

RESEARCH

Open Access



Recent trends in agri-food Made in Italy exports

Anna Carbone¹ and Roberto Henke^{2*} 

*Correspondence:
roberto.henke@crea.gov.it

¹ University of Tuscia, Viterbo,
Italy

² CREA - Research Center
for Policies and Bioeconomy,
Rome, Italy

Abstract

The agri-food sector is a key component of the Italian economy and the Made in Italy products are altogether the core of it with a strong export propensity. This paper analyses the recent export performance of the Made in Italy as a whole and at product level. The analysis is based on the conjoint measure of export specialization (RCA) and sophistication (Prody). Results show that the Made in Italy aggregate is performing well but, at the same time, which single products face significant difficulties. On the one hand, this is the case for those items for which Italy is improving its specialization, but international competition is increasingly based on price, thus reducing profitability (e. g. prepared vegetables, chocolate products, blue cheeses). On the other hand, there are products whose sophistication is growing, and remuneration perspectives rise with it, but for which Italy is eroding its comparative advantage (e. g. ice creams, pasta, grape and wine > 2lt).

Keywords: Export specialization, Trade sophistication, Prody index, Italy, Agri-food trade

Introduction

Agri-food international suppliers are increasingly focused on product diversification with respect to a variety of attributes, especially when they intend to compete on the global arena through non-price strategies. Quality plays a key role in successfully positioning a product on specific market segments, and particularly on high-income and fast-growing markets (Fontagnè et al. 1999). With regard to agricultural and food products, quality and differentiation are frequently investigated as factors determining non-price competitiveness (Fisher 2010; Carraresi and Banterle 2015). Unit value indices have been widely used as proxies of quality of export flows, despite their limits and drawbacks have been also acknowledged (Gehlhar and Pick 2002; Ninni et al. 2006; Schott 2004). The concept of sophistication and the related indices have been also largely studied as an effective way to measure quality, both on the export and the import sides (Lall et al. 2006; Hausmann et al. 2007; Carbone et al. 2020). Product sophistication is defined as the content of a good in terms of technology, design, intrinsic quality, branding, scale economies and any other factors affecting final value (Lall et al. 2006). Sophistication is, then, seen as a major export driver in competitive markets, along with other innovative

elements such as logistics and digitalization (Remondino and Zanin 2022; Scuderi and Sturiale 2015).

On the track of recent studies elaborating on the concept of trade sophistication, this paper analyses the dynamics of Italian food exports applying sophistication indices together with a more traditional measure of export specialization (Carbone and Henke 2012; Carbone et al. 2015). The focus is on a group of Italian agri-food items which are internationally recognized as “Made in Italy” (MiI from now on), characterized by a positive trade balance and with a strong identification on the world market as “Italian,” together with other non-agri-food products such as fashion, cars, design items and furniture, and so on. This set of products is characterized by a higher income elasticity and for them the international competitiveness is largely based on specific attributes other than price (Carbone et al 2015).

Italy is an important player in the international food market and has developed a global food industry with a world-wide reputation for high quality (for example wine, cheese, olive oil, pasta, processed coffee, and so on) (Fortis and Sartori 2016). In time, the MiI food exports have increasingly limited the negative trade balance of the Italian agri-food sector, contributing to reduce the financial burden of agri-food imports. In recent years, the overall trade balance has turned slightly positive, thanks also to the contribution of the agri-food exports. As a matter of fact, the performance of Italian agri-food exports on world markets has quite substantially varied over time. During the Eighties and the beginning of the Nineties the quality of Italian exports was largely inadequate to meet the international demand. Later on, in the mid-Nineties, Italian exporters gained larger market shares thanks to a generous exchange rate policy. The strategy had proved to be fruitful both in terms of new markets conquered and growth of the export flows (Antimiani and Henke 2005 and 2007; Antimiani et al. 2012; Crescimanno et al. 2013; Carbone et al. 2015). In the last 20 years, the whole Italian agri-food sector made a significant effort to improve quality and the strategy proved to be successful in terms of export growth, so much that the net balance shifted from decisively negative into slightly positive in the last few years, following a constant upward trend (CREA, 2020). The MiI aggregate—which encompasses a few fresh agricultural products and many processed food items as well as some beverages—accounted for 35.5 billion Euros of exports in 2019–20 while it was 27.1 in 2010–11, with a grow rate of 30.8% in the period. This is a much higher growth compared to the non-MiI aggregate which grew by 25.5% ¹. However, for the same two aggregates, when we look at the world exports, we find that the growth for the MiI goods was even larger (32.5%) while the non-MiI increased at a slower pace (20.9%) compared to the Italia ones. Based on these data, we posit that: (i) other countries did better in selling around the world products that we consider typical and strategic for the Italian food exports; or, put it differently, the observed growth is basically explained by an increasing demand to which Italy is capable to comply only partially; (ii) Italy itself is doing better than competitors in exporting non-MiI goods.

The main goal of this paper is to formulate a categorization of the performance's dynamics of MiI exports on the international markets, which is assessed through to the

¹ The detailed list of goods included in the two aggregates is shown in the annex at the end of the paper.

combined effect of a sophistication index based on export data (Prody index), and a traditional measure of the exports' specialization based on a classic Balassa index (Index of revealed compared advantages—RCA).

Despite a large literature on the main sources of competitiveness of the Italian exports, there is a lack of in-depth and updated analyses looking at the Italian agri- food export dynamics from a comprehensive medium-long term perspective. This paper tries to fill this gap. We look at the dynamics of the performance of Italian food exports both at a general (MiI) and at a detailed product level.

The paper is organized as follows: Sect. 2 analyses the background and previous results based on the concept of export sophistication. Section 3 presents the methodology used in the paper. Results are discussed in Sect. 4, while Sect. 5 concludes.

Background

The analysis of the recent literature shows that the role of quality in the trade of agri-food MiI products has not received large attention (Fortis and Sartori 2016). Some work on international competition has been done but only with regards to specific MiI products, some of which are particularly relevant for Italy, such as wine and olive oil. In the case of wine, Agostino and Trivieri (2014)—moving from the seminal work of Linder (1961) and other more empirical works on quality and trade²—discuss about quality as an unobserved attribute of exported goods. Unlike most contributions, that used unit values as a proxy of quality, their work is based on the Geographical Indications (GIs) as a proper proxy for quality. They demonstrate that GIs are associated with higher values of exports, especially on high-income destination markets, and represent a spendable factor in the competition with new exporters on the international market. Looking at the traditional European exporters, there is particularly positive evidence in the case of France, which seems to take better advantage of higher quality wines to create new export routes, while Italy and Spain do not seem to benefit to the same extent. All in all, the positive effect of quality on wine exports can be perceived both on the demand and on the supply side: on the demand side because consumers trust quality labels and certifications of origin; on the supply side because quality is able to differentiate goods and pays off on the export markets (Agostino and Trivieri 2014).

Tasgodan et al. (2005) have investigated mainly price competition and market power in olive oil exports of the main EU producers, exporters, and consumers: Spain, Italy and Greece. This work mainly focuses on indicators of market power in the EU olive oil market, based on real exchange rates at the time before euro, and shows how Italy in the last decades for the twentieth century had a higher market power compared to its competitors, dominating the price. In the same time span, Greece and Spain had a strong competitive relationship on the European and world markets, but both were influenced by Italian prices and by the behavior of Italian producers and exporters. A later paper by Türkekul et al. (2010) extended the analysis of competitiveness to other Mediterranean countries (Turkey and Tunisia, besides Italy, Spain, and Greece) and equally focused mainly on price competitiveness, while the issue of quality had been only marginally

² The authors refer to the reviews of McPherson et al (2001) and Crozet et al. (2010).

considered and treated mainly as a technical agronomic issue (cultivars, irrigation, and so on). However, in the case of Tunisia, the authors stress how the lack of a leading brand name in the sector is one of the main causes of its low world competitiveness and inability to occupy larger shares of the world market (Türkekul et al. 2010).

Quite surprisingly, not many works have focused on the case of pasta, despite Italy is basically the most relevant producer and exporter, deeply influencing price and quality levels in the world market. In previous works (Carbone and Henke 2012; Carbone et al. 2015) pasta was presented as one of the strong “identity” products among the Made in Italy cluster of agri-food products, for which Italy showed a good position in the international arena and the product a higher level of sophistication. However, in a study at the national level (De Filippis 2012), it emerged that for a long while Italy paid little attention to the issue of quality, especially on markets where the consumption of pasta is rather limited, while its focus had been mostly on countries where consumption is larger, due to large Italian communities or an affirmed HoReCa industry (e.g., United States, Canada, Germany). More recently, there seems to be a more careful strategy based on quality also in rising markets, such as the far East. This was also confirmed by an analysis of the sophistication of MiI agri-food exports coupled with the more traditional analysis of the elasticities of exports to the world demand and to unit values (Carbone et al. 2015). The paper also focused on wine and olive oil showing how Italy played different roles with respect to different varieties within the same product, thus differentiating its competitive strategies in the world markets.

Many works have shown how the performance of Italian agri-food exports on the world market has been quite variable over time (Carbone and Henke 2012; Antimiani et al. 2012; Carbone et al. 2015, 2021). However, not many works have so far specifically investigated the interlinks between the sophistication attributes of the goods and their performance on the international markets. Carbone et al. (2015) have highlighted the positioning of the MiI agri-food export flows on the international markets looking both at the global and at the country-specific trends and working specifically on price competition and on quality elements as drivers of competitive advantages. Results have showed that there is an evident differentiation of behaviors according to the selection of products included in the MiI set. Although the aggregate seems in general quite competitive and keeps a relevant position on the international markets, other elements represent an alarm bell for the overall performance, such as counting on low prices on dynamic markets or markets where technology is rapidly evolving (Balogh and Jambor 2018).

Interesting work has been done on the determinants of competitiveness in EU countries by Carraresi and Banterle (2015). The authors focus on elements that help to keep and increase market shares of EU partners over time, looking at other competitors on the global market. They show how, despite agriculture and food industry are interlinked, their trends and determinants of competitiveness are often diverse. The general competitive performance seems to be mainly driven by the production and processing specialization of each country and by the rate of openness to exports of their economy.

Finally, specific work on sophistication and performance of Italian food exports has been carried out by Carbone and Henke (2012 and 2021), and the present analysis follows those results. First, the authors showed how the concept of sophistication fits well with the MiI agri-food products given how relevant quality, product segmentation,

food safety and other quality features are (e.g., Geographical Indications). In short, those results highlighted that the core of Mil agri-food exports was in good health with increasing sophistication levels and with Italy enjoying high and increasing revealed competitive advantages. However, some weaknesses also emerged with some products for which Italy had not been able to catch-up the intense quality-based competition. These exports have an overall less strong Italian identity and/or are less rooted in place of origin and traditional local culture. Differently, for other products results showed that worldwide re-localization processes did lead poorer countries, basically competing on a price base, to challenge Italian exporters' gain possibilities.

Methodology and data

The Prody index associates the concept of product sophistication to the level of wealth of the exporters of each good. Wealth is measured by the level of per capita GDP of the exporting countries (Lall et al. 2006; Hausmann, et al. 2007). The relationship implied is as follows: Richer countries are better endowed for producing high quality goods from many points of view such as human capital, technology, branding, infrastructures and so on and so forth (Sadeghi and Biancone 2018). In turn, the export specialization in sophisticated high-quality products places countries in markets different than perfect competition would. In this case, prices are higher, hence remuneration is greater, which contributes to the level of wealth. Other authors explored the role of income in fostering high quality exports based on similar arguments (Fajgelbaum et al. 2011). As such, the Prody index is a synthetic measure of the overall level of sophistication of each good, so it helps drawing the battlefield of the competition on which exporting countries play.

For each exported good, the Prody index is calculated here following Hausmann et al. (2007):

$$\text{Prody}_i = \sum_j s_{ij} \text{GDP}_j$$

where $s_{i,j}$ is the weighting factor of the per capita GDP of each country j exporting the item i . This weight is the product/country revealed comparative advantage (RCA) index, scaled over the RCAs of all the countries exporting that item. In symbols:

$$S_{i,j} = \frac{\text{RCA}_{i,j}}{\sum_j \text{RCA}_{i,j}}$$

where RCA is calculated as follows:

$$\text{RCA}_{i,j} = \frac{\frac{X_{i,j}}{X_j}}{\sum_j \frac{X_{i,w}}{X_w}}$$

where $X_{i,j}$ is the exports of the item i of the country j ; X_j is the total agri-food exports of the country j ; $X_{i,w}$ is the world exports of the good i and X_w is the world agri-food exports³. The RCA is also referred to as an export specialization index.

³ The Prody index does not catch all the factors influencing the kind of competition and the remuneration level for exported products. Localization factors are influential too, and this is particularly true for the agri-food sector, for which comparative advantages such as those linked to resource endowments, transport costs and policy interventions, are key

Table 1 Basic statistics of Prody for Mil and non-Mil aggregates. *Source:* our elaborations on UN-ComTrade and WB-WDI data

2019–20	Mil	non-mil
Mean	29,152	24,994
Median	28,000	25,117
Max	47,468	46,541
Min	12,596	5981
Standard deviation	8920	10,218
Mean of the ranking	40	50
Median of the ranking	42	49

The Prody index sums up quite a large set of data, it is relatively easy to calculate, and, through comparisons, it gives an immediate and synthetic idea of the product ranking with respect to sophistication. Furthermore, its time variation, in combination with the variation of a more traditional one such as the RCA index, offers a sound assessment of changes in exports' positioning and performance.

More in details, the time variation of the Prody, given the way the index is constructed, includes two distinct components: (a) it changes consequently to the change in the per capita GDP of each exporting country of each considered good. To catch this component, we calculate Prody in the final year twice, once with current GDP and once keeping GDP it constant at the start year. The difference between these two values measures changes in Prody due to the GDPs dynamics; hence, we call this variation the “GDP-effect”; (b) Prody changes over time also because the role of each exporter may change by time and new exporters might join the market while others can leave. These changes are measured by the changes in the weights (normalized RCA indices) and are measured as a residue by subtracting the start year Prody from the latest year Prody at constant GDP. We call this component “GEO-effect” (Carbone and Henke 2012).

To answer the main research question of this paper we calculated the Prody index and the RCA index of specialization for two sets of years: average 2019–20 and average 2010–11; then their time variations were determined (Table 1).

We suggest that, looking at the variation of the Prody index (the GEO-effect in particular⁴), together with the changes in the RCA index, allows to identify 4 different cases of positioning and performances for Italian Mil agri-food exports on the global market (Carbone and Henke 2012):

- (1) Products whose indices vary both positively: Italy is growing its competitive advantage in exporting products that are progressively more sophisticated.

Footnote 3 (continued)

in explaining the dynamics of export goods (Di Maio and Tamagni, 2008; Carbone et al., 2009). Consequently, to catch all the complex features influencing export positioning and dynamics, this index can be used together with other indicators.

⁴ The reason why we used here the GEO-effect variation is due to the more relevant interest in the change in geographical aspects of the index rather than in the change of GDP, which on a long run is generically positive unless specific economic turbulences. In our case, only four products had a negative record in the total Prody variation: grapes, virgin olive oil, vermouths, and blue cheeses.

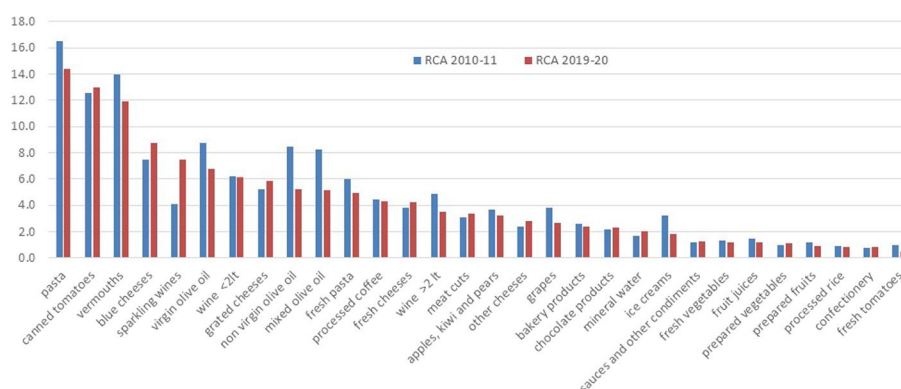


Fig. 1 Italy's RCA for MiI products. *Source:* our elaborations on UN-ComTrade and WB-WDI data

- (2) Products whose indices vary both negatively: Italy is reducing its competitive advantage in exporting products that are progressively less sophisticated.
- (3) Products whose RCA index varies negatively while Prody index varies positively: Italy is reducing its competitive advantage in exporting products that are progressively more sophisticated.
- (4) Products whose RCA index varies positively while Prody index varies negatively: Italy is growing its competitive advantage in exporting products that are progressively less sophisticated.

The analysis focuses on 30 items which well-represent the MiI agri-food aggregate, as opposed to the 65 non-MiI ones (see Appendix 1 for the complete list of items included in both aggregates; the MiI items list also appears in Fig. 1 and Table 2). The MiI group includes both fresh unprocessed goods and processed foods. Overall, it represents a share of 71.1% of total Italian agri-food exports (2019–2020). These are typical Italian goods, well reputed abroad and mainly with strongly positive trade balances (with the notable exception of the categories of olive oil whose balance is negative even if they are very relevant also on the export side). In some cases, the adopted classification refers to individual products (e.g., processed coffee and fresh grapes) while in some other cases it refers to bundles of products as they are presented in the data based used (e.g., apples-pears-kiwis and chocolate-based products or bakery products). The items have been selected according to a combination of criteria: (1) their importance for the Italian food trade balance; (2) the degree of Italy's export specialization as measured by the RCA index; (3) their normalized trade balance (the share of net exports to the total value of commerce); (4) their worldwide reputation as Italian typical food.

Trade data come from United Nations ComTrade databank. The index is built on the export flows of 130 countries which represent around 90% of world exports. Data are in current US dollars (US\$). The food products here considered are a selection from 95 items obtained by aggregating the 700 items of the entire agri-food sector originally defined at 6-digit level of HS-6 1996 version. For each country the per capita GDP is measured in International Dollars at 2017 PPP values (Purchasing Power Parity) as released by the World Bank (WDI-World Development Indicators).

Table 2 Prody index for Mil agri-food exports. *Source:* our elaborations on UN-ComTrade and WB-WDI data

Mil products	PRODY 2019/2020 (US \$ PPP)	PRODY 2010/11 (US \$ PPP)	Total Var	GDP effect	GEO effect
Processed coffee	47,468	42,529	4938	3492	1446
Grated cheeses	46,836	41,596	5241	3733	1508
Blue cheeses	39,999	42,672	— 2673	3535	— 6208
Other cheeses	38,706	34,846	3860	3479	381
Confectionery	38,116	31,222	6894	5873	1021
Fresh cheeses	37,377	28,844	8533	4058	4475
Sauces and other condiments	36,457	29,875	6583	4856	1726
Meat cuts	36,454	30,357	6096	5193	904
Chocolate products	36,453	32,973	3480	3999	— 519
Sparkling wines	36,370	30,635	5736	3237	2499
Ice creams	35,193	25,343	9850	4283	5568
Bakery products	34,400	29,486	4914	3872	1042
Wine > 2 lt	29,300	22,822	6479	2889	3590
Wine < 2lt	29,006	27,912	1094	2661	— 1566
Fresh pasta	28,645	26,594	2051	3732	— 1682
Canned tomatoes	27,355	22,412	4942	1248	3695
Mineral water	25,745	19,644	6101	2718	3383
Fruit juices	24,970	22,916	2054	2403	— 349
Pasta	24,817	21,549	3268	1808	1460
Apples, kiwi and pears	24,224	20,686	3539	2392	1147
Prepared vegetables	24,164	23,004	1161	1891	— 730
Non-virgin olive oil	23,923	23,406	517	— 618	1135
Mixed olive oil	23,559	19,831	3727	251	3476
Prepared fruits	20,937	20,119	818	2149	— 1330
Virgin olive oil	20,584	20,944	— 360	— 116	— 245
Fresh vegetables	19,705	18,991	715	2303	— 1588
Grapes	18,442	20,098	— 1656	1626	— 3282
Vermouths	17,180	20,948	— 3768	863	— 4631
Fresh tomatoes	15,579	15,386	193	1325	— 1132
Processed rice	12,596	9952	2644	2419	225

Results

The overall positioning of the Mil agri-food products

The first evidence gathered from our data about the positioning of MiI comes from the export RCAs (Fig. 1). With the notable exceptions of prepared fruit, processed rice, confectionery, and fresh tomatoes, all the products show an RCA above 1, which indicates a comparative advantage for Italy on the international markets. However, the dynamics of the index in the period from 2010 to 11 to 2019–20 reveal that for a good number of MiI products the RCA index decreases over the decade. Among these there are both fresh and processed goods as well as some of the most typical MiI agri-food exports

(e.g., pasta, both dry and fresh, wine > 2lt ⁵, different categories of olive oil, vermouths, and ice creams ⁶) together with some less relevant ones in terms of export flows and recognisability (e.g., grapes, fruit juice, and bakery products). Furthermore, only sparkling wine enjoys a significant increase in the RCA; the different cheese typologies moderately improve their advantage; while all the remaining show basically stable specialization degrees.

Coming to the sophistication level of MiI products, the Prody index shows that these are overall more sophisticated compared to the non-MiI ones (Table 1). In fact, although the maximum values for both distributions are very close, the mean and the median of the Made in Italy are higher as well as the minimum value. This indicates that at the bottom of the sophistication distribution there are mostly non-MiI products as these are exported mainly by lower income countries. The result is also confirmed by the comparison of the positions of the products for both groups in the ranking based on the Prody, where the mean and the median of the ranking for the MiI are higher than those of the non-MiI.

The sophistication of MiI agri-food products in details

In Table 2, the value of Prody for all the MiI agri-food products is reported. As it was expected, in 2019/2020 the index stems within a wide range, from a minimum of \$ 12,596 for processed rice to \$ 47,468 for processed coffee. The ranking of the MiI is fully coherent with the definition and measure of sophistication, as at the top of the distribution there are mainly highly processed and more complex products in terms of embodied components and production, technology, and skills required. In addition, for specific top sophisticated items branding is especially relevant (as, for example, cheeses, confectionery, “sauces and other condiments”), while, proceeding downward along the distribution, more simple, less processed, or even raw materials and agricultural products are more frequent (olive oils, fresh fruits and vegetable, processed rice, and so on).

Coming to the sophistication dynamic over the decade, figures show an encouraging and generalized growth of the Prody values from 2010–11 to 2019–20, with only few products with a negative variation (blue cheeses, grapes, virgin olive oil and vermouth). However, as mentioned earlier, this increase in the sophistication index can be better analyzed separating what we called the “GDP-effect” from the “GEO-effect” which is more directly related to changes in the geography of world competition for each traded item.

The first evident remark, to this respect, is that the GDP-effect is positive for all the products, except for olive oil (virgin and non-virgin). This is not surprising, since the per capita GDP generally increased in the decade -with only 16 exceptions that are mostly represented by low-income countries and only a few middle-income ones plus the two notable exceptions of Italy and Greece that also faced a reduction of their per capita GDP. It is worth noticing that Italy and Greece are two major exporters of olive oil and

⁵ Our basket of MiI products includes 3 different wine categories: still wines bottled in recipients of maximum 2 L (wine < 2lt), still wines in larger recipients (wine > 2lt), and sparkling wines following the chosen HS-1996 classification.

⁶ The RCA index for Italian ice creams exports decreases despite the growth in the export flow probably due to delocalization processes and to a more pronounced capability of the competitors to catch-up with the lively world demand which pushed exports of different European producers (Nòva 2018).

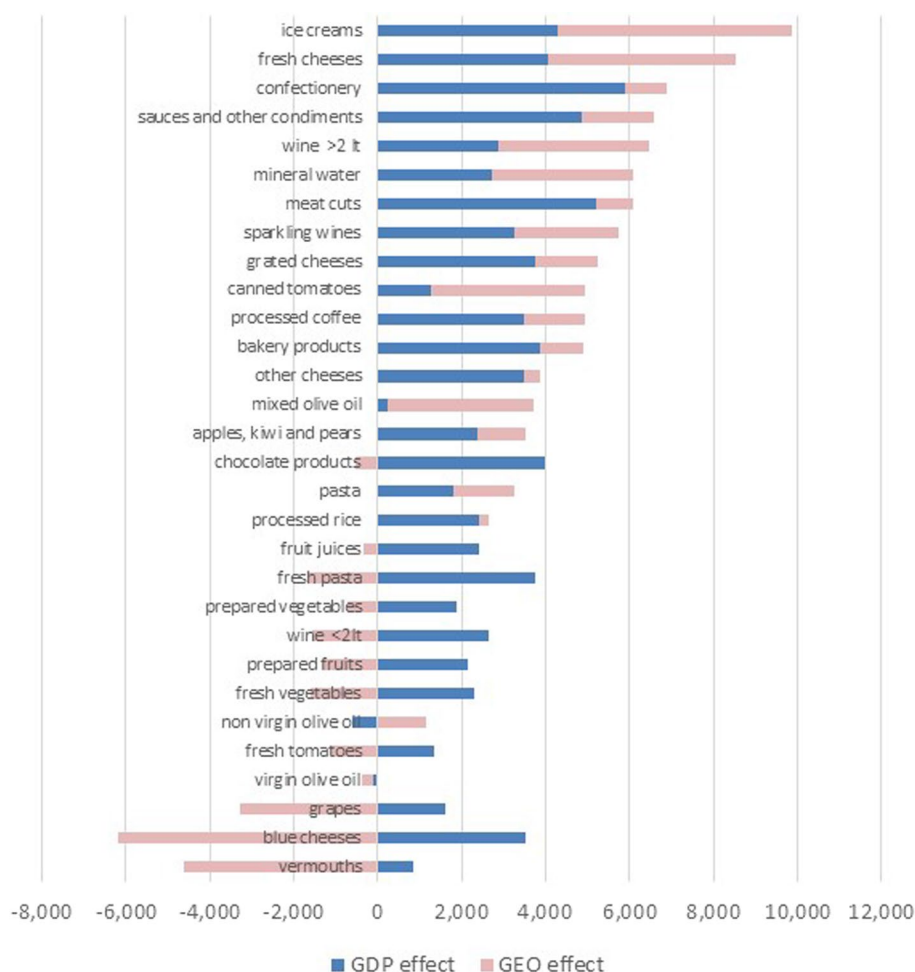


Fig. 2 Dynamics of Prody indices and their GEO and GDP components. *Source:* our elaborations on UN-ComTrade and WB-WDI data

thus the reduction of their per capita GDP explains the negative GDP-effect for these two products. The widespread positive GDP-effect assesses the overall income upgrade of the countries competing on international markets for selling MiI products. It is, however, also worth noticing that the GDP-effect is more intense for some products than for others. For example, it is strong for meat cuts, fresh pasta, confectionery and “sauces and other condiments,” while is small for fresh and canned tomatoes, grapes, and vermouths.

The GEO-effect, instead, is much more variable, thus indicating that a significant reshape of the trade geography of MiI agri-food products occurred in the decade. Figure 2 shows that the GEO-effect is positive and particularly evident for ice creams, fresh cheeses, wine >2lt, mineral water, and canned tomatoes, whose sophistication is growing. On the contrary, there are many products (vermouths, blue cheeses, fresh fruits and vegetables, wine <2lt, fresh pasta, prepared fruits) associated to a negative GEO-effect. This means that the role of lower income countries as exporters is increasing, and hence, probably, a more intense price competition is at stake.

The picture described above highlights the complexity of the trade dynamics for the MiI items as witnessed by the following examples. Blue cheeses faced a significant

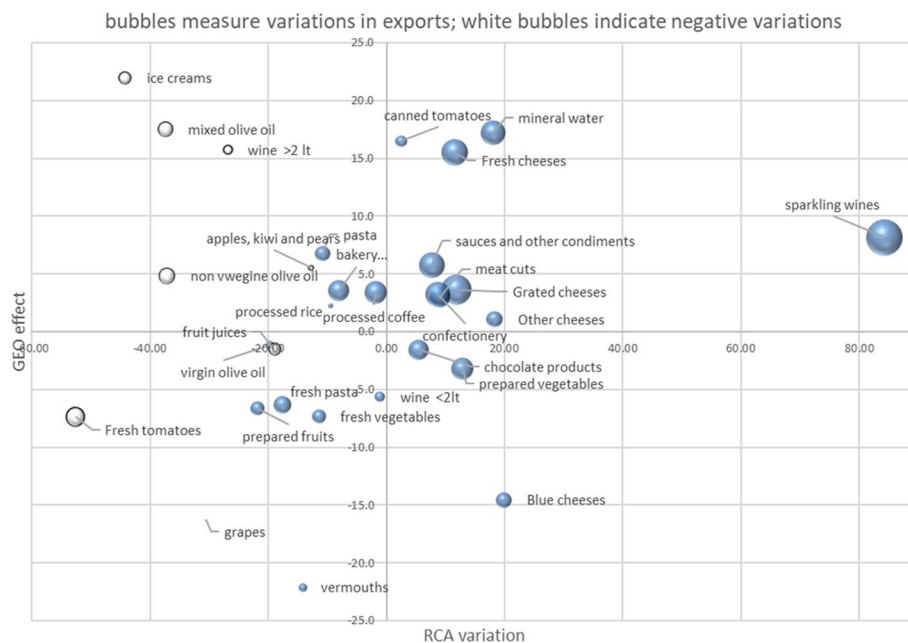


Fig. 3 Changes in the positioning of Made in Italy products: the GEO-effect of the Prody variations, the RCA variations, and export flow variations (2019–20/2010–11)

negative GEO-effect that overtook the positive GDP-effect, resulting in a downgrade of competition. For virgin olive oil the negative GEO-effect sums to the negative GDP-effect; however, both are limited, thus resulting in a small negative total variation. Finally, the positive GDP-effect for the chocolate products is only partly offset by the small negative GEO-effect.

Changes in the positioning of Made in Italy products

In this section we analyze the typologies of performance described in Sect. 3 and here visualized in a four-quadrant graph. On the abscissas the percent variations of the RCA index are displayed, while the ordinates measure the GEO-effect, and the dimensions of the bubbles represent the size of the variation of the export flow for that specific item (Fig. 3). The four quadrants correspond to as many categorizations of the dynamics of the Italian export performance on the international arena.

Starting from the top-right and bottom-left quadrants, they identify a coherent dynamic of Italian exports according to the evolution of the international markets. In the first case (top-right), both the indicators vary positively in the decade considered: Italy increased its export specialization in products which are progressively more sophisticated (*desirable outcome*). In this quadrant, 9 products are displayed. In particular, sparkling wines seem to be on their own in an extremely positive trend, with a clearly distinctive path characterized by a significant growth of export flows and specialization, combined with a steady growth of the Prody index. Fresh cheeses, canned tomatoes and mineral water make another rather homogeneous group, in which a relatively sustained growth of the specialization is combined with a distinctive growth of the sophistication. For all the products in this quadrant exports grow, more or less vigorously, in the decade analyzed.

In the bottom-left quadrant, both indicators face a negative trend in the decade under study: Italy reduces its export specialization in markets where products are comparatively less sophisticated and, in some cases, it seems to fully withdraw from them (*rational outcome*). We find 9 products in this quadrant: for some of them export flows are decreasing (fresh tomatoes, virgin olive oil and grapes) while for others flows increase, despite the reduction in specialization and sophistication (vermouths, prepared fruits, wine < 2lt, fresh pasta, fresh vegetables). Interestingly enough, some of these are the same products for which the overall Prody variation is negative (see footnote 3). For some fresh products, located in this quadrant, Italy is probably withdrawing from international markets where new players are progressively more competitive on other leverages than the sophistication ground, like fresh tomatoes and other fresh vegetables (Capobianco-Uriarte et al. 2021).

The third and the fourth cases reveal less straightforward and more problematic outcomes. In the top-left quadrant the GEO-effect improves, while the Italian RCA decreases: Italy seems to lose competitiveness from increasingly rewarding markets, revealing a loss of competitiveness due to the increased role of the sophistication attributes (*backward outcome*). This is the case for other 9 products. It is worth to highlight that the loss of competitiveness reflects in a reduction of the export flows for some of them, such as ice creams, mixed olive oil and non-virgin olive oil, wine > 2lt. Three important fresh products of the MiI agri-food exports are also positioned in this quadrant: apples, kiwis and pears. For these products, Italy seems to be de-specializing on the international markets where the competition is shifting toward sophistication characteristics especially related to branding, patents and product differentiation (Wilson et al 2017; Pace and Cefola 2021).

With regards to the bottom-right quadrant, Italy increases its exports specialization of goods that are less and less sophisticated. This can be seen as a *risky outcome*: The competitive advantage is now played more on the ground of price and less on quality than ten years before. The good news is that this is the least populated quadrant in the graph, with 3 MiI products only: blue cheeses, chocolate products and prepared vegetables, which are all, to different extents, increasing their export values in the period considered. It is just worth noting that these are all traditional Italian products for which Italy probably still holds a significant competitive margin in terms of prices also on wealthier markets even if it is undeniable that it is well capable to compete first on the quality ground in order to raise profitability.

Given this picture from the most recent data available, let's now see what has changed in the comparison with the past. Most works of the past decade on agri-food trade and MiI products agreed on the general conclusion that the sector was, overall, in good health and that the level of sophistication of most items is actually an important element of the country capacity to be competitive on the international markets and to adequately remunerate inputs (De Filippis 2012; Carbone et al. 2015). There were, however, a few cases calling for "alert" for Italy losing competitiveness or competing on a different ground than quality and sophistication⁷. Ten years after, the overall picture seems quite

⁷ In a similar work carried out in 2012 (De Filippis 2012), there were 18 products in the top-right quadrant, while only 4 in the bottom-left, 3 in the bottom right and 5 in the top-left (see Fig. 4).

	RCA -		RCA +	
GEO +	2019/20-2010/11 processed coffee mixed olive oil processed rice non-virgin olive oil apples, kiwis and pears dry pasta bakery products ice creams wines >2 lt	2010/11-1996/97 processed coffee mixed olive oil	2019/20-2010/11 grated cheeses fresh cheeses other cheeses meat cuts confectionery canned tomatoes sauces and other condiments mineral water sparkling wine	2010/11-1996/97 grated cheeses blue cheeses virgin olive oil fresh pasta fruit juices
	9	2	9	5
GEO -	2019/20-2010/11 fresh tomatoes fresh vegetables prepared fruits grapes virgin olive oil fresh pasta fruit juices wine <2lt vermouths	2010/11-1996/97 fresh tomatoes fresh vegetables prepared fruits non-virgin olive oil processed rice confectionery wines >2lt	2019/20-2010/11 chocolate products blue cheeses prepared vegetables	2010/11-1996/97 chocolate products apples, kiwis and pears wines <2lt fresh cheeses other cheeses sparkling wine grapes bakery products meat cuts sauces and other condiments ice creams vermouths canned tomatoes prepared vegetables mineral water dry pasta
	9	7	3	16
dark green quadrant: desirable outcome				
light green quadrant: rational outcome				
yellow quadrant: risky outcome				
red quadrant: backward outcome				

Fig. 4 Position of the 30 Made in Italy agri-food products: a comparison of the dynamics in 2010/11–2019/20 and in 1996/97–2010/11

different, with more lights but also with some shadows (Fig. 4). In the figure we reported the changes in the positioning of MiI products along almost 25 years (2019/20–2010/11 and 2010/11–1996/97). In bold we indicated the products that kept the same position in the quadrants, while we indicated in italics the position of products in the first of the two periods considered (2010/11–1996/97). The number of products that associate the increasing specialization of Italy with a positive GEO-effect (*desirable outcome*) increases from 5 to 9. Only one of them is present in both periods: grated cheeses. One more improvement regards the drop in the number (from 16 to 3) of products considered as *risky outcome* (negative GEO-effect associated to an increase in specialization). On the negative side, the number of products showing a *backward outcome* (positive GEO-effect and negative variation of the RCA) increase from 2 to 9. This is overall not a good sign, since it means that Italy is reducing its presence on markets characterized by an increasing level of sophistication⁸. Finally, the group with both indices showing a negative variation (*rational outcome*) improves from 7 to 9 products, with 3 confirming their behavior: fresh tomatoes, fresh vegetables, and prepared fruits.

⁸ With respect to coffee, Pascucci (2018) affirms that the rise of new competitors together with the expansion of consumption worldwide, created new opportunities but also new challenges for Italian exporters who ended up by worsening their competitive performance in the last two decades as they were not able to innovate.

In conclusion, the analysis reveals that, according to the dynamics of the two indices here used, even for MiI products, which represent the Italian top range of agri-food exports in terms of contribution to the trade balance, the performance seems generally improving but not always fully satisfactory. Overall, it is positive that, compared to the past, for a larger number of products labeled as MiI, international competition is increasingly based on the sophistication ground and, thus, are likely to bring increasing opportunities for higher remuneration. It is also positive that for a much fewer number of MiI products than in the past, Italy tends to compete on segments where price competition is more intense. This means that the country has been able to relocate its exports in more promising markets. On the other hand, in the observed time span, the number of “lost occasions,” meaning those items for which competition seems to be increasingly based on quality but for which Italy is losing ground, has increased and this is certainly bad news. All in all, these exported items seem not fully capable to compete in markets where the competition is becoming more and more sophisticated. These exports have an increasingly weaker Italian identity and/or are less rooted in place of origin and traditional local culture. Consequently, on the one hand, these Italian products meet a more intense international competition in world markets; on the other hand, for these products factors like innovation, customer care, distribution channels become, more than ever, important fields of the struggle for competition.

Concluding remarks

Changes in the international agri-food arena and for the MiI agri-food sector have been relevant in the past decade. Many past studies highlighted how the sector was in good health but also revealed some weak points in its ability to compete in a fast changing and increasingly complex world. The growth of some global partners and the internationalization of many food-supply chains have reduced the stability of the markets for the MiI products and have mined some of the strong elements of Italian competitiveness. The analysis proposed combines the ability to summarize, at a glance, major world trends for a high number of trade flows with the positioning of specific exporters.

The picture drawn from this study on the MiI agri-food sector is quite articulated and requires specific comments on different situations. The Prody index, here used together with a more traditional indicator like the RCA index, introduces an interesting and little explored dimension with which to investigate the dynamics of MiI agri-food exports. Our analysis pinpointed four different typologies of performance of which the most problematic is represented by products whose sophistication increased by time, but Italy's specialization reduced. Among these we find some of the most appreciated MiI products abroad, such as pasta, wine > 2lt, ice creams, together with some categories of olive oil. Why is Italy losing competitiveness in the international markets of these products? Further investigation is needed at the product level, but we can here sketch some possible explanations at least for some of them.

The case of pasta is quite emblematic since Italy is by far the largest world producer and exporter and, thus, leads internationalization strategies and competition. We observed that while trade sophistication increased, Italian export flows expanded but,

at the same time, its comparative advantage eroded. These results show how a number of changes occurred both on the demand and on the supply side. As for the first, pasta is becoming quite a common basic food also in non-traditional consuming countries. Consequently, domestic production of pasta raised in different countries that also started or expanded their exports (i.e., Turkey). Italian producers are responding to these changes along different lines: fostering exports, delocalizing production in major consumption markets, and through product segmentation (i.e., reintroducing traditional bronze machinery, using whole cereal wheats as well as using different raw materials, renewing packages and so on and so forth, but also supplying basic produce for hard discounts). All in all, these changes and emerging competitors are threatening its leading position and the typicity of its product and, at the same time, are pushing Italy toward a strategy aimed at covering a wider spectrum of quality for pasta.

Ice creams is another interesting case that would need more analysis. This product has always been highly characterized as MiI for both the technology and for the final products; however, most production is currently in the hands of large multinationals that control both the “cold chain” technology as well as the distribution of the final products, so that delocalization processes are in place and Italy is losing ground as a single actor of the value chain (Nòva 2018).

The most important and probably the most widely renown MiI product is wine. Our analysis highlighted strongly positive outcomes for sparkling wines which sophistication increased and for which Italy is more and more competitive and almost caught up with France, the world leader. Trade outcomes are less straightforward for still wines, for which the trends of the two aggregates included in the analysis (wine < 2lt and wine > 2lt) appear divergent but interlinked. The sophistication levels are similar for the two categories; however, while the GEO-effect for wine < 2lt is negative in the decade, the contrary holds for wine > 2lt. This means that relatively poorer countries increased their capability to export wine < 2lt and that richer countries, previously oriented to export mainly high value wine, partially switched to the lower segments of the market in order to respond to demand changes and, thus, saving the previously conquered market shares. These trends indicate that a convergence process is at stake, where, on the one side, richer countries increasingly cover also lower market segments (wine in bottles > 2 lt) that enlarged also due to demand changes driven by the world long economic recession started at the end of the first decade of the century. On the other side, along time less-rich countries have been able to upgrade the quality of their bottled wines (< 2lt) thus increasing their exports. In the meanwhile, Italy has been on an opposite path as it improved its export performance for wine < 2lt—thanks to intensive quality improvements and to its ability to create solid niches in the market—but, at the same time, it reduced its exports and specialization regard wine > 2lt, due to the difficulties of its small-medium wineries to compete on these bottom market segments where price is the key competitive leverage and reputation is linked to quantity and market shares (Köhr et al. 2018).

All these complex changes occurred in the international arena for the MiI trade are in part the effect of the fast changes of a very dynamic sector, where all the elements of competition assume different importance and weight according to the political, social, and macro-economic conditions that change so fast around the world. The agri-food MiI set as a whole still enjoys a leading position in the world trade, but as shown by the

analysis of the recent dynamics, the alarm bells highlighted in the previous decade are still ringing and should rise some preoccupation among the actors of the agri-food system and the policy makers. The analysis shows quite clearly a different behavior between primary fresh products—for which international competition is played on the ground of prices but also on the new technologies and logistics—and processed products for which the “know how” and non-price elements—that we called altogether sophistication—are key on the competitive arena.

The results provided by the analysis help also to give some indications in terms of appropriate managerial and policy actions. The situations calling for deeper changes are the two labelled as “risky outcome” (negative GEO-effect and positive RCA) and backward outcome” (positive GEO-effect, negative RCA). Regarding the first, the increased Italian specialization would be rewarded by exports set at a higher level of sophistication. This may require incorporating support services such as logistics, transports, cold-chains and so on, so to reach new fields of competition as well as accessing global marketing and distribution chains. The second case may call for pushing the pedals of innovation and technology, also with the support of research and technical assistance. Furthermore, investing in more effective design and branding activities can lead to more diversified and innovative products without losing the roots in the traditional characters that enhance the reputation of the MiI products around the world. The situation labeled as “rational outcome” (both GEO-effect and RCA negative), may benefit of a combination of the previous, while the so-called “desirable outcome” does not seem to require substantial changes, although these exports may equally benefit expansive trade policies toward international bilateral and multilateral agreements, reducing at the same times controversies and non-tariff barriers, so to give them new markets and to expand old ones.

All in all, the methodology proposed here can contribute to shed light on the more sensitive sectors where the Italian positioning is not fully expressed and/or where it is losing ground. These are the sectors for which new and more effective strategies of market penetrations and of defense of the actual market shares, as well as new competitive tools, are needed to keep the MiI agri-food sector healthy and able to gain new space in the global market. The methodology also helps to figure out the kind of competitors Italy is facing on the most relevant markets, and on which ground, in the near future, the competition for new or larger markets will be played. The Prody index used here together with the RCA index gives a proper operational dimension to a rather multifaceted concept such as sophistication. Indeed, this methodology is rather simple but also quite powerful in keeping together a large amount of information and in describing the evolution of the recent trends of agri-food trade. On this matter, recent evolutions of this field of research are in the direction of comparing the level of sophistication of the MiI products on the export side with the sophistication of the client markets, so to have also the vision of the trade competitiveness from the demand side. This helps to better understand the kind of competition Italy faces on the world markets (Carbone et al. 2020, 2021).

Finally, it is also worth to point out a limit of the sophistication indicators, especially when applied to a sector like agri-food, since they cannot give any indication on the roles of relevant elements such as physical factors, like environmental conditions and physical

distance, and also political issues, like bilateral or multilateral agreements or non-tariff barriers to trade, which can heavily condition flows and directions of trade. On this matter, the integration of the sophistication indices with other methodologies able to keep these key factors in the game is another direction that can and needs to be explored.

Appendix 1

List of Made in Italy items (30)	List of non-Made in Italy items (65)	
Pasta	Living animals for breeding	Melons and watermelons
Canned tomatoes	Living animals (except for breeding)	Stone fruits
Vermouths	Living fowls	Berries
Blue cheeses	Bovine carcasses and half carcasses, fresh or chilled	Fruits semi-processed and Frozen
Sparkling wines	Bovine carcasses and half carcasses, frozen	Dried fruits
Virgin olive oil	Swine carcasses and half carcasses, fresh or chilled	Raw coffee
Wine < 2lt	Swine carcasses and half carcasses, frozen	Spices
Grated cheeses	Sheep, goat and horse carcasses and half carcasses, fresh, chilled or frozen	Durum wheat
Non-virgin olive oil	Mammal offals fresh or frozen	Tender wheat
Mixed olive oil	Poultry not cut fresh or frozen	Other cereals
Fresh pasta	Poultry cut fresh or frozen	Flour, groats, flakes of cereals and potaoes
Processed coffee	Meat n.e.s. fresh or frozen	Seeds and flour of protein and oil plants
Fresh cheeses	Bovine and swine prepared meats	Seeds for sowing
Wine > 2 lt	Other meats prepared	Gums, juices and roots preserved
Meat cuts	Live fish	Bamboo, cane, etc
Apples, kiwi and pears	Fish fresh or chilled	Animal fats n.e.s
Other cheeses	Fish frozen	Seed oils
Grapes	Fish smoked, salted, dried	Special meat preparations
Bakery products	Milk	Meat preparations
Chocolate products	Yogurt, butter and dairy spreads	Meat extracts and sauces
Mineral water	Milk semi-processed	Fish preparations
Ice creams	Fresh cheese, unfermented Whey cheese, curd	Sugars
Sauces and other condiments	Eggs	Candies and chewin gum
Fresh vegetables	Honey	Raw cocoa
Fruit juices	Flowers and plants	Processed cocoa
Prepared vegetables	Potatoes	Couscous, bulgur, etc
Prepared fruits	Frozen vegetables	Soft drinks, sodas
Processed rice	Semiprocessed vegetables	beer
Confectionery	Vegetables in pieces or powder	Must, alcohol, sidro
Fresh tomatoes	Roots	Alcoholic liqueurs
	Nuts	Animal feed
	Tropical fruits	Raw tobacco
	Citrus	

Abbreviations

EU	European Union
GDP	Gross domestic product
GDP-effect	Gross domestic product effect
GEO-effect	Geographic effect
GI	Geographical Indication
HoReCa	Hotellerie Restaurant Catering
Mil	Made in Italy
non-Mil	Non-Made in Italy
PPP	Parity of purchasing power
RCA	Revealed comparative advantage
UN	United Nations
US\$	United States Dollars
Var.	Variation
WB	World Bank
WDI	World Development Indicators
> 2 lt	More than 2 liters
< 2 lt	Less than 2 liters

Acknowledgements

No acknowledgements were necessary for this research.

Author contributions

The authors share the responsibility of the parts of the paper in equal measure.

Funding

No fundings were available for this research.

Availability of data and materials

Data used are fully available on COMTRADE website. Elaborations produced in the paper are available upon request.

Declarations**Ethics approval and consent to participate**

The authors confirm that they have both approved the manuscript for submission.

Consent for publication

The authors confirm that the content of the manuscript has not been published or submitted for publication elsewhere.

Competing interests

The authors declare there are no potential competing interests.

Received: 23 March 2023 Revised: 2 August 2023 Accepted: 3 August 2023

Published online: 23 August 2023

References

- Agostino M, Trivieri F (2014) Geographical indication and wine exports. An empirical investigation considering the major European producers. *Food Policy* 46(22):36. <https://doi.org/10.1016/j.foodpol.2014.02.002>
- Antimiani A, Henke R (2005) Struttura e specializzazione degli scambi agro-alimentari tra Italia e Cina. *Riv Econ Agrar* 4(745):768
- Antimiani A, Henke R (2007) Emerging competitors in the EU and Italian agri-food trade, *acta agriculturae scand. Sect C - Food Econ* 2(129):138. <https://doi.org/10.1080/16507540701596925>
- Antimiani A, Carbone A, Costantini V, Henke R (2012) Agri-food exports in the enlarged European union. *Agric Econ Czech* 58(8):354–366
- Balogh JM, Jambor A (2018) On the duration of comparative advantages: the case of European cheese industry. *Bulg J Agric Sci* 24(1):1–7
- Capobianco-Uriarte M DLM, Aparicio J, De Pablo-Valenciano J, Casado-Belmonte M DP (2021) The European tomato market. An approach by export competitiveness maps. *Plos One* 16(5): e0250867. <https://doi.org/10.1371/journal.pone.0250867>
- Carbone A, Henke R (2012) Sophistication and performance of Italian agri-food exports. *Int J Food Syst Dyn* 3(1):22–34. <https://doi.org/10.18461/ijfsd.v3i1.9625x>
- Carbone A, Henke R, Pozzolo AF (2015) Italian agro-food exports in the international arena. *Bio-Based Appl Econ* 4(1):55–75
- Carbone A, Demaria F, Henke R (2020) The “sophistication” of agri-food international trade: switching the concept to imports. *Int J Food Syst Dyn* 11(5):451–467. <https://doi.org/10.18461/ijfsd.v11i5.67>
- Carbone A, Demaria F, Henke R (2021) The sophistication of international wine trade: a new import measure. *Ital Econ J* 7(2):199–218. <https://doi.org/10.1007/s40797-020-00139-8>
- Carrarese L, Banterle A (2015) Agri-food competitive performance in EU countries: a fifteen-year retrospective. *Int Food Agrobuss Rev* 18(2):37–62

- CREA, Il commercio con l'estero dei prodotti agroalimentari, 2020, Roma. Available at: <https://www.crea.gov.it/web/politiche-e-bioeconomia/-/rapporto-commercio-estero-prodotti-agroalimentari>
- Crescimanno M, Galati A, Yahiaoui D (2013) Determinants of Italian agri-food exports in non-EU mediterranean partner countries: an empirical investigation through a gravity model approach. *New Medit* 4(46):54
- Crozet M, Head K, Mayer T (2012) Quality sorting and trade: firm-level evidence for French wine. *Rev Econ Stud* 79(609):644
- Fajgelbaum P, Grossman GM, Helpman E (2011) Income distribution, product quality, and international trade. *J Politic Econ* 119(4):721–765
- De Filippis F (2012) L'agroalimentare italiano nel commercio mondiale. Specializzazione, competitività e dinamiche. Quaderni del Gruppo 2013, Tellus, Roma
- Fisher C (2010) Food quality and product export performance: an empirical investigation of the EU situation. *J Food Agribus Mark* 22(3):210–233
- Fontagné L, Freudenberg M, Ünal-Kesenci D (1999) Trade in technology and quality ladders: where do EU countries stand? *Int J Develop Plann Lit* 14(4):561–582
- Fortis M, and Sartori A (2016) Food & wine: quality, tradition and innovation 283–317. In: Fortis M, The pillars of the Italian economy: manufacturing, food & wine, tourism, Springer International, <https://doi.org/10.1007/978-3-319-40186-7>
- Gehlhar MJ, Pick DH (2002) Food trade balances and unit values: what can they reveal about price competition? *Agribusiness* 18(1):61–79
- Hausmann R, Hwang J, Rodrik D (2007) What you export matters. *J Econ Growth* 12(1):1–25
- Köhr CK, Camanzi L, Malorgio G (2018) Exploring structural and strategic correlates of difficulties in the internationalisation process of Italian wine SMEs. *Wine Econ Policy* 7(1):13–23
- Lall S, Weiss J, Zhang J (2006) The “sophistication” of exports: a new trade measure. *World Develop* 34(2):222–237
- Latruffe L (2010) Competitiveness, productivity and efficiency in the agricultural and agri-food sectors. OECD food, agriculture and fisheries papers (30), OECD Publishing, Paris
- Linder SB (1961) An essay on trade and transformation. Wiley, New York
- McPherson M, Redfearn M, Tieslau M (2001) International trade and developing countries: an empirical investigation of the Linder hypothesis. *Appl Econ* 33(649):657
- Ninni A, Raimondi M, and Zuppiroli M (2006) On the success of “Made in Italy”: an appraisal of quality-based competitiveness in food markets. Università di Parma-Italy WP Series: Economia e Politica Economica 10/2006. Available at: <http://ideas.repec.org/p/par/dipeco/2006-ep10.html>
- Nòva (2018) Il gelato italiano ai raggi X. Economia del settore. Sole24ore of 1/18/2018. Downloaded from <https://nova.ilssole24ore.com/infodata/il-gelato-italiano-ai-raggi-x-leconomia-del-settore/> on 3/6/2023
- Pace B, Cefola M (2021) Innovative preservation technology for the fresh fruit and vegetables. *Foods* 10(4):719. <https://doi.org/10.3390/foods10040719>
- Pascucci F (2018) The export competitiveness of Italian coffee roasting industry. *Br Food J* 120(7):1529–1546
- Remondino M, Zanin A (2022) Logistics and Agri-food: Digitalization to increase competitive advantage and sustainability literature review and the case of Italy. *Sustainability* 14:787. <https://doi.org/10.3390/su14020787>
- Rodrik D (2006) What's so special about China's exports? *China World Econ* 14(5):1–19
- Sadeghi VJ, Biancone PP (2018) How micro, small and medium-sized enterprises are driven outward the superior international trade performance? A multidimensional study on Italian food sector. *Res Int Bus Financ* 45(597):606
- Schott PK (2004) Across-product versus within-product specialization in international trade. *Q J Econ* 119(2):647–678
- Scuderi A and Sturiale L (2015) Social commerce and marketing strategy for “made in Italy” food products. In: proceedings of the 7th international conference on information and communication technologies in agriculture, food and environment (HAICTA 2015), 17–20 Sept
- Tasgodan C, Tsakiridou E, Maytas K (2005) Country market power in EU olive oil trade. *South-East Eur J Econ* 2:211–219
- Türkekul B, Günden C, Abay C, Miran B (2010) Competitiveness of mediterranean countries in the olive oil market. *New Medit* 1(41):46
- Wilson MD, Stanley RA, Eyles A, Ross T (2017) Innovative processes and technologies for modified atmosphere packaging of fresh and fresh-cut fruits and vegetables. *Critic Rev Food Sci Nutr* 59(3):411–422. <https://doi.org/10.1080/10408398.2017.1375892>

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.