

# The competitiveness of French exports of animal products: a methodological and comparative approach

Angela Cheptea\* and Marilyne Huchet†

SMART-LERECO, AGROCAMPUS OUEST, INRA, 35011, Rennes, France

**Acknowledgments:** The authors thank Beya Ben Mahmoud for technical assistance. This version has benefited from the financial support of the French Agri-Food Ministry.

## Abstract

The aim of the paper is to measure the competitiveness of French exports of animal products, relative to foreign competitors, based on a shift-share approach, and identify the main drivers of this competitiveness. Over 2000-2016, France lost half of its market share in animal products, considerably more than other European countries. Only half of these losses can be explained by a drop in competitiveness. Negative structural effects explain the other half. Moreover, we find that non-tariff measures (especially, price controls), production costs (capital and labor), good infrastructures and public policies are the main drivers of countries' competitiveness in international markets.

**JEL codes:** F14, Q14, C10, C18

**Keyword:** competitiveness, animal products, shift-share, France, international trade

---

\* UMR SMART-LERECO, INRA, Rennes, France. E-mail : [angela.cheptea@inra.fr](mailto:angela.cheptea@inra.fr).

† UMR SMART-LERECO, Agrocampus Ouest, Rennes, France. E-mail: [marilyne.huchet@agrocampus-ouest.fr](mailto:marilyne.huchet@agrocampus-ouest.fr).

## 1 - Introduction

The agricultural and agri-food sector is particularly important for the French economic growth since it constitutes the third largest trade surplus (after aeronautics-space and chemicals). However, recent works and international trade data reveal a loss of competitiveness of French animal industries since the beginning of the 21st century. Although France is a net exporter in this sector, since 2013 it runs a trade deficit with the EU-27. Other European countries face the same economic environment (liberalization of markets, stronger competition from emerging countries, wide use of the public and private standards, etc.), not all follow the same trajectory as France.

In the field of international trade, the overall competitiveness of a territory is usually assessed based on market share evolutions or comparative (dis)advantages. These indicators reflect a country's position relative to its competitors. In addition to this global approach of competitiveness, a panel of additional indicators focuses on individual potential sources of competitiveness (*e.g.* labor productivity, labor costs, innovation, value chains, etc.).

The aim of the paper is to measure the competitiveness of French exports of animal products, relative to its foreign competitors, based on a shift-share approach, and identify the main drivers of this competitiveness or lack thereof. We compare the results across the French animal products inside the sector and with respect to the main competing countries worldwide and within the EU market. Indeed, the EU is a major destination market of agri-food and animal product exports. The focus on the EU market (in addition to the global one) is also motivated by the fact that most French exports of animal products are sold to other EU countries. This share is particularly large in the animal products sector, above the levels observed for other agri-food products and in the industrial sector. Lastly, we analyze how different factors affect countries' level of competitiveness estimated previously. We focus on the main factors that the economic literature associates with competitiveness: productivity, technology, production costs, trade policy costs, exchange rate, infrastructure, public policy.

The paper is structured as follows. Section 2 provides an overview of global agri-food trade with a focus on French animal sector exports relative to the world market and then to the EU market. Section 3 explains the data and methodology used to measure the competitiveness of the French animal sector relative to that of other countries. In Section 4 we compute the competitiveness of each country in the animal products sector. The contribution of different competitiveness factors is analyzed and discussed in Section 5. Section 6 summarizes our conclusions.

## 2 – Trade in animal products at the global level and at the scale of France

### 2.1 – Global trade in animal products

Trade in animal products has increased steadily in the early 2000s (Figure 1). Similarly to trade in other agri-food sectors, trade volumes plunged after the 2008-2009 financial crisis, and recovered slowly in the following years. Since 2014, we observe a slowdown in worldwide trade activity, in animal products as well as in other agri-food sectors. This trend is more pronounced for EU exports. Over the entire period, French exports grew at a slower pace than global trade, leading to a decrease in France's share of the global market.

**Figure 1: Evolution of trade in animal products** (base year 2000 indices)



Source: Authors' computations using data from BACI.

Table 1 shows the redistribution of world market shares in the animal products sector among main exporters (with 1% or more of the world market). The European Union accounts for over half of the world exports of animal products. This high figure includes intra-EU trade.<sup>1</sup> According to Table 1, in 2016 France accounted for almost 6% of worldwide exports of animal products. Since 2000, it lost 39% (3.8 percentage points) of its market share. Its main European competitors remain Germany (9.3%) and Netherlands (9.2%). Outside the EU, the main exporters are US, Brazil, New Zealand, and Australia. The position of Netherlands, USA, and Australia deteriorates, but less (in relative terms) than for France. On the contrary, Brazil stands out with a 150% increase of its 2000 market share. Large increases are observed as well for Poland (+280%), India (+252%), Belarus (+373%), and Switzerland (102%).

<sup>1</sup> When we exclude intra-EU trade this figure drops to 22%.

**Table 1: Market shares of main exporters of animal products, 2000-2016**

Exporter	Market share (%)		Change in market share	
	2000	2016	(p.p.)	(%)
<b>EU28</b>	<b>56.81</b>	<b>52.71</b>	<b>-4.10</b>	<b>-7.2</b>
Germany	8.92	9.27	0.35	3.9
Netherlands	10.69	9.17	-1.52	-14.2
<b>France</b>	<b>9.67</b>	<b>5.88</b>	<b>-3.79</b>	<b>-39.2</b>
Ireland	4.36	3.70	-0.66	-15.2
Spain	2.40	3.65	1.25	52.1
Denmark	5.87	3.45	-2.42	-41.2
Belgium and Luxembourg	4.38	3.38	-1.00	-22.8
Poland	0.83	3.15	2.32	280.0
Italy	2.13	2.69	0.56	26.1
United Kingdom	2.83	2.10	-0.73	-25.8
Austria	1.36	1.55	0.19	13.9
United States of America	12.54	9.38	-3.17	-25.2
Brazil	2.47	6.17	3.70	150.1
New Zealand	5.10	5.78	0.68	13.4
Australia	6.23	5.20	-1.03	-16.5
Canada	5.10	3.08	-2.02	-39.6
Thailand	1.13	2.07	0.94	83.4
India	0.51	1.79	1.28	252.2
Mexico	1.06	1.23	0.18	16.9
China	1.48	1.15	-0.33	-22.6
Belarus	0.24	1.14	0.90	372.8
Argentina	1.46	1.09	-0.36	-24.9
Switzerland	0.53	1.07	0.54	101.6
Uruguay	0.72	1.03	0.31	42.7
Rest of the World	4.63	7.11	2.48	53.5

Source: Authors' computations using data from BACI.

Notes: We report only countries accounting for at least 1% of world exports in 2016.

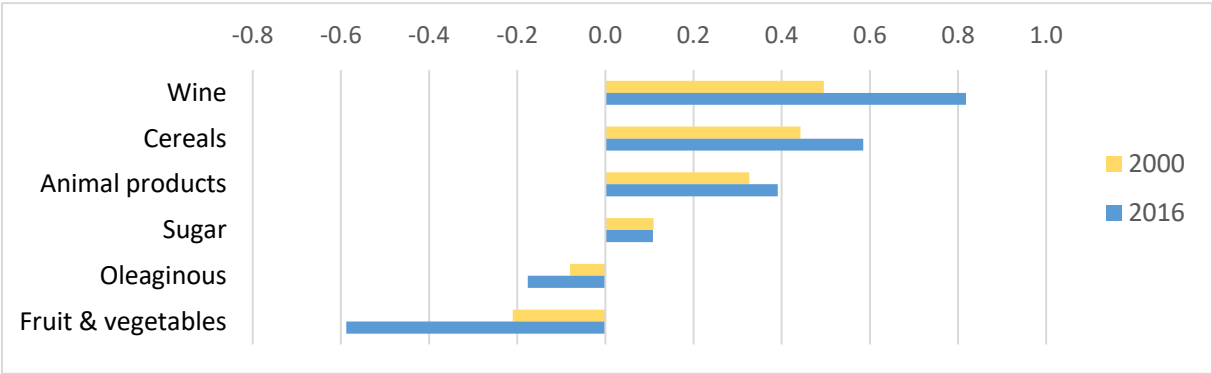
## 2.2 – State of the art of French exports of animal products

The French agri-food sector is characterized by a trade surplus. However, there is a strong disparity across products: the trade balance is positive for wine, cereals, animal products and sugar, but negative for oleaginous and fruit and vegetables. These disparities have widened over time (2000-2016), with the French trade surplus or deficit increasing for most products groups (Figure 2a).

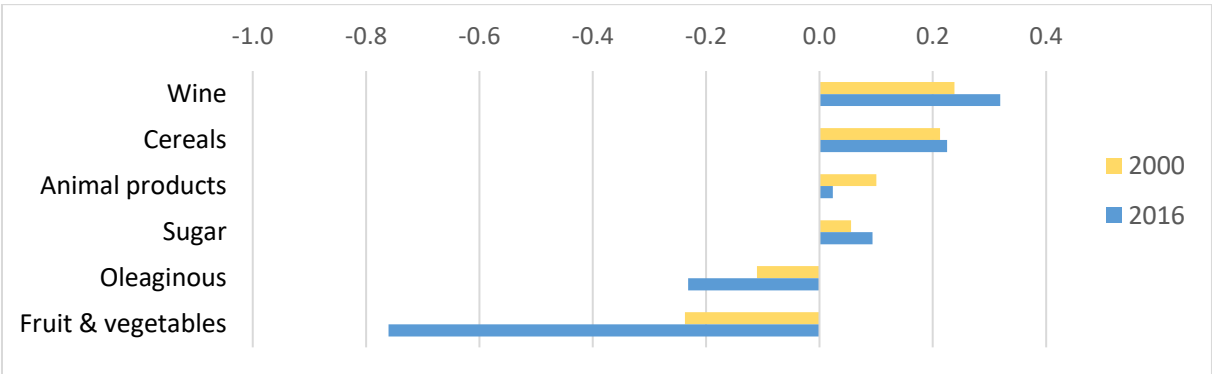
Because of the high weight of EU partners in French exports, we also focus on France's performance on the EU market. Over the 2000-2016 period, the share of the EU market in world exports of animal products ranges from 42% to 54%, while it stands between 37% and 47% for the entire agri-food sector. The share of the EU market in French exports is much higher: in the range [70%; 82%] for animal products, and within [62%; 72%] for the agri-food

sector.<sup>2</sup> However, the contribution of trade with EU partners to the French overall trade balance varies greatly across product groups. Although France is a net exporter of wine and cereal products, both globally and on the European market, most of the trade surplus in these two sectors comes from exports to non-EU partners. On the opposite, the French trade deficit in fruit and vegetables, and in oleaginous products arises mostly from trade with other EU member states. France was a net exporter of these products on extra-EU markets (the deficit with the EU [Figure 2b] was larger than the country’s global trade deficit [Figure 2a]). Disparities between the global and EU market are the strongest in the case of animal products. The large global trade surplus observed in Figure 2a comes essentially from French exports to non-EU markets. While France remains a net global exporter in this sector, most of its trade surplus with the EU, already low in 2000, vanished by 2016.

**Figure 2: French trade balance by products (billion USD)**



a) World market



b) EU market

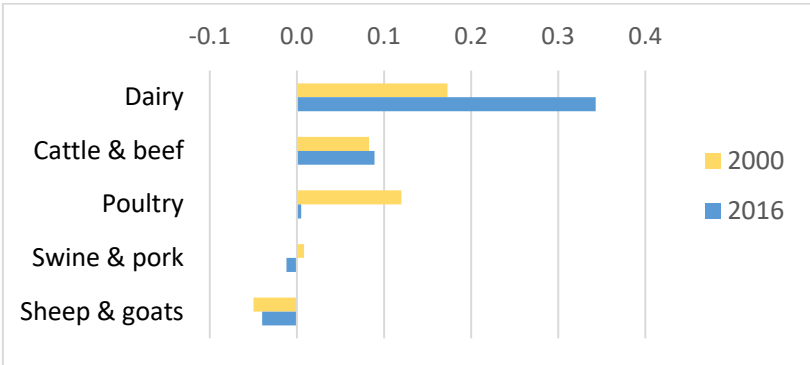
Source: Authors’ computations using data from BACI.

<sup>2</sup> Similar figures are observed for the entire EU. The bulk share of EU agri-food exports are shipped to other European partners (71% to 76% over the 2000-2016 period). The share of intra-EU trade was particularly strong during the mid-2000s (at 80%-82%: food price crisis) and decreased afterwards (to reach 70% in 2016). The concentration of trade within the EU is even larger in the animal products sector (74% to 83%).

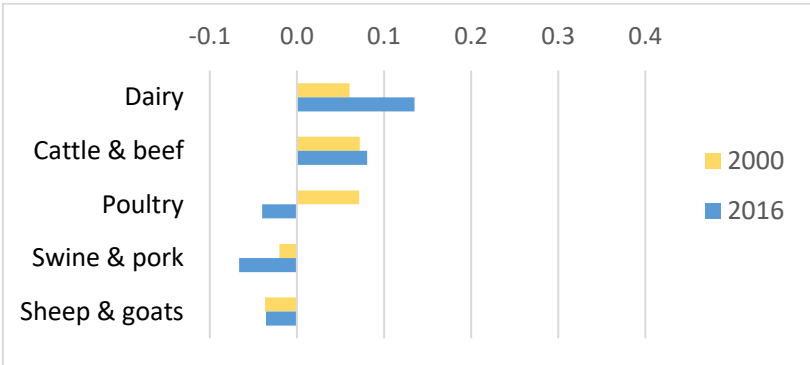
Analyzing more deeply the animal products sector, we notice that the positive trade balance is strongly supported by dairy products, followed by cattle and beef products (Figure 3). The contribution of the dairy sector to the French exports and trade balance is particularly strong with respect to non-EU partners. France is a net exporter of dairy products, both on the EU and extra-EU market. Its trade balance in this sector improved with both types of partners, most of the recent growth being driven by the Chinese and other Asian countries' demand. Thus, the French dairy sector exhibits a good overall performance, despite an increase in EU production after the loosening of milk quotas since 2008 and their complete removal in 2015, and despite the loss of a major destination market after the introduction of the Russian import ban in 2014.

The cattle and beef sector continues to account for the lion's share of French meat production and exports, despite the strong decline in global production and consumption in favor of other meat products, especially poultry. Differently from the dairy sector, the French production of cattle and beef targets primarily domestic and European consumers. In 2016, 90% of the French exports of cattle and beef products were shipped to the EU market, generating most of the country's positive trade balance in this sector. Exports to non-European markets remain marginal, despite a strong increase since 2009. French cattle and beef producers compete mainly against Dutch, Irish, and German producers, as the EU regulation (*e.g.* ban on meat products of hormone-fed animals, animal health standards, stringent maximum residue limits) protects them from non-EU competitors.

**Figure 3: French animal products trade balance (billion USD)**



a) World market



b) EU market

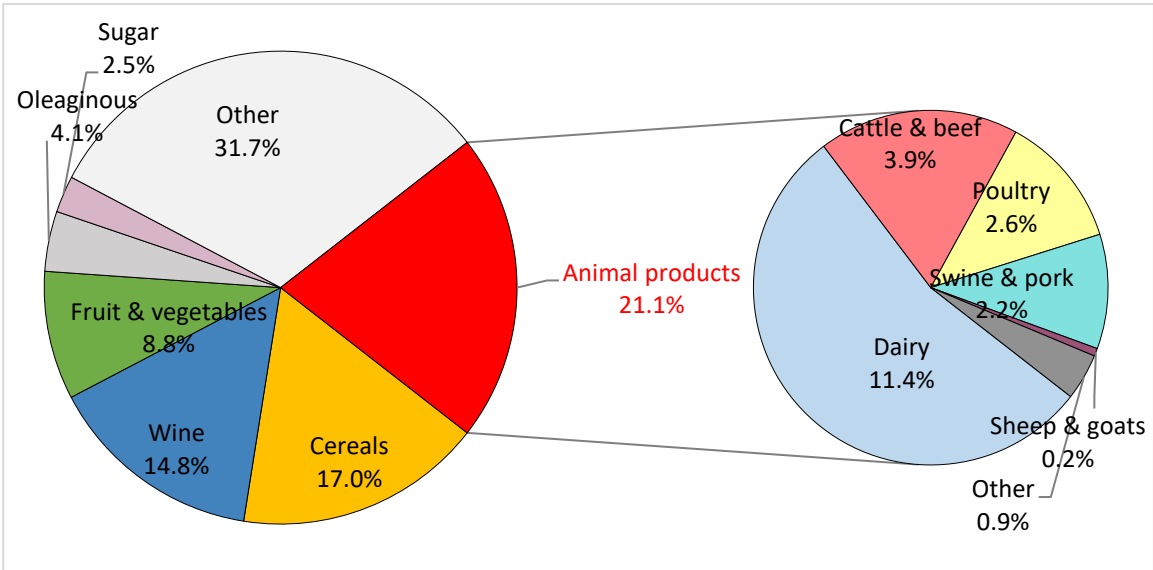
Source: Authors' computations using data from BACI.

The French poultry sector suffered a strong decline over the last two decades. The positive balance observed in 2000 completely eroded by 2016, due to a strong (fourfold) increase in French imports from EU countries. The trade balance with the EU became negative in 2009 and continued to deteriorate afterwards, although it remained positive and steady with extra-EU partners. Indeed, over the past 15 years the competitiveness of the French poultry sector deteriorated especially with respect to other European countries, mainly Germany and Poland, leading to a drop in French production (Chatellier *et al.*, 2015). Non-EU poultry producers (Brazil, USA, and Thailand) have improved their position on the global and EU market. Although French imports from these countries remain marginal, this trend may accentuate in the future and become an important threat for the French poultry sector.

France is less competitive in other animal products. The globally balanced trade in swine and pork products (Figure 3a) masks the country’s contrasting positions on the EU and extra-EU markets. Thus, the French positive and improving trade balance with non-EU partners cancels out its negative and deteriorating balance with EU trade partners. France remains a net importer of sheep and goat products, from both EU and non-EU countries. Except for sheep and goats, the bulk of French imports of animal products are of EU origin.

As illustrated in Figure 4, animal products are a major component of French agri-food exports (21.1%), followed by cereals (17%), wines (14.8%), and fruits and vegetables (8.8%). The share of animal products is even larger when we focus on exports to the EU market alone. Within the animal products sector, dairy products account for over half of French exports, most of the rest being attributed to cattle and beef, poultry, and swine and pork products. Sheep and goats represent only a marginal share of French agri-food exports, France being a net importer in this sector. Therefore, we spend less attention to this last group of products in the rest of the analysis. French exports to the EU market display a very similar structure. The main differences with respect to the global market are the smaller share of wines, and the larger share of fruit and vegetables. This indicates that French wines are largely exported outside the EU, while French exports of fruit and vegetables are concentrated on the EU market.

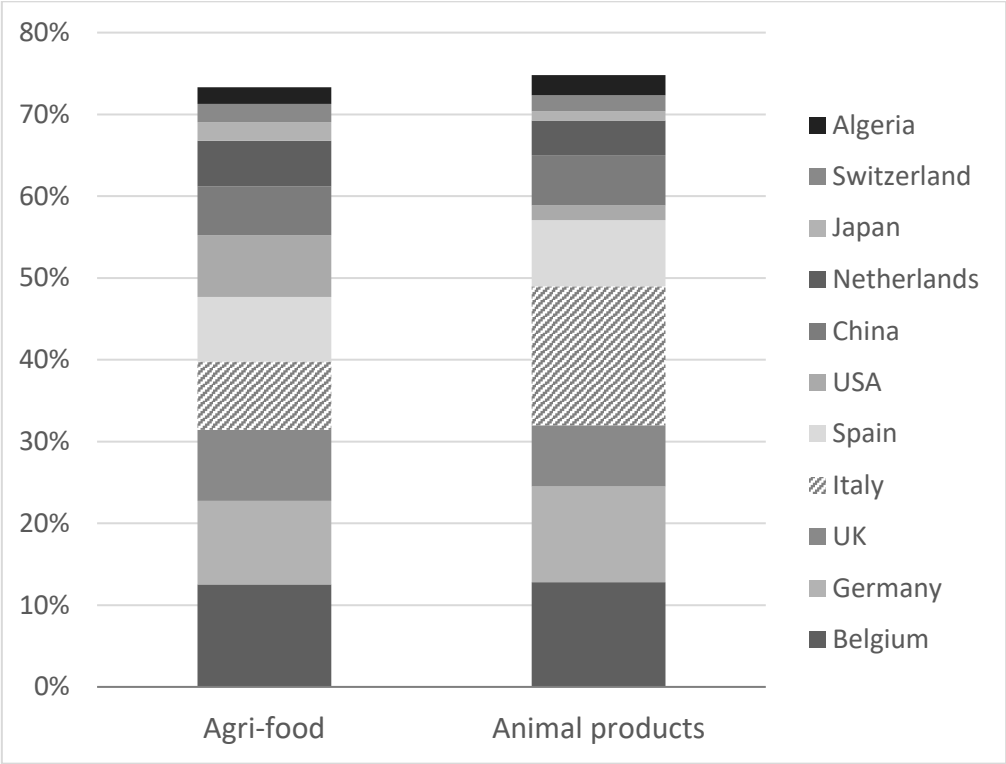
**Figure 4: Structure of French agri-food exports on the world market, 2016**



Source: Authors’ computations using data from BACI.

France sells its agri-food and animal products to over 155 different countries. Still, its main customers are its EU neighbors: Belgium, Germany, Italy, and Spain (Figure 5). 70% of the French exports of animal products are directed to EU partners (against 62% for agri-food exports). Moreover, French exports of animal products are concentrated in a small number of destination markets, and, therefore, strongly exposed to country-specific shocks. This geographic concentration is higher than for other agri-food products. The top three (five) destinations represent 41% (57%) of French exports of animal products, all EU member states. In the agri-food sector, the first three (five) partners account for 31% (48%) of the French exports. There are sizable differences in the French exports of agri-food and animal products to some destination markets. Italy absorbs 17% of the French animal products exports, the double of its share in French agri-food exports, and becomes the main destination of French exports in this sector (ahead of Germany and Belgium). On the opposite, while the US is the largest extra-EU market for French agri-food exports (7.6%), its share is much smaller for animal products (1.8%). France’s main non-EU partners in the animal products sector are China, Algeria, and Switzerland, followed by the US and Japan.

**Figure 5: Main destinations of French exports**



Source: Authors’ computations using data from BACI.

**3 – Methodology and data**

**3.1 Defining competitiveness**

A large number of works address, measure, and attempt to explain the competitiveness and/or the lack thereof, at country or region level. Despite the wide interest for analyzing and understanding competitiveness, there is no consensus in the economic literature on the definition of this term, or on the elements that it encompasses. The definition of



competitiveness varies greatly on the adopted approach and level of analysis.<sup>3</sup> Still, some similarities emerge across macro-level analyses. Competitiveness most often refers to how well a country (or region or territory) performs in the market against its competitors.<sup>4</sup> From the point of view of international economics, competitiveness is reflected by the performance on international markets, mainly in terms of exports or foreign direct investments. It is measured through a wide number of economic indicators, such as trade balance, market shares, revealed comparative advantage, relative prices, real effective exchange rates, unit costs, productivity, innovation and technology, export sophistication, quality of produced/exported goods, *etc.* See Latruffe (2010), Castellani and Koch (2015), Osbat *et al.* (2015) and Wijnands and Verhoog (2016) for an overview of most commonly employed indicators.

We adopt the definition of competitiveness that relies on countries' export performance. More specifically, we follow Gaulier *et al.* (2013) and Cheptea *et al.* (2014) and measure competitiveness as the evolution of export market shares, adjusted by structural effects. The geographic and sectoral structure of a country's exports may greatly affect the evolution of its exports. Thus, a country's market share erodes if it sells to partners whose demand grows more slowly than that of the trade partners of its main competitors. Similarly, a country's position deteriorates if the global demand for the products it exports grows at a lower rate than the demand for products exported by competing countries. On the opposite, a beneficial geographical orientation or product composition of exports improves the country's performance at no effort. Adapting to the evolving demand conditions is usually a slow and costly process. It takes a long time for a country to change its specialization and trade partners. Therefore, we separate the contribution of structural effects and focus on country's intrinsic market share evolutions.

### **3.2 Competitiveness as the intrinsic evolution of exporter's market share**

We start by constructing a competitiveness indicator at country-and-sector level, based on the econometric shift-share decomposition of annual changes in market shares (Cheptea *et al.*, 2005; Gaulier *et al.*, 2013; Cheptea *et al.*, 2014; World Bank's device Measuring Export Competitiveness). In a first stage, we identify the specific trade dynamics for each exporter, destination, and product, based on the growth rates of trade flows defined at the most disaggregated level. In a second stage, we aggregate results by exporting country, and compute a decomposition of changes in market shares. The competitiveness of an exporting country is identified with the evolution of its market share corrected by structural factors

---

<sup>3</sup> For example, the OECD defines competitiveness as the "ability of companies, industries, regions, nations, and supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels on a sustainable basis" (Hatzichronoglou, 1996). According to the European Commission, "a competitive economy is one that raises living standards sustainably and provides access to jobs for people who want to work" (European Commission, 2012). The World Economic Forum (WEF) that computes the Global Competitiveness Index (GCI) perceives competitiveness as "the set of institutions, policies, and factors that determines the level of productivity of an economy, which in turn sets the level of prosperity that the economy can achieve." (Schwab and Sala-i-Martin, 2017).

<sup>4</sup> Latruffe (2010) summarizes that "Competitiveness can be defined as the ability to face competition and to be successful when facing competition."

(product mix and export geography). The analysis encompasses all agri-food products traded internationally. When aggregating results by exporting countries, we distinguish between the different agri-food sectors/value chains. This approach permits to compare the competitiveness of France with that of its main competitors on the whole world market, as well as on various markets (intra-EU and extra-EU), for different sectors. For this analysis, we employ BACI data on world trade over the 2000-2016 period.

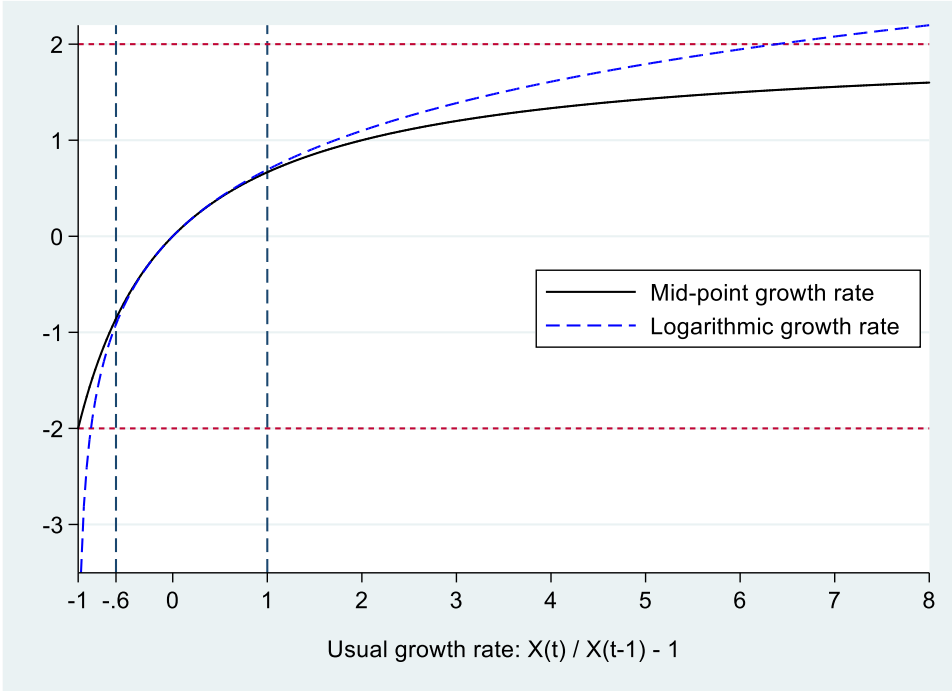
Following Bricongne *et al.* (2012) and Gaulier *et al.* (2013), we measure the evolutions of trade flows using mid-point growth rates rather than usual or logarithmic growth rates:

$$g_{ijk}^t \equiv \frac{X_{ijk}^t - X_{ijk}^{t-1}}{0,5 \cdot (X_{ijk}^t + X_{ijk}^{t-1})} \tag{1}$$

with  $X_{ijk}^t$  reflecting the value of country  $i$ 's exports of product  $k$  to partner  $j$  in year  $t$ . This permits to compute growth rates for trade flows that disappear or are newly created from year to year, and which constitute the extensive trade margin. Although the extensive margin has a marginal contribution to the global exports growth, its share can be quite large at country level and for specific sectors (see Table A1 of the Appendix).

For moderate values of the usual growth rate (ranging between -50% and +100%), the mid-point growth rate is almost identical to the logarithmic growth rate. For very small and very high growth rates, the mid-point growth rate underestimates the actual growth rate. As illustrated in Figure 6, the mid-point growth rate represents a flattening of the logarithmic growth rate into the range [-2; 2]. It takes the value -2 for ceased flows and the value 2 for newly created flows.

**Figure 6: Mid-point growth rates vs. logarithmic and usual growth rates**



For each year  $t$  and group of products  $s$ , we identify the trade dynamics specific to each exporting country  $i$ , destination market  $j$ , and product  $k$ , using a weighted fixed effects estimation of export growth rates defined at the highest level of data disaggregation:

$$g_{ijk}^t = \alpha_i^t + \beta_j^t + \gamma_k^t + \varepsilon_{ijk}^t, \quad \forall k \in s \quad (2)$$

$\alpha_i^t$ ,  $\beta_j^t$ , and  $\gamma_k^t$  stand for exporter, importer, and product fixed effects in year  $t$ , while  $\varepsilon_{ijk}^t$  is a zero mean error term. We use the share of each flow in global trade,  $w_{ijk}^t$ , as weights and impose the following constraints:  $\sum_i \alpha_i^t w_i^t = g_s^t$ ;  $\sum_j \beta_j^t w_j^t = 0$ ;  $\sum_{k \in s} \gamma_k^t w_k^t = 0$ . This permits us to interpret destination- and product-specific trade dynamics  $\beta_j^t$  and  $\gamma_k^t$  as deviations from the world average, and exporter-specific dynamics  $\alpha_i^t$  as deviations from the growth in global trade in sector  $s$  ( $g_s^t$ ). We estimate equation (2) for each sector  $s$ . Accordingly, our estimates of exporter and importer fixed effects  $\alpha_i^t$  and  $\beta_j^t$  are also sector-specific.<sup>5</sup> For ease of presentation, we drop the subscript  $s$  from these parameters.

Weights are computed as  $w_{ijk}^t = (X_{ijk}^t + X_{ijk}^{t-1}) / (X_s^t + X_s^{t-1})$  to allow aggregate-level growth rates to be obtained as the weighted sum of disaggregated growth rates:

$$g_{i,s}^t \equiv \frac{X_{i,s}^t - X_{i,s}^{t-1}}{0,5 \cdot (X_{i,s}^t + X_{i,s}^{t-1})} = \sum_j \sum_{k \in s} g_{ijk}^t w_{ijk}^t \quad (3)$$

We introduce (2) into (3), subtract the global trade growth rate, and sum results across years:

$$r_{i,s} = \sum_t (g_{i,s}^t - g_s^t) = \underbrace{\sum_t (\alpha_i^t - g_s^t)}_{\text{Competitiveness}} + \underbrace{\sum_t \left( \sum_j \beta_j^t w_{ij}^t \right)}_{\text{Geographic structure}} + \underbrace{\sum_t \left( \sum_{k \in s} \gamma_k^t w_{ik}^t \right)}_{\text{Product mix}} \quad (4)$$

The left hand side of (4),  $r_{i,s}$ , is an approximation of the logarithmic growth rate of country  $i$ 's market share in sector  $s$  over the analysed period. We express it as the sum of three terms: the country's "pure" competitiveness, and two structural terms reflecting the geographic orientation and the product mix of its exports. A positive (negative) value for either term indicates an increase (decrease) in the country's market share. By construction, the three right-hand side terms of (4) are orthogonal. Our competitiveness measure reflects the country's market share evolution that one would observe if the structure of its exports by destination markets and by products were identical to that of global trade.

### 3.3 Data

Data on product-level bilateral trade flows come from the BACI database in the Harmonized System (HS) 1992 product classification, constructed by CEPII. Data are expressed in current USD. The agri-food sector corresponds to products in HS chapters 1 to 23, 699 HS 6-digit codes in total. Within the agri-food sector, we focus on the group of animal products (identified by 109 HS6 codes), and compare it to five other groups of products (agri-food value-chains) of particular interest for France: wines, cereals, fruit & vegetables, oleaginous, sugar. We disregard the rest of agri-food products from our detailed analysis. This residual group, labeled

<sup>5</sup> In our computations in section 4, sector  $s$  denotes successively the entire group of agri-food products, the animal products sector, each of the five complementary groups of agri-food products (wines, cereals, fruit and vegetables, oleaginous, and sugar), and each of the five groups of animal products (dairy, cattle & beef, poultry, swine & pork, and sheep & goats).

as “other”, covers fish and fish preparations, coffee, tea, cocoa, live plants, wool, feathers, skins, cotton, bamboo and similar products, mainly from chapters 3, 5, 6, 13, 14, 18, 23. Each HS6 product code is univocally attributed to one agri-food group (sector or value-chain). Each group includes both primary and processed products. For example, the cereals group includes raw cereals (such as wheat and maize), flours, malt, starches, as well as pasta, biscuits, and other processed products obtained from cereals. Further, we split the animal products sector into five groups: dairy, cattle & beef, poultry, swine & pork, and sheep & goats. A small number of animal products, cannot be attributed to either of these groups: honey, meats of other animals (*e.g.* horse, ass, mule), products combining meats, offal or fats of different animals, and foodstuff combining meat and dairy products. We base our definition of agrifood sectors (value chains) and groups of animal products on the EU classification of agri-food products.<sup>6</sup> The detailed product composition of each group of animal products is listed in Table A2 of the Appendix.

Our analysis covers the 2000-2016 period. We exclude non-independent territories and small countries, for which small amounts of trade may generate very large growth rates.<sup>7</sup> Within each agri-food sector, we also exclude countries that do not export or import continuously over the period (*i.e.* we keep only countries that trade some positive amount in at least one HS 6-digit product in the sector with at least one partner).<sup>8</sup> This reduces the number of countries in the analysis to 122 exporters and 155 importers. Excluded flows represent less than 3% of the global trade in each agri-food sector or group of products. The number of trading countries is smaller for some product groups, reflecting countries’ specialization across products (Table 2). Thus, we have 116 dairy exporting countries, but only 62 exporters of sheep and goats products.

**Table 2: Number of products, exporting, and importing countries in the analysis**

	Products (HS6 codes)	Exporters	Importers
Animal products	109	121	155
Dairy	22	116	155
Cattle & beef	14	92	149
Poultry	22	100	155
Swine & pork	19	87	152
Sheep & goats	13	62	128
Other animal products	19	119	154
Cereals	69	122	155
Fruit & vegetables	174	122	155
Oleaginous	56	118	155
Sugar	12	111	155
Wine	4	90	151
Other agri-food products	275		
Total agri-food	699	122	155

<sup>6</sup> [https://ec.europa.eu/agriculture/sites/agriculture/files/trade-analysis/statistics/outside-eu/2015/product-classes-details\\_en.pdf](https://ec.europa.eu/agriculture/sites/agriculture/files/trade-analysis/statistics/outside-eu/2015/product-classes-details_en.pdf)

<sup>7</sup> We exclude exporters that account for less than 0.01% of the global trade in agri-food products between 2000 and 2016.

<sup>8</sup> This is necessary in order to have an estimate of exporter and importer fixed effects  $\alpha_i^t$  and  $\beta_j^t$  for each year  $t$ . Setting missing effects equal to an arbitrary value (*e.g.* zero) introduces a strong assumption (competitiveness or import demand growth equal to the world average).

## 4 – The competitiveness of France and its main competitors

### 4.1 The animal products sector

In Table 3, we present the results of the shift-share decomposition of the 2000-2016 market share evolution in the animal products sector for the world's largest exporters. Market share evolutions are decomposed into a sum of a competitiveness term specific to the exporting country, and two structural terms, reflecting the orientation of exports to destinations with a strongly increasing import demand and the country's specialization in products with a rapidly increasing global demand.<sup>9</sup> Positive (negative) values reflect an increase (decrease) in market share.

**Table 3: Decomposition of market share evolutions in the animal products sector, exports to the global market, 2000-2016**

Exporter	Market share evolution	Competitiveness	Geographic structure	Product mix
<b>EU28</b>	<b>-0.07</b>	<b>0.04</b>	<b>-0.15</b>	<b>0.04</b>
Germany	0.04	0.11	-0.13	0.06
Netherlands	-0.15	-0.10	-0.12	0.07
<b>France</b>	<b>-0.50</b>	<b>-0.25</b>	<b>-0.20</b>	<b>-0.04</b>
Ireland	-0.17	-0.03	-0.16	0.02
Spain	0.42	0.64	-0.31	0.09
Denmark	-0.53	-0.60	-0.08	0.15
Belgium and Luxembourg	-0.26	-0.06	-0.21	0.01
Poland	1.32	1.48	-0.04	-0.12
Italy	0.23	0.35	-0.21	0.09
United Kingdom	-0.30	-0.15	-0.03	-0.12
Austria	0.13	0.20	-0.22	0.15
United States of America	-0.29	-0.61	0.33	-0.01
Brazil	0.90	1.00	0.09	-0.19
New Zealand	0.12	0.03	0.31	-0.22
Australia	-0.18	-0.34	0.19	-0.04
Canada	-0.50	-0.55	-0.05	0.10
Thailand	0.60	0.17	0.03	0.40
India	1.23	0.97	0.35	-0.09
Mexico	0.15	0.24	-0.15	0.07
China	-0.25	-0.61	0.07	0.29
Belarus	1.53	2.52	-0.63	-0.37
Argentina	-0.29	-0.15	-0.02	-0.12
Switzerland	0.69	0.69	-0.19	0.19
Uruguay	0.35	0.63	-0.18	-0.11

Source: Authors' computations using data from BACI. Only countries accounting for 1% or more of world exports in 2000 or 2016 are reported.

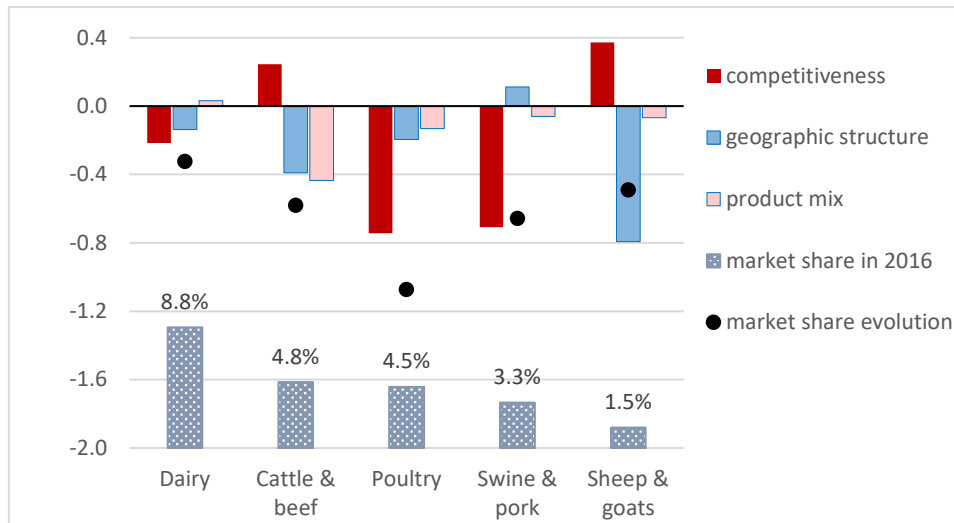
<sup>9</sup> Figure A1 of the Appendix lists the most dynamic import markets and traded animal products.

From Table 3 we read that only half of the decrease in the French market share (-0.50) was due to a loss in country's competitiveness (-0.25). The concentration of French exports in markets with a slowly progressing demand (below the world average) generated a similar contraction of the French market share (-0.20). Indeed, nearly one fifth of French exports were sold to Italy, one of the world's slowest-growing import markets. At the same time, French exports to countries with the highest growing import demand were considerably lower in relative terms than global exports to these countries (see Figure A1 of the Appendix). The product mix has a minor contribution to the loss in competitiveness; the top products exported by France include both products with a highly growing global demand (e.g. fresh cheese, poultry cuts, yogurt, eggs, see Figure A1 of the Appendix) and with a slowly progressing demand (e.g. poultry and swine livers, milk and cream powder). These results show that France can considerably improve its market position in the animal products sector by better targeting its export markets. Adjusting the product structure of French exports to the global demand will have only a marginal effect.

France's main EU and non-EU competitors display very different performances. Similar to France, Netherlands' market share also deteriorates due to a loss in competitiveness and an unfavorable geographic structure, but effects are smaller in magnitude and partially compensated by a strong global demand for Dutch products. Germany improves its competitiveness in this sector and conserves its 2000 market share. The US competitiveness in the animal sector deteriorates more than that of France. However, the orientation of American exports to markets with a highly dynamic demand reduces its impact on market shares by half. The strong increase in Brazil's market share comes from its enhanced competitiveness.

Within the animal products sector, the French market share deteriorates the most for poultry products, from 13% in 2000 to only 4.5% in 2016 (see Figure 7 and Table A3 of the Appendix). This outcome results from a strong loss in competitiveness, complemented by an unfavorable geographic structure and product mix. The competitiveness of French exports greatly deteriorates also for swine and pork products, but the above-world-average demand growth of France's main clients limits its market share loss in this product group. Although France loses market shares in all product groups of the animal products sector, it manages to reinforce its competitiveness (above the world average) for the exports of cattle and beef and of sheep and goats products (Figure 7). In both these product groups, the market share loss is entirely driven by the weak evolution of global demand for French products and the concentration of exports in countries with a slowly growing demand, reflected in negative structural effects. French exports display the highest resilience in the dairy sector, where the market position of France is also the strongest (8.8% in the world exports 2016). Still, the small competitiveness loss and adverse geographical structure of exports were sufficient to make France lose its position as the world's third-largest exporter of dairy products to New Zealand.

**Figure 7: French competitiveness by groups of animal products, 2000-2016**



Source: Authors' computations using data from BACI.

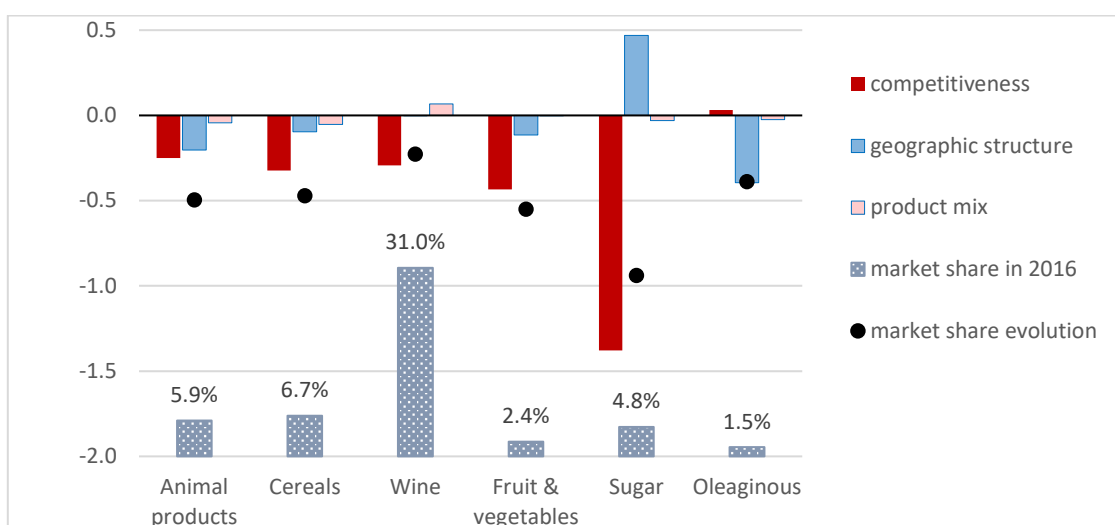
Notes: Market shares in 2016 are labelled on a separate (not displayed) vertical axis.

#### 4.2 Animal products vs. other agri-food sectors

The French market share and competitiveness losses in the animal product sector are comparable to those observed for cereal products and fruit and vegetables (Figure 8). The position of France remains strong in the cereals sector (second world exporter, after US), although it loses ground to new competitors: Poland and Romania within the EU; Russia, India, Ukraine, and Brazil outside of the EU market. The French market share is much weaker in the fruit and vegetables sector, where France remains a net importer. Similarly to the animal products sector, the French exports of cereals and fruit and vegetables were marked by an important decline in competitiveness, accompanied by a concentration of exports on markets with a lagging demand.

The French share in world exports dropped the less for wines, where France has a dominant position with a market share of 31% (Figure 8), far ahead of its competitors (Italy at 21%, Spain at 9%, Australia at 7%, Chile at 6%). French wine exports also benefited from a favorable product mix, the global demand for French wines increasing more rapidly than the demand for wines of other origins. The French market share loss was the strongest for sugar, a trend shared by most European countries. Still, France remains the first EU exporter of sugar, concentrating its exports in markets with a strongly growing demand (positive geographic structure). The large drop in the competitiveness of French and European sugar exports was induced by the extensive delocalization of production units to developing and emerging economies over the last decade. The oleaginous sector is the only one where the competitiveness of French exports did not decline. Yet, this sector suffered from a poor orientation of exports (strong negative geographic structure), damaging the country's market position.

**Figure 8: French competitiveness across agri-food sectors, 2000-2016**



Source: Authors' computations using data from BACI.

Notes: Market shares in 2016 are labelled on a separate (not displayed) vertical axis.

### 4.3 Competitiveness on the European market vs on the global market

Most of French exports of animal products are sold to EU partners, calling for a closer look at country's performance on this market. Unsurprisingly, France holds a stronger position on the EU market (9.7% in 2016) than on the global market (5.9% in 2016). Over the 2000-2016 period, the share of France in EU imports also eroded, although by a smaller amount than its share in world trade.

Table 4 displays the evolution of countries' position, competitiveness, geographic structure and product mix on the EU market. Results are obtained by running the analysis detailed in section 3.2 on exports (of all countries, both EU and non-EU) to the EU market. In section 4.1, we analyzed evolutions on the global market and used the growth rate of global trade as reference. Restricting the analysis to the EU market, we express all terms as deviations from the growth of EU imports. This change of reference leads to a slight change in the interpretation of terms. The geographic structure indicates now the country's ability to orient its exports to EU countries with the highest growth of import demand, while the product mix reflects the adaptation of country's exports to product-level differences in European demand (its ability to export products for which EU demand increased the most). The evolutions of France on the EU market (Table 4) are similar to its evolutions on the global market (Table 3), both in terms of sign and magnitude. Again, the loss in competitiveness explains only half of the decrease in the French market share. The other half is evenly generated by the country's poor geographic orientation of exports and the product composition of its exports. This difference with respect to the global market indicates that French exports of animal products are less adapted to the demand of European customers. Similar to France, most EU member states perform better – both in terms of market share and of competitiveness – on the European market, where they enjoy a higher level of protection against non-European competitors. Contrary to the global market, where the position of EU28 deteriorated (-0.07 in Table 3), we observe a slight increase in the share of EU28 on the EU market (0.03 in Table 4).



On the opposite, the main non-EU exporters are less competitive on the EU market. New Zealand and Australia also suffer from a poor targeting of destination markets within the EU (reflected in their negative geographical structures), which contrasts with the concentration of their global exports on markets with a strongly growing demand. Non-EU exporters (except for the US and Switzerland) also display a better adaptation of their exported product mix to the EU demand (last column in Table 4) than to the global demand (last column in Table 3). However, this did not compensate for the negative competitiveness and geographic structure effects. As a result, these countries saw their market shares deteriorate more on the EU market than on the global market.

The variation of French competitiveness and structural effects on the EU market across different groups of animal products (Figure A2 of the Appendix) is very similar to the one observed on the global market (Figure 7). The main difference consists in the larger market share of France on the EU market for all products, except poultry. This gap is particularly large for cattle and beef products and for swine and pork products, where the share of French export to the EU market is triple, respectively double, the share of French exports to the global market.

**Table 4: Decomposition of market share evolutions in the animal products sector, exports to the EU, 2000-2016**

Exporter	Market share evolution	Competitiveness	Geographic structure	Product mix
<b>EU28</b>	<b>0.03</b>	<b>0.06</b>	<b>0.00</b>	<b>-0.02</b>
Germany	0.10	0.09	0.03	-0.01
Netherlands	-0.12	-0.13	-0.05	0.06
<b>France</b>	<b>-0.43</b>	<b>-0.21</b>	<b>-0.10</b>	<b>-0.12</b>
Belgium and Luxembourg	-0.16	-0.09	-0.04	-0.03
Ireland	-0.03	-0.02	-0.07	0.07
Poland	1.87	1.95	0.10	-0.18
Spain	0.24	0.52	-0.20	-0.07
Denmark	-0.26	-0.43	0.11	0.06
Italy	0.37	0.36	-0.02	0.03
United Kingdom	-0.18	-0.19	0.10	-0.09
Austria	0.21	0.22	-0.02	0.01
Hungary	0.04	-0.04	0.22	-0.15
Czech Republic	1.05	0.64	0.54	-0.13
Brazil	-0.12	-0.52	0.09	0.30
New Zealand	-0.51	-0.54	-0.05	0.08
Thailand	0.40	-0.17	-0.04	0.61
Argentina	-0.60	-0.93	-0.02	0.35
United States of America	-0.82	-1.04	0.32	-0.10
Australia	-0.59	-0.79	-0.04	0.24
Switzerland	0.17	0.24	-0.10	0.03

Source: Authors' computations using data from BACI. Only countries accounting for 0.5% or more of EU imports in 2000 or 2016 are reported.

Similarly to the global market, the competitiveness of France on the EU market deteriorates in all agri-food sectors (Figure A3 of the Appendix). Sectors where the French share in EU imports is significantly larger than in global trade also display different contributions of competitiveness and structural factors. The competitiveness loss of France in cereals is much larger on the EU market, while the opposite is true for sugar. French exports to the EU of oleaginous products and of fruit and vegetables match better the most dynamic EU import demand, both geographically and by products.

## 5 – Competitiveness factors

This section aims to identify factors with the strongest impact on countries' competitiveness in the animal products sector at the global level. We focus on the main factors that the economic literature associates with competitiveness: productivity, technology, production costs, trade policy, exchange rate, infrastructure, institutions, and public policy. We estimate the effect of each factor on annual country-specific competitiveness levels computed in section 4, i.e. on the first right hand side term of equation (4). Table A4 of the Appendix summarizes the data sources used for each factor. Data on some factors are available only for a subset of countries and/or years. Some factors are highly correlated with each other and therefore cannot be included simultaneously. Given these aspects of the data, we estimate the effect of each factor separately using OLS. This permits to exclude multicollinearity and sample selection issues. Results are reported in Table 5. We report only the signs of statistically significant effects. The magnitude of the effect on competitiveness is not comparable across factors because of different measurement units (*e.g.* US\$, %, number of measures, index).

Most factors affect competitiveness in a similar way (same sign of the effect) for all groups of animal products. For only three, the effect on competitiveness varies across groups of animal products (real effective exchange rate and cereal yield). We find no statistically significant effect for variables reflecting the use and adoption of technology.

First, we consider factors that reflect countries' trade policies. Most non-tariff measures (NTMs) erode the country's competitiveness, in accordance with their perception as barriers to trade. This is true for NTMs faced on destination markets, as well as for NTMs imposed to trade partners. The negative effect is particularly strong for NTMs that take the form of price controls. On the opposite, we find a positive effect for sanitary and phytosanitary (SPS) measures imposed by trade partners (in the swine & pork and poultry sectors), and for pre-shipment inspections that the exporting country demands to its partners (in the cattle & beef and sheep & goats sectors). This result confirms the informational role of SPS measures in helping exporters meet regulation requirements specific to each market, and the capacity of exporters from countries with more stringent regulations to more easily penetrate foreign markets. Differently, import tariffs on exports to different markets or on imports from trade partners seem to have no significant effect on a country's competitiveness.

**Table 5: Drivers of competitiveness**

	Animal products	Dairy	Cattle & beef	Swine & pork	Poultry	Sheep & goats
<b>Trade policy</b>						
Tariff on exports					(+)**	
Tariff on imports						
Number non-tariff measures on exports						
- SPS measures				(+)**	(+)**	
- TBT measures						
- Pre-shipment inspections			(-)**			
- Price controls	(-)**			(-)**	(-)**	
- Quantity controls			(-)*			(-)**
- Taxes and charges						
Number non-tariff measures on imports						
- SPS measures						
- TBT measures	(-)**	(-)*				
- Pre-shipment inspections			(+)**			(+)*
- Price controls		(-)**	(-)**	(-)*	(-)*	
- Quantity controls				(-)**	(-)**	
- Taxes and charges		(-)**				
<b>Exchange rate</b>						
Real effective exchange rate index		(+)*		(-)**		(-)**
<b>Productivity</b>						
Agricultural value added (M current US\$)	(-)**	(-)**	(-)**	(-)**		(-)**
Agricultural value added (% GDP)				(-)**		
Agricultural value added per worker (M US\$)			(-)**			
Cereal yield (kg/ha)	(+)*	(+)*	(-)**	(+)*	(+)**	
Volatility of agricultural production				(+)**	(+)**	(+)*
Output per worker		(-)**	(-)**			
<b>Technology</b>						
Agricultural machinery (tractors/100 km <sup>2</sup> )						
Availability of latest technology (index)						
Firm-level technology absorption (index)						(-)*
<b>Production costs</b>						
Access to financing for farmers				(+)*	(+)**	(+)**
Ease of access to loans			(-)**			
Redundancy costs (weeks of salary)	(-)*			(-)**	(-)**	(-)**
Monthly earnings of employees in agriculture	(-)**	(-)**		(-)**	(-)**	
Credit to agriculture (current US\$)	(-)**	(-)**	(-)**			
Soundness of banks	(-)*		(-)**		(-)*	(-)**
Adequate crop storage facilities	(+)**		(+)**	(+)**	(+)**	(+)**
<b>Public policies</b>						
Inflation (%)	(-)**	(-)**		(-)*	(-)**	
Number procedures to start a business			(-)**	(-)*		(-)*
Number days to start a business			(-)**	(-)*		(-)**
Agricultural policy costs			(-)**	(-)*		(-)*
Public expenditure on agricultural R&D						(+)**
R&D expenditure (% of GDP)	(-)**	(-)**	(-)*			

Source: \*\*, \*, and \* reflect significance at the 1%, 5% and 10% level respectively.

Next, we turn to the exchange rate, which some works in the literature interpret as an indicator of competitiveness *per se*. The real effective exchange rate (REER) has a negative effect in the case of swine & pork and sheep & goats. This is in line with the macroeconomic theory predictions, as an increase in a country's REER means that its products become more expensive with respect to those of its main trade partners, leading to a competitiveness loss. We find a puzzling positive effect of the REER on countries' competitiveness in the dairy sector, but this effect is statistically significant only at 10%. Results are very similar when we consider the nominal effective exchange rate or the official exchange rate (not displayed).

A third array of factors refers to countries' productivity. The negative effect of agricultural value added (VA) shows that small countries are more competitive than large countries. We do not find any evidence of a positive effect on competitiveness when we adjust for the size of the country, *i.e.* when we look at the effect of agricultural VA as a share of GDP or of agricultural VA per worker. This indicates that increasing the domestic VA of exported products does not help the country become more competitive. On the contrary, this strategy may increase production costs and consequently export prices, with an opposite (negative) effect on competitiveness, as we find for swine & pork, and respectively cattle & beef sectors.

Cereal yield is a more accurate indicator of agricultural productivity. It has a strong positive effect on country's competitiveness in the animal products sector and in most groups of animal products considered separately. It has a negative effect only in the case of cattle & beef, most probably because cereals are an important input in the production of goods from this sector (for animal feeding). The opportunity cost of using cereals to feed cattle rather than selling them directly in international markets is higher when cereal yields are higher. The volatility of agricultural production reflects the countries' capacity to adjust to demand shocks. It has a positive effect for three groups of animal products (swine and pork; poultry; cheep & goats).

We also question whether countries' competitiveness in animal products is driven by their overall economic productivity. The negative effect of overall economic output per worker on competitiveness in some animal products shows that countries with a high level of economic productivity are not necessarily competitive in the agri-food sector.

The use of modern technologies does not have a statistically significant effect on countries' competitiveness. We reach this conclusion using three different indicators: the use of agricultural machinery, the availability of most recent technologies, and the absorption of modern technologies at firm level.

On the contrary, lower production costs improve, in most cases, the country's competitiveness. We find such an effect for both capital costs (measured by farmers' access to financing and credit to agriculture) and for labor costs (measured by monthly wages in agriculture and redundancy costs). These findings are not contradicted by the negative effect of credits in the agricultural sector and the soundness of domestic banks. A large amount of credit to agriculture does not reflect easy access to credit, but rather the high cost of capital (a high interest rate and/or a high debt ratio, both generating large interest payments). The overall soundness of domestic banks does not mean lower financial costs, but rather their easiness to recover loans, as well as profit opportunities in the non-agricultural sector.

Adequate crop storage facilities also permit to reduce production costs and improve competitiveness in all sectors, less dairy. This is a representative indicator of agriculture-specific infrastructure. We find no significant effect of general infrastructure indicators, such

as the share of paved roads, the capacity of ports, or the quality of water and power supply (results not displayed).

Last, we focus on the effect of public policies. Inflation reduces competitiveness as it increases domestic production costs. Reducing the number of administrative procedures and their length (number of procedures and days to start a business) also has a positive effect on competitiveness. We find a similar effect of large spending on agricultural policies. Public investment in agricultural research and development (R&D) has a positive effect on competitiveness only in the sheep & goats sectors. Since agriculture is not a highly intensive R&D sector, overall public investment in R&D and advanced technologies most likely improve productivity and competitiveness in industrial and service sectors, to the detriment of agricultural and food sectors. This explains the negative effect of the last variable in Table 5.

Note that results in Tables 5 reflect general tendencies observed for the overall group of exporting countries considered in the analysis. Additional or different tendencies may be found for smaller groups of similar countries. In other words, our results may omit mechanisms that what improve the competitiveness of, say Brazil, but not that of France, and *vice versa*.

## 6 – Conclusion

This paper presents an overview of the global animal sector with a focus on French exports to the world market and to the EU market. We adopt a definition of competitiveness that relies on countries' export performance. More specifically, we follow Gaulier *et al.* (2013) and Cheptea *et al.* (2014) and measure competitiveness as the evolution of export market shares, adjusted by structural effects. The geographic and sectoral structure of a country's exports may greatly affect the evolution of its exports. They reflect the evolution of demand of specific importers and of global demand for specific products, and, therefore, cannot be attributed to exporter's competitiveness. In a second stage, the contribution of different factors to this estimated competitiveness is analyzed and discussed.

Over the 2000-2016 period, France lost half of its market share in animal products, significantly more than its main European competitors, including Germany and Netherlands. The deterioration of France's competitiveness explains only half of its market share losses, both on the global and on the EU market. On the global market, the other half is mostly due to the orientation of French exports to destination markets with a declining or slowly growing demand. On the EU market, the unfortunate choice of destination markets and the underrepresentation of products with a strong European demand in the product composition of French exports are equally responsible for the rest of the market share loss.

France suffered the largest market share losses in poultry and pork products. These sectors also registered the highest drop in competitiveness. The dairy sector shows the strongest resilience, France conserving 9% of the world market, *i.e.* more than the double of its share in other animal products. Our work concludes with an analysis of factors that explain countries' competitiveness or lack thereof. We find that loose access to export markets (*e.g.* fewer price and quantity controls type of non-tariff measures), low production costs, good infrastructures, and simplified administrative procedures and efficient spending on agricultural policies are the main drivers of countries' competitiveness in international markets for animal products.

## Bibliography

- BACI, International Trade Database at the Product-Level, Cepii. [http://www.cepii.fr/cepii/en/bdd\\_modele/presentation.asp?id=1](http://www.cepii.fr/cepii/en/bdd_modele/presentation.asp?id=1)
- Bricongne, J.C., Fontagne, L., Gaulier, G., Taglioni, D. and Vicard, V. (2012). Firms and the Global Crisis: French exports in the turmoil. *Journal of International Economics* 87(1): 134-146.
- Castellani, D. and Koch, A. (2015). Mapping competitiveness with European data. Bruegel Blueprint, Bruegel, pp185. ISBN 9789078910367
- Chatellier, V., Magdelaine, V. and Trégaro Y. (2015). La compétitivité de la filière volaille de chair française : entre doutes et espoirs. *INRA Productions Animales* 28 (5): 411-428
- Cheptea, A., Gaulier, G. and Zignago, S. (2005). World Trade Competitiveness: A Disaggregated View by Shift-Share Analysis. CEPII Working Paper 2005-23.
- Cheptea, A., Fontagné, L. and Zignago, S. (2014). European export performance. *Review of World Economics* 150: 25–58.
- European Commission (2012). European Competitiveness Report 2011, European Commission, Brussels.
- Gaulier, G., Santoni, G., Taglioni, D. and Zignago, S. (2013). Market shares in the wake of the global crisis: The quarterly export competitiveness database. Bank of France, Working paper series 472.
- Hatzichronoglou, T. (1996). Globalisation and Competitiveness: Relevant Indicators. OECD Science, Technology and Industry Working Papers 1996/05
- Osbat, C., Zollino, F., Aiello, G., Bluhm, B., Buelens, C., Cavallini, F. Joseph, A., Leonte, A., Lommatzsch, K., Momchilov, G., Giord (2015). Compendium on the diagnostic toolkit for competitiveness. Occasional Paper Series 163, European Central Bank.
- Latruffe, L. (2010). Competitiveness, Productivity and Efficiency in the Agricultural and Agri-Food Sectors. OECD Food, Agriculture and Fisheries Papers, No. 30, OECD Publishing, Paris.
- Schwab, K. and Sala-i-Martin, X. (2017). The Global Competitiveness Report 2017-2018, Geneva, Switzerland: World Economic Forum.
- Wijnands, J.H.M. and Verhoog, D. (2016). Competitiveness of the EU food industry: Ex-post assessment of trade performance embedded in international economic theory. Wageningen, LEI Wageningen UR, LEI Report 2016-018.
- World Bank, Measuring Export Competitiveness: <https://mec.worldbank.org/>

## Appendix

**Table A1: Intensive and extensive trade margins**

sector	Global trade		French exports	
	extensive margin	intensive margin	extensive margin	intensive margin
Animal products	1.15	98.85	0.83	99.17
Dairy	-0.48	100.48	-0.82	100.82
Cattle & beef	3.61	96.39	14.49	85.51
Swine & pork	1.09	98.91	-0.40	100.40
Poultry	2.22	97.78	-16.88	116.88
Sheep & goats	-7.12	107.12	15.86	84.14
Other	4.38	95.62	-1.00	101.00
Cereals	7.14	92.86	1.10	98.90
Fruit & vegetables	0.63	99.37	1.63	98.37
Oleaginous	3.54	96.46	-4.73	104.73
Sugar	11.88	88.12	-50.51	150.51
Wines	0.48	99.52	-0.04	100.04
Other	2.12	97.88	-1.10	101.10

Source: Authors' computations using data from BACI. Only countries accounting for 1% or more of world exports in 2000 or 2016 are reported.

**Table A2: The list of product codes in the animal products sector, by group of products**

Group	HS 6 code	Short description
Dairy	040110	Milk not concentrated nor sweetened < 1% fat
	040120	Milk not concentrated nor sweetened 1-6% fat
	040130	Milk and cream not concentrated nor sweetened < 6% fat
	040210	Milk powder < 1.5% fat
	040221	Milk and cream powder unsweetened < 1.5% fat
	040229	Milk and cream powder sweetened < 1.5% fat
	040291	Milk and cream unsweetened, concentrated
	040299	Milk and cream nes sweetened or concentrated
	040310	Yogurt
	040390	Buttermilk, curdled milk, cream, kephir, etc.
	040410	Whey
	040490	Natural milk products nes
	040500	Butter and other fats and oils derived from milk
	040610	Fresh cheese, unfermented whey cheese, curd
	040620	Cheese, grated or powdered, of all kinds
	040630	Cheese processed, not grated or powdered
	040640	Cheese, blue-veined
	040690	Cheese except fresh, grated, processed or blue-veined
	170210	Lactose and lactose syrup
	190110	Infant foods of cereals, flour, starch or milk
220290	Non-alcoholic beverages nes, except fruit, veg juices	
350110	Casein	

Group	HS 6 code	Short description
Cattle & beef	010210	Bovine animals, live pure-bred breeding
	010290	Bovine animals, live, except pure-bred breeding
	020110	Bovine carcasses and half carcasses, fresh or chilled
	020120	Bovine cuts bone in, fresh or chilled
	020130	Bovine cuts boneless, fresh or chilled
	020210	Bovine carcasses and half carcasses, frozen
	020220	Bovine cuts bone in, frozen
	020230	Bovine cuts boneless, frozen
	020610	Bovine edible offal, fresh or chilled
	020621	Bovine tongues, frozen
	020622	Bovine livers, frozen
	020629	Bovine edible offal, frozen except livers and tongues
	021020	Bovine meat salted, dried or smoked
	160250	Bovine meat, offal nes, not livers, prepared/preserved



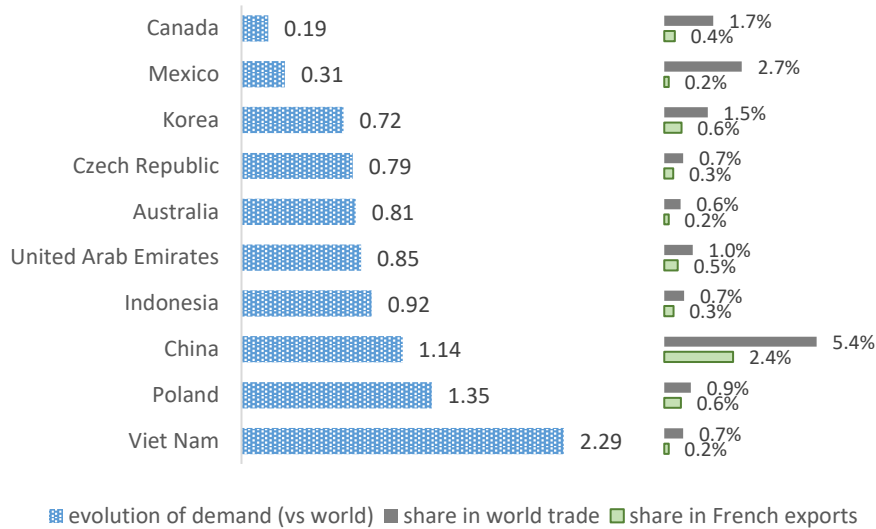
Group	HS 6 code	Short description
Swine & pork	010310	Swine, live pure-bred breeding
	010391	Swine, live except pure-bred breeding < 50 kg
	010392	Swine, live except pure-bred breeding > 50 kg
	020311	Swine carcasses and half carcasses, fresh or chilled
	020312	Swine hams, shoulders & cuts bone in, fresh or chilled
	020319	Swine cuts, fresh or chilled, nes
	020321	Swine carcasses and half carcasses, frozen
	020322	Hams, shoulders and cuts, of swine, bone in, frozen
	020329	Swine cuts, frozen nes
	020630	Swine edible offal, fresh or chilled
	020641	Swine livers, frozen
	020649	Swine edible offal, frozen except livers
	021011	Hams and shoulders, swine, salted, dried or smoked
	021012	Bellies (streaky) of swine, salted, dried or smoked
	021019	Swine meat, salted/dried/smoked not ham/shoulder/bell
	160100	Sausages, similar products of meat, meat offal & blood
	160241	Swine hams & cuts thereof, prepared or preserved
	160242	Swine shoulders & cuts thereof, prepared or preserved
	160249	Swine meat or offal nes, prepared,preserved, not live

Group	HS 6 code	Short description
Poultry	010511	Fowls, live domestic < 185 grams
	010519	Poultry, live except domestic fowls, < 185 grams
	010591	Fowls, live domestic > 185 grams
	010599	Poultry, live except domestic fowls, > 185 grams
	020710	Poultry, domestic, whole, fresh or chilled
	020721	Fowls, domestic, whole, frozen
	020722	Turkeys, domestic, whole, frozen
	020723	Ducks, geese and guinea fowls, domestic, whole, frozen
	020731	Fatty livers (geese,ducks) domestic fresh or chilled
	020739	Poultry cuts & offal, except livers, fresh or chilled
	020741	Fowl cuts & offal, domestic, except livers, frozen
	020742	Turkey cuts & offal, except livers, frozen
	020743	Duck, goose, guinea fowl cuts, offal not liver, froze
	020750	Poultry livers, domestic, frozen
	021090	Meat and edible meat offal cured, flours, meals nes
	040700	Birds eggs, in shell, fresh, preserved or cooked
	040811	Egg yolks dried
	040819	Egg yolks except dried
	040891	Eggs, bird, not in shell, dried
	040899	Eggs, bird, not in shell not dried
	160231	Turkey meat, offal prepared or preserved, except live
	160239	Fowl, duck,goose, offal, prepared, preserved not live

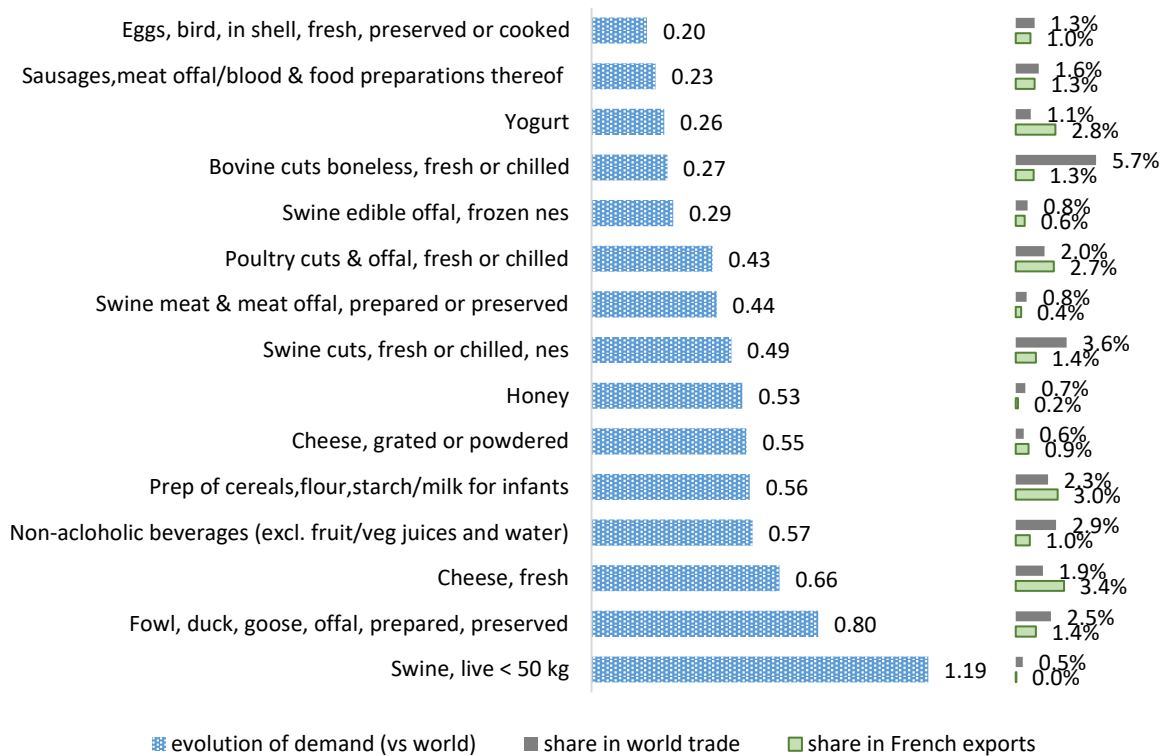
Group	HS 6 code	Short description
Sheep & goats	010410	Sheep, live
	010420	Goats, live
	020410	Lamb carcasses and half carcasses, fresh or chilled
	020421	Sheep carcasses and half carcasses, fresh or chilled
	020422	Sheep cuts, bone in, fresh or chilled
	020423	Sheep cuts, boneless, fresh or chilled
	020430	Lamb carcasses and half carcasses, frozen
	020441	Sheep carcasses and half carcasses, frozen
	020442	Sheep cuts, bone in, frozen
	020443	Sheep cuts, boneless, frozen
	020450	Goat meat, fresh, chilled or frozen
	020680	Sheep, goat, ass, mule, hinnie offal, fresh or chilled
	020690	Sheep, goat, ass, mule, hinnie edible offal, frozen

Group	HS 6 code	Short description
Other animal products	010111	Horses, live pure-bred breeding
	010119	Horses, live except pure-bred breeding
	010120	Asses, mules and hinnies, live
	010600	Animals, live, except farm animals
	020500	Horse, ass, mule, hinny meat, fresh, chilled or frozen
	020810	Rabbit or hare meat, offal, fresh, chilled or frozen
	020820	Frog legs, fresh, chilled or frozen
	020890	Meat and edible offal nes fresh, chilled or frozen
	020900	Pig and poultry fat, unrendered
	040900	Honey, natural
	041000	Edible products of animal origin nes
	150100	Lard, other pig fat and poultry fat, rendered
	150200	Bovine, sheep and goat fats, raw or rendered
	150300	Lard stearin, oleostearin & oils, natural tallow oil
	150430	Marine mammal fats, oils, etc. not chemically modified
	151610	Animal fats, oils, fractions, hydrogenated, esterified
	160210	Homogenized preparations of meat and meat offal
	160220	Livers of any animal prepared or preserved
	160290	Meat, meat offal and blood, prepared or preserved, nes

**Figure A1: Most dynamic import markets and traded animal products**



**a) Destination markets with the highest imports growth over 2000-2016**



**b) Products with the highest growth of global demand over 2000-2016**

Source: Authors' computations using data from BACI.

Notes: The evolution of demand (vs global) by destination markets corresponds to the sum of country-specific fixed effects in eq.(2) over the analysed period:  $\sum_t \beta_j^t$ . It reflects the difference between the evolution of each market's demand for imports and the evolution of global trade. The evolution of demand (vs global) by products corresponds to the sum of product-specific fixed effects in eq.(2) over the analysed period:  $\sum_t \gamma_j^t$ . It reflects the difference between the evolution of global demand for each product and the evolution of global trade.

**Table A3: Decomposition of market share evolutions by product groups**

Exporter	market share 2016	2000-2016 change	mkt share evolution	competitiveness	geographic structure	product mix
<b>DAIRY</b>						
<b>EU28</b>	<b>62.21</b>	<b>-9.80</b>	<b>-0.15</b>	<b>-0.11</b>	<b>-0.08</b>	<b>0.04</b>
Netherlands	11.87	-0.61	-0.05	-0.08	0.02	0.00
Germany	11.57	-3.50	-0.26	-0.18	-0.14	0.06
<b>France</b>	<b>8.83</b>	<b>-3.37</b>	<b>-0.32</b>	<b>-0.22</b>	<b>-0.14</b>	<b>0.03</b>
Ireland	5.22	-0.81	-0.14	-0.18	-0.05	0.09
Belgium & Luxembourg	4.07	-1.40	-0.30	-0.09	-0.18	-0.02
Italy	3.70	0.81	0.25	0.28	-0.18	0.15
Denmark	3.16	-1.78	-0.45	-0.56	0.03	0.08
Poland	2.50	1.64	1.03	1.16	0.01	-0.14
Austria	2.18	-0.03	-0.01	-0.08	-0.15	0.21
United Kingdom	2.07	-1.27	-0.48	-0.48	0.03	-0.03
Spain	1.74	-0.14	-0.08	0.04	-0.29	0.17
New Zealand	10.41	2.32	0.25	0.28	0.21	-0.24
United States of America	5.65	2.26	0.51	0.43	0.01	0.06
Switzerland	2.85	1.42	0.68	0.52	-0.08	0.24
Australia	2.46	-3.02	-0.80	-0.86	0.21	-0.15
Belarus	2.16	1.74	1.62	2.11	-0.30	-0.19
Thailand	1.76	1.40	1.57	1.10	0.22	0.26
Saudi Arabia	1.37	1.03	1.35	0.55	0.81	-0.02
United Arab Emirates	1.10	0.92	1.72	1.66	0.15	-0.09
Argentina	0.94	-0.19	-0.20	0.66	-0.67	-0.18
<b>CATTLE &amp; BEEF</b>						
<b>EU28</b>	<b>31.52</b>	<b>-4.43</b>	<b>-0.13</b>	<b>0.15</b>	<b>-0.19</b>	<b>-0.09</b>
Netherlands	5.24	-1.18	-0.20	-0.08	-0.26	0.14
<b>France</b>	<b>4.82</b>	<b>-3.81</b>	<b>-0.58</b>	<b>0.25</b>	<b>-0.39</b>	<b>-0.43</b>
Ireland	4.43	-0.74	-0.15	0.04	-0.37	0.18
Germany	3.80	-2.14	-0.45	-0.37	0.00	-0.07
Poland	2.55	1.94	1.39	1.84	-0.18	-0.28
Spain	1.79	0.04	0.02	0.46	-0.32	-0.12
Belgium & Luxembourg	1.70	-0.34	-0.18	0.14	-0.21	-0.11
Italy	1.33	0.13	0.10	0.11	-0.04	0.03
Austria	1.13	0.01	0.01	0.20	-0.07	-0.12
United Kingdom	1.11	0.84	1.36	1.24	-0.06	0.18
Denmark	0.76	-0.69	-0.64	-0.52	-0.19	0.07
Australia	14.21	1.77	0.13	0.01	0.04	0.08
United States of America	11.49	-9.69	-0.34	0.25	-0.78	0.18
Brazil	10.34	6.51	0.98	0.62	0.28	0.08
India	6.93	5.32	1.43	1.13	0.31	0.00
Canada	5.32	-4.90	-0.64	-0.16	-0.37	-0.11
New Zealand	4.19	0.41	0.10	0.10	-0.04	0.04
Mexico	3.32	1.23	0.45	1.33	-0.43	-0.45
Uruguay	3.30	1.28	0.48	0.31	0.11	0.06
Argentina	2.32	-1.04	-0.33	-0.84	0.32	0.19
Paraguay	2.14	1.67	1.40	1.48	-0.27	0.20

**Table A3: Decomposition of market share evolutions by product groups (cont'd)**

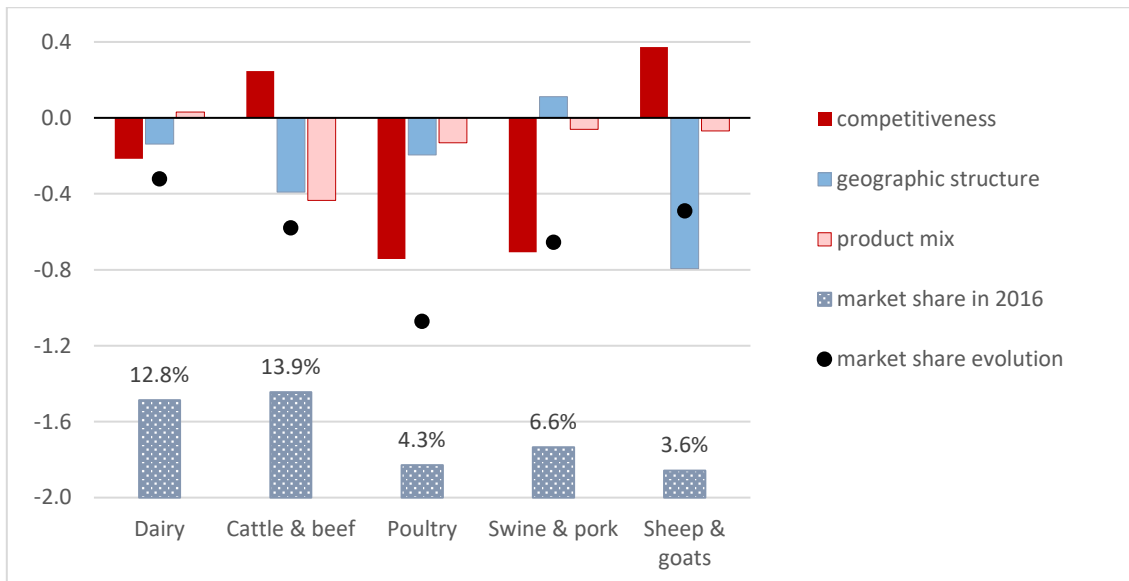
Exporter	market share 2016	2000-2016 change	mkt share evolution	competitiveness	geographic structure	product mix
<b>SWINE &amp; PORK</b>						
<b>EU28</b>	<b>69.48</b>	<b>-1.33</b>	<b>-0.02</b>	<b>0.02</b>	<b>-0.04</b>	<b>0.00</b>
Germany	15.12	8.24	0.78	0.75	0.02	0.01
Spain	11.08	5.76	0.73	1.16	-0.43	0.00
Denmark	10.06	-9.07	-0.64	-0.70	-0.01	0.07
Netherlands	8.81	-5.15	-0.46	-0.55	0.04	0.06
Belgium & Luxembourg	4.20	-2.85	-0.52	-0.36	-0.07	-0.09
Italy	4.10	0.82	0.22	0.60	-0.30	-0.08
<b>France</b>	<b>3.31</b>	<b>-3.08</b>	<b>-0.66</b>	<b>-0.71</b>	<b>0.11</b>	<b>-0.06</b>
Poland	3.30	2.52	1.38	1.52	0.13	-0.27
Ireland	1.89	0.11	0.06	0.07	-0.05	0.04
Austria	1.76	0.38	0.24	0.22	0.00	0.02
Hungary	1.39	-0.47	-0.29	-0.37	0.14	-0.07
United Kingdom	1.33	-0.49	-0.26	-0.66	0.43	-0.04
United States of America	14.02	1.66	0.12	-0.44	0.53	0.03
Canada	7.41	-2.83	-0.32	-0.16	-0.31	0.14
Brazil	3.58	2.31	1.01	1.82	-0.44	-0.37
Mexico	1.15	-0.60	-0.42	-0.15	-0.32	0.05
Chile	1.02	0.67	1.06	1.39	-0.26	-0.08
<b>POULTRY</b>						
<b>EU28</b>	<b>46.85</b>	<b>-2.56</b>	<b>-0.05</b>	<b>0.26</b>	<b>-0.36</b>	<b>0.06</b>
Netherlands	11.24	-3.00	-0.23	0.13	-0.50	0.13
Germany	7.03	2.19	0.37	0.59	-0.36	0.14
Poland	6.07	5.23	1.93	2.52	-0.59	0.00
<b>France</b>	<b>4.47</b>	<b>-8.63</b>	<b>-1.07</b>	<b>-0.74</b>	<b>-0.20</b>	<b>-0.13</b>
Belgium & Luxembourg	3.30	-0.02	-0.01	0.11	-0.25	0.14
United Kingdom	2.32	-1.04	-0.37	-0.26	-0.15	0.05
Hungary	2.23	-0.31	-0.13	0.49	-0.54	-0.08
Spain	1.69	0.41	0.27	0.24	-0.04	0.07
Italy	1.41	0.32	0.24	0.57	-0.32	-0.02
Denmark	1.38	-0.69	-0.40	-0.31	-0.09	0.00
Ireland	0.95	-0.14	-0.14	0.17	-0.57	0.26
Brazil	19.07	9.70	0.70	0.91	0.14	-0.36
United States of America	11.09	-9.07	-0.60	-1.27	0.74	-0.07
Thailand	8.00	1.28	0.18	0.16	-0.41	0.43
China	3.69	-3.81	-0.72	-0.95	-0.23	0.46
Turkey	1.78	1.66	2.54	1.48	1.31	-0.25
Canada	1.36	-0.07	-0.05	-1.73	1.60	0.08
Chile	1.11	0.70	0.96	0.87	0.43	-0.33
Malaysia	1.08	-0.28	-0.23	-0.45	-0.11	0.33

**Table A3: Decomposition of market share evolutions by product groups (cont'd)**

Exporter	market share 2016	2000-2016 change	mkt share evolution	competitiveness	geographic structure	product mix
<b>SHEEP &amp; GOATS</b>						
<b>EU28</b>	<b>26.75</b>	<b>-3.99</b>	<b>-0.14</b>	<b>0.74</b>	<b>-0.69</b>	<b>-0.18</b>
United Kingdom	6.74	-4.97	-0.50	0.50	-0.90	-0.10
Spain	4.69	2.19	0.62	1.73	-0.88	-0.24
Ireland	3.72	-1.76	-0.39	0.44	-0.82	0.00
Romania	3.25	1.90	0.86	1.77	0.01	-0.91
Netherlands	2.65	0.44	0.17	1.08	-0.74	-0.16
<b>France</b>	<b>1.50</b>	<b>-0.94</b>	<b>-0.49</b>	<b>0.37</b>	<b>-0.79</b>	<b>-0.07</b>
Belgium & Luxembourg	1.01	-0.10	-0.10	-0.11	-0.25	0.26
Germany	0.91	-0.14	-0.15	0.10	-0.30	0.05
Hungary	0.65	-0.63	-0.68	1.49	-1.20	-0.97
Australia	31.86	8.35	0.30	-0.20	0.40	0.11
New Zealand	28.80	-2.39	-0.08	-0.13	-0.19	0.25
India	2.94	2.20	1.31	0.04	0.93	0.33
Jordan	1.78	1.44	3.00	3.25	0.61	-0.86
Ethiopia	1.47	1.34	2.16	1.47	0.60	0.10
Iran	1.11	-0.02	0.89	1.33	0.06	-0.50
Uruguay	0.72	-0.65	-0.67	-1.52	0.90	-0.05
United States of America	0.40	-1.07	-1.30	-0.71	-0.40	-0.19
Sudan	0.19	-2.70	-1.17	-0.61	0.37	-0.94
Syrian Arab Republic	0.01	-3.43	-4.85	-4.45	0.50	-0.91

Source: Authors' computations using data from BACI. Only countries accounting for 1% or more of world exports in 2000 or 2016 are reported.

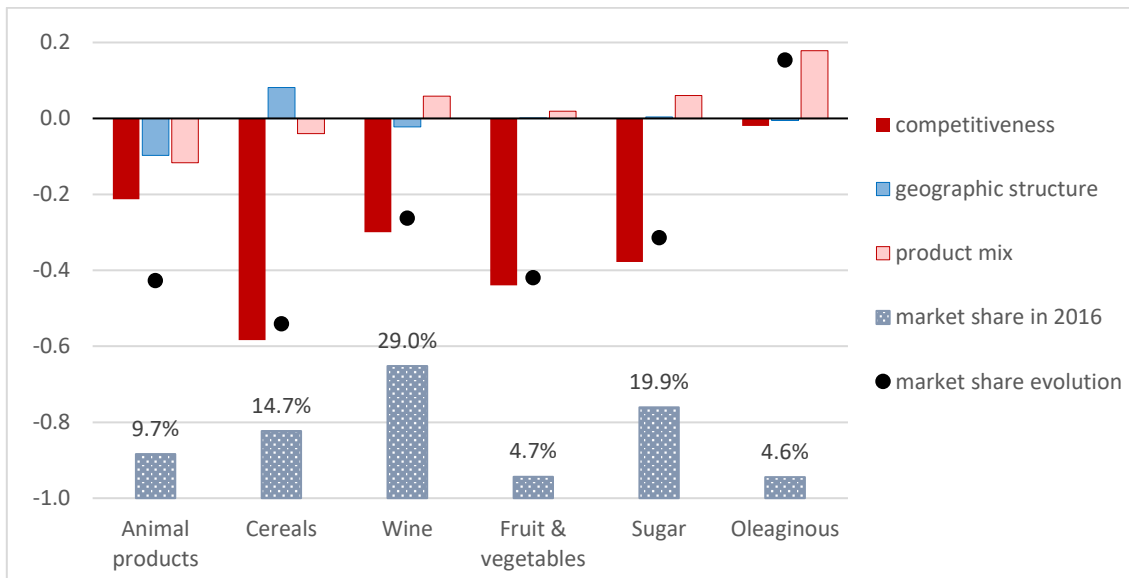
**Figure A2: French competitiveness on the EU market by groups of animal products, 2000-2016**



Source: Authors' computations using data from BACI.

Notes: Market shares in 2016 are labelled on a separate (not displayed) vertical axis.

**Figure A3: French competitiveness on the EU market, across agri-food sectors, 2000-2016**



Source: Authors' computations using data from BACI.

Notes: Market shares in 2016 are labelled on a separate (not displayed) vertical axis.

**Table A4: Definition of variables and data sources**

Variable	Data source	Years	Countries
Trade flows	BACI, CEPII	2000-2016	122
Trade policy costs			
Import tariff (weighted average across partners and products)	TRAINS	2012-2016	122
Number of non-tariff measures (weighted average across partners and products), separately by type of NTM (SPS, TBT, ...)	WITS	2012-2016	122
Exchange rate			
Real effective exchange rate index	IMF	2001-2016	74
Productivity			
Agricultural value added (million US\$)	World Development Indicators, World Bank	2001-2016	120
Agricultural value added (% GDP)	World Development Indicators, World Bank	2001-2016	120
Agricultural value added per worker (million US\$)	World Development Indicators, World Bank	2001-2016	120
Cereal yield (ton/ha)	World Development Indicators, World Bank	2001-2016	119
Volatility of agricultural production	Global Food Security Index, Economist Intelligence Unit	2012-2016	94
Output per worker (million US\$)	World Development Indicators, World Bank	2001-2016	120
Technology			
Agricultural machinery (tractors per km <sup>2</sup> of arable land)	World Development Indicators, World Bank	2001-2009	55
Availability of latest technology (1 to 7, 7=to a great extent)	World Economic Forum, Executive Opinion Survey	2007-2016	115
Firm-level technology absorption (1 to 7, 7=to a great extent)	World Economic Forum, Executive Opinion Survey	2007-2016	115
Production costs			
Access to financing for farmers (0 to 4, 4=very easy access)	Global Food Security Index, Economist Intelligence Unit	2012-2016	94
Ease of access to loans (1 to 7, 7=extremely easy)	World Economic Forum, Executive Opinion Survey	2007-2016	115
Redundancy costs (weeks of salary)	World Economic Forum, Executive Opinion Survey	2007-2016	109
Monthly earnings of employees in agriculture	International Labor Organisation, ILOSTAT	2001-2016	58
Credit to agriculture (million US\$)	Food and Agriculture Organisation, FAOSTAT	2001-2016	81
Soundness of banks (index)	World Economic Forum, Executive Opinion Survey	2007-2016	112
Existence of adequate crop storage facilities (dummy, 1=yes)	Global Food Security Index, Economist Intelligence Unit	2012-2016	94
Public policies			
Inflation (%)	World Development Indicators, World Bank	2001-2016	119
Number of procedures to start a business	Doing Business Indicators, World Bank	2007-2016	111
Number of days to start a business	Doing Business Indicators, World Bank	2007-2016	111
Agricultural policy costs (1 to 7, 7 = balances well the interests of taxpayers, consumers, and producers)	World Economic Forum, Executive Opinion Survey	2007-2016	115
Public expenditure on agricultural R&D (1 to 9, 9=very high)	Global Food Security Index, Economist Intelligence Unit	2012-2016	94
R&D (research & development) expenditure (% of GDP)	International Labor Organisation, ILOSTAT	2001-2015	81