products, pigmeat and poultry meat; it is higher for eggs (2.9) and beef (2.7) and lower for live sheep/goats (1.6) and live pigs (0.9).

World trade in animal products is dominated by a few large private multinational companies or very large cooperatives. These well-known companies include JBS, Tyson Foods, Cargill, Dairy Farmers of America, Smithfied, Fonterra, Nestlé, Lactalis, Arla, Campina-Friesland, Yili, Danish Crown, Vion, Saputo, Brazilian Meat Producers or Marfrig.

Trade in animal products is increasingly oriented towards elaborated, transformed and assembled products (finished products for consumers or ingredient products for the agro-food industries). Products are increasingly "cracked" and reassembled, which gives rise to complex trade flows. This cracking of products concerns both milk (separation of the different components), meat (separation and boning of parts) and eggs. As an illustration of this expansion of the processed meat trade, note the growing share now taken by of "individual ready meals" with animal ingredients, made possible by the wide adoption of Individual Quick Freezing technology. An advantages of this method is that the freezing process takes only a few minutes. This prevents the formation of large ice crystals in the product’s cells, which can destroy the membrane structures at the molecular level. The product thus keep its shape, colour, smell and taste after defrosting.

In 2018, international trade in animal products (in value) is composed of 52% meat, 32% dairy products, 5% live animals and 11% other animal products (Figure 1). Although trade in live animals is frequent between neighbouring countries, it remains

more complex to organise over long distances and, moreover, gives rise to some criticism from many citizens who are increasingly concerned about animal welfare.

World trade in animal products is geographically concentrated. The top ten exporting countries will account for 80% of exports in 2018. These are, in descending order, the EU (22% of the world total), the United States (15%), New Zealand (10%), Brazil (9%), Australia (8%), Canada (4%), China (4%), Thailand (3%), India (3%) and Argentina (2%). The top ten importing countries account for 61% of world imports. In 2018, China will be the largest importer (17% of the total), followed by Japan (9%), the United States (9%), the EU (6%), South Korea (4%) and Mexico (4%). The next five countries, Vietnam, Russia, Canada, Saudi Arabia and the United Arab Emirates, each account for around 3% of world imports. An analysis of the trade trajectories for the main countries involved in exports and imports of animal products is carried out below.

The European Union

The EU is the world's leading exporter of animal products (€32.4 billion in 2018, i.e. 23% of total agri-food exports). Although European agriculture is less endowed in agricultural surface area (178 million hectares, 60% of which is arable land) than other studied countries (United States, Brazil, etc.), yields per hectare are higher due to a high agronomic potential and an often favourable climate. Livestock productions, which are unevenly distributed among member states (Roguet et al., 2015), account for about 40% of final agricultural production in the EU. It is mainly the result of smaller family farms than in most other competitor countries. Within the EU, however, production models are very heterogeneous from one area to another (Hercule et al., 2017), depending on land availability (which requires more or less intensification), relief (in some countries mountain areas contribute significantly to livestock farming activities),

148 the agronomic potential of the soils (arable or not), the availability of labour, or
149 economic organisation (more or less vertical integration). The development of
150 European livestock activities has long been encouraged by the Common Agricultural
151 Policy. Although successive reforms have profoundly modified the way in which public
152 support is allocated to the agricultural sector (gradual convergence of European prices
153 on world prices, abandonment of export refunds, limitation of recourse to public
154 storage, etc.), subsidies still represent today a significant part of the income of very
155 large number of European livestock farmers (Guyomard and Détang-Dessendre,
156 2020). Nevertheless, for European farms specializing in monogastric production, the
157 level of subsidies is historically much lower than for dairy and beef farms.
158 The EU was in surplus in several animal products since the end of the 1970s, with the
159 notable exception of sheepmeat. The EU is currently the world leader in terms of trade
160 balance in animal products, with €23 billion in 2018 compared to €6.5 billion in 2000-
161 09 (Table 1). This positive development is due to a combination of several factors: a
162 levelling off of domestic consumption of animal proteins; a significant improvement in
163 the balance in the dairy (particularly since the end of milk quotas in 2015, which has
164 led to an increase in European milk production) and pigmeat sectors (African swine
165 fever has led to a rapid increase in pigmeat imports by China); several importing
166 countries, including Japan, trust in the quality and food safety of European products.
167 In 2018, the EU is in surplus in dairy products (€15.4 billion) and pigmeat (€7.2 billion),
168 but in deficit in beef (-€807 million) and poultry meat (-€497 million). However, this EU
169 trade surplus in animal products is made possible by significant imports of plant
170 proteins, mainly from the American continent (Brazil and the United States). Thus, in
171 2018, for example, European imports amount to €6.1 billion for soya meal and €4.8
172 billion for soya beans.

Exports account for around 12% of European milk production, 14% of pigmeat, 10% of poultry meat and 5% of beef (European Commission, 2019). EU exports of animal products are mainly dairy products (52% of the total in 2018) and pigmeat (22%). Exports of poultry meat (5%), live cattle (4%) and beef (4%) are less developed, mainly due to higher prices than those of competitors. The evolution of the parity between the different currencies has an impact on the EU's ability to market (or not) its products internationally. For example, the Brazilian real and the Argentine peso have fallen against the Euro. Both countries have been undergoing continuous currency devaluations for ten years, giving them an export advantage. On the other hand, the euro to US dollar has changed significantly over the period, from 0.86 in January 2002, to 1.57 in July 2008, 1.07 in January 2017 and 1.21 in December 2020.

A little over two thirds of EU exports in animal products are destined to no more 15 countries. China has become the EU's biggest customer (European Commission, 2016), with imports increasing tenfold between 2000-09 and 2018 (€7.8 billion). Thus, this country alone will account for 24% of EU exports in animal products in 2018. This rate is 31% for pigmeat, 26% for dairy products, 12% for poultry meat and 17% for beef. The EU will provide 30% of China's supplies (by value) of animal products in 2018, compared with 22% in the period 2000-09. Far behind China, the United States are the EU's second largest customer in terms of animal products, accounting for 8% of total European exports. From €1.4 billion between 2000-09, they rose to €2.5 billion in 2018, of which 55% were dairy products and 23% pigmeat. Japan ranks third (7% of EU exports) due mainly to its imports of pigmeat (65% of purchases) and dairy products (26%). Behind this top trio, the following countries are Switzerland, South Korea, Saudi Arabia, Turkey, Algeria, the Philippines and Australia. Russia, which has

197 long occupied an important place in European exports, is now ranking behind these
198 countries (Chatellier et al., 2018; Smutka et al., 2019; Cheptea and Gaigné, 2020).
199 EU imports of animal products increased slightly over the under review period. Indeed,
200 they rose from €7.2 billion in 2000-09 to €9.4 billion in 2018. Several factors explain
201 this evolution: the demographic stability of the EU; the decline in individual
202 consumption of animal proteins for a large number of Europeans; the recent
203 development of animal productions in several Member States, especially Spain,
204 Germany, the Netherlands and Poland (but not France); and, the EU's quality import
205 requirements (health and environmental standards). A large proportion of European
206 imports of animal products are subject to zero or reduced duty import quotas under the
207 World Trade Organization agreements. They mainly concern poultry meat (23% of the
208 total in 2018, 47% from Thailand and 30% from Brazil) and beef (21% of the total, 29%
209 from Brazil, 22% from Argentina and 16% from Uruguay). Imports of dairy products are
210 modest (16% of the total from Switzerland (63%) and New Zealand (11%)) and account
211 for about 1% of domestic consumption. While imports are practically nil in the pig
212 sector, they account for about 5% of domestic consumption of poultry and pig meat
213 and almost 20% of sheep meat. For the latter, 85% is purchased from New Zealand
214 and 10% from Australia.
215
216 ***The United States***
217 With an agricultural area more than twice that of the EU (408 million hectares, including
218 155 million hectares of arable land), the US are the world leader in terms of agricultural
219 production. In addition to grain maize and soya, they are heavily involved in poultry,
220 beef and milk production (USDA-a, 2020). More than in other competitor countries,
221 including Australia, New Zealand and Brazil, US livestock productions benefit from

budgetary support through the Farm Bill (Winders, 2020). In terms of trade, the North American Free Trade Agreement (NAFTA), which came into force in 1994, has favoured trade between the three signatory countries of the United States, Mexico and Canada.

US exports of animal products amount to €23.5 billion in 2018 (second in the world behind the EU), or 17% of agri-food exports. They are fairly balanced between the different production sectors: 29% for beef, 24% for pork, 20% for dairy products and 15% for poultry meat. In proportion to domestic production, exports represent 10% of milk, 12% of beef, 17% of poultry meat and 21% of pig meat. Exports go first to the other two NAFTA member states (20% to Mexico and 13% to Canada), then to Japan (15%), China (11%) and South Korea (10%). Note that it is still too early to measure how the Phase One Deal (USDA-b, 2020) could have an impact on future US exports of animal products to China (Jean, 2020).

The United States rank third in the world, behind China and Japan, in imports of animal products (€14.1 billion in 2018). These mainly come from Canada (27%), the EU (18%) and Mexico (14%). They mainly concern beef and veal (35%, of which 0.7% from the EU), dairy products (20%, of which 49% from the EU) and pigmeat (10%, of which 39% from the EU).

Overall, the United States record a positive trade balance in animal products (€9.4 billion in 2018), thanks mainly to bilateral relations with Japan (+€3.4 billion), Mexico (+€2.6 billion) and China (+€2.3 billion). This positive balance is mainly due to the pork (+€4.1 billion) and poultry (+€3.0 billion) sectors. The situation is also positive in beef and veal (+€1.9 billion) and in the dairy sector (+€1.9 billion), where cross-flows between imports and exports are significant (Table 2).

The EU enjoys a positive balance with the United States in terms of animal products (€1.8 billion in 2018 compared with €900 million over the 2000-09 period). This surplus is mainly due to dairy products (€1.3 billion, mainly cheeses) and pigmeat (€570 million). The EU's trade relations with the United States have been the subject of negotiations for many years, following on from the project for a "transatlantic trade and investment partnership". This draft free trade agreement, whose negotiations were suspended at the end of 2016 following opposition from President Donald Trump, aims to develop a common market by tackling the obstacles, both tariff and non-tariff, that exist between the two partners. It mainly aims to reduce customs duties, to further harmonise regulatory standards between the two partners and to strengthen cooperation in the formulation of international standards. In April 2019, the EU Council instructed the European Commission to relaunch negotiations for a new trade agreement with the United States, despite France's opposition. The new agreement, if concluded, would, however, be more limited than Transatlantic Trade and Investment Partnership was intended to be, as it would not apply to agricultural products or government procurement. However, the US has announced that it wants agriculture to be included in the agreement (Johnson and Schwarzenberg, 2020).

New Zealand

Despite a particularly small agricultural area (11.6 million hectares), New Zealand occupies an important place in the international trade of animal products. In this country, where grassland occupies almost 90% of the agricultural surface area, agricultural production is dominated by the dairy and sheep sectors. Because of a small domestic market (4.7 million inhabitants) and thanks to a political and economic organisation that has long been outward-looking, the country ranks second in the world

271 in terms of trade balance for animal products: €14.4 billion in 2018, with a doubling of
272 this amount in current currency compared to the period 2000-09.
273 New Zealand's exports in animal products (€15 billion in 2018), which represent 70%
274 of agri-food exports, are 65% dairy products, 14% beef (including cull dairy cows,
275 frozen raw material for mince, calves, etc.) and 15% sheep meat. New Zealand's main
276 customers for livestock products are China (31% of the total in 2018), the United States
277 (10%), the EU (8%), Australia (6%) and Japan (4%). Exports to China have increased
278 considerably, from €434 million in 2000-09 to €4.7 billion in 2018.
279 New Zealand exports more than 90% of its domestic milk production and 80% of its
280 beef production. Boosted by increased purchases from China, dairy exports are mainly
281 whole milk powder and butter, while cheese exports are more reduced, as are exports
282 of infant milk powder, offering development opportunities for the EU. New Zealand is
283 the world's largest exporter of dairy products in volume (in milk equivalent) and second
284 in value (behind the EU). This position is due to several factors: an abundance of high-
285 quality grassland; abundant water resources; a high concentration of industrial
286 facilities, with a single company (the Fonterra cooperative) providing most of the
287 marketing; and the willingness of political and economic players to boost exports. After
288 a very strong growth in milk production between 2000 and 2015, a slowdown in the
289 dynamics of supply has however been observed since then, in a societal context where
290 the damage caused to the environment by dairy farming (high use of irrigation water,
291 levels of fertilisation, etc.), particularly in the South Island, has led to local disputes
292 (Institut de l'Elevage, 2017; Ratnayake, 2019).
293 New Zealand's imports in animal products are very low (€588 million in 2018). Its main
294 suppliers are the EU (37%), Australia (27%) and the United States (18%). New Zealand
295 is a serious competitor to the EU in the international market, but trade relations

296 between the two areas are unbalanced (European Commission, 2020-a). Indeed, New
297 Zealand represents 0.6% of the EU's export for animal products, but 14% of its import.
298 However, the EU's deficit with New Zealand (-€1.1 billion in 2018, of which -€882
299 million for sheepmeat) is less than in the past (-€1.3 billion in 2000-09) for two reasons:
300 this country has benefited from trade opportunities following the opening of the
301 Chinese market; the EU's needs in sheepmeat are decreasing in parallel with the
302 decline in consumption. In this context, it is not certain that the signing of a free trade
303 agreement between the EU and New Zealand (negotiations started in June 2018) will
304 lead to profound changes in these trade flows; the exit of the United Kingdom from the
305 EU will, however, have an influence insofar as this country has historically had
306 privileged relations with New Zealand (Saunders et al., 2020).
307
308 ***Brazil***
309 Thanks to its 240 million hectares of usable agricultural area and the efforts made to
310 modernise its agri-food complex, Brazil is one of the world's leading agricultural
311 producers (Buainain et al., 2019). The country stands out for its performance in the
312 production of sugar, orange juice, soya, ethanol, but also beef (Brazilian Beef
313 Exporters Association, 2020) and poultry meat (OECD-FAO, 2015). This situation
314 should not obscure the existence of controversies concerning the duality of the forms
315 of agriculture prevailing in this country (farms dedicated to export versus small family
316 structures oriented towards the domestic market); the strong inequalities in access to
317 land; the lack of transport infrastructures in the remote areas (notably behind the
318 colonisation front in the North West part of the country) ; the high level of debt in the
319 sector; the environmental problems caused by deforestation, the massive use of
320 mineral fertilisers, soil erosion and greenhouse gas emissions (Sabourin, 2014).

Brazil's exports of animal products amount to €13.5 billion in 2018, or 19% of total agri-food exports. They are dominated by poultry meat (41%), beef (40%) and, far behind, pork (8%). Brazil has a small deficit in dairy products (-€450 million). It exports the equivalent of 31% of its poultry meat production, 23% of its pigmeat production and 20% of its beef production. Brazil's main clients in animal products are China (31% of the total in 2018), the EU (10%), Saudi Arabia (6%), Japan (4%), the United Arab Emirates (4%) and Egypt (4%). The United States, although less distant geographically, only account for 3% of Brazilian exports. Indeed, some sanitary (non-tariffs) barriers for Brazilian exports to the US, notably for beef are still in place. After having progressed from €2.4 billion in 2000 to €13.1 billion in 2012, Brazil's exports in animal products have been more stable since then.

Despite a large population (207 million inhabitants) and an individual consumption of meat that has increased over the last few decades, Brazil's imports of animal products are still limited (€1.1 billion in 2018, 50% of which are dairy products). The main suppliers are the neighbouring countries of Mercosur, including Argentina (31% of the total), Uruguay (20%), Paraguay (18%) and the EU (16%).

The EU's trade balance with Brazil is clearly in deficit both in the agri-food sector (-€8.1 billion) and in animal products (-€1.2 billion in 2018). The deficit is substantial in poultry meat (-€672 million) and beef (-€589 million), where the Brazilians are very competitive.

In summer 2019 a trade agreement between the EU and Mercosur was signed after 20 years of negotiations. The agreement, which is now the subject of many disputes within the EU, still needs to be ratified by each EU Member State and the European Parliament before it can be implemented. Many consider that the impact of further

liberalisation with Brazil would be unfavourable to European livestock production and damaging to the environment (Ambec et al., 2020).

Australia

Scarcely populated (24 million inhabitants), but richly endowed with land (412 million hectares, of which "only" 48 million are arable), Australia is a country with a large surplus in animal products (€10.6 billion, mainly beef and sheep meat). As evidenced by its positions in the World Trade Organization negotiations, Australia has long been a proponent of trade liberalisation. According to the Organisation for Economic Co-operation and Development (OECD) estimates, government support for Australian farms is ten times lower than for European farms (OECD, 2020). Access to the Australian market is not always straightforward due to geographic distance and the existence of certain SPS non-tariff barriers.

Australia's exports in animal products amount to €12.6 billion in 2018 (fifth in the world), or 45% of the country's agri-food exports. They doubled between 2000-09 and 2018 and mainly concern beef and veal (48%), sheep and goat meat (20%) and dairy products (17%). They are mainly destined for China (21%), Japan (17%), the United States (15%), South Korea (9%) and Indonesia (6%). Australia's imports in animal products are very limited (€2 billion in 2018). They mainly concern dairy products (62% of the total) and pig meat (23%). Three supplier countries provide the bulk of its supplies: New Zealand (42%), the EU (33%) and the United States (16%).

Thus, Australia benefits from a positive trade balance in animal products (€10.6 billion in 2018). It is positive with China (+€2.7 billion), Japan (+€2.1 billion), the United States (+€1.5 billion) and South Korea (€1.1 billion), but negative with New Zealand (-€667 million) and the EU (-€342 million).

Australia's deficit with the EU is true for dairy products (-€346 million) and pigmeat (-€245 million), but the situation is the opposite for beef (+€161 million) and sheepmeat (+€102 million). Trade relations between these two areas could increase as a result of the negotiations launched since June 2018 to reach a global trade agreement (Drake-Brockman and Messerlin, 2018).

China

China has become the country with the world's largest deficit in agri-food goods (-€54.9 billion in 2018), ahead of Japan (-€49.5 billion). In animal products, the balance has sharply deteriorated from -€1.1 billion in 2000-09 to -€20.7 billion in 2018. This deficit is mainly due to dairy products (-€9.4 billion) and pigmeat (-€3 billion). In addition to this deficit in animal products, China is also the world's largest importer of vegetable proteins, particularly soya, from the American continent, to feed domestic animals (Gale et al., 2019). China's trade development in the agro-food sector must be seen in the light of the country's low availability of agricultural land (9% of the world's arable land for 20% of the population); the production difficulties (low water resources, limited yields, rapid restructuring of small farms, etc.); the trade-off sometimes given to crop production, including rice, over animal production in land use; the mistrust of many Chinese consumers towards local products, mainly following the melamine milk crisis in 2008; and, of course, the rapid growth in domestic needs linked to a gradual change in diet, especially in the large cities. The consumption of meat by a Chinese has quadrupled since the early 1980s and that of dairy products has increased all the more rapidly as the level remains modest (40 kg per inhabitant per year compared with 280 kg for Europeans (Chaumet and Pouch, 2017).

Despite a high level of production (25% of world meat production, but only 5% of milk production), China's exports of animal products have been low and relatively stable in recent years. They reach €6 billion in 2018, i.e. about five times less than those of the EU. Exports mainly concern poultry meat and are primarily destined for neighbouring Asian countries (Japan, Vietnam).

China has become the world's largest importer of animal products (18% of the world total). After representing an annual average of €3.6 billion over the period 2000-09, Chinese imports have increased considerably to reach €26.8 billion in 2018. Imports mainly concern dairy products (36%), beef (26%), pigmeat (15%) and poultry meat (7%). Imports represent a third of domestic production in milk, 20% in beef and only 4% in pig meat.

The EU is China's leading supplier of animal products, accounting for 29% of its imports in 2018. Mainly an exporter of dairy products and pigmeat, it is ahead of Brazil, New Zealand and the United States. While the Chinese market represents an opportunity for many companies seeking new outlets, it must also be considered that this market does not offer all the guarantees of stability. Uncertainties about the level of domestic supply, the signing of more or less advantageous bilateral agreements with other competitor countries, changes in health regulations, exchange rate variability, and political tensions between countries are all factors that can alter the expected balances (Trégaro, 2016).

Japan

With a small territory of 4.5 million hectares of agricultural land for 127 million people, Japan is the world's fourth-largest importer of agri-food products. Despite strong government support and the implementation of agricultural policy reforms (OECD,

2009), Japanese agriculture can only cover 40 per cent of the country's food needs (Japan ministry of international affairs and communications, 2019).

In animal products, Japan's exports are marginal (€573 million in 2018); they mainly concern dairy products and beef destined mainly for neighbouring Asian countries. Imports, on the other hand, are very high (€14.8 billion), by far the highest in the world in proportion to population. The imported volumes represent around 175% of domestic production in beef, 115% in pork, 55% in poultry and 30% in milk and dairy products. These imports come mainly from the United States (25%), the EU (15%), Australia (14%) and Thailand (12%).

Japan's deficit in animal products reaches €13.5 billion in 2018, including €4.3 billion of pigmeat, €3.5 billion of beef, €2.9 billion of poultry meat and €1.5 billion of milk and dairy products. Japan's deficit in animal products has hardly increased over the recent period. Not only is the Japanese population today decreasing, but the individual level of consumption is now more stable.

European exports to the Japanese market mainly concern pigmeat (33% of the country's imports) and dairy products (32%). The EU's trade relations with Japan are set to strengthen following the entry into force of the Economic Partnership Agreement (European Commission, 2018). The agreement removes the vast majority of duties paid by EU companies exporting to Japan and a number of long-standing regulatory barriers. For the dairy sector, the agreement envisages the removal of duties on many cheeses such as Gouda and Cheddar (currently set at 29%). For pigmeat, trade will be duty-free for processed meats, while fresh meat will be almost exempt. The agreement also provides for the protection of more than 200 quality European agricultural products (recognition of geographical indications) on the Japanese market.

International trade in several animal sectors

After an analysis focusing on the situation of the main countries involved in international trade in animal products, this second part looks at the markets situation of the following four productions: poultry meat; pork; beef and dairy products.

Poultry meat

Poultry meat is today the first meat consumed and produced in the world. According to OECD and Food and Agriculture Organization (FAO) statistics, global production of poultry meat is on average 125 million tonnes annually over the three-year period 2017-19. The main producing countries are the USA (17.4% of world production in 2017-19), China (16.3%), Brazil (10.9%), the EU (12.0%) and Russia (3.9%). According to the prospective work carried out by these same international organisations, the world supply of poultry meat is expected to increase by 20.3 million tonnes (+16%) between 2017-19 and 2029 (OECD-FAO, 2020).

Poultry is enjoying a much higher annual growth rate in consumption than other meats for several reasons: i) the price paid by consumers is lower because of the zootechnical performance obtained in this sector (a good consumption index); ii) the nutritional quality of this (lean) meat is recognised; iii) this meat does not suffer from the religious bans to which pigmeat (Islam and Judaism) or beef (India) are subject; iv) as production is less directly linked to the land than other productions (cattle and sheep), it is easier to develop it near urban areas with strong demographic growth; v) Moreover, poultry is easier to develop vs other animal productions due to the "technological packages" sold by some global companies to any local entrepreneur.

In 2018, international trade (excluding intra-EU) in poultry meat accounts for 11% of world production. It has risen from €8.4 billion in 2000-09 to €19.1 billion in 2018

(including 50% of frozen chicken pieces, 24% of preparations and 12% of frozen whole chickens). The share of whole chickens in chicken exports is steadily declining.

As the third largest producer, Brazil is the leading exporter, with 30% of international flows expressed in value in 2018. Brazilian exports, which increased by €2.8 billion between 2000-09 and 2018 (Figure 2), are destined for 17% to China (in 2018), 12% to the EU, 12% to Saudi Arabia and 11% to Japan. This development of exports is based on cost competitiveness and the adaptation of supply to the specific demands of customers. With 18% of world exports by value, the United States rank second. US products, which have a lower unit value than in Brazil, are marketed first in Mexico (21% of exports in 2018, with low added value products), China (12%) and Canada (10%). With 16% of world exports, including a large share of boneless cuts and cooked meats, Thailand is ahead of China (10%) and the EU (9%).

The main importers of poultry meat are Japan (16% of world imports by value in 2018), the EU (11%), China (10%), Saudi Arabia (5%), Mexico (5%) and the United Arab Emirates (3%). Purchases are increasing in all the main purchasing countries. Thailand is Japan's preferred supplier (51% of its supplies) ahead of China (26%) and Brazil (20%). In China, imports come mainly from Brazil (50%) and the United States (21%). With the end of export refunds in 2013, European exports to Middle Eastern countries have become more difficult in the face of Brazilian competition. In volume terms, nearly 80% of poultry meat imports come from developing countries.

Pork meat

World pigmeat production represents 116 million tonnes on average per year over the three-year period 2017-19. The main producing countries are China (43.2%), far ahead of the EU (20.5%), the USA (10.1%), Brazil (3.4%), Russia (3.2%), Vietnam (3.1%),

494 and Canada (1.8%). According to the prospective work of the OECD-FAO, world
495 supply should increase by 11.1 million tonnes (+9%) between 2017-19 and 2029.
496 International trade (excluding intra-EU) in pigmeat accounts for 7% of world production.
497 Exports of pigmeat (10.6 million tce in 2018) have increased throughout the studied
498 period, both in volume (+5.1 million tce between 2000-09 and 2018) and in value
499 (Figure 3). In 2018, the top three exporters of pigmeat are the EU (38% of the value),
500 the United States (29%) and Canada (13%). These three countries, which together
501 account for 80% of world exports, are followed far behind by Brazil (6%), China (4%)
502 and Mexico (3%). The competitive games between the three leading countries do not
503 depend solely on the differences in production costs at the breeding and processing
504 industry stage. They are also influenced by the internal health situation, bilateral
505 agreements between countries and the evolution of the parity between the euro and
506 the dollar. Moreover, their client countries are not always the same. Thus, for example,
507 the United States' leading customer for pork meat is Japan (25% of exports by value
508 in 2018), while China is in first place in the case of the EU (31% of exports by value in
509 2018) and the United States in the case of Canada (38%). Despite its status as the
510 world's largest pigmeat producer, China is also the second largest importer, with 20%
511 of world imports by value in 2018; this rate is expected to increase in 2019-2020 due
512 to the decline in livestock numbers induced by African swine fever (Mason-D'Croz,
513 2020). Suppliers to this strategic market are the EU (58% of the total in value), the USA
514 (14%), Brazil (13%) and Canada (9%). Between 2000-09 and 2018, Chinese imports
515 of pigmeat increased considerably (+€3.4 billion), including in relation to the leading
516 importing country, Japan (23% of world imports in 2018 and +€1.4 billion between the
517 two periods). South Korea, the United States and Mexico are also well placed in the
518 hierarchy of importing countries (between 6% and 8% of world imports for each

519 country); EU imports of pigmeat are less significant. The EU enforces strict sanitary
520 barriers for pig meat imports from third countries particularly in relation to Classical
521 Swine Fever status.
522
523 ***Beef and veal***
524 World beef production, which represents nearly 70 million tonnes in 2017-2019
525 (OECD-FAO, 2020), is expected to increase by 6.3 million tonnes by 2029. The main
526 producing countries are the United States (16.8%), ahead of Brazil (13.1%), the EU
527 (11.7%), China (9.3%), Argentina (4.1%), India (3.7%), Australia (3.7%) and Mexico
528 (2.8%).
529 International trade (excluding intra-EU) in beef accounts for about 13% of world
530 production (Institut de l'Elevage, 2020-a). Beef and veal is the leading meat traded in
531 value terms (€34.9 billion), but second in volume behind poultry meat and ahead of
532 pork. International trade in beef and veal, which grew strongly between 2000-09 and
533 2018 (+4.3 million tce), is influenced by a range of factors, including economic issues
534 (oil prices, growth rates in importing countries, currency devaluation, etc.) or health
535 issues (foot-and-mouth disease, bovine spongiform encephalopathy). The sudden
536 closure of the Japanese market to American exports in 2002-03 is an example often
537 cited to evoke this sensitivity (Chatellier, 2017).
538 The international trade in beef and veal is 73% (in value terms) frozen meat, 23% fresh
539 and chilled meat and 4% processed meat. It is dominated in exports by four countries
540 which together account for around two thirds of world exports (Figure 4). These are
541 Brazil (18% of volumes and 16% of value in 2018), India (14% and 9% respectively),
542 Australia (16% and 17%) and the United States (14% and 20%). The next countries
543 are New Zealand (6% of volumes), Argentina (6%), the EU (5%), Canada (5%),

544 Uruguay (5%), Paraguay (4%) and Mexico (3%). The production models adopted in
545 the four leading countries differ from one to another (in terms of breeds, rations, farm
546 structuring, etc.) and the types of products produced by the cattle industry are not
547 identical either, with varying selling prices. The development of Indian beef exports is
548 one of the most striking elements of recent years (Landes et al., 2016). In this country
549 where per capita consumption of beef is very low (less than 2 kg per year) and where
550 milk production is increasing rapidly, exports concern products sold at low prices and
551 mainly destined for Asian countries, including Vietnam and China. Note that India only
552 exports beef from male buffaloes. Strict religious edicts against slaughtering of *bos*
553 *taurus indicus* have become stricter since the Bharatiya Janata Party came to power,
554 with attacks reported against the people (mainly Muslims and lower casts) involved in
555 the beef industry. This is as much a constraint on the development of buffalo meat
556 export from India, as are sanitary status.
557 The main importers of beef and veal are China (21% of world imports by volume in
558 2018), the United States (12%), Vietnam (9%), Japan (8%), South Korea (6%) and
559 Russia (5%). Vietnam is a rather atypical importing country insofar as part of its imports
560 correspond to products that are then reshipped to the Chinese market. With 3% of
561 world imports, the EU imports less beef than South Korea or Egypt. In recent years, it
562 is mainly Asian countries, especially China (+1.6 million tce of imports between 2000-
563 09 and 2018) and Vietnam, which have contributed to the growth in international trade.
564
565 ***Milk and dairy products***
566 World milk production of all species has increased considerably over the decades, from
567 344 billion litres in 1961 to 839 billion litres in 2017-19 (Food and Agriculture
568 Organization, 2020). This increase is largely due to the increase in animal numbers,

569 progress in animal genetics and improved breeding techniques. The main producing
570 countries are India (21.9% of volumes in 2017-19), the EU (19.9%), the USA (11.7%),
571 Pakistan (5.4%) and China (4.1%). With 2.6% of world milk production, New Zealand's
572 contribution to international trade is very significant (26% by volume).
573 International trade (excluding intra-EU) in dairy products amounts to 72 million tonnes
574 in milk equivalent in 2018. This volume, which is equivalent to 8% of world milk
575 production, is growing at an average annual rate of around 2% (Institut de l'Elevage,
576 2020-b). Trade in dairy products increased throughout the period studied (+24.3 million
577 tonnes in milk equivalent between 2000-09 and 2018).
578 International trade in dairy products is divided into different categories of products,
579 including cheeses (20% of total trade in value in 2018), infant milk powder (16%), whole
580 milk powder (15%), flavoured milks (12%), skimmed milk powder (9%), butter (8%),
581 liquid milk (3%), whey (3%), concentrated milks (3%), casein (3%), yoghurt (3%) and
582 cream (2%). The structure of imports or exports according to these different product
583 categories differs greatly from one country to another. For example, the United States
584 are major importers of cheeses, while the Chinese are more likely to be purchasers of
585 whole milk powder and infant milk powder. Similarly, New Zealand's exports are more
586 oriented towards whole milk powder than towards cheeses, unlike the EU (Chatellier,
587 2016).
588 The world market for dairy products is dominated by a small number of countries for
589 export (Figure 5), mainly the EU (34% of world exports by value in 2018), New Zealand
590 (20%) and the United States (10%). Next come Australia (5%), Switzerland (4%), and
591 Belarus (3%). Between 2000-09 and 2018, the growth in exports was very significant
592 in New Zealand (+7.1 million tonnes in milk equivalent), this country being favoured by
593 one of the lowest milk production costs in the world, geographical proximity to the major

importing countries and an economic organisation dedicated to exports (5% of the milk produced in this country is consumed locally). The United States, which historically exported few dairy products, have developed its exports, primarily to neighbouring countries, including Mexico. The EU has also improved its performance, especially in recent years, as domestic milk supply has been boosted following the end of milk quotas in 2015. The main dairy importing countries are, in value terms, China (€9.7 billion in 2018), the United States (€2.8 billion), Russia (€2 billion), Japan (€1.8 billion), Saudi Arabia (€1.6 billion) and Mexico (€1.6 billion). Between 2000-09 and 2018, the growth in China's dairy imports (+€8.8 billion) has no equivalent on a global scale; the next following countries are the United Arab Emirates (+€964 million), the United States (+€907 million), Russia (+€770 million) and Japan (+€747 million).

Conclusion

International trade in animal products, which amounts to €152 billion in 2018, is dominated by exports from a few countries, including the EU, the USA, New Zealand, Brazil and Australia. Exporters' strategies differ. Some countries, such as Brazil or New Zealand, are particularly successful in terms of "price competitiveness", while others, including EU Member States, seek to enhance "non-price competitiveness" (quality or typicality of products, high degree of product processing, etc.). With a trade balance of €23 billion in animal products in 2018, the EU contributes to the supply of Asian countries, which are heavily in deficit (-€63 billion). This balance is mainly due to surpluses in the dairy (€15.4 billion) and pig sectors (€7.2 billion). On the import side, the role of China in recent developments is significant. The increase in the consumption of animal proteins is, in fact, faster than the development of domestic supply, all the

618 more so as the pig sector is going through a major production crisis due to African
619 swine fever.
620 In many countries, however, trade in animal products represents a very limited share
621 of domestic production and consumption. This is particularly true in developing
622 countries, especially those in Africa, because animal products play a rather modest
623 role in the food supply and economic resources are often insufficient to import products
624 from industrialised countries.
625 The increase in world trade in the agro-food sector has been favoured by technical
626 progress in the broad sense (including logistics), by the adoption of recognised
627 standards (public and private) and by the increasing openness of economies. While
628 World Trade Organization negotiations have not changed much in recent years, many
629 economic areas, including the EU, are now signing bilateral agreements. Faced with
630 the growing importance of environmental and climate concerns, these trade
631 agreements are today the subject of many reservations (Balogh and Jámbor, 2020;
632 Kolcava et al., 2020); access to a good at a competitive price does not, in fact, justify,
633 at least in the eyes of many citizens/consumers, the fact that this has as its counterpart
634 a deterioration of the environment in the exporting country. Thus, the question of
635 sustainability is increasingly being placed at the heart of discussions of trade
636 agreements. The trade war between the United States and China is also likely to have
637 an influence on future trade trajectories (He et al., 2020). The same is true of recent
638 reflections within the EU on the so-called "farm to fork strategy" (European
639 Commission, 2020-b) or on the links between the Common Agricultural Policy and the
640 expectations of the Green Deal (European Commission, 2020c; Guyomard et al.,
641 2020).

642 The prospective analyses carried out by the OECD and the FAO up to 2029 highlight
643 several important developments for the global animal productions sector (OECD-FAO,
644 2020). In terms of global demand for animal products, the annual growth rate is
645 expected to decline over the next ten years compared to the last ten years. However,
646 three combined factors will continue to play a role in increasing (in absolute terms)
647 global demand: i) the annual growth of global population, which averages 1.1% (United
648 Nations, 2019), varies greatly between continents and countries, and are higher in
649 developing countries, particularly in Africa; ii) the evolution of per capita annual calorie
650 consumption ; iii) diet composition: animal proteins in diets is increasing rapidly in many
651 Asian countries (including China for meat and India for dairy products), especially
652 where household purchasing power is improving.
653 According to estimates, global meat production is expected to increase by about 12%
654 between 2017-19 and 2029 (+40 million tons, half of which from poultry meat), with
655 nearly 80% of this increase coming from developing countries. In dairy products, the
656 expected increase in global production is around 16% between these two dates; half
657 due to growth in livestock and the other half to improved animal performance (kg of
658 milk per animal per year). World meat trade is expected to increase by about 12% over
659 the same period, suggesting a lower annual growth rate than that observed over the
660 previous decade. In the dairy sector, trade growth should be higher, with a continuing
661 high contribution from the three main exporting zones (EU, New Zealand and the
662 United States).
663
664 **Ethics approval**
665 Not applicable.
666

Data and model availability statement

None of the data were deposited in an official repository.

BACI data are available on CEPII website: www.CEPII.fr.

BACI provides disaggregated data on bilateral trade flows for more than 5000 products and 200 countries. The database is built from data directly reported by each country to the United Nations Statistical Division (Comtrade). The CEPII developed a procedure that reconciles the declarations of the exporter and the importer that may be different in the original data.

Corresponding author ORCID

Vincent Chatellier: 0000-0008-8919-0271

Author contributions

Vincent Chatellier (alone): writing, reviewing and editing.

Declaration of interest

None.

Acknowledgements

The author would like to thank Cécile Le Roy (INRAE, UMR SMART-LERECO) for her efficient support in customs data processing.

Financial support statement

689 This research received no specific grant from any funding agency, commercial or non-
690 for-profit section.
691

692 **References**

693 Brazilian Beef Exporters Association (ABIEC), 2020. Beef report - Brazilian Livestock Profile
694 2020. ABIEC, Brasilia, Brazil.
695 Ambec, S., Angot, J.L., Chotteau, P., Dabène, O. Guyomard, H., Jean, S., Laurans, Y., Nouvel,
696 Y., Ollivier, H., 2020. Dispositions et effets potentiels de la partie commerciale de
697 l'Accord d'Association entre l'UE et le Mercosur en matière de développement durable.
698 Report for the Prime Minister, Paris, France.
699 Balogh, J.M., Jámbor, A., 2020. The environmental impacts of agricultural trade: A systematic
700 literature review. Sustainability 12, 1152-1168.
701 Buainain, A.M., Lanna, R., Navarro, Z., 2019. Agricultural development in Brazil. The rise of a
702 global agro-food power. Routledge, London, UK.
703 Centre d'études et de prospective, 2017. Mond'Alim 2030 : panorama prospectif de la
704 mondialisation des systèmes alimentaires. La Documentation française, Paris, France.
705 Centre français d'étude et de recherche en économie internationale (CEPII), 2010. BACI:
706 International trade database at the product-level. The 1994-2007 version. CEPII, Paris,
707 France.
708 Chatellier, V. 2016. Le commerce international, européen et français de produits laitiers :
709 évolutions tendancielles et dynamiques concurrentielles. INRA Productions Animales
710 29, 143-162.
711 Chatellier, V. 2017. Les échanges de bovins vivants et de viande bovine dans le monde et
712 dans l'UE. INRA Productions Animales 30, 199-218.
713 Chatellier, V., Pouch, T., Le Roy, C., Quentin, M. 2018. Les relations commerciales
714 agroalimentaires de la Russie avec l'UE, l'embargo russe et les productions animales.
715 INRA Productions Animales 31, 83-103.

716 Chaumet, J.M., Pouch, T., 2017. La Chine au risque de la dépendance alimentaire. Editions
717 Presse Universitaire de Rennes, Rennes, France.
718 Cheptea, A., Gaigné, C., 2020. Russian food embargo and the lost trade. European Review of
719 Agricultural Economics 47, 684-718.
720 Claquin, P., 2017. La mondialisation par le commerce des produits alimentaires : tendances
721 structurelles et exploration prospective. Centre d'Etudes et de Prospective, Analyse,
722 102, 1-8.
723 Drake-Brockman, J., Messerlin, P., 2018. Potential beneficts of an Australian-EU free trade
724 agreement: key issues and options. University of Adelaide Press, Adelaide, Australia.
725 European Commission (EC), 2016. Agri-food trade in 2015: China boosts EU exports.
726 Monitoring Agri-trade policy 1, 1-24.
727 European Commission (EC), 2018. Key elements of the EU-Japan Economic Partnership
728 agreement. EC, Brussels, Belgium.
729 European Commission (EC), 2019. EU agricultural outlook for markets and income 2019-2030.
730 EC, Brussels, Belgium.
731 European Commission (EC), 2020a. Agri-food trade statistical factsheet EU - New Zealand.
732 DGAGRI note. EC, Brussels, Belgium.
733 European Commission (EC), 2020b. A farm to fork strategy for a fair, healthy and
734 environmentally. COM (2020) 381 final. EC, Brussels, Belgium.
735 European Commission (EC), 2020c. Analysis of links between Common Agricultural Policy
736 Reform and Green Deal. Commission staff working document, 93 final. EC, Brussels,
737 Belgium.
738 Food and Agriculture Organization (FAO), 2020. Food outlook: biannual report on global food
739 markets. FAO, Rome, Italy.
740 Gale, F., Valdes, C., Ash, M., 2019. Interdependence of China, United States and Brazil in
741 Soybean Trade. USDA Economic Research Service, Washington, DC, USA.
742 Guyomard, H., Bureau, J.C., Chatellier, V., Detang-Dessendre, C., Dupraz, P., Jacquet, F.,
743 Reboud, X., Requillart, V., Soler, L.G., Tysebaert, M., 2020. The Green Deal and the

744 Common Agricultural Policy: policy implications to adapt farming practices and to
745 preserve the EU's natural resources. European Parliament, Brussels, Belgium.
746 Guyomard, H., Détang-Dessendre C., 2020. Quelle politique agricole commune demain ?
747 Editions Quae, Paris, France.
748 He, X., Hayes, D.J., Wendong, Z., 2020. China's Agricultural Imports under the Phase One
749 Deal: Is Success Possible? Card policy briefs, 20-PB 29. Iowa State University, Ames,
750 IA, USA.
751 Hercule, J., Chatellier, V., Piet, L., Dumont, B., Benoit, M., Delaby, L., Donnars, C., Savini, I.,
752 Dupraz, P. (2017). Une typologie pour représenter la diversité des territoires d'élevage
753 en Europe. INRA Productions Animales 30, 285-302.
754 Institut de l'Elevage, 2017. La filière laitière en Nouvelle-Zélande rattrapée par les exigences
755 de durabilité. Dossier Economie de l'Elevage 484, 1-40.
756 Institut de l'Elevage, 2020-a. La covid-19 a percuté un marché mondial en plein essor. Dossier
757 Economie de l'Elevage 510, 1-32.
758 Institut de l'Elevage, 2020-b. Les marchés mondiaux des produits laitiers. Dossier Economie
759 de l'Elevage 511, 1-36.
760 Japan ministry of international affairs and communications, 2019. Statistical handbook of
761 Japan. Ministry of Internal Affairs and Communications, Tokyo, Japan.
762 Jean, S., 2020. Phase One Deal. Une trêve qui crée plus de problèmes qu'elle n'en résout.
763 CEPII Policy Brief 29, 1-6.
764 Johnson, R., Schwarzenberg, A.B., 2020. US-EU trade agreement negotiations: trade in food
765 and agricultural products - R46241. Congressional Research Service, Washington, DC,
766 USA.
767 Kolcava, D., Nguyen, Q., Bernauer, T., 2020. Does trade liberalization lead to environmental
768 burden shifting in the global economy? Ecological Economics 162, 98-112.
769 Landes, M., Melton, A., Edwards, S., 2016. From where the Buffalo roam: India's beef exports.
770 USDA Economic Research Service, Washington, DC, USA.

771 Mason-D'Croz, D., Bogard, J.R., Herrero, M., Robinson, S., Sulser, T.B., Wiebe, K.,
772 Willenbockel, D., Godfray, H., 2020. Modelling the global economic consequences of a
773 major African swine fever outbreak in China. Nature Food 1, 221-228.
774 Organisation for Economic Co-operation and Development (OECD), 2009. Evaluation of
775 agricultural policy reforms in Japan. OECD Publishing, Paris, France.
776 Organisation for Economic Co-operation and Development (OECD), 2020. Agricultural policy
777 monitoring and evaluation. OECD Publishing, Paris, France.
778 Organisation for Economic Co-operation and Development (OECD) and Food and Agriculture
779 Organization (FAO), 2015. Brazilian agriculture: prospects and challenges. In OECD and
780 FAO Agricultural Outlook 2015-2024. OECD Publishing, Paris, France.
781 Organisation for Economic Co-operation and Development (OECD) and Food and Agriculture
782 Organization (FAO), 2020. OECD and FAO Agricultural Outlook 2020-2029. OECD
783 Publishing, Paris, France.
784 Pouch, T., 2015. Le commerce international de produits agricoles et ses rivalités permanentes.
785 Hérodote 156, 108-124.
786 Ratnayake, R., 2019. Trade and environment: a New Zealand perspective. Routledge, London,
787 UK.
788 Roguet, C., Gaigné, C., Chatellier, V., Cariou, S., Carlier, M., Chenut, R., Daniel, K., Perrot, C.
789 (2015). Spécialisation territoriale et concentration des productions animales
790 européennes. INRA Productions Animales 28, 5-22.
791 Sabourin, E., 2014. L'agriculture brésilienne en débat : évolutions récentes, controverses et
792 politiques publiques. Problèmes d'Amérique latine 95, 33-55.
793 Saunders, J.T., Guenther, M., Saunders, C., 2020. The impacts of changes in agricultural
794 policies in the United Kingdom on trade and agriculture especially in New Zealand - the
795 Swiss Option. Discussion Research Report prepared for the European Union Centres
796 Network. Lincoln University, Lincoln, UK.
797 Smutka, L., Maitah, M., Svatoš, M., 2019. Policy impacts on the EU-Russian trade
798 performance: the case of agri-food. Journal of International Studies 2, 88-98.

799 Thompson-Lipponen, C. and Greenville, J., 2019. The evolution of the treatment of agriculture
800 in preferential trade agreements. OECD Food, Agriculture and Fisheries Papers 126.
801 OECD publishing, Paris, France.
802 Trégaro, Y., 2016. Marché chinois : opportunités et risques pour les entreprises agro-
803 alimentaires européennes. Le Déméter 2016, 257-265.
804 United Nations, 2019. World population prospects 2019 (volume 1). United Nations, New York,
805 NY, USA.
806 United States Department of Agriculture (USDA), 2020a. Agricultural projections to 2029.
807 USDA, Washington, DC, USA.
808 United States Department of Agriculture (USDA), 2020b. Economic and trade agreement
809 between the United States of America and the People's republic of China. USDA,
810 Washington, DC, USA.
811 Winders, B., 2020. The global context of the US farm bill in 2018: world markets, instability and
812 policy preferences in agriculture. Renewable Agriculture and Food Systems 35, 367-375.
813 World Trade Organization (WTO), 2020. World trade statistical review. WTO, Geneva,
814 Switzerland.
815

816 **Table 1.** International trade (exports, imports and trade balance) in animal products

817 for different countries between 2000 and 2018 (current billion euros)

	Exports			Imports			Trade balance		
Countries	2000-09	2010-17	2018	2000-09	2010-17	2018	2000-09	2010-17	2018
European Union*	13.6	27.1	32.4	7.2	9.4	9.4	6.5	17.8	23.0
Other Europe	2.6	6.4	7.2	7.0	11.5	8.6	-4.4	-5.1	-1.4
Belarus	0.7	2.5	2.6	0.1	0.3	0.2	0.5	2.2	2.4
Ukraine	0.6	0.8	1.1	0.3	0.6	0.5	0.2	0.3	0.5
Russia	0.3	0.6	0.9	4.7	7.7	4.4	-4.4	-7.1	-3.5
North America	15.2	26.7	30.2	10.6	16.1	18.3	4.6	10.6	11.9
Canada	4.8	6.2	6.7	2.0	3.8	4.1	2.8	2.4	2.6
United States	10.5	20.5	23.5	8.6	12.2	14.1	1.9	8.3	9.4
Central America	1.4	3.4	4.3	4.9	8.4	9.5	-3.4	-4.9	-5.2
South America	10.0	20.7	22.1	2.3	5.6	4.8	7.7	15.1	17.3
Argentina	1.7	2.8	3.4	0.1	0.2	0.2	1.6	2.6	3.1
Brazil	6.2	13.5	13.5	0.4	1.0	1.1	5.8	12.4	12.4
Paraguay	0.2	0.9	1.1	0.0	0.1	0.1	0.2	0.9	1.0
Uruguay	0.9	2.1	2.6	0.0	0.1	0.2	0.8	2.0	2.4
Oceania	12.7	23.6	27.6	1.1	2.6	3.2	11.6	21.0	24.4
Australia	6.3	10.3	12.6	0.6	1.5	2.0	5.6	8.7	10.6
New Zealand	6.4	13.3	15.0	0.2	0.5	0.6	6.2	12.9	14.4
Asia	8.4	20.3	26.6	27.5	67.1	89.1	-19.1	-46.8	-62.5
India	0.8	2.6	3.9	0.1	0.2	0.2	0.7	2.3	3.6
Thailand	1.3	3.4	5.2	0.5	1.1	1.1	0.8	2.3	4.0
Japan	0.1	0.4	0.6	8.5	11.8	14.2	-8.3	-11.4	-13.5
South Korea	0.1	0.5	0.6	1.7	3.8	5.9	-1.6	-3.3	-5.3
China	2.4	4.5	6.0	3.5	17.0	26.8	-1.1	-12.4	-20.7
Vietnam	0.2	0.3	0.3	0.5	2.5	5.1	-0.3	-2.2	-4.8
Africa	1.0	2.2	1.8	4.5	10.2	9.8	-3.4	-7.9	-8.0
World	65.0	130.8	152.8	65.0	130.8	152.8	0.0	0.0	0.0

818 *Excluding intra-European Union trade

819 Source: INRAE, SMART-LERECO according to BACI

820

Table 2.

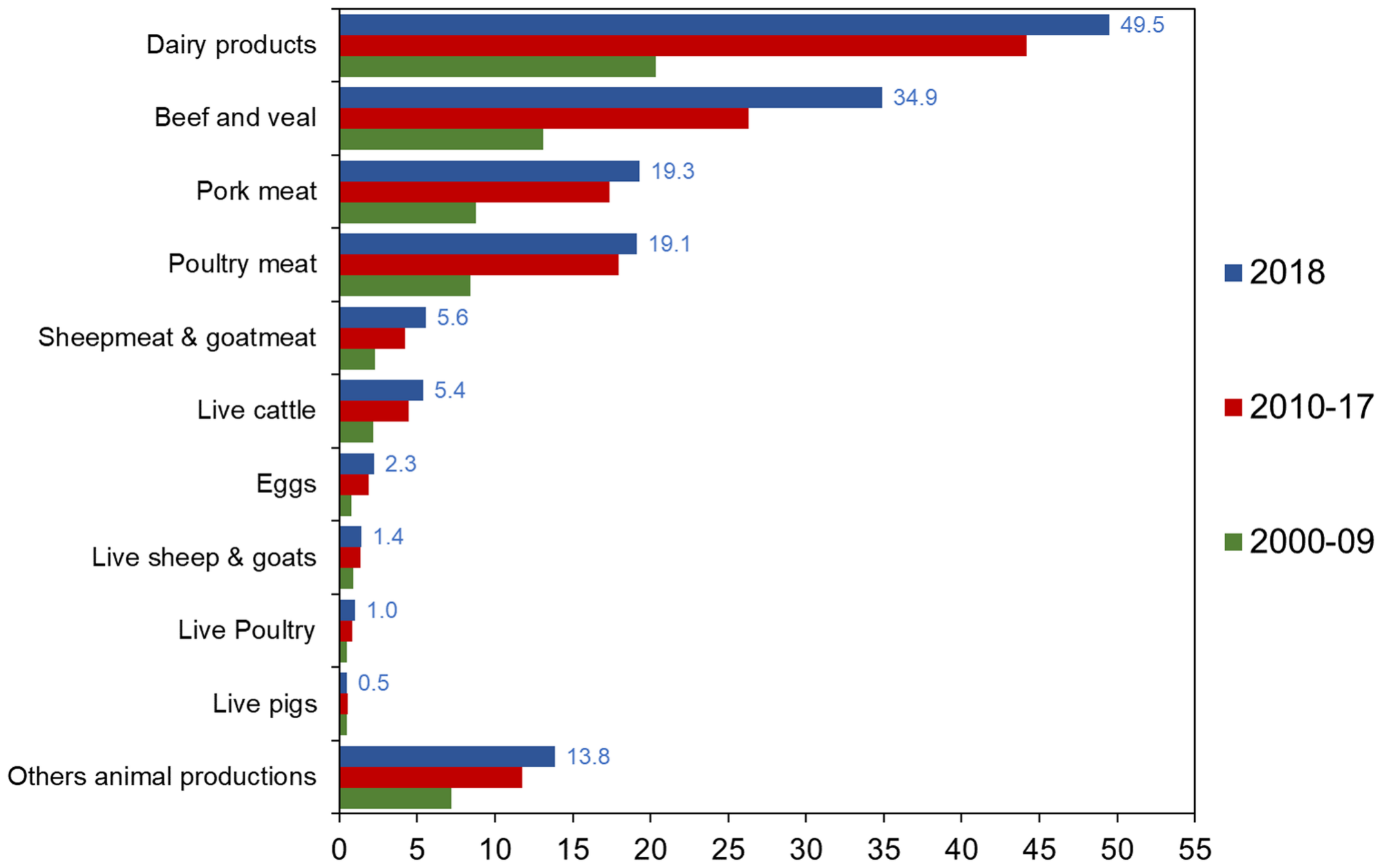
The trade balance in animal products in 2000-09 and 2018 (current billion euros)

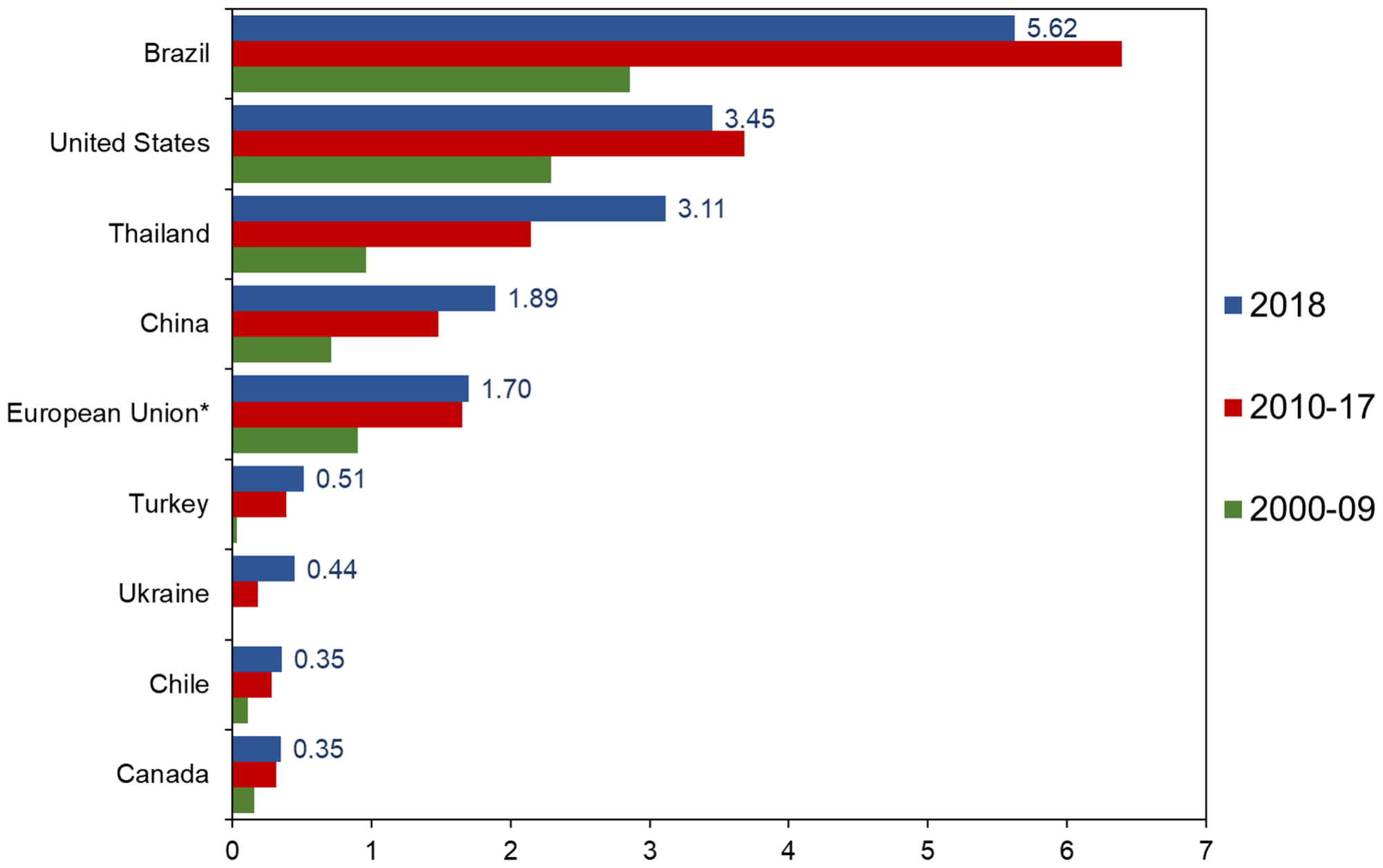
	Dairy products		Beef meat		Pig meat		Poultry meat	
Countries	2000-09	2018	2000-09	2018	2000-09	2018	2000-09	2018
European Union*	6 125	15 440	-1 000	-807	2 716	7 251	-593	-497
Other Europe	-33	830	-1 091	-1 029	-1 376	-475	-1 101	62
Belarus	396	1 638	101	437	38	77	2	216
Ukraine	327	113	104	97	-83	-102	-81	336
Russia	-993	-1 690	-1 146	-1 205	-1 108	-58	-781	-129
Northern America	-652	1 121	305	2 864	2 620	5 613	2 032	2 929
Canada	-322	-791	639	952	1 296	1 573	-138	-57
United States	-321	1 927	-330	1 921	1 336	4 053	2 172	2 990
Central America	-1 373	-2 211	-743	232	-429	-1 421	-604	-1 663
South America	104	4	3 384	8 716	802	964	2 893	5 808
Argentina	465	711	879	1 913	-50	-60	79	218
Brazil	-71	-451	2 091	5 267	717	1 080	2 850	5 608
Paraguay	-15	-30	205	964	0	4	0	3
Uruguay	185	542	546	1 481	-12	-68	1	-8
Oceania	4 830	10 141	3 735	7 855	-129	-548	-28	-57
Australia	1 289	877	2 833	5 960	-55	-349	16	7
New Zealand	3 639	9 462	958	2 001	-46	-131	4	57
Asia	-6 816	-21199	-4 094	-16812	-4 048	-10980	-2 134	-4 832
India	97	133	463	3 073	1	-2	3	8
Thailand	-154	883	-9	-116	26	83	955	3 089
Japan	-960	-1 511	-2 139	-3 491	-2 965	-4 341	-1 463	-3 062
South Korea	-205	-472	-731	-2 502	-390	-1 636	-97	-309
China	-826	-9 490	-201	-6 454	-226	-3 002	-43	-29
Vietnam	-168	-1 080	-88	-2 080	-3	-236	-57	-616
Africa	-2 184	-4 063	-497	-1 065	-157	-404	-464	-1 749
World	0	0	0	0	0	0	0	0

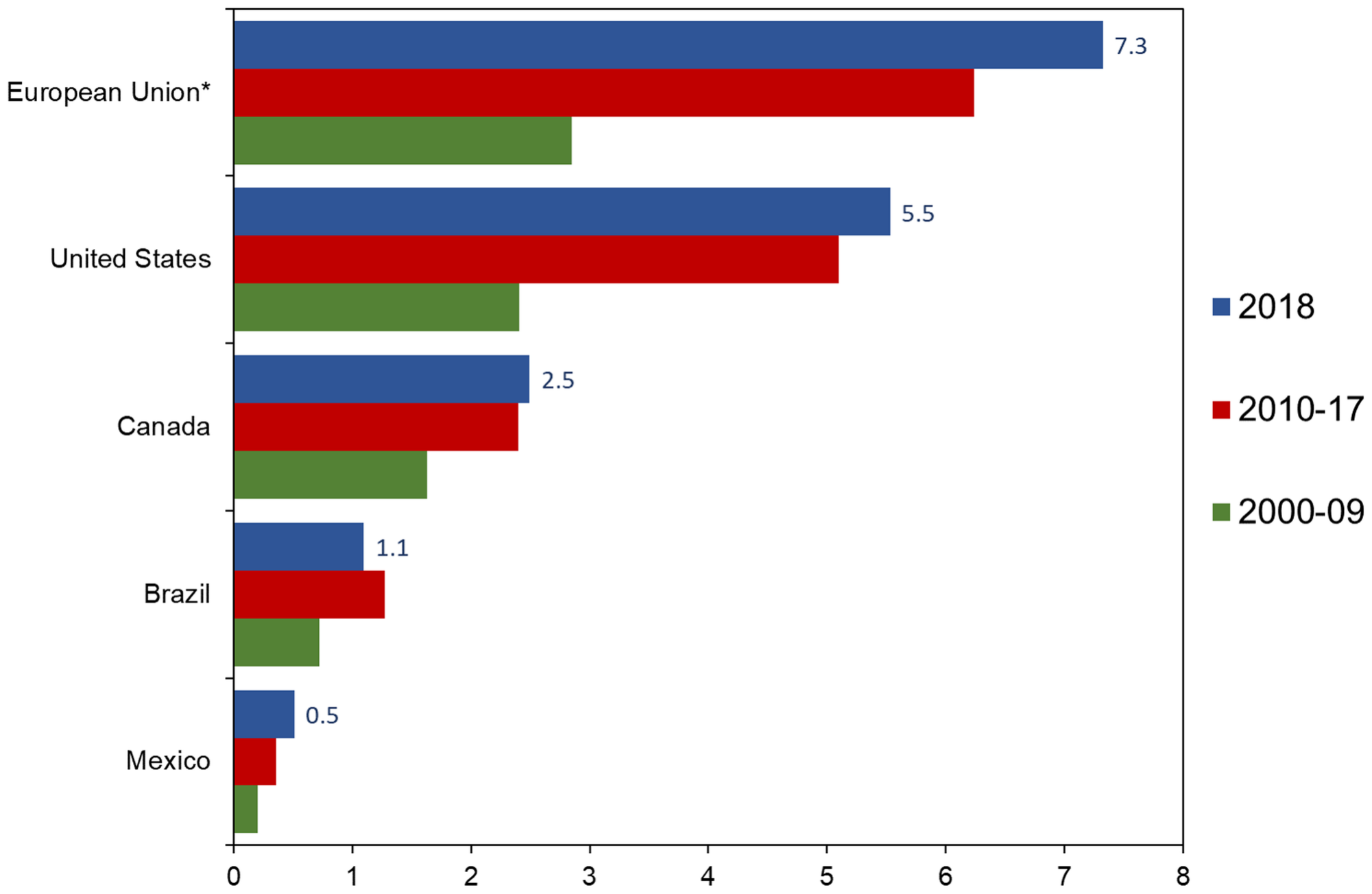
*Excluding intra-European Union trade

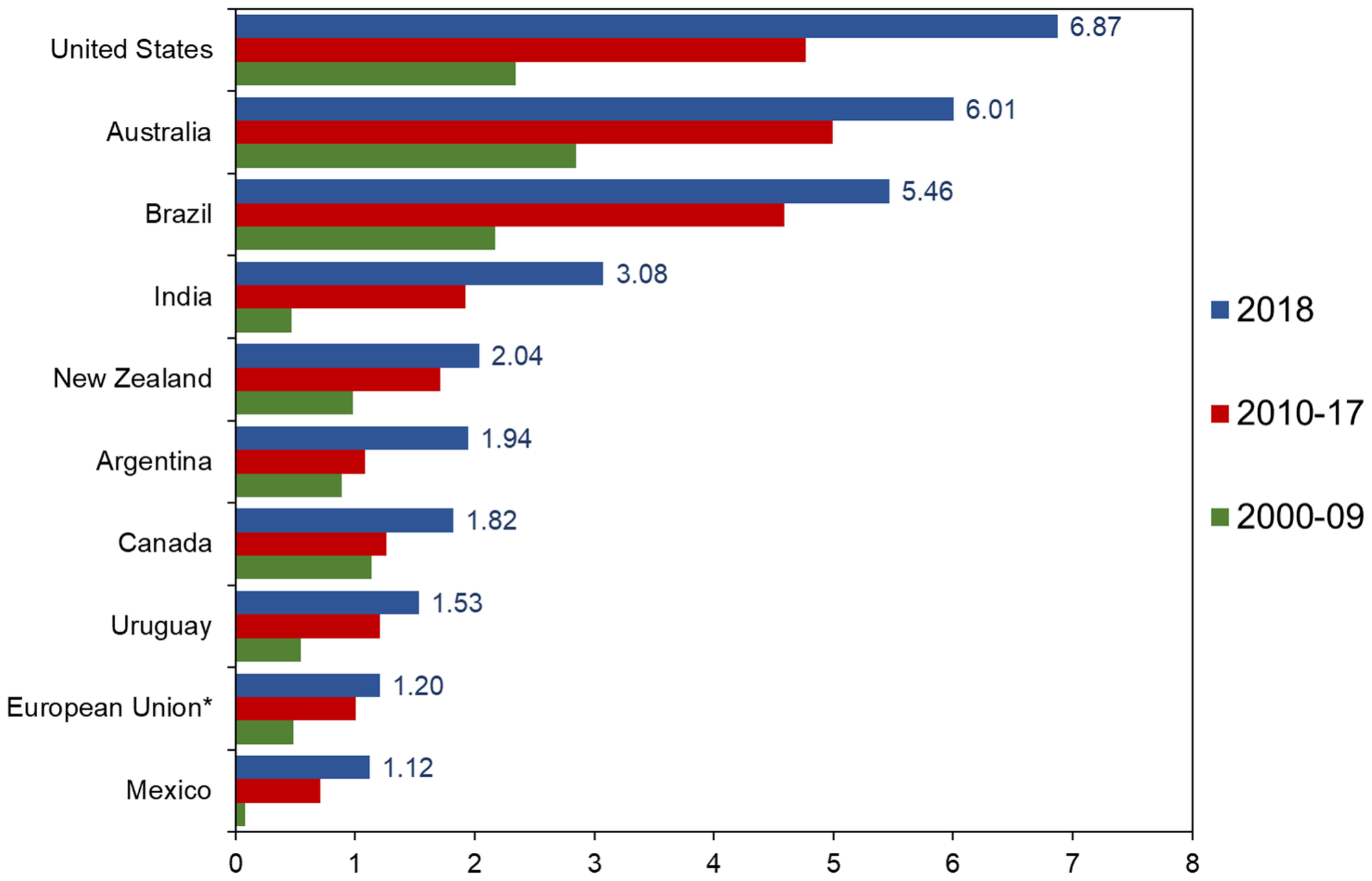
Source: INRAE, SMART-LERECO according to BACI

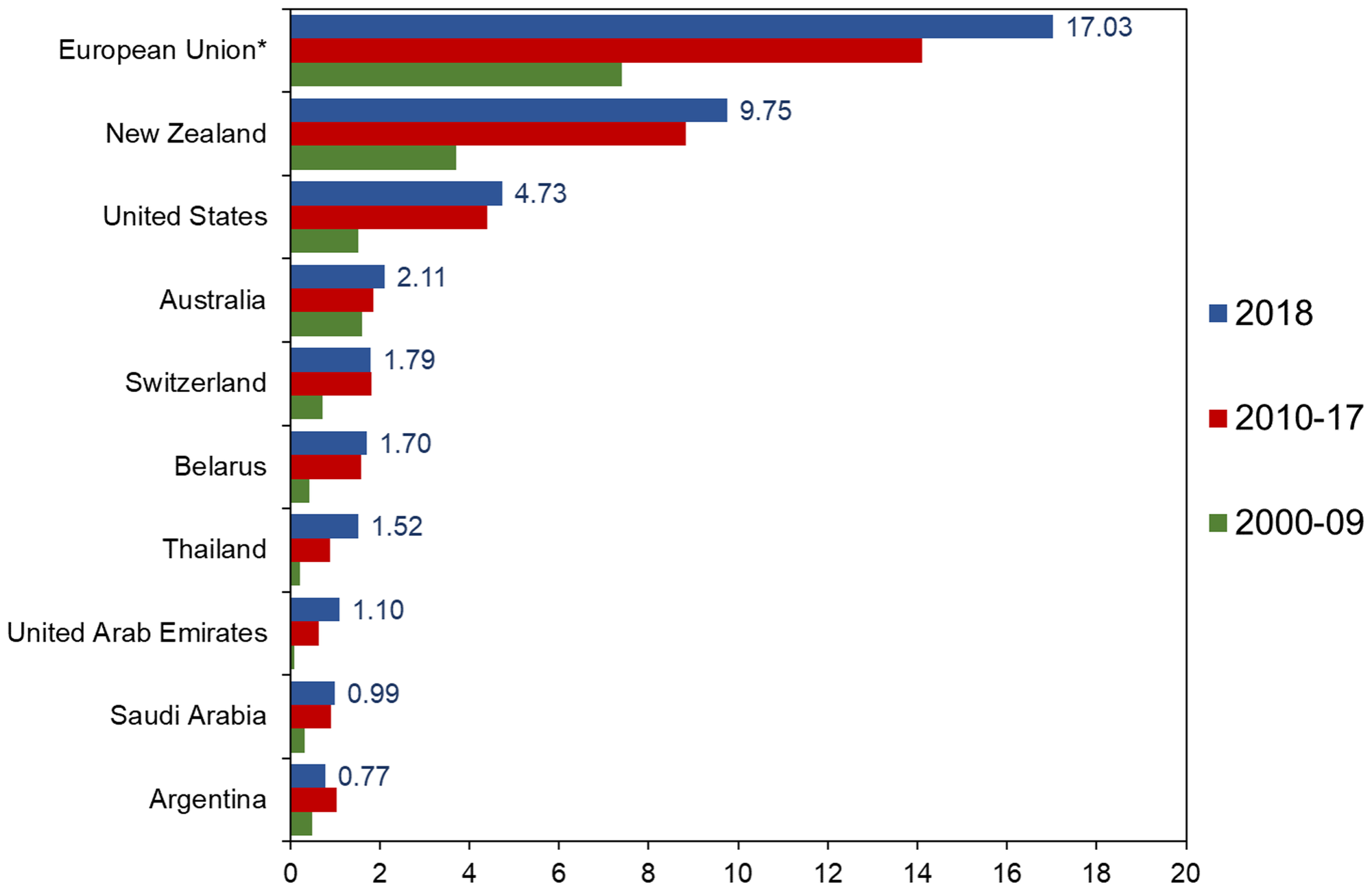
826 **Fig. 1.** International trade* in animal products between 2000 and 2018 (current billion
827 euros). *Excluding intra-European Union trade. Source: INRAE, SMART-LERECO
828 according to BACI
829
830 **Fig. 2.** Main poultry meat exporters between 2000 and 2018 (current billion euros).
831 *Excluding intra-European Union trade. Source: INRAE, SMART-LERECO according
832 to BACI
833
834 **Fig. 3.** Main pigmeat exporters between 2000 and 2018 (current billion euros).
835 *Excluding intra-European Union trade. Source: INRAE, SMART-LERECO according
836 to BACI
837
838 **Fig. 4.** Main beef meat exporters between 2000 and 2018 (current billion euros).
839 *Excluding intra-European Union trade. Source: INRAE, SMART-LERECO according
840 to BACI
841
842 **Fig. 5.** Main exporters of dairy products between 2000 and 2018 (current billion euros).
843 *Excluding intra-European Union trade. Source: INRAE, SMART-LERECO according to
844 BACI


Dairy products
Beef and veal
Pork meat
Poultry meat
Sheepmeat & goatmeat
Live cattle
Eggs
Live sheep & goats
Live Poultry
Live pigs
Others animal productions
49.5
34.9
19.3
19.1
5.6
5.4
2.3
1.4
1.0
0.5
13.8
0
5
10
15
20
25
30
35
40
45
50
55
2018
2010-17
2000-09


Brazil
United States
Thailand
China
European Union*
Turkey
Ukraine
Chile
Canada
5.62
3.45
3.11
1.89
1.70
0.51
0.44
0.35
0.35
0
1
2
3
4
5
6
7
2018
2010-17
2000-09


European Union*
United States
Canada
Brazil
Mexico
7.3
5.5
2.5
1.1
0.5
0
1
2
3
4
5
6
7
8
2018
2010-17
2000-09


United States
Australia
Brazil
India
New Zealand
Argentina
Canada
Uruguay
European Union*
Mexico
6.87
6.01
5.46
3.08
2.04
1.94
1.82
1.53
1.20
1.12
2018
2010-17
2000-09
0
1
2
3
4
5
6
7
8


European Union*
New Zealand
United States
Australia
Switzerland
Belarus
Thailand
United Arab Emirates
Saudi Arabia
Argentina
17.03
9.75
4.73
2.11
1.79
1.70
1.52
1.10
0.99
0.77
0
2
4
6
8
10
12
14
16
18
20
2018
2010-17
2000-09