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Competitiveness of the EU agri-food sector: a synthesis of findings from the COMPETE project

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Abstract

This paper seeks to build a coherent picture of the competitiveness of the EU agri-food sector, drawing on comparisons across EU MS. With the aim of gaining a deeper understanding of competitiveness, for better targeted and evidence-based policies, particular attention is paid to the main drivers of competitiveness in agri-food value chains. To this purpose, the theoretical and empirical findings from the work packages of the COMPETE project are summarised. The paper follows closely the research objectives of the project and its key objectives. For a clear and structured synthesis, the findings are classified under four main topics: (i) trade, (ii) enterprise performance, (iii) market efficiency and supply chain relations, (iv) policy measures and governance. This research provides the basis for policy recommendations.

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1 Introduction

The European Union (EU) stated in the Lisbon strategy its ambitious goal to become "the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion" (EC, 2000). The important task of improving the EU's competitiveness was further developed within the Europe 2020 strategy, with the aim of transforming the EU into "a smart, sustainable and inclusive economy, delivering high levels of employment, productivity and social cohesion" (EC, 2010). A High Level Forum for a Better Functioning Food Supply Chain was also established by the European Commission in July 2010 to improve the efficiency of the food supply chain and thus the competitiveness of the agri-food sector.

The competitiveness of the agri-food sector is of strategic importance given that it accounted for 5% and 7% of the EU's value added and total employment respectively in 2009 (EC, 2009), with agricultural land use accounting for 43% of the total area (Eurostat, 2015). However, while the sector has many strengths, it has underperformed since 1995, compared to the rest of the EU economy, when considering annual value added growth rates (EC, 2009). It faces a host of challenges ranging from new competitors from emerging economies to changes in consumer demand and demographics as well as a policy environment characterised by greater restrictions on government spending and weak macroeconomic performance in Europe as a whole (Hockmann et al., 2013).

The COMPETE project was established to support the EU in its aim to define and foster competitiveness of European food supply chains on domestic and international markets. The project involves a set of research activities to analyse current competitiveness and identify its determinants and thus provide policy recommendations for a prosperous EU agricultural sector. However, it is worth emphasising that competitiveness is a relative and dynamic concept which lacks of a universally accepted definition (Gorton et al., 2013). As it is assessed at various levels (country, region, industry, supply chain and firm) it can thus be measured by a large set of indicators, from the macroeconomic level to the characteristics of an industry of firm. Moreover, there is only limited research on the identification of the determinants and indicators of agri-food supply chain competitiveness per se. In contrast, the existing literature regarding the competitiveness of the agri-food sector focuses mainly at the farm level and draws largely on trade, productivity and value added indicators (ibid).

Against this background, the project seeks to fill this gap and focuses on selected determinants of competitiveness, which are investigated in respective work packages. These include: conceptual framework for assessing product chain competitiveness (WP2), trade patterns and performance of EU countries (WP3) and major EU competitor countries (WP4),

policy intervention and business environment (WP5), productivity in agriculture and food processing (WP6), functioning of domestic and international markets (WP7), vertical integration, institutions and market performance (WP8), innovation and competitive strategies (WP9).

In particular, the key objectives of the project are:

- to discuss recent developments and future challenges on world markets, to provide a conceptual framework for the assessment of product chain competitiveness and to identify criteria and indicators for comparative analysis of competitiveness;
- to analyse major trade patterns of the EU, to assess the stability and development of trade competitiveness of the EU MS in various market segments and to identify the market potential for products produced and processed according to the EU quality schemes and organic standards in internal and international markets;
- to provide results regarding the competitive positions of EU competitors;
- to identify the role of governments and business environment as catalysts for achieving competitive positions on world markets;
- to assess the exploitation of economies of scale, production possibilities and the impact of technical change in agriculture and food processing and to identify the relationship between agricultural productivity and food processing performance;
- to assess the functioning of markets in selected value chains in the EU, to assess the effect of governance on price transmission, to assess the extent of market power and to identify factors of market efficiency and the existence of market failures;
- to study governance structures that coordinate vertical transactions in agri-food supply chains and to study the relationship between product quality, productivity growth, competition and trade policy;
- to assess the importance of supply chain organisation for innovation and to study the link between innovation and general competitive strategies.

Based on these, the specific objective of this paper is to present a coherent synthesis of the main theoretical and empirical findings from the work packages of the COMPETE project (WP2-WP9), and thus develop a coherent picture of the competitiveness of EU agri-food chains and its determinants.

For a clear and structured picture of competitiveness, the findings are classified under four main topics: (i) trade, (ii) enterprise performance, (iii) market efficiency and supply chain relations, (iv) policy measures and governance. While drawing on comparisons across EU Member States (MS), the analysis of the determinants contributes significantly to a better and deeper understanding of competitiveness and provides the basis for policy recommendations.

2 Trade

2.1 EU Trade Patterns

The discussion of the competitiveness and performance of the agri-food sector draws largely on trade theory. In particular, various trade measures have been applied extensively to assess the trade performance and export competitiveness of a country. These include: revealed comparative advantage, level (volume, share) of exports and imports, intra-industry trade, export variety and diversification, quality or sophistication of exports. Hence, this section summarises the main findings regarding EU trade patterns including trade development and stability (Bojnec and Fertő, 2013; Bojnec and Fertő, 2014a; Bojnec and Fertő, 2014b; Bojnec and Fertő, 2014c; Bojnec and Fertő, 2014d; Bojnec and Fertő, 2015a; Bojnec and Fertő, 2015b; Bojnec and Fertő, 2015c; Bojnec and Fertő, 2015d).

The extensive analysis of EU agri-food trade since the year 2000 suggests that the EU remains one of the key players in global agri-food trade with the value of trade (in terms of both exports and imports), having grown considerably in the last decades. The EU's agri-food export and import value almost doubled in nominal terms between 2001 and 2011, increasing by 162 percent and 158 percent respectively. The balance of trade also turned positive in 2010 after a long period of constant deficit. However, the EU-27's export share in global agri-food markets has declined from 47.2 percent in 2001 to 41.3 percent in 2011, although the NMS have experienced an increase in their export shares.

In 2011, the most important export markets of the EU-27 were the USA, Russia, Switzerland, China and Japan. However, despite the USA remaining the major importer of EU agri-food products, the share of EU export value to the USA has decreased (from 19.8 percent in 2001 to 12.8 percent in 2011). In contrast agri-food trade with Russia and China has intensified. This is particularly the case for China, where an increase in demand for quality food products has led to an increase of agri-food imports from the EU in recent years, with their absolute value increasing by over a quarter between 2010 and 2011. In 2011, the top three agri-food exporters to the EU-27, in terms of export value, were Brazil (20.99 billion US$), the USA (12.35 billion US$) and Argentina (9.37 billion US$), followed by China, Switzerland, Indonesia, Turkey, India, Ukraine and Cote d'Ivoire.

A thorough examination of trade patterns within the EU-27 reveals that the six top exporting countries in 2011, in terms of export shares in agri-food global markets, were the Netherlands (7.4%), Germany (6.5%), France (5.9%), Belgium (3.4%), Italy (3.2%) and Spain (3.1%), whereas the top importing countries were Germany (7.4%), the Netherlands (4.8%), the UK (4.7%), France (4.4%), Italy (3.9%) and Belgium (3.1%). The EU's agri-food trade is generally biased toward exports of processed goods (accounting for 61.2% of the total value in 2011), while imports are geared to semi-processed foods, tropical bulk and horticultural commodities which are too costly to be produced due to climatic conditions, such as coffee and bananas. This feature of EU agri-food trade has not changed dramatically since 2000.

The overall analysis of agri-food product coverage indicates that the EU-27 realised a high export share of dairy products in global markets reaching over 65 percent in 2011, yet deteriorating during 2000-2011 (-7.9 percentage points), and accounted for almost 50 percent of global meat trade, with a stable export share (-0.7 percentage points). The export

shares for fruit and vegetables represented 40 percent in the global market and for grains 23 percent, with declining export shares for both product groups (respectively -6.6 percentage points and -4.3 percentage points). Although substantial differences characterise the individual export performance of countries, some states such as Poland performed well and were able to improve their export share in global markets for the selected agri-food groups.

The agri-food export competitiveness of the EU-27 has been assessed through the calculation of the Balassa index (B), which identifies the revealed comparative advantage of a country. In other words, it measures a country's exports of a commodity relative to its total exports and the corresponding export ratio for the reference countries, typically the rest of the world. Hence, when B > 1, a country is said to possess a revealed comparative advantage on world markets, as its export share for the sector in question is greater than the average share of all its exports. The findings suggest that the revealed comparative advantage has slightly increased following the recent rounds of EU enlargements (2004 and 2007), especially for some established EU-15 countries. The most successful Member States (MS) in agri-food export competitiveness are the Netherlands, Spain and France, with respectively 55.7%, 44.8% and 43.5% of their agri-food products revealing comparative advantages in global markets.

The heterogeneity of product coverage across MS highlights important differences in terms of export competitiveness. Although for dairy products strong export competitiveness was evident for almost all of the EU-27, in 2011, the largest revealed comparative advantages were achieved by Denmark, Luxembourg, Latvia, Ireland and the Netherlands. Significant revealed comparative advantages in global meat markets were realised by Cyprus, Bulgaria, Ireland, Hungary and Denmark. With respect to fruit and vegetables, Greece, Cyprus, Spain, Lithuania and Bulgaria achieved the largest comparative advantages. The countries that experienced comparative advantages in global grain markets were Latvia, Bulgaria, Estonia, Lithuania and Luxembourg.

The development of agri-food trade competitiveness in the EU, and specifically the changes in patterns of revealed comparative advantage during 2000-2011, has also been investigated. The analysis suggests that the EU enlargements have contributed to some changes in the B index. Overall, the degree of mobility in the B index is relatively low for the EU-27. This is holds particularly for some EU-15 countries, such as Finland and Germany, who display the highest stability in the revealed comparative advantage. In the NMS the mobility in the B index is slightly higher, where the lowest stability in the revealed comparative advantage is found in Cyprus, Malta and Slovakia.

Furthermore, the Kaplan-Meier survival rates, which measure the probability that the comparative advantage for a particular sector (product group) has persisted over the period measured, are higher for some of the EU-15, such as Netherlands, France and Spain. For instance, for France the survival rates are higher for grains, meats and dairy products, whereas for both the Netherlands and Spain, higher survival rates are for fruit and vegetables, meats and dairy products. The more pronounced export competitiveness duration performance for these countries, and some other EU-15, is related to a greater number of competitive agri-food products. This can be explained by a longer tradition of

competing in complex agri-food international trade markets, and thus greater market efficiency and mature presence on agri-food markets.

The investigation of price and quality competition in agri-food trade shows that most of the EU MS compete successfully in world markets via price and quality. Moreover, the analysis reveals that high vertical intra-industry trade (IIT), where the export price is at least 15% higher than the import price, increased for the majority of the EU-27. As vertical intra-industry trade represents specialisation in varieties of different quality, this finding suggests that the quality of the EU-27 agri-food exports has increased compared to similar agri-food products imported from non-EU countries. Moreover, although the EU-15 records the highest levels of vertical ITT, a degree of convergence has occurred with the NMS experiencing higher growth rates.

The adoption and diffusion of EU quality schemes, such as protected designation of origin (PDO), protected geographical indication (PGI), and traditional speciality guaranteed (TSG), constitute an innovative governance mechanism for adding value to the EU agri-food production, and thus for upgrading the competitiveness of the sector. A review of studies in selected countries, including six MS and one candidate country (Czech Republic, Germany, Italy, the Netherlands, Romania, the UK and Serbia), shows that these products and other high value added products, such as organic, represent, overall, a growing market and with potential for further growth opportunities. Some PDO and PGI products benefit from strong market positions, with substantial market shares, such as PDO cheese and meat products, which in Italy accounted for 52% and 39.3% respectively of retail sales in 2011.

Since these quality schemes cover products with significant price premiums, it is unsurprising that in MS with lower GDP per capita, such as Romania, demand is constrained due to consumers' lower purchasing power. Although the majority of sales take place in countries with higher income per capita, e.g. the UK, Scandinavia and Germany, other factors are also responsible for the success of these quality schemes. Agri-culinary traditions towards higher-quality products are often embedded in the culture of individual countries and may play a fundamental role in the diffusion and consumption of such products. To a great extent, the level of education and the awareness for organic (and PDO and PGI labels) are equally important. The lack of consumer awareness, such as the unclear definition of organic production, and scepticism over the superior nutritional benefits compared with conventionally produced products remain important constraints. Hence, as consumers become more educated and informed about food issues, they expect higher food quality and safety, looking for benefits in terms of both their own health and the environment.

2.2 Performance of EU Competitors

Since 2000, significant changes have occurred in global agri-food trade, particularly the intensification of competition from emerging economies. The EU's traditional and main competitors in global agri-food markets, such as the USA, Canada, Argentina, New Zealand and Australia, are being gradually caught up and replaced by emerging economies, i.e. China, Russia and Brazil. These pose a strong threat to the EU's export trade position, and thus to the competitiveness of traditional EU dominated markets in the near future.

Hence, in order to assess the strengths and weaknesses for EU competitiveness a thorough understanding of the export performance of major EU competitors in global agri-food trade is required (Grau et al., 2014). In this respect, the main EU competitors intensified their agri-food exports and were able to boost their export values tremendously, playing a larger role in global markets than ever before. During 2000-2011, Russia experienced the fastest growth and its agri-food exports increased by 16 times in value, reaching 9.2 billion US$ in 2011. This was followed by Brazil and Argentina, who also increased their agri-food exports by 4 and 3 times respectively.

The analysis of agri-food trade structure for the EU's main competitors, during 2000-2011, indicates that the change in the export structure, by degree of processing, is more pronounced in comparison to the EU. A common trend from higher to less value added agri-food exports was observed in Russia, Australia, Brazil, Canada, and the USA. The large structural change in Russia saw a shift from semi-processed products towards bulk commodities (the latter reaching 46 percent of its agri-food export value), as a consequence of the vast expansion in wheat production and exports, reaching 3.7 billion US$ in 2011. Australia, Brazil, Canada, and the USA experienced a slight shift from processed (decline between 3 and 9 percentage points) to bulk commodities (increase between 5 and 6 percentage points). New Zealand and China were exceptions to this trend, as their trade structures moved towards higher value-added goods. In particular, China experienced a tremendous shift in its agri-food export structure from bulk towards horticulture, semi-processed and processed commodities. New Zealand, which did not export any bulk products in the analysed period, also increased its value share in processed goods, accounting for over 80 percent of its agri-food export value in 2011, with the remaining 20 percent comprising semi-processed products and horticulture.

The exports of EU competitors are often highly specialised and concentrate on a small number of products. For instance, the top five agri-food export products accounted for more than 40 percent of the overall export value in 2011 for the USA, Canada and Australia and for more than 60 percent for Russia, Brazil and Argentina. These mainly consisted of crops or processed crop products. For instance, crops represent the main source of exports by Russia, Canada and Australia, mainly targeted for sale in North Africa, East Asia, the Middle East and the CIS (Commonwealth of Independent States). In this respect, wheat exports accounted for 40 percent of Russia's total agri-food exports by value in 2011. Soybeans and soybean products are the leading agri-food exported products, in terms of total value, from the USA, Brazil and Argentina, and are primarily sold to China. Exceptions were again New Zealand and China, with mainly processed dairy or meat products for the former, and the much more differentiated export structure towards food preparations, horticulture, processed fruit and meat products for the latter.

The trade patterns are partly determined by geographical reasons, both via sea transport well-connected markets, e.g. Republic of Korea, and important and populous neighbouring countries, such as Japan. Overall, the agri-food exports of the main EU competitors are concentrated on a small number of markets. More than 50 percent of the export value of the USA, Canada, Australia, New Zealand, Russia and Brazil is designated to only five markets. In contrast, China and Argentina's export flows are more diversified. Nonetheless, the acceleration of globalisation and the increasing importance of economically emerging

countries, as export destinations of agri-food products, such as China and Egypt, have led towards a diversification of export flows. As a consequence, the importance of traditional and significant import markets, such as Japan, is changing. In particular, China is of growing importance as an agri-food exporter to the emerging economies of Pacific Rim, and is also the main import market for the USA, Australia, New Zealand, Brazil and Argentina.

Since the competitiveness of a country depends to a large extent on its institutional and business situation *vis-à-vis* the rest of the world, it is important to consider the nature and level of governmental regulation of agri-food chains in the EU's major competitors (Hockmann and Levkovych, 2014). The review of agricultural and trade policy regulations suggests that all countries generally support their agricultural sector although different patterns characterise individual products and food chains. For instance, in Russia and Ukraine, policies led to a taxation of domestic wheat production. Overall, the business environment has improved in those countries that performed relatively poorly at the beginning of the century. Moreover, during the period 2000-2011, the currencies of emerging countries generally devalued against the Euro, including the US$, which improved their competitiveness.

The competitiveness of the agricultural sector has been strongly protected in developed countries and competing countries have historically used different sets of policies to support their agricultural producers. During the years 2004-2012, the % PSE (share of producer support estimate in gross farm receipts) was the highest in the EU, followed by North America. The declining trend in PSEs in the majority of countries indicates some reductions in price supports, buoyed by high, relative international commodities prices and some switching to non-product specific interventions. The largest fluctuations in % PSE were observed in China, where governmental intervention has become more intense, and in the CIS, whereby export bans have been enacted on the grounds of ensuring food security. Looking at the major competitors for selected food value chains, the analysis indicates that the % PSCT (producer single commodity transfer)[1] is rather low, reaching almost 0 for wheat (in the EU and Canada) and milk (in the EU, USA and Oceania), especially towards the end of the analysed period. One reason, apart from the policy reforms conducted by the major competitors, may be the sharp increase in food prices at the end of 2010, which have reduced the impact and the effectiveness of market price support.

Given its natural and economic resources, the EU is competitive in highly processed products and premium quality products. Hence, a review of public policies regarding quality schemes and other high value added products was also carried out. Despite lacking rules for mutual acceptance of national standards, all major EU competitor countries have regulations regarding organic production. However, the two exceptions are Russia and Ukraine, which are still in the process of passing national legislation. Organic production not only targeted to the domestic market but also to the global market, whereby major export destinations are the most developed countries. The 'equivalency' agreement, firstly signed in 2009 between Canada and the USA, became the main instrument to stimulate the international trade of

[1] The PSCT refers to support granted for individual commodities. It is an important indicator to be considered when assessing competitiveness as it gives a better impression of the additional production incentives for a specific product provided by policies than the PSE measure.

organic products in recent years, and is soon to be joined by other countries. The expansion of trade agreements, such as those between the USA and Canada, the EU and Japan, has facilitated the global exchange of organic products. Similar trade partnerships are currently being discussed with South Korea and Switzerland.

The trade patterns of the EU and competitor countries are also determined by non-tariff barriers (NTB), such as sanitary and technical measures, which have a significant impact on export performance and competitiveness. An in-depth discussion on the assessment of non-tariff measures on the competitiveness of the EU and selected trade partners can be found in the framework of the EU FP7 NTM-IMPACT Project.[2]

3 Enterprise Performance

3.1 Productivity

Productivity can be defined as the ratio of output to inputs used in the production process and measures the efficacy of factor input and thus efficiency in production. Hence, the economic performance at the enterprise level depends in part on productivity, and so it is a critical indicator of competitiveness of the agri-food sector. Although productivity can be measured at different levels, the most comprehensive measure is total factor productivity (TFP), which is a ratio of aggregated outputs and inputs.[3] Moreover, differences in the development of productivity are decomposed into technical efficiency, economies of scale and technical change. Therefore, the analysis of the technical capabilities of EU food supply chains focuses, in particular, on economies of scale and technical efficiency, developments in TFP and impact of technical change. The comparative assessment of TFP, based on meta-frontier analysis[4], covers both agricultural production (Čechura and Hockmann, 2014) and food processing (Čechura *et al.*, 2014) across various EU MS. Furthermore, the TFP relation between agricultural production and food processing is also analysed (Olper *et al*., 2015a).

Starting with agricultural production, the analysis covers cereal, milk and pork production in 24 MS (excluding Croatia, Cyprus, Luxembourg and Malta). With economies of scale pronounced in the majority of countries, scale efficiency has a significant impact on productivity. Variations in production are often accounted by differences in technical efficiency. Although the variation in average technical efficiency is not necessarily large across the MS, there is a significant difference between the best and the worst performing farms.

A positive trend in TFP is observed in the majority of countries and technical change constitutes an important factor contributing positively to TFP development. Biased technical

[2] The final report summary of the NTM-IMPACT project is available online at: http://cordis.europa.eu/result/rcn/142946_en.pdf.

[3] The most simple and disaggregated measures of productivity include yield per hectare and milk per cow. More aggregated are partial measures of productivity where the total output value is related to one input, such as labour and land productivity.

[4] The meta-frontier analysis is employed to estimate country or regional-specific frontiers and obtain comparable efficiency scores, and thus to gain insights into competitiveness among the EU MS.

change, i.e. increasing the productivity of a specific factor of production (such as capital, labour, land, materials, etc.) over others[5], is also pronounced for almost all MS, except for Hungary and Romania. Nonetheless, the direction of the bias is country specific and thus does not allow for the identification of common patterns. As revealed by the meta-frontier analysis, productivity differences in agricultural production among and within countries remain substantial, and provide no evidence for convergence or catch-up. Developments in TFP in cereal, milk and pork production over time are driven by the most competitive producers and leapfrogging is uncommon. Instead, falling-behind processes can be observed, e.g. while the most successful producers strengthen their positions, those with poor performance are not able to catch up and fall even more behind.

Regarding the food processing industry, significant differences exist between the technologies employed across the EU MS and Serbia[6], as suggested by the stochastic frontier analysis. The pronounced heterogeneity in food processing concerns both intra- and inter-sectoral differences, for all four analysed industries, namely slaughtering, fruits and vegetables, dairy and milling. In regards to scale efficiency, and in contrast to agricultural production, there is no indication of economies of scale in the food processing industry, which appears to exhibit constant returns to scale.

Differences in technical efficiency between food processors lead to variations in production in all four industries under analysis. However, the variation in the average technical efficiency is not large among countries, albeit significant differences exist between the best and the worst food processors in EU countries, similarly to agricultural production. The technical efficiency gap between the top and bottom 10% of companies varies across countries, with the largest disparities found in Bulgaria and Romania.

TFP in food processing shows a positive trend in the majority of the examined countries, with the exceptions of Bulgaria and Serbia. Technical change represents an important factor contributing positively to the development of TFP, despite technological regress occurring for Germany, UK, Greece and Italy. Inter- and intra-sectoral differences in technological progress are generally pronounced and slaughtering and dairy experienced higher positive technological change in the majority of EU countries in comparison to the other food processing sectors. Moreover, biased technical change is also pronounced for almost all countries. In this respect, material-saving technology is apparent in most countries, whereas labour-saving biased technological change is identified only for Spain, France, Greece, Hungary, Italy and Sweden.

The meta-frontier analysis indicates that productivity differences in food processing, amongst and within some countries, persist and are substantial. Overall, the EU-15 display higher TFP in comparison to the NMS and Serbia, for all analysed industries. In particular, the lowest TFP scores are generally found for Baltic States, Bulgaria, Romania and Serbia, while

[5] When technological change occurs, it can increase the productivity of the factors of production in an equi-proportional way (Hicks neutral) or it can be biased towards a specific factor, increasing the marginal productivity of that factor, such as a labour-saving and capital-using technical change.

[6] The analysis of TFP change in the food processing sector covers the same 24 EU MS as analysed for agriculture with the addition of Serbia.

Belgium, Germany, France, Italy and the Netherlands scored consistently high. The only exception among the NMS is Hungary, which displayed high TFP in all four industries.

Catching-up processes are not so strong. While some countries with average or poor TFP performance are catching-up, others are falling further behind, as those countries with a relatively higher productivity continue to enhance their performance. Similarly to agricultural production, leapfrogging in TFP development is extremely rare, and producers with poor performance are expected to fall further behind the sector's leaders. Moreover, whereas the disparities within the worst performing countries are generally small, the variation in productivity between food processors in the best performing countries is large. Similarly, differences between processors in terms of their quality strategies, i.e. the quality of input use accounted for by the unobserved heterogeneity component, are greatest in the most productive countries.

The analysis of the TFP relation between agricultural production and food processing in the dairy sector shows that farm productivity has a positive effect on the performance of the food processing industry, on both productivity and efficiency. By the same token, productivity in food processing positively determines farm productivity and efficiency. Furthermore, productivity improvements in agriculture contribute positively to technical change in the dairy food processing sector. The same holds true on the farm level, i.e. productivity improvements of food processors contribute positively to the technical change of milk producers.

Since international trade, and specifically trade openness, can be an important catalyser for productivity growth, it is also worth looking at the significant increase in import competition which has characterised the European food market. This was fuelled by multilateral and bilateral trade agreements, as well as successive enlargements of the EU. Therefore, the positive relationship between import competition and productivity growth has been tested across 25 EU MS (excluding Croatia, Latvia and Malta) and nine food industries (meat, fish, fruit and vegetables, oils and fats, dairy products, grain mill products, animal feeds, other food products, beverages), during 1995-2008 (Olper *et al.*, 2014). The empirical findings suggest that the contribution of international trade to productivity growth is substantial, with the pro-competitive effect of import penetration accounting for more than 20 percent of the overall growth in TFP. The size of this effect depends on the origin of imports and is almost exclusively driven by competition in final products from developed countries, especially the EU-15[7]. The fact that EU food imports are found to be close substitutes for domestic production, in comparison to non-EU imports, implies that the EU Single Market is beneficial for productivity growth.

Furthermore, the impact of import penetration of intermediate inputs on productivity growth, at both industry and upstream sector level, was analysed for a sample of over 20,000 French and Italian food firms, over the period 2004-2012 (Olper *et al.*, 2015b). As emphasised in the study, France and Italy are interesting cases as both are renowned worldwide for the quality of their foods but differ in that the former is a net exporter of intermediate inputs while the latter is a net importer. Hence, understanding the effect of horizontal and, especially, vertical

[7] The analysis accounted for imports from the world and those within the following regional groupings: EU-15, NMS, OECD non-EU, and BRIC countries.

import penetration on firms' productivity growth becomes critical, particularly due to the growing importance of trade in intermediate inputs.

The empirical results suggest that the productivity growth effect induced by import penetration in upstream sectors is ten times higher than the one at the industry level (food processing). More specifically, horizontal import competition from the EU-15 and OECD countries (non-EU) exerts the strongest effect on productivity growth in comparison to other country groupings. In regards to vertical import penetration, the TFP growth effect is also positively driven by intermediate inputs from emerging countries[8]. In particular, the magnitude of the positive economic effect of import penetration increases with the initial level of the firm's productivity. From a policy point of view, these findings further highlight the positive effect trade liberalisation can have on productivity growth in the agri-food industry.

3.2 Innovation

It has often been emphasised that knowledge is a key driver of economic growth and productivity in modern societies (OECD, 2005). Moreover, from the previous section, it seems clear that in order to boost competitiveness in agricultural production and food processing the adoption and spread of innovation should be supported, since it constitutes the most important factor in TFP growth. However, the precise ways in which knowledge and information affect innovation remains unclear. At the EU level, several bodies and institutions are involved in the policy framework for research and innovation. The numerous policy measures are aimed at encouraging the creation and growth of innovative enterprises, improving key interfaces in the innovation system, and fostering a society open to innovation, towards a network approach (Materia *et al.*, 2014a). In the context of competitiveness, the extent to which supply chain organisation matters for the innovative capacity of the agri-food sector is an important aspect that requires attention. In this respect, understanding the determinants of, and barriers to, innovation in SMEs, which represent an extremely important segment of the EU food industry[9], remains a key objective.

The determinants of innovation strategies and the potential complementarity of these strategies are investigated using cross-sectional data for 1,393 agri-food firms in seven EU MS, namely Austria, France, Germany, Hungary, Italy, Spain and the UK (Materia *et al.*, 2014b). Although the combination of in-house and outsourcing innovation seems the most common in the European agri-food sector, these decision strategies are not found to be interlinked or complementary, but instead are considered as substitutes. As expected, large and internationalised firms are more likely to pursue in-house strategies, i.e. innovate in-house, while SMEs are more inclined to outsource innovation, probably due to their difficulties in approaching innovation only on the basis of internal resources.

[8] The group of emerging countries includes 21 economies following the MSCI classifications. These are: Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Morocco, Peru, Philippines, Poland, Russia, South Africa, Taiwan, Thailand, and Turkey.

[9] According to the EC (2009), SMEs account for approximately 99% of all the enterprises active in the supply chain.

Furthermore, in establishing an effective innovation system, firms have to consider whether to innovate by cooperating and sharing ideas or innovate in-house, i.e. open versus closed innovation processes. The adoption of an open innovation approach, and more specifically the factors that drive such process at three different innovation stages, i.e. idea generation, idea development and idea commercialisation, have been explored for the Hungarian wine sector (Dries *et al.*, 2014a). The analysis indicates that 'open sources' are actively used in the innovation processes of Hungarian SMEs with respect to the wine industry. The high degree of openness in all the different stages is an interesting result considering that the wine industry is generally a relatively closed sector, with 'exclusive' and 'secret' local and family recipes. This implies that innovation in SMEs is deeply affected by cooperation, and thus that collaborative and open innovation networks may create a favourable climate for sharing knowledge, with important consequences for their competitiveness.

The results also suggest that specific company's capabilities are significant determinants of the openness of the innovation process, especially for the phases of idea generation and commercialisation. Intense interactions and information flows between wine companies and downstream buyers, i.e. the retailers, stimulate open innovation in the commercialisation phase. Furthermore, the high positive correlation between the degree of openness in different stages of the innovation process suggest that companies are inclined to be either open, or closed, throughout the whole process.

Lastly, a good understanding of network management, and of the conditions under which a network can remain relevant, are fundamental for improving the firm's ability to manage their network of relationships effectively. In this respect, the vitality of an open innovation network has been examined from the perspective of a large Dutch cooperative in the food and beverage industry[10] (van Lohuizen *et al.*, 2015). Six main conditions are identified for the effective management of an open innovation network, namely network openness, trust, formal governance, sharing knowledge, leadership, and network diversity between different actors. The empirical findings suggest that trust is a very important aspect within open innovation networks, which is based on previous interactions, and knowledge sharing is a key success factor to create value.

4 Market Efficiency and Supply Chain Relationships

4.1 Efficiency of Markets

The competitiveness of EU agri-food value chains depends on the functioning of both domestic and international markets. Therefore, this section discusses the main findings with respect to price formation along the value chain, the exploitation of market power at various stages of the value chain, the efficiency of internal markets, and the existence of market failures.

The analysis of the price formation along the value chain focuses on the price transmission along the various stages of the agri-food chain, from farm to processing and to retail, and *vice versa*. Of special interest is asymmetric price transmission, which often reflects the

[10] The name of the company is anonymised due to confidentiality issues.

existence of market failures. This refers to when downstream prices react in a different manner to upstream price changes and, in particular, output prices respond faster to input price increases than to decreases. In this context, the reasons for asymmetric price transmission have been investigated while focussing on the bargaining power of actors operating at subsequent stages of the supply chain (Bakucs *et al.*, 2014a).

In line with existing theories, the results suggest that price transmission asymmetries in farm-retail relationships are more likely in the presence of factors negatively affecting farmers' bargaining power. Hence, asymmetric price transmission is more likely in sectors/countries with a more fragmented farm structure, a high degree of governmental intervention and more restrictive regulations on price controls in the retail sector which restrict price competition. Conversely, the relative importance of the retail sector and more restrictive regulations on entry barriers in this sector tend to promote symmetric farm-retail price transmission. This is also achieved in the presence of a strong processing industry, whereby processors are key players in the supply chain and are able to influence both farm and retail prices. Lastly, the positive association between symmetric price transmission and retailers' market power may instead reveal the existence of market imperfections, which in turn would provide benefits to farmers.

The presence of market imperfections, and specifically the degree of non-competitive behaviour in the input food processing market as well as the degree of oligopolistic market power in the output food processing market, have been analysed in 24 MS, excluding Croatia, Cyprus, Luxembourg and Malta, for the period 2003-2012 (Bakucs *et al.*, 2014b). The results, based on the estimated mark-down model[11], indicate some degree of non-competitive behaviour in the input food processing market for all sectors under analysis, namely slaughtering, fruits and vegetables, dairy and milling. The degree of market imperfections varies across sectors. Although on average only small market imperfections are found in the EU input food processing markets, especially in the dairy and milling sectors, the slaughtering sector displays a significantly greater amount.

Moreover, the differences among producers within the same MS, in terms of non-competitive behaviour, appear to be more pronounced in slaughtering, with considerably less variation among producers of fruits and vegetables, and especially in the dairy and milling sectors. The differences among MS are also substantial. With respect to slaughtering, Austria, Belgium, Germany, Finland, France and Italy display a higher mean of relative mark-down than the EU average. A relatively high degree of market imperfections in fruits and vegetables sectors is shown for Belgium, Finland, France, the Netherlands and Romania, whereas the discrepancies among MS in the dairy and milling sector are only marginal.

In contrast, market imperfections in output markets are not so pronounced for the slaughtering sector, as revealed by the fitted mark-up model. Nonetheless, the degree of market imperfections in the dairy and milling sectors is higher for the output market as compared to the input market, whereas the fruits and vegetables sectors for the output and input markets display similar results.

[11] This represents the degree of non-competitive behaviour and is expressed as an interval from zero to one, whereby zero indicates the absence of market imperfections, namely competitive behaviour.

Market imperfections in output markets are generally low in all sectors, although the degree of non-competitive behaviour differs among MS. In slaughtering, strong market imperfections are found in Bulgaria, Hungary, the Netherlands and Romania. In fruits and vegetables sectors, the highest relative mark-up is found in Bulgaria, Estonia, Romania, Slovenia and Slovakia. For the dairy sector, significant market imperfections exist in Austria, Finland, Hungary and Portugal. The milling sector presents the largest market imperfections in Bulgaria, the Czech Republic, Denmark, Greece and the Netherlands. Moreover, the differences among producers are more pronounced in the dairy and milling sectors, as compared to the slaughtering and the fruits and vegetables sectors.

The developments of the relative mark-down and mark-up are characterised by a stochastic trend, suggesting that, in the majority of countries and for the analysed sectors, the degree of non-competitive behaviour in input and output markets, during the analysed period, did not considerably change.

The efficiency of domestic agricultural markets has been tested through spatial integration analysis for selected agricultural markets, based on the assumption that perfectly integrated markets are expected to be efficient (Bakucs *et al.*, 2014b). Selected commodity prices, specifically for raw milk, pork meat, eggs, beef, poultry and sheep meat, have been tested for spatial market integration and for the existence of the law of one price (LOP). In a spatially integrated market, the price information of a product should freely be transmitted between MS. Hence, the law of one price, based on the assumption that price differences lead to price arbitrage, which eventually equalise prices and prevent price discrimination in the long-run, reveals the efficiency of the EU's spatial market integration. The findings indicate that the highest degree of market integration across MS is recorded for pork meat, followed by raw milk, eggs, beef, poultry and sheep meat. However, the examination of the determinants of market integration, and thus market efficiency, has not produced clear results, with the only consistent explanatory variables being trade quantity and value.

The examination of producer prices for selected markets, harmonised consumer prices index (HCPI) and food inflation rates, carried out to assess the convergence of the NMS with the EU-15, indicates that the process is still ongoing (Bakucs *et al.*, 2014b). Although there is some evidence for convergence in some NMS, this is not uniform for all countries or groupings of countries. The only exception are the former-CEFTA (Central European Free Trade Agreement) members, namely Czech Republic, Hungary, Poland, Slovakia and Slovenia, which exhibit a group convergence. Moreover, both the degree of horizontal market integration and the producer price/inflation rate convergence, of NMS towards the benchmark price and Eurozone 17 inflation rate average, are below expectations. In particular, pork meat and eggs producer prices strongly convergence towards their benchmark, whereas for beef and poultry producer prices convergence was found only in few NMS. This suggests that markets are less efficient than expected and may point to the existence of internal market inefficiencies in price discovery and price coordination in the EU.

The degree of spatial integration in the wheat market has been empirically examined between two neighbouring NMS engaged in wheat trade, namely net exporting Hungary and net importing Slovenia (Bakucs *et al.*, 2015). The analysis is based on monthly price data for 2000-2011, during which both countries experienced rapid changing market conditions,

following the 2004 EU enlargement, as well as economic recession and macroeconomic and sectorial adjustments during 2009-2011. The results reject the validity of the LOP and suggest that Hungary is the price-leading market, with Hungarian wheat producer prices determining Slovenian ones. Despite competitive market conditions through symmetric price adjustment, the wheat price elasticities are trade volume dependent. This emphasises the role of Hungarian market share in total Slovenian imports. Nonetheless, the former is just one among the many suppliers on the international wheat market which is dominated by much larger players, such as France, Russia and Ukraine. Hence, wheat producer prices in Hungary are in turn internationally determined by larger, global players. This implies that Hungary *per se* cannot exercise market power or alter prices set on the international market, which is an important consideration in regards to the competitiveness of the European wheat market.

The functioning of international markets has been examined through pricing to market (PTM) analysis. Pricing to market refers to "the destination-specific adjustment of mark-ups in response to exchange-rate changes" (Knetter, 1993, p. 473), which implies that currency exchanges are not fully transmitted into export prices with divergent movements in different markets (Krugman, 1986). Hence, with PTM analysis it is possible to investigate the relationship between the export unit value and the exchange rate, and thus detect the existence of price discrimination, i.e. whether exporters can differentiate their prices between destination markets. In particular, EU pricing behaviour in the wheat market is estimated with respect to its main export destinations, in terms of value, namely Norway, Switzerland, Albania, Belarus, the Democratic Republic of Congo, Mauritania, Tunisia, Egypt, Morocco, Algeria and Iceland (Dawson *et al.*, 2014). Wheat is an ideal product for testing PTM theories as it is a widely traded good, which is largely unbranded and of strategic importance for both the EU and its main destination markets.

The empirical results, based on panel cointegration methods using quarterly data for 11 importing countries for 2000-2013, provide evidence of only limited PTM behaviour across export markets, with the exception of Belarus and Iceland. This suggests that EU wheat export markets are generally integrated. Where this is not the case, EU wheat exporters adopt a local currency price stabilisation strategy, by adjusting their mark-ups to offset local exchange rate movements and maintain relatively constant prices in export markets. This is in line with the findings of previous PTM studies that considered agri-food markets. There appears to be no clear distinction in the behaviour of EU wheat exporters towards developing and developed countries, nor any relationship with geographical proximity.

4.2 Vertical Integration and Market Performance

The effective organisation of transactions along agri-food value chains is fundamental for an efficient allocation of resources and economic performance, and thus for the competitiveness of the agri-food sector. This is particularly true for production processes which require multiple, interdependent and sequential production stages. Moreover, the growing attention to food quality and safety issues in international markets, as witnessed by rising demand for high quality products, implies that the quality of products is an important determinant of both the direction of trade and countries' export performance. This section provides insights regarding how supply chain institutions and institutional arrangements determine inter-firm

relationships and affect economic outcomes. Furthermore, the relationships between trade, product quality and market performance have also been addressed.

The impact of power and buyer trustworthiness in buyer-supplier relationships on supplier performance has been examined (Gorton *et al.*, 2015). The analysis, based on a Multiple Indicators and Multiples Causes (MIMIC) model, draws on organisational supply chain perspectives of power. The model is tested using data for the Armenian dairy sector. The latter, in common with many agri-food supply chains in emerging and transitional economies, is characterised by a fragmented supply base, a predominance of small-scale producers and low levels of physical capital. The results suggest that that the execution of power in buyer-seller relationships depends upon the relative position of each actor. Greater competition in the buyer's market (i.e. dairy processors) increases buyer trustworthiness, as the supplier (i.e. milk producers) can more easily switch between alternative buyers. Similarly, a limited number of sales options depresses the prices received by suppliers for their output, and may lead to inflated fees for inputs provided by the buyers.

Where buyers possess a monopsony they are significantly more likely to act opportunistically as exploited suppliers are unable to switch to an alternative buyer. The size of the supplier and membership of a marketing cooperative are positive determinants of buyer trustworthiness. Marketing cooperatives are thus one vehicle for small-scale producers to improve their bargaining power in supply chains and curb the likelihood of buyers' acting opportunistically. This has important spill-over effects as buyer trustworthiness has a positive impact on suppliers' satisfaction and on their economic performance, measured in terms of the quality and quantity of their produced output. This confirms the importance of a supply chain perspective in studying competitiveness, as power asymmetries and high levels of buyer opportunism may hinder producers' productivity and competitiveness in the long-term.

The investigation of the distribution of power in supply chain relationships has focussed on three stages along the food chain with respect to the dairy sector in Poland, to better understand farmers' bargaining position *vis-à-vis* the processing industry and inputs suppliers (Falkowski *et al.*, 2015). The analysis is based on survey data from 300 individual dairy farms containing farmers' subjective assessments of the ease with which they could be substituted for by their contractors. Despite the facts which have often been emphasised, i.e. the fragmented farm structure, the relative low income of small agricultural holdings and the weak position of farmers with respect to the large food processing and retail sector, this study suggests a rather different picture. The results provide counter-evidence on the popular view according to which farmers are 'exploited' or 'squeezed' by other stages in the food chain. In fact, a great majority of respondents reveal good and very good relationships with dairy processors and feed suppliers. Moreover, controlling for the size and quality of output, farmers with strong bargaining power receive higher milk prices from the dairy company and enjoy bigger discounts from feed suppliers.

The analysis on vertical coordination also explored the determinants of supply chain relationships (farm - processor), the provision of supplier support measures and their impact on farm level investment in the Armenian dairy sector (Dries *et al.*, 2014b). Supplier support measures are "activities undertaken by a buying firm to improve either supplier performance, or supplier capabilities, or both, and to meet the buying firm's short- and/or long term supply

needs" (Krause *et al.*, 2007, p. 34). The most important support tools include the provision of physical inputs, credit, training, guaranteed prices and prompt payments. The empirical analysis, drawing on a sample of 300 commercial dairy farms, indicates that such support measures stimulate supplier investment, which is vital in sectors hampered by low levels of productivity and quality of primary production. The provision of supplier support measures is positively associated with the degree of exclusivity of the buyer-supplier relationship (i.e. a higher share of milk being sold to the main buyer), the initial capital of the supplier, the level of co-operation between suppliers, and the foreign ownership of the buyer, i.e. if suppliers deliver to more internationally oriented buyers. Conversely, support measures are less likely to be offered in a competitive market, due to the high costs that buyers face for monitoring and enforcing contracts in an environment where several buyers are competing for the same supply.

The agri-food supply chain's resilience to institutional reforms and adverse shocks has been studied in the context of transition from a centrally-planned economy to a market economy. The impact of a radical reorganisation of the linkages between upstream and downstream producers has been estimated for the dairy sector in Poland. The evidence suggests that the dislocation of relationships between farmers and milk processors, following the collapse of the communist vertically coordinated system in 1989, negatively affected milk production. This accounted for approximately 20% of the drop in milk production during the early years of transition, between 1989 and 1992 (Falkowski, 2015a). In particular, the dislocation of the milk procurement system and the break-up of vertical linkages between farmers and the dairy industry, coupled with limited options for farmers to market their products, led to a decline in production. Hence, effective coordination mechanisms between upstream and downstream firms are crucial for the governance of economic relations and the well-functioning of input and output markets.

The determinants of the resilience of farmer-processor relationships to adverse shocks have also been explored with respect to the Polish dairy supply chain during the first years of transition, 1989-1992 (Falkowski, 2015b). Larger disruptions to supply relations, and thus lower resilience, are observed when the supply base is more fragmented and when farmers have greater options to market their products via direct sales to consumers. Moreover, regions with a larger share of state-owned land indicate a lower level of supply chain resilience, whereas there is a positive, although weak, association between resilience and the level of commercialisation of agricultural production.

Studying the role of competitive strategies in agri-food markets, with respect to price and quality competition, is a prerequisite for understanding market performance, and thus competitiveness. Nonetheless, since quality is difficult to directly observe, it becomes important to test the reliability of proxies for the estimated quality from trade data, and thus ensure an effective assessment of market competition. The empirical exercise, carried out on the EU food export sector, suggests that export unit values are often a poor measure of quality (Curzi and Pacca, 2014). Instead, more reliable quality measures can be obtained using the approach of Khandelwal (2010) by disentangling the price from the quality component of traded goods. Interestingly, in many developing and emerging countries an increase in quality does not implicitly correspond to an equivalent increase in prices, but often lower prices are accompanied by higher qualities. Hence, the gap in prices between

developing and developed countries may not necessarily reflect differences in quality, but may suggest different export strategies or different production costs. This implies that countries' competitive strategies in international markets, in terms of price and quality competition, vary when moving from OECD to non-OECD countries. The analysis also confirms that quality growth is strongly correlated with TFP growth.

The 'collapse in quality' hypothesis states that during the 2008-09 collapse in international trade, following the global financial crisis, higher quality goods experienced a stronger import collapse compared to those of low-quality. This hypothesis is tested using disaggregated trade data for France, Italy and Spain, renowned as high quality food producers and exporters (Curzi *et al.*, 2013). Despite the substantial reduction in food export prices, and the greater decrease in the value than in the volume of exports, the quality component of the products did not display any significant change. The evidence instead identified the trade effects of the crisis, which led firms to adjust by reducing their mark-ups to maintain their market shares.

Furthermore, the extent to which import competition, as a result of the reduction in import tariffs, affected the quality upgrading of the food products exported to the EU-15, has been investigated for more than 70 exporters and 1500 agri-food products, over the period 1995-2007 (Curzi *et al.*, 2015). The empirical results, based on a 'distance to the frontier' model, confirm the existence of a non-monotonic relationship between competition and quality upgrading. An increase in the level of competition for those products close to the world quality frontier is associated with a greater likelihood of upgrading quality, whereas the opposite effect holds for those products far from the frontier. Nonetheless, varieties far from the world frontier display faster quality upgrading, providing support for a clear convergence on quality. The relationship holds for both OECD and non-OECD countries, and is particularly strong for those countries and products targeted by FDI flows, which are likely to boost the rate of quality upgrading in the host countries. Moreover, there is a positive relationship between the diffusion of EU voluntary standards and quality upgrading.

4.3 Requirements of Multiple Retailers

European agri-food supply chains have witnessed substantial restructuring in recent years, with power shifting to increasingly concentrated grocery retailers operating in multiple countries, such as Carrefour, Tesco, Metro Group, Lidl, Auchan and Aldi (Hingley, 2005). Market access for suppliers is dependent upon meeting the stringent requirements (e.g. quality and safety standards, volume, delivery and logistics) imposed by these multiple retailers. While such practices were developed in Western Europe, retailers from this region have aggressively expanded their operations in CEE countries and other continents (Dries *et al.*, 2004). Meeting these requirements for small-scale producers is often problematic.

Table 1 lists the typical criteria employed by multiple retailers regarding their procurement of Fresh Fruits and Vegetables (FFV). This set of criteria, which is common to other agri-food sectors, include target margins, year round availability, information sharing by suppliers, compliance with standards, maximising shelf life and strategies for differentiation.

Of particular importance is the proliferation of food quality standards and safety regulations, which followed a series of food scares in the 1990s (e.g. BSE in the UK) and public

concerns. This also saw the emergence of systems for quality control, such as Hazard Analysis Critical Control Points (HACCP). Retailers have also created their own (private) quality control systems to improve food safety throughout the supply chain, both to meet legislative requirements and protect their reputation.

Table 1 Typical Criteria employed by Multiple Retailers for the evaluation of Fresh Fruits and Vegetables (FFV) Suppliers

Criterion	Description
Gross Margin	Retailers have targets for gross margins and expect transparency in viewing producers' margins. Seek to establish cost margins. For common FFV, typical gross margins are 30 – 35%.
Availability	Desire all year round availability of product, with producers encouraged to extend the growing season.
Information	On-going, daily reporting on sourcing, flavour, Brix values/sugar levels. Performance measured against set Key Performance Indicators.
Standards	Suppliers must meet all relevant public and private standards. Extensive product testing.
Shelf life	To reduce waste, retailers require extensions in the shelf life of produce (up to 14 days for FFV).
Differentiation	Retailers seek points of difference from competitors. This for example, could be the introduction of biodegradable packaging, for which it is the supplier's responsibility to implement.

Source: Gorton *et al.*, 2013.

The private quality and safety standards set by the retailers are generally stiffer than those imposed by national regulatory authorities and required under EU law. For instance, Metro Group, a leading German retailer, announced in 2007 that it would only procure FFV with less than 70% of EU permitted maximum residue levels of pesticides and would refuse to deal with suppliers who were unable to meet the higher standard (Planet Retail, 2007).

Meeting these private standards, as well as other technical requirements, demand a high degree of asset specificity and may act as a significant barrier to market access and/or exclusion of small-scale producers. Moreover, conformity with labour and environmental standards may also be required, with compliance costs proportionately much higher for small holders (FAO, 2008). As a consequence, many small-scale producers which are unable to meet the volume and quality standards of multiple retailers, particularly in Central and Eastern Europe, can be locked into declining, low-value added wholesale and informal markets (Gorton *et al.*, 2011). Similarly, the export opportunities of developing countries to the highly regulated markets of high-income economies are hampered by the imposition of non-tariffs import restrictions. In contrast, EU enterprises have benefitted, since they have been able to control more effectively food safety standards and quality, as well as ensuring traceability across the entire supply chain via tighter vertical integration and coordination (Hockmann *et al.*, 2013).

5 Policy Measures and Governance

5.1 Impact of Policy Measures on Competitiveness

Governments can aid agri-sector competitiveness by bolstering the efficient allocation of factors and market functioning along the value chain. With the aim of examining how agricultural policies and other regulations affect resource allocation in EU agri-food chains, this section discusses the business environments in EU countries. In particular, special attention is given to EU and national food laws, in terms of food safety regulations and quality-based certifications, and policies regarding research and development.

The key message is that countries with both good governance and policy implementation are also those which exhibit greater competitive performance due to the better quality business environment. The summarised findings are based on the analysis of a wide array of indicators of governance and competitiveness performance, namely the Global Competitiveness Index (GCI), the Sustainability-Adjusted Global Competitiveness Index (SA-GCI), the Trade Performance Index (TPI), The Ease of Doing Business Report, the Worldwide Governance Indicators (WGI) and the Enabling Trade Index (ETI) (Stojanović *et al.*, 2014). These measures provide a reasonable and sensible benchmark against which the more specific issues of competitiveness in the agri-food chain can be assessed and contextualised.

According to the GCI, which represents perhaps the most general and comprehensive measure of competitiveness[12], the EU is characterised by a heterogeneous composition of countries. Germany, Denmark and the Scandinavian countries are among the best performing countries in the world rankings, whereas Eastern European economies lag behind. Overall, the lowest ranked countries are associated with numerous problems, and in particular poor institutions, low market efficiency and macroeconomic instability. Conversely, the best performing countries are overall highly ranked for business sophistication and innovation. In particular, investments in research and development are among the main factors driving economic development. As supported by the evidence for Germany and the Netherlands, the excellent innovation system and the strong adoption of technology have positively contributed to their food chain competitiveness. Hence, knowledge-based and innovation-driven competitiveness becomes increasingly important for the EU-15. Conversely, for the majority of the NMS, improvements can be achieved by efficiency-driven factors.

In terms of SA-GCI, which measures the extent to which competitiveness relates to sustainability, and precisely “the set of institutions, policies and factors that make a nation remain productive over the longer term while ensuring social and environmental sustainability” (WEF, 2015), the Nordic countries perform best. Overall, the EU-15 countries

[12] The index takes into account several factors influencing global competitiveness of an economy and is composed of 12 pillars which characterise economies into factor-driven, efficiency-driven and innovation-driven economies. These can be summarised as: basic requirements (institutions, infrastructure, macroeconomic environment, health and primary education); efficiency enhancers (higher education and training, goods market efficiency, labour market efficiency, financial market development, technological readiness, market size); innovation and sophistication factors (business sophistication, innovation).

perform better than the NMS. However, the scores on environmental protection are relatively low and indicate areas for improvement.

Based on the TPI, which assesses the performance of 14 export sectors in 184 countries, the EU is highly ranked in terms of agri-food competitiveness[13]. The EU-15 countries are leaders in the world food market, with the majority of food exports related to processed food, and especially high value added food. In particular, during the period 2007-2011, the top 5 EU exporters of processed food, in terms of value, were Germany, France, the Netherlands, Italy and Belgium, with the first four MS dominating in global markets. As far as the NMS are concerned, a significant level of competitiveness is found in specific food sectors which are traditionally important to the individual economies. Their competitiveness in both fresh and processed food, which is mainly related to intra-EU trade, has been preserved after accession to the EU.

According to the Ease of Doing Business Report, which evaluates how easy or difficult is to run a business when complying with national regulations[14], the EU-15 countries are highly ranked, and are followed by Estonia, Latvia, and Lithuania from the NMS. The remarkably strong position of the EU-15 is also evident from the various WGI[15]. These indicators, which are highly correlated, support the notion that good governance is a key factor for achieving economic growth. In particular, government effectiveness is highly scored in the Nordic countries, especially Finland, Denmark and Sweden, whereas a low level of government effectiveness is reported in some Southern MS, such as Portugal, Spain and Greece, as well as in the NMS. Similarly, according to the ETI, which measures the development of institutions, policies and services facilitating trade flows[16], the EU-15 are highly positioned in the ranking, with Denmark displaying the best performance. The NMS are lagging behind, with the best performing country being Estonia, followed by Slovenia, Cyprus, Czech Republic and Lithuania.

With regard to the government's role in agricultural sector performance, a sub-index of the GCI looks at agricultural policy costs. The assessment of the relationship between agricultural policy costs and stakeholders benefits indicates that the EU support under the CAP is not perceived equally among MS. In the period 2013-2014, a well-balanced cost-benefit relationship, which thus reflects the interests of taxpayers, consumers and producers, is perceived in Luxembourg, the Netherlands, Sweden and Ireland. Less satisfactory results

[13] Countries are ranked according to several trade performance indicators under three main headings: country general profile (value of exports, export growth in value, shares in national exports and imports, relative trade balance and relative unit value); current position of country and sector in export performance (values of net exports and per capita exports, world market shares, diversification and concentration of export products and markets); country's change in export performance (relative changes in world market share and dynamics in world demand).

[14] This indicator is derived from 9 sub-factors, i.e.: starting a business, dealing with construction permits, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts, closing a business.

[15] The 6 WGI indicators are the following: government effectiveness, political stability, voice and accountability, rule of law, regulatory quality, control of corruption.

[16] The ETI covers the main enablers of trade under 4 main sub-indexes: market access, border administration, transport and communication infrastructure, and business environment.

are found in the remaining EU-15 countries, with the least balanced interests perceived in Italy, Germany, Denmark and France. As far as the NMS are concerned, the top positioned countries are Estonia and Malta, with Croatia, Slovakia, Bulgaria and Romania in the worst positions.

The growing importance of complementary dimensions of food production towards social, environmental, health and ethical issues gave rise to the local food concept and quality based food certifications, promoting organic production and traditional products. The EU labelling regulation of geographical indications and designations of origin for agricultural products and foodstuffs is designed to protect and foster tradition and cultural heritage. Hence, the promotion of quality schemes and high value added products, such as PDO, PGI, TSG, and organic, places great emphasis on the sustainable food chain competitiveness of high value added products.

5.2 Impact of Quality Policy

As previously discussed in section 2.1, the adoption and diffusion of EU quality schemes represent an expanding market with potential for further growth opportunities. The intensification of competition from emerging countries on the global market also implies that these countries have high potential for economic growth, with considerable potential for high value added export opportunities for the EU. The EU quality schemes constitute an important governance mechanism for adding value to agri-food production, and thus for upgrading the competitiveness of the sector. This section discusses some of the main developments and challenges for products produced under the EU quality schemes (PDO, PGI and TSG) and organic standards and identifies the market potential in internal and international markets.

The analysis, carried out in eight EU countries, specifically Czech Republic, Germany, Italy, the Netherlands, Poland, Romania, the UK and Serbia, suggests that wide disparities exist across countries in regards to the size of the market and the potential for these products (Alboiu and Voicilas, 2014). These disparities are particularly pronounced between the EU-15 and NMS and are reflected by differences in specific traditions, cultural differences, consumption behaviour and level of purchasing power. Overall, the EU-15 are quite active players in the sector and have benefitted from more experience under Measure 132, i.e. participation of farmers in food quality schemes, in their 2007-2013 Rural Development Programmes (RDP).

The market growth for GIs is quite slow in the NMS with participation in quality schemes generally being low. For instance, Romania has only one product with PGI and two with PDO status, while the Czech Republic has five PGIs and one TSG registered. In contrast, in the EU-15 the market is well developed in some countries, such as Italy, with 156 PDO, 92 PGI and 2 TSG approved, but remains of peripheral importance in some others, such as the UK. The top countries in terms of registration of GIs are Italy, France, Spain, Portugal, Greece and Germany. Despite the promotion in the EU of PDO, PGI, and TSG designations, a major constraint to the further growth of the market is still limited consumer knowledge of the quality schemes. Moreover, consortium formation and registration remain problematic for many producers, so that implementing new production and processing methods to respect the quality schemes remains a special challenge. Specifically for the NMS, the low level of market development is a consequence of lower incomes, lack of experience, tradition, and

insufficient models to be replicated by other interested potential applicants for quality schemes.

Concerning organic products, several changes have characterised their development. The market is heavily influenced by EU policy, especially in terms of financial support. The majority of countries have experienced a rapid increase in organic production, with the exception of the UK, although trade is mainly oriented to other EU countries, with only minor exports to the US and the BRIC countries. The recent global economic crisis halted this process, especially in the NMS, where demand for organic products is limited due to lower levels of consumer incomes. Within the EU countries, Germany ranks first in terms of market demand for organic products, and second in the world following the US. In the UK, organic production and sales grew rapidly in the late 1990s and early 2000s, when organic was widely perceived as offering a credible food alternative and a future of UK farmers. Since the financial crisis started, both demand and supply contracted, and scepticism amongst consumers was widespread regarding whether organic food offers superior nutritional benefits compared to conventional alternatives. In some other countries, such as in Serbia, where the local market is restricted by low purchasing power, the development of the organic sector relies exclusively on export sales. Although the organic sector has a longer history in comparison to other EU quality schemes, consumer understanding is still limited. This constitutes an important obstacle as consumers must be convinced that the consumption of these products will improve their quality of life.

Expansion of the markets for organic foods and GIs is hindered by several barriers. First, consumers are often unwilling to pay a premium price for organic and GIs products. This is particularly true in countries with lower level of incomes, such as in the NMS. Most sales take place in countries with high purchasing power where consumers are better educated and informed on food issues, in terms of food safety, environmental concerns, or health motives. Second, there are high investment costs for conversion, in the case of organic products, and for legal registration procedures, in the case of GIs products. Limited and non-existent financial support is thus a significant constraint to market development, especially in several NMS, and particularly in Romania. Moreover, the system of application is complex and time-consuming and there is low confidence in the recognition of labels by potential buyers. Hence, high costs and complicated procedures often discourage large-scale enterprises to invest in this sector. Third, domestic markets for quality schemes are inefficient or do not exist, especially in some countries like Serbia and Romania. The participation of the government is weak and national/EU funds are mainly oriented towards other agricultural and rural priorities. In such countries, the absence of successful certification organisations and the lack of an advisory service contribute to the difficulties encountered.

Hence, the lack of consumer awareness of EU quality and protected schemes has a negative effect on demand for these products. As supermarkets are the main market channels through which consumers buy organic and GIs, the main opportunity lies in their growing demand for these products. This, in turn, is driven by customer attention towards social, environmental, health and ethical issues concerning conscious food choices, sustainable production, and locally produced food.

The potential for adding value to agri-food production through GIs and for upgrading the competitiveness of small-scale producers has been examined in the context of the PDO for Makó onion in Hungary (Gorton *et al.*, 2014). As identified in the study, there are three main potential channels through which GIs may facilitate upgrading. These are: a) acting as a quality signal, and thus capturing higher margins for existing products; b) stimulating collective action, with producer groups, pooling of resources and cooperative networking leading to benefits from knowledge sharing and reduction of transaction costs; c) encouraging diversification into higher margin activities, within the same supply chain, such as downstream processing or retailing of agricultural produce, or via auxiliary services, such as farm tourism. However, the evidence indicates that none of these potential benefits for upgrading competitiveness have been delivered in the case of the Makó onion PDO. In fact, the outcomes achieved by established GI systems are not necessarily transferred to nascent systems, as fundamental differences exist between reputation building and reputation protection.

For upgrading to occur in nascent systems, such as the relatively new Makó onion PDO, additional actions must occur. First of all, there needs to be a shift to a more customer-oriented mind-set within consortia, to identify customer needs through consumer segmentation and targeting, and thus establish market presence. In this process, brand building is essential for nascent GI systems, and producer consortia often lack expertise in this field. The conversion of a protected product name into a brand identity, although complex and difficult, is a strategic step to signal high quality and build reputation, and thus compete effectively in domestic and international markets. Lastly, building effective networks with external actors can be crucial to foster supply chain and cross-sectoral links, especially for nascent GI systems which, as in the Makó case, may lack internal capabilities and capital.

5.3 Opportunities and Limitations to Adding Value

Quality policy can serve as a useful instrument to foster the competitiveness of the agri-food sector. Nonetheless, heterogeneity in the EU in terms of structural and socio-economic characteristics as well as production systems implies that addressing the diverse interests and needs still remains a challenge. Therefore, in order to understand the market potential for products under EU quality schemes and organic certification, and thus the opportunities for adding value, it is important to consider the weaknesses and strengths encountered across MS.

The main challenges which have been emphasised include: high costs for organic production compared to conventional products, time-consuming and complex system of application and registration of protected products, credit constraints (especially in the NMS), lack of financial support from the government, low recognition of the labels by potential buyers, low confidence among consumers and unwillingness to pay the price premium (often due to lower purchasing power, mainly in NMS and particularly in Romania), general scepticism over superior quality and nutritional benefits to conventionally produced alternatives (not only in NMS but also in well-developed countries such as the UK), weak customer awareness of quality schemes and a hazy understanding of what certified organic production actually entails. These weaknesses are then exacerbated by the low national market demand for these products coupled with low levels of income per capita (especially in the NMS).

Turning to successful experiences among MS, it seems evident that a common driver is government support for quality schemes to ensure a sustainable and competitive agriculture. The promotion of activities which focus on quality, healthy eating and sustainability has significantly contributed to the development and strengthening of the sector. The positive impact is particularly significant in the case of Italy, which is globally renowned for its quality food schemes. Attention to sustainability issues is becoming increasingly common in several MS, and particularly in the Netherlands and the UK, whereby the positive attitude of consumers towards ethically conscious food choices and locally produced food are growing.

6 Conclusions

This paper seeks to build a coherent picture of the competitiveness of the EU agri-food sector, drawing on comparisons across EU MS. With the aim to gain a deeper understanding of competitiveness, for better targeted and evidence-based policies, particular attention was paid to the main drivers of competitiveness in agri-food value chains. To this purpose, the theoretical and empirical findings of previous work packages (WP2-WP9) in the framework of the COMPETE project were summarised. In particular, the discussion focused on four main sections: trade, enterprise performance, market efficiency and supply chain relationships, policy measures and governance. The key conclusions that emerge from this synthesis of findings are as follows.

(i) *The agri-food export competitiveness of the EU is driven by a few successful MS, such as the Netherlands, Spain and France, which reveal significant comparative advantages for several products on global markets*. The EU-15 exhibits higher revealed comparative advantages and stability in trade competitiveness in comparison to the NMS. It also records higher levels of vertical intra-industry trade, although some degree of convergence is taking place as the NMS are experiencing higher growth rates. While the EU remains one of the key players in global agri-food trade, the intensification of competition from new emerging markets, i.e. China, Russia and Brazil, has seen the EU losing export share in world markets and its traditional and main competitors also being gradually caught up, namely the USA, Canada, Argentina, New Zealand and Australia.

(ii) *Convergence in the EU has been limited, and the leaders, in the EU-15, are further pulling away from those lagging behind (the NMS) in terms of productivity*. The argument that EU membership would promote convergence in terms of agricultural and food sector productivity is not supported by empirical evidence. While TFP growth in the NMS has overall been disappointing there are some exceptions, most notably Poland and Hungary, which overall revealed higher comparative advantages and TFP in comparison to other NMS. Generally, however, catching-up processes are not so strong. While some countries with average or poor TFP performance are catching-up, others are falling further behind, as those countries with a relatively higher productivity continue to enhance their performance. Leapfrogging in TFP development is extremely rare, and producers with poor performance are expected to fall further behind the sector's leaders.

(iii) *Generalisations about the competitiveness of the EU's agri-food sector are increasingly difficult to make*. Following the 2004 and 2007 waves of EU enlargement, the diversity of the agri-food sector has significantly increased. Hence, the assessment of EU competitiveness, and the impact of policy measures, entails heterogeneous considerations across MS. Certainly, as some NMS are still experiencing structural changes, and with the enlargement process not yet completed, raising the productivity of the EU will prove difficult and further catching-up will be required.

(iv) *There is mixed evidence regarding the efficiency of markets.* The degree of market imperfections varies across sectors with significant differences between MS. Overall, markets are less efficient than expected, with the presence of internal market inefficiencies in price discovery and price coordination in the EU. The analysis on the efficiency of domestic agricultural markets, tested through spatial integration, indicates that markets are not perfectly integrated. However, 'pricing to market' (PTM) analysis of EU wheat exports suggests little evidence of price discrimination between export destinations.

(v) *Structural problems in the poorest NMS persist*. The largest disparities in efficiency and low TFP are found within the NMS, particularly in Bulgaria and Romania. Several structural problems hinder the competitiveness and the market development in these countries, such as low levels of physical capital, weak local purchasing power, a fragmented farm structure and supply base, and imperfections in credit and other input markets. In this respect, their ability to capture added value through organic and higher premium quality food production targeting the domestic market is limited.

(vi) *Quality policy has the potential to contribute to economic growth and upgrade the competitiveness of the EU agri-food sector, although its general development is quite limited, and it certainly does not promote convergence*. There are many successful Geographical Indications, for instance in France and Italy, that add value for consortium members and represent substantial business networks. However, the ability of this business / supply chain model to be replicated in the NMS is limited. This is because of weaker local purchasing power and limited consumer awareness of EU quality schemes. Registration procedures for GIs remain time-consuming and complex, with high costs of conversion for organic products.

(vii) *The competitiveness of the EU's agri-food sector largely mirrors macro-economic and social indicators for general competitiveness, such as the World Economic Forum's Global Competitiveness Index (GCI).* Overall, good governance and policy implementation are essential prerequisites for achieving economic growth and fostering competitiveness. The EU-15 and especially the Nordic countries perform better than the NMS, where business sophistication and innovation are key drivers of economic performance and agri-food chain competitiveness.

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Duration:	01/10/2013-30/09/2015 (36 months)
Objective:	The objective of the COMPETE project is to gain a more comprehensive view on the different elements which contribute to the competitiveness of the European agri-food supply chain in order to provide better targeted and evidence based policies on the EU as well as on the domestic level. The project investigates selected determinants of competitiveness like policy interventions and the business environment, productivity in agriculture and food processing, the functioning of domestic and international markets, the choice of governance structures, and innovative activities in food processing. The research results will enable a congruent, coherent and consistent set of policy recommendations aiming at improving competitiveness of European product supply chain.
Coordinator:	IAMO, Germany, Prof. Heinrich Hockmann
Consortium:	16 Partners from 10 European countries. COMPETE brings together academics, trade bodies, NGOs, agricultural co-operative, industry representative advisory services. In addition, the project is supported by the group of societal actors, incorporating farmer, food processing and consumer associations, providing in-depth knowledge on the agri-food sector and speeding up the achievement of the project goals.
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COMPETE
International comparison of product supply chains in the agro-food sector

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