Paper presented at the WICaNeM/IFAMA 2016 conference, 19-23 June, Aarhus, Denmark
Theme: Become the Solution. Food Security & Sustainability Through Innovation

Competitiveness of agri-food chains in EU's Eastern Neighbours. Quantifying Porter's diamond

Siemen van Berkum, Jo H.M. Wijnands and David Verhoog, LEI Wageningen UR, The Hague, The Netherlands
Submission ID# 4881712

Abstract

In order to construct a comparative framework for analysing the competitiveness of agri-food chains in EU's Eastern Neighbours (EN), Porter's diamond approach is used to assess national and food chain competitiveness. Despite its average to above average strength in factor conditions, the overall competitive position of the EN agri-food chains shows to be weak: strong upstream industries are lacking, scores on firm strategy and rivalry are low, and the regulatory framework provided by the government is weak. The international competitiveness of the agri-food sectors in the EN, therefore, would be most enhanced by strengthening the agri-food supplying industries and by government policies that are more supportive to agri-food sector development. The latter need not be agricultural sector policies per se, but would refer in the first place to policies that help to establish institutional infrastructures that a market driven agricultural system needs.

Problem statement

With the enlargement of the European Union (EU) in 2004 and 2007 the EU border shifted eastwards, prompting the Union to launch the European Neighbourhood Policy (ENP)[1] as a cooperation strategy to deepen its political and economic relations with its new eastern neighbourhood, the former Soviet Union republics. In that context the EU has recently established free trade agreements with Ukraine, Georgia and Moldova, and aims at enhancing trade relations with other Eastern neighbours (EN)[2], despite the current political tensions with Russia. In order to estimate the possible effects of further economic integration on the competitive position of EU's agri-food sector, strengths and weaknesses are assessed in a comparative framework of a set of most important but also diverse subsectors of the agri-food industry.

This paper evaluates the competitiveness of the agri-food sectors in the four largest EN benchmarked against EU countries. In the approach, Porters' diamond framework of determinants of competitiveness is applied to analyse the competitive strength of agri-food sectors. The performance of the agri-food sectors is quantified by a rich set of performance indicators and captured in a composite index of each of Porter's determinants of competitiveness. The paper concisely summarises the results of a broad analyses covering nine agri-food sectors and focuses on the competitive position of the food industry in Russia, Ukraine, Kazakhstan and Belarus, which together

[1] The ENP framework is proposed to EU's 16's closest neighbours in the east and the south of the Union, regionally divided into the Eastern Partnership and a Euro-Mediterranean Partnership (EUROMED). The Eastern Partnership includes the countries Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine.
[2] In this paper we define EU's Eastern neighbours (EN) to include Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Moldova, Russia and Ukraine.

account for over 90% of total production value of these agri-food sectors in the former Soviet Union republics.

Key features of the agri-food industry

The main agricultural sectors in Russia, Ukraine, Kazakhstan and Belarus are cereals, oilseeds, potatoes, meat (pork and poultry) and dairy products (Figure 1, left panel). Azerbaijan, Armenia, Georgia and Moldova ('rest of CIS' in figure 1) have favourable conditions for vegetables, fruits and cereals, with wine being the most important high-value agricultural product. At EU level, major producing member states of each agri-food sector are selected for benchmarking (see figure 1, right panel).

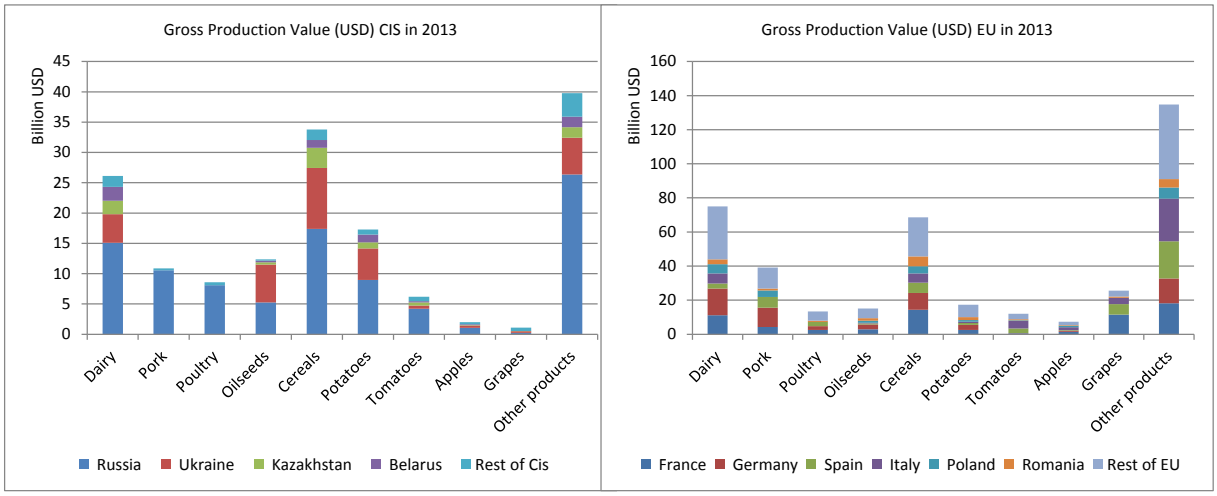

Figure 1 Gross agricultural production value (billion USD) of selected sectors and countries. Source: FAOstat. Note: total agricultural production value in EU's Eastern Neighbours was 158 bn USD, in the EU this was 408 bn USD in 2013.

Some of the key features of the food industry in EU's Eastern Neighbours are presented in table 1 below. In this region, the food industry is an important part of the manufacturing sector, accounting for about one third (Moldova, Georgia and Armenia) to on-fifth (Belarus and Ukraine) in terms of production value and employment. In countries rich in minerals and with a large mining industry - Russia, Azerbaijan and Kazakhstan - the food sector's industrial share is around 10% (Drozdz et al., 2015). The food sector is the largest manufacturing sector in the EU, representing around 15% of total manufacturing turnover and 15% of total employment (ECSIP-consortium, 2016).

Food sectors in the eight countries are rather diverse. In Russia, for instance, meat, dairy and bakery production are the most important food processing industries in terms of production value. In Kazakhstan, the grain milling industry is the largest food industry, next to meat and dairy. In Moldova and Azerbaijan, processed fruits and vegetables have the largest shares. Oils and fats (mainly based on oilseed production) and 'other food products' (consisting of sugar, sugar confectionery and chocolate products) are the major food subsectors in Ukraine, next to meat and dairy. The latter two are also the major food processing industries in Belarus. Beverages (e.g. wine) play a distinctive role in Georgia, Armenia and Moldova.

Table 1 below indicates the differences in size of the food industry in the countries and provides first insights into performance. The main observations from the table are:

- The Russian food industry is by far the largest in the region, with a turnover that is four times the level of Ukraine's food industry, which is ranked second. The food industry in Armenia has the lowest production value of all food manufacturing sectors in the region. Note that the turnover of the EU food industry is ten times as large as the Russian one;

- All food industries (except for the one in Moldova) recorded a significant growth in production value/turnover (in nominal euros) over the period 2004-2012, with double digit annual growth figures. This expansion follows a transition period of decline after the collapse of the communist regime in these countries.
- The size of firms (in terms of turnover per firm) is rather different in the EN, from especially small in Georgia, to medium (Armenia, Azerbaijan, Moldova) to large (Kazakhstan, Russia, Ukraine) and very large (Belarus). For comparison: the EU28's average turnover per enterprise in the food and drink industry was 3.7m euros in 2012 ((ECSIP-consortium, 2016):16), hence less than in Belarus and Ukraine, but more than in the other EN countries.
- Developments in employment in the food industry show mixed results with declining figures in Moldova, Kazakhstan and Armenia to very small growth in Belarus and Ukraine. Employment growth is significant in Azerbaijan and Georgia only.
- Turnover per employee is highest in Azerbaijan, followed Kazakhstan, Russia and Belarus. Turnover per employee in Ukraine, Moldova, Georgia and Armenia are relatively similar. For comparison: EU28's average turnover per employee in the food and drink industry was 235,000 euro ((ECSIP-consortium, 2016):16).[3]

Table 1 Key data of EN Food industry[3], 2012

Country	Turnover (in million euro)	Growth in turnover (annual % change 2004-12)	Number of enterprises	Turnover per enterprise (in 1,000 euros)	Number of employees (1,000 persons)	Growth in number of employees (annual % change 2004-12)	Turnover per employee (in 1,000 euros)
Armenia	485	10.5	793	611.5	13.6	-0.1	35.7
Azerbaijan	2,490[1]	29.6	3792	656.7	18.8	7.9	132.5
Belarus	10,315	27.0	805	12,814.3	150.9	0.3[2]	68.4
Georgia	1,085	25.1	27,801	39.0	28.8	5.1	37.7
Kazakhstan	5,980[1]	24.6	2440	2,450.8	69.7	-2.9	85.8
Moldova	1,743[1]	7.0	1474	1,182.7	35.4	-4.9	49.2
Russia	100,181[1]	9.4[2]	41,274	2,427.2	1,400	n.a.	71.6
Ukraine	24,776	17.4[2]	5,768	4,295.3	417	0.3[2]	59.4
EU28	1,061,000	1.5[4]	288,655	3,700.0	4,515	0.8[4]	235.0

Note 1: production value. 2: annual growth 2010-2012; 3: Kazakhstan, Moldova, Russia and Ukraine report on Food, Beverages and Tobacco (NACE 10, 11 and 12), data of other countries refers to NACE 10 only; 4. Growth rates 2008-2012. Source: National data (statistical bureaus), except for Russia, for which data are from FAS/USDA GAIN report 29 December 2014. EU data from ECSIP, 2016.

Approach

Competitiveness is a broad, complex concept embracing many issues of (the availability, quality and use of) resource endowment and is often heavily affected by policy interventions. There is no general agreement on how to define and measure precisely competitiveness. Studies often adopt own definitions and choose a specific measurement method that fits the entity of analysis, which can be at country, sector or firm level (Sagheer et al., 2009) or choose a specific scope which can be (past) performance, (future) potential or (governance) process (Buckley et al., 1988).

Most literature on competitiveness emphasise its multi-dimensional features. The World Economic

[3] Turnover is not a measure of competitiveness: value added in turnover or value added per employee is a better indicator of profit generating capacities of an enterprise. Unfortunately, data on value added in the food industry is not available.

Forum, for instance, distinguishes over 100 indicators divided into 12 pillars to assess the global competitiveness of countries (Schwab, 2014). Porter argues that five forces determine the long run competition, whether on the international or domestic market, of any industry. Each force is measured by several indicators (Porter, 1980). Porter's diamond model for analysing competition between nations distinguishes four determinants, each with several sub-determinants for determining the competitiveness between nations (Porter, 1990). Siggel (2006) as well as Latruffe (2010) underline the need to include not only economic (costs, productivity, value added) and trade indicators (unit values, export indicators) but also institutional factors such as infrastructure or government policies. These insights also built on the critique by Krugman (1994) that it makes little sense to measure an industry's competitiveness on the export market if it is (almost) fully focused on the domestic market[4]. The crux of Krugman's critique on studies of competitiveness comparing economic performances across countries is that domestic considerations largely determine the extent of a country's economic health - especially over a longer horizon. Although foreign considerations can affect a nation's domestic output and employment growth in the short term, its living standards (and thus its economic competitiveness) are largely determined by such factors as productivity growth. Hence, an analysis of competitiveness requires both trade and economic indicators.

In several studies assessing the competitive position of the EU food industry, performance indices such as the development in production value, value added, profits, productivity, export market shares and Revealed Comparative Advantage (RCA) indicators are used (Wijnands et al., 2008, Latruffe, 2010, ECSIP-consortium, 2016). Trade data used to calculate export market shares or compile RCA indicators are available for all countries in the world via the UNCOMTRADE database. Other economic data such as on production value, value added and profits have to come from national statistics on the economic activities of the food industry. For the EU countries, for instance, a major source of relevant data is Eurostat's Structural Business Statistics (SBS). The SBS describes the structure, conduct and performance of businesses across the EU: data are available for the EU and for the individual Member States. Our survey exploring the national statistical sources of EN, however, did not provide the details necessary for a food industry analyses that differentiates among subsectors within the food industry in detail (Wijnands, Van Berkum and Verhoog, 2015). Hence, although trade data are available to compile relevant trade indicators, data to build the economic indicators of performance of the food industry in EN countries are too incomplete for making a useful country comparison with the aim to evaluating competiveness. Therefore, we explored an alternative approach for assessing the competitiveness of agri-food sectors in EN.

This paper presents an approach to measure competitiveness that is based on Porter on the international competitive advantage of nations (Porter, 1990). This approach includes a set of indicators that cover trade, structure and strategy as well as institutions. We use Porter's diamond approach to compile a national indicator of advantage, based on a country's score on 1) factor conditions; 2) demand conditions; 3) firm strategy, structure and rivalry; 4) related and supporting industries (the four determinants of competitiveness, according to Porter's analytical framework). We also included the roles of the government, as institutions and the regulatory framework determine the level playing field for enterprises. Some of these indicators are of a general nature, that is, they refer to macroeconomic variables related to all sectors, while others are or can be interpreted as agri-food sector (commodity) specific. Porter's framework has, however, a highly qualitative and abstract nature and lacks a methodology for measuring competitiveness (e.g (Rugman and Verbeke, 1993)). Indeed, there seems to be little literature that operationalises and

[4] For instance, over 90% of the food processed in the EU is also consumed in the EU: hence less than 10% is traded outside the internal market of the Union WIJNANDS, J. H. M. & VERHOOG, D. 2016. Competitiveness of the EU food industry. An ex-post assessment of the performance embedded in international economic theory. The Hague: LEI Wageningen UR..

quantifies the determinants and the underlying categories of Porter's Diamond. Analysing global competitiveness of Korea and Singapore Moon et al. use several quantitative indicators, but only for the economy as a whole and not including all of Porter's determinants fully and consistently (Moon et al., 1998). Another example is an explorative research by Sledge who explains the performance of firms in the global automotive industry constructing quantitative indicators linked to Porter's determinants (Sledge, 2005). Overall, the findings show that Porter's diamond depicts this industry quite well. However, this study looks at a specific group of enterprises, while we study the agri-food sectors, which are in fact value chains from farm to fork. Kaplinsky and Morris (2001) suggest a broad range of indicators to analyse value chains in an international contract. Despite the relevancy of the suggested indicators, their analytical framework is not well elaborated (Kaplinsky and Morris, 2001). Several other studies applying Porter's approach (e.g (Jin and Moon, 2006, Flanagan et al., 2007) have a largely qualitative, narrative nature, without much measuring. We therefore conclude that Porter's Diamond that is an useful integrated framework to analyse agri-food value chains competitiveness is poorly elaborated in its quantitative aspects; that is, in measuring the weight of each of the determinants of competitiveness identified in its approach.

In this paper we consistently follow Porter's arguments and assign a quantitative indicator to each aspect, and by this build a composite index for each determinant and, finally, for Porter's full set of determinants of competitiveness. This quantification adds a new dimension to the extensive literature on Porter's diamond.

Indicators of Porter's determinants of competitive advantage

We have developed an operational set of indicators that quantify the importance and the impact of each of the determinants on the competitive performance of agri-food sectors in EN and EU countries, including the role of government in the process of creating competitive advantage. This section presents and clarifies the categories of each determinant and the quantitative or qualitative indicators of performance assigned to each category. These indicators will be the criteria based on which we assess competitiveness according to Porter's diamond. To operationalise the model, each determinant, category and indicator is further explained, next to the weight of each of the indicators. The full overview of determinants, categories, indicators and their weights is presented in appendix 1.

Factor conditions

In economics, factor conditions are described as land, labour and capital. Porter (1990:74) argues that these categories are too general to determine the competitive advantage of an industry, and should be further specified. Porter provides a number of examples for such specifications. We further detail factor conditions into five categories. These are Human resources (quantity and quality/skills of labour), physical resources (land, water, climate and weather conditions), knowledge resources (knowledge stock and potential, R&D expenditures), capital resources (ease of getting credit, inflow of foreign direct investment) and the type, quality and costs of existing infrastructural (transport and communications) facilities. Indicators (the metrics) are linked to each subcategory in an effort to quantify its contribution to the performance on Factor conditions (see Table 2). The argument is that a nation or an industry gains competitive advantages if domestic resources and access to credit and infrastructure are abundantly available or at low costs.

Table 2 Factor conditions: categories, subcategories and indicators

Category	Subcategories	Indicator(s)	Data Source
Human resources	Quantity	Labour force participation rate, total (% of total population ages 15-64)	WDI
	Skills	Education index	HDR
	Costs	GDP per person employed (constant 1990 PPP $)	WDI
Physical resources	Land	Agricultural land (sq. km)	WDI
	Water	Total renewable water resources per capita (m3/inhab/yr)	FAO-aquasta
	Environment	Production specialization ratio (sector specific)	FAO, WDI
	Fuel costs	Pump price for diesel fuel (US$ per liter)	WDI
Knowledge resources	Knowledge potential	Research and development expenditure (% of GDP)	WDI
	Knowledge stock	Relative Export Advantage of seeds/breeds (sector specific)	UNCOMTRADE
Capital resources	Credit access	Getting Credit (part of Ease of Doing Business indicator, World Bank)	World Bank
	FDI-inflow	Foreign direct investment, net inflows (% of GDP)	WDI
Infrastructure	Air-freight	Air transport, freight (million ton-km)/GDP million USD	WDI
	Sea-freight	Quality of port infrastructure	WDI
	Phone	Mobile cellular subscriptions (per 100 people)	WEF
	Internet	Internet users (per 100 people)	WDI

Notes: WDI = World Development Indicators (World Bank), HDR = Human Development Report (UNDP), WEF = World Economic Forum Global Competitiveness Report

Demand conditions

In Porter's analytical framework (1990:86) home market demand conditions play an important role in determining competitive advantage of a nation. Home market demand shapes how domestic firms perceive, interpret and respond to buyers' preferences. The basic hypothesis is that domestic firms may better understand and, hence, more quickly respond to changes in the domestic buyer preferences due to cultural nearness of these buyers. Home market demand is also less prone to fluctuations such as those caused on external markets by exchange rate changes or trade policy changes in destination countries. The home market provides a reliable base for companies to focus on and can reduce risks, thus fostering investment. The categories and subcategories Porter distinguishes within this determinant are discussed below. In contrast to the Factor condition determinant, a number of indicators measuring the performance of categories that reflect Demand conditions can be made product specific.

In the home demand composition category, subcategories would specify what consumers prefer (the segment structure of demand) and the quality/variety they prefer (sophisticated and demanding buyers; see table 3). However, detailed information on how much of each differentiated product consumers demand is not available in global databases. The hypothesis is that consumers with high incomes demand quality and differentiated products in line with the pyramid of Maslow's hierarchy of needs. Indicators that serve our purpose of measuring demand segmentation are derived from FAOstat's food supply balances, such as levels of protein consumption from animal origin (which are seen as higher valued products), and fat consumption (in many processed and ready-to eat food products, fat is an essential ingredient for sensory and taste aspects of the food). Next, GDP/capita is a proxy for measuring home demand composition as it influences the demand for complementary goods and services that go into processing differentiated food products: poorer people do not eat such a large range of differentiated food. Where GDP/capita is high, people demand differentiated food as well as complementary goods and services along with their food, and the agri-food industry can accumulate expertise and experience in adding these goods and services (i.e. producing specialised processed products). Income per capita levels, therefore, is used as a proxy for 'sophisticated and demanding buyers'.

Next, a second category of this determinant is the size of demand (in terms of population, total GDP, and GDP/capita) and the pattern of growth in demand. A large and growing home market is considered a competitive advantage (a fast rate of growth of demand leads firms to adopt new technologies faster and to build large, efficient facilities with the confidence that they will be utilised) And as a third category, demand by foreign buyers, measured as exports[5], are an important aspect of this Demand determinant. Table 3 summarises the specifications of the Demand condition determinant.

Table 3 Demand conditions: categories, subcategories and indicators

Category	Subcategories	Indicator(s)	Data Source
Home demand composition	Segment structure of demand	Food supply (kcal/capita/day)	FAOstat
		Protein supply (g/capita/day)	FAOstat
		Fat supply (g/capita/day)	FAOstat
		Share animal protein (%)	FAOstat
		Share vegetable fat (%)	FAOstat
	Sophisticated and demanding buyers	Self-sufficiency (Production/domestic consumption)	FAOstat
		GDP/capita	WDI
Demand size and pattern of growth	Size of the home market	Population size	WDI
	Rate of growth of home demand	Annual growth domestic supply (% over 10 years)	FAO
Internationalisation of domestic demand	Mobile or multinational local buyers	Relative Export Advantage (RXA) index	UNCOMTRADE

Related and supporting industries

The third broad determinant of competitive advantage of an industry is the presence in the nation of supplier industries or related industries that are internationally competitive (Porter, 1990:101). This determinant distinguishes two categories: supplier industries and related industries. Supplier or upstream industries may, if they are competitive, create advantages in the downstream industries such as access to cost-effective inputs and gives impetus to innovation. Suppliers industries - important to the agribusiness- are providers of inputs such as fertilizers, seeds, pesticides and machinery. Indicators on trade data on machinery used in agriculture and food processing, seeds and fertilizers produced and exported are used as proxies of competitiveness (see Table 4).

Table 4. Related and supporting industries: categories, subcategories and indicators

Category	Subcategories	Indicator(s)	Data source
Suppliers industry	Fertilizers production	Production Quantity Nitrogen Fertilizers (N total nutrients)/ha	FAO
	Fertilizers trade	RTA Net trade advantage for fertilizers	UNCOMTRADE
	Plant protection net trade	RTA Net trade advantage for plant protection	UNCOMTRADE
	Machinery trade	RTA Net trade advantage for machinery	UNCOMTRADE
	Sector specific machinery trade	Sector specific RTA Net trade advantage for machinery	UNCOMTRADE
Related industry	Transportation	Logistics performance index	UNCOMTRADE
	Communications	ICT Development Index (IDI)	UNCOMTRADE

Note: see (Scott and Vollrath, 1992) for the definition of the Relative Net Trade Advantage (RTA) index

Related industries that are internationally competitive may strengthen the position of the agri-food sector when activities such as technology development, manufacturing, distribution and marketing are being shared or when there are opportunities to benefit from information flows (Porter, 1990:100). Here, in the vein of Porter's argumentation, we add performance indicators that indicate institutional strengths of logistic and communicational aspects. Logistics is important for agricultural

[5] In the form of an index that measures the export share of a product of one country in the total export of the world relative to the country's export share in the world of all products; see SCOTT, L. & VOLLRATH, T. 1992. Global Competitive Advantages and Overall Bilateral Complementarity in Agriculture: A Statistical Review. Washington: Economic Research Service,U.S. Department of Agriculture. for the definition and use this index

products that are bulky with a relative low value per tonne. Information and communication technology enhance the information transparency in the value chains such as price information.

The food retail sector is an important related sector to the food sector - in many cases it is considered as part of the food supply chain. Ideally some indicators of the development of the food retail sector should have been included in this analysis. However, the lack of consistent and comparable data, for instance on turnover, on this sector made inclusion of such an indicator not useful.

Firm strategy, structure and rivalry

This fourth determinant addresses the context in which firms are '*created, organised as well as the nature of domestic rivalry'* (Porter, 1990:107).We distinguish between two categories. One is the s*trategy and structure of domestic firms.* The national context of resource endowments and policy environment determines critically the way firms are managed and compete for production means and markets. Nations will tend to succeed in industries in which the management practices and modes of organization favoured by the national business environment are well suited to the industries' sources of competitive advantage. Distinctive management practices of the agribusiness are world-wide sparsely available and make assessment difficult. A wider assessment of country conditions for governance of firms is the Ease of Doing Business ranking from The World Bank Group. This indicator – that is used in the list of indicators - measures the favourability of the business environment in a country to run a firm.

The second category in this determinant is Domestic rivalry. Rivalry sharpens advantages at home and stimulates domestic firms to sell abroad in order to grow. It creates pressure on firms to improve and innovate. It can also upgrade the competitive advantage of a nation's firms by nullifying the advantages that come from only being in the nation. As indicators, we use prices, productivity (yields), and net trade of the food products selected. Table 5 provides an overview of the categories and indicators used to build the index of the determinant 'Firm strategy, structure and rivalry' of competitiveness.

Table 5. Firm strategy, structure and rivalry: categories, subcategories and indicators

Category	Subcategories	Indicator(s)	Data source
Strategy and structure	-	Ease of doing business (EoDB)	World Bank
Domestic rivalry	Domestic competition.	Price of products	FAO
Foreign competition	Productivity	yield/ha or yield/animal (sector specific)	FAO
	New business formation	Starting a business (EoDB)	World Bank
	Foreign suppliers processed food	Relative Net Advantage (RTA) index, processed food	UNCOMTRADE
	Foreign suppliers raw material	Relative Net Advantage (RTA) index, raw material	UNCOMTRADE

Role of government

Government influences each of the four determinants above, with an either positive or negative effect on the competitive advantage. Governments shape the playing field for the business community by, for instance, changing the regulatory framework, providing subsidies or taxing activities. On the other hand, government policies might also by influenced by stakeholders that have an interest in changing the performance of a determinant of competitive advantage to their benefit (Porter, 1990:126-128). The latter may result, for instance, in agricultural policies that provide subsidies to inputs used or to exports, protect the domestic market by import tariffs, or reduce taxes to encourage investments in the agri-food sector. In this study we do not address these policies as separate factors affecting the competitive position of the EN food sectors, but assume that the

impacts of these policies are embodied in the performances measured by the indicators of each of the determinants of competitiveness. We measure the impact of the government on competitive advantage by taking a broad and general scope of the government's role on the economy by selecting a number of Worldwide Governance Indicators (WGIs), provide by World Bank (info.worldbank.org), such as political stability and absence of violence, regulatory quality, rule of law measures and control of corruption.

Results on Porter's determinants of competitiveness

The indicators of Porter's determinants of competitiveness have been quantified for nine agri-food sectors and 14 countries (8 from EN and 6 from the EU). For the sake of conciseness, we only show the results of an overall score in which the evaluation of all sectors are included, and for the larger four EN countries. The presentation of indicators, categories, determinants and overall scores are based on Z-scores the indicators (Joint#Research#Centre and European#Commission, 2008) enabling a graphical presentation. The overall weight of each determinant adds up to 22.2 % each and the determinant government to 11.1%, indicating that this has half the weight of the four main determinants (see appendix for more detailed presentation of weights of indicators).

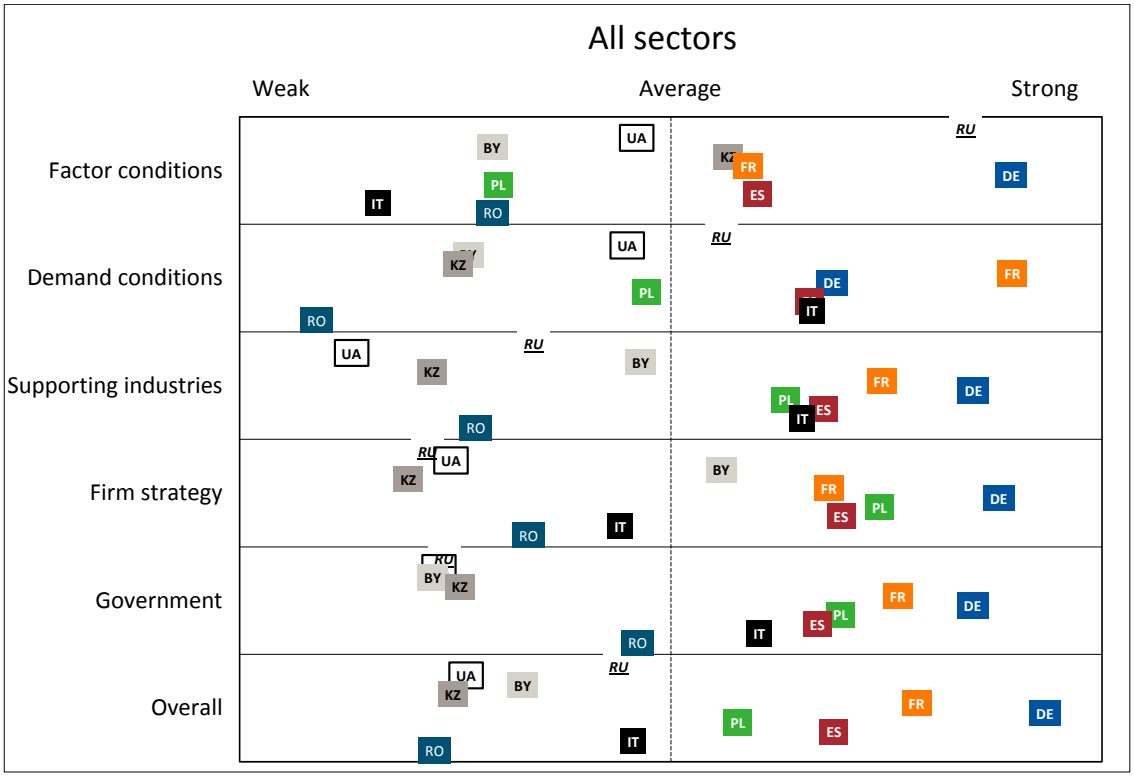

Figure 2 Scores on Porter's diamond determinants for all food sectors (Z-scores of presented countries). Note: Countries are indicated by the 2 letter country acronym.

Figure 2 shows that, overall, the competitive position of the four selected EN agri-food sector is weak. This is caused in particular by the lack of strong supplier industries and a government that provides regulatory quality and ensures compliance with rules of society (including formal laws and informal norms). More competitive upstream industries and services would enhance efficiency in processing and distributing stages in the agri-food sectors while 'good governance' adds to an economically sound and stable business environment. The international competitiveness of the EN agri-food sectors, therefore, would benefit from strengthening the agri-food supplying industries and

from government policies that create an enabling business environment, which is more supportive to the agri-food sectors' development.

The four EN countries (see figure 2: Russia RU, Belarus BY, Ukraine UA, Kazakhstan KZ) show the highest scores on the Factor Conditions and Demand Conditions determinants, indicating that the food sectors' strength is mainly in cheap and abundant labour and land, and the home country orientation (although all of these countries also export at least some agricultural commodities in significant volumes). All four EN are particularly weak compared to EU countries, though, on the determinants Supporting industries and Government, whereas on Firm Strategies there are some positive outliers. Note, however, that "overall" the EU member state Romania (RO) is weakest of all countries considered.

Competitiveness of sectors

Next, we focus on the state of competitiveness of each of the agri-food sectors. Figure 3 shows that the competitiveness of the four EN countries is weak for almost all food sectors included when benchmarked against EU's major producers of these food commodities. For almost all agri-food sectors the overall majority of EN scores are below the average and in most cases EN countries are on the weak side of the assessment spectrum. Positive scores are only measured for some products in Russia (dairy, oilseeds, wine) and Belarus (dairy). Ukraine and Kazakhstan have positions close to that of Romania, one of latest accessors to the EU with a relatively low GDP/capita, whilst Italy also scores below average for many of the commodities presented. When all sectors are taken together, no EN country has a comparative advantage over EU countries except for Romania.

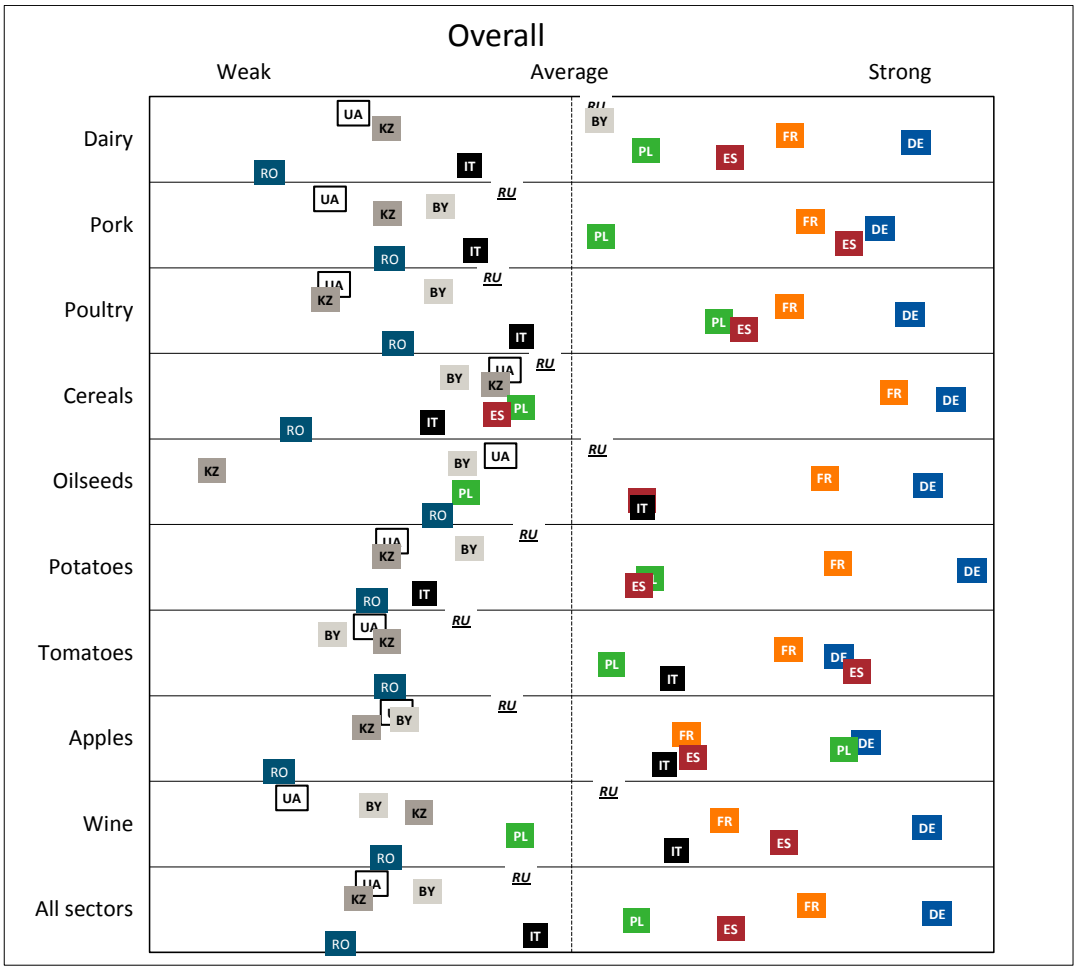

Figure 3 Overall competitiveness of selected sectors (Z-scores of presented countries).

Discussion

Data and indicators used

The presented approach is based on data available in publicly available databases covering the EU and its Eastern Neighbours at least, next to many other countries in the world. These are mainly databases from FAO on production, UN on trade and World Bank on several other issues. The advantages of such data are the harmonised definitions and internationally quality control of national data delivered to these institutions. These aspects and the richness of information and data in these databases make them very useful sources for international comparisons and benchmarking. Our approach of quantifying Porter's determinants of competitiveness is a novel attempt to measure country's competitive position for agri-food sectors. We emphasise the difficulty in selecting indicators that grasp the determinants and their underlying categories and acknowledge that work should continue on looking for more appropriate indicators that would better reflect Porter's framework of competitiveness. The disadvantage of relying on the international databases used is that there is rather little sector specific information related to agri-food firms and institutions. The translation of Porter's approach towards a more sector specific one, with sector specific sector indicators, therefore remains a challenge for improvement in this type of research.

Government, policies and agricultural policies

Porter (1980) is ambiguous on the role of government, arguing that 'while the role of government in creating and sustaining national advantages is significant,...., it is inevitably *partial*'(1990:617). Porter claims that governments influence the other four determinants and that these determinants on their part affect government policy. In our approach we value Porter's argumentation by including the role of government in our quantitative measurement of competitiveness, but by attaching a lower weight to it in our overall assessment.

Individual stakeholders may consider government policies are external: they simply have to comply with the regulatory framework. However, stakeholders organize themselves and promote their interests in debates with other stakeholders and government representatives. Stakeholders are expected to emphasise their individual or sector interests, and might go for short-term advantages (e.g. low costs of production) which might not be in the overall public interest and can even detract from enhancing national competitive advantage. In order to create and sustain national advantages government policy's main goal should be to deploy a nation's resources with high and rising productivity, which requires continually upgrading and innovating in existing and new industries. In Porter's words: 'Government's aim should be to create an environment in which firms can upgrade competitive advantages in established industries by introducing more sophisticated technology and methods and penetrating more advanced segments' (Porter, 1990:618). Crucial aspects of government policies that help improve competitiveness of an industry and a nation are investing in education, research and knowledge transfer, ensuring a competitive environment by providing clear competition rules and standards, and guaranteeing the enforcement of laws and rules. All four determinants of competitiveness are affected by one or each of the policies mentioned as increased investment in knowledge and education will enhance the Factor conditions determinant, and clear and enforced competition rules and low market entry barriers will encourage competition and innovation that will promote economic growth affecting Demand conditions (e.g. income), increase competition in Related and supporting industries and strengthening Domestic rivalry (as impart part of the Firm strategy, structure and rivalry Determinant).

In this study, policies directly aiming at the agri-food sector are of particular interest. Government interventions in agricultural markets are widespread around the world, and so they are in the EU and in the Eastern neighbours. Farmers in the EU benefit from CAP support policies. Volk et al. (2015) provides a concise overview of agricultural policies pursued in countries in the east, showing that

these countries use a broad range of policy measures such as prices support, import protection and a specific tax regime favouring agriculture. Government policies supporting agricultural production affects producers' production decisions, and subsequently product prices and trade performances. In short, agricultural support policies make the sector appear (much) more competitive than it really is. Our approach of measuring competitiveness in this paper has in common with many other studies on this topic that it does not address agricultural policies as a separate factor affecting competitiveness, but assumes impacts of these policies are embodied in the performances measured by the indicators. Hence, we repeat what is stated in many other competitiveness studies that our results should be interpreted with care as they may be distorted by government policies.

Conclusions

The analysis of the competitive advantage of EU's Eastern Neighbours in a number of agri-food sectors shows that these countries have a weak position when benchmarked against EU's major producers of the commodity studied. There are only a few agri-food sectors that shows an above average score that would indicate a competitive strength. The majority of the sectors score below the average and many countries are on the weak side of the assessment spectrum. Only Russia is above average for three sectors and Belarus is just above average for dairy.

The four largest EN countries (Belarus, Kazakhstan, Russia and Ukraine) show the highest scores on the factor conditions and demand conditions determinants, indicating that the sectors' strength is mainly in cheap labour and land, and the home country orientation (although some countries also export commodities in significant volumes). All countries are particularly weak, though, on the determinants 'Supporting industries' and 'Government', whereas on 'Firm Strategies and rivalry' some positive outliers are found.

Russia and Belarus are the strongest of the four studied EN countries (Figure 3). However, Italy is in the same range as Russia and is one of weakest EU countries studied. Ukraine and Kazakhstan are the weakest of the four EN countries. The position of Romania, one of latest accessors to the EU with a relatively low GDP/capita, is in the same range as these two EN countries.

The overall conclusion therefore is that the competitiveness of the agri-food sectors in the EN countries is largely based on low prices (based on abundant and hence cheap resource endowments), yet lack the presence of strong supplier industries and a government that provides regulatory quality and ensures compliance with rules of society. Competitive supplier industries and services would contribute to more efficient processing and distributing stages in the agri-food sectors while 'good governance' adds to an economically sound and stable business environment. The international competitiveness of the agri-food sectors in the EN, therefore, would be most enhanced by strengthening the agri-food supplying industries and by government policies that are more supportive to agri-food sector development. The latter need not be agricultural sector policies per se, but would refer in the first place to investments in education, knowledge and innovation and policies that help to establish institutional infrastructures that a market driven agricultural system needs (see also (Liefert and Liefert, 2012)). Such policies would stimulate dynamism and upgrading, necessary to improve the competitive position of the agrifood sector in EU's eastern neighbours.

As competitiveness is not only about performance in terms of exports but also largely about using production means efficiently in response to market demands, an assessment of competiveness needs to take the broader economic context into account. This study argues that an analysis of competitiveness requires both trade and economic indicators. The availability of the latter describing the performances of the food industry in EU's Eastern Neighbours were, however, insufficient to use the common types of analysis. As an alternative we apply Porter's diamond approach and develop a

quantification method using publicly available databases that cover most countries of the world. As far as we know this is one of the first attempts to quantify Porter's concept of competitiveness and to apply this approach in the food sector. This attempt is open to further improvement in terms of interpretation of Porter's determinants and categories of factors within each determinant, and the indicators and data used for quantification.

References

BUCKLEY, P. J., PASS, C. L. & PRESCOTT, K. 1988. Measures of international competitiveness: A critical survey. *Journal of marketing management,* 4**,** 175-200.

ECSIP-CONSORTIUM 2016. *The competitive position of the European food and drink industry,* Luxemburg, Publications Office of the European Union.

FLANAGAN, R., LU, W., SHEN, L. & JEWELL, C. 2007. Competitiveness in construction: a critical review of research. *Construction Management and Economics,* 25**,** 989-1000.

JIN, B. & MOON, H.-C. 2006. The diamond approach to the competitiveness of Korea's apparel industry: Michael Porter and beyond. *Journal of Fashion Marketing and Management: An International Journal,* 10**,** 195-208.

JOINT#RESEARCH#CENTRE & EUROPEAN#COMMISSION 2008. *Handbook on constructing composite indicators: Methodology and User guide*, OECD publishing.

KAPLINSKY, R. & MORRIS, M. 2001. *A handbook for value chain research*, IDRC Ottawa.

LATRUFFE, L. 2010. Competitiveness, Productivity and Efficiency in the Agricultural and Agri-Food Sectors", OECD Food, Agriculture and Fisheries Working Papers No. 30. Paris: OECD Publishing.

LIEFERT, W. M. & LIEFERT, O. 2012. Russian agriculture during transition: performance, global impact, and outlook. *Applied economic perspectives and policy,* 34**,** 37-75.

MOON, H. C., RUGMAN, A. M. & VERBEKE, A. 1998. A generalized double diamond approach to the global competitiveness of Korea and Singapore. *International business review,* 7**,** 135-150.

PORTER, M. E. 1980. *Competitive strategy: Techniques for Analyzing Industries and Competitiors,* New York, The Free Press.

PORTER, M. E. 1990. *The competitive advantage of nations,* London, The MacMillam Press Ltd.

RUGMAN, A. M. & VERBEKE, A. 1993. How to operationalize Porter's diamond of international competitiveness. *The International Executive,* 35**,** 283-299.

SAGHEER, S., YADAV, S. S. & DESHMUKH, S. G. 2009. Developing a conceptual framework for assessing competitiveness of India's agrifood chain. *International Journal of Emerging Markets,* 4**,** 137-159.

SCHWAB, K. 2014. The Global Competitiveness Report 2014–2015. Geneva: World Economic Forum.

SCOTT, L. & VOLLRATH, T. 1992. Global Competitive Advantages and Overall Bilateral Complementarity in Agriculture: A Statistical Review. Washington: Economic Research Service,U.S. Department of Agriculture.

SLEDGE, S. 2005. Does Porter's diamond hold in the global automotive industry? *Journal of Competitiveness Studies,* 13**,** 22.

WIJNANDS, J. H. M., BREMMERS, H. J., POPPE, K. J. & VAN# DER#MEULEN, B. M. J. 2008. An economic and legal assessment of the EU food industry's competitiveness. *Agribusiness,* 24**,** 417 - 439.

WIJNANDS, J. H. M. & VERHOOG, D. 2016. Competitiveness of the EU food industry. An ex-post assessment of the performance embedded in international economic theory. The Hague: LEI Wageningen UR.

Appendix 1: Determinants, categories, subcategories, indicators, signs and weights

Det.	Category	Subcategories	Indicator(s)	Sign	Weight
Factor conditions	Human resources	Quantity	Labour force participation rate, total (% of total population ages 15-64)	1	1.5%
		Skills	Education index	1	1.5%
		Costs	GDP per person employed (constant 1990 PPP $)	-1	1.5%
	Physical resources	Land	Agricultural land (sq. km)	1	1.1%
		Water	Total renewable water resources per capita (m3/inhab/yr)	1	1.1%
		Environment	Production specialisation ratio (oilseeds)	1	1.1%
		Fuel costs	Pump price for diesel fuel (US$ per litre)	-1	1.1%
	Knowledge resources	Knowledge potential	Research and development expenditure (% of GDP)	1	2.2%
		Knowledge stock	Relative Export Advantage of seeds and breeds for oilseeds	1	2.2%
	Capital resources	Getting credit	Getting Credit (part o	1	2.2%
		FDI-inflow	Foreign direct investment, net inflows (% of GDP)	1	2.2%
	Infrastructure	Attract. of nation	Net migration	1	0.9%
		Air-freight	Air transport, freight (million ton-km)/GDP million USD	1	0.9%
		Sea-freight	Quality of port infrastructure	1	0.9%
		Phone	Mobile cellular subscriptions (per 100 people)	1	0.9%
		Internet	Internet users (per 100 people)	1	0.9%
Demand conditions	Home demand composition	Segment structure of demand;	Food supply (kcal/capita/day)	1	0.7%
			Protein supply (g/capita/day)	1	0.7%
			Fat supply (g/capita/day)	1	0.7%
			Share animal protein (%)	1	0.7%
			Share vegetable fat (%)	1	0.7%
		Sophisticated and demanding buyers	Self-sufficiency (oilseeds)	1	1.9%
			GDP per capita (current USD)	1	1.9%
	Demand size and pattern of Growth	Size home market	Population size	1	3.7%
		Rate Growth of home demand	Annual growth domestic supply oilseeds (% over 10 years)	1	3.7%
	Internationalization of domestic demand	Mobile or Multinational local buyers	Relative Export Advantage (RXA) oilseeds raw material (index)	1	3.7%
		Mobile or Multinational local buyers	Relative Export Advantage (RXA) oilseeds processed food (index)	1	3.7%
Related and supporting industries	Suppliers industry	Fertilizers production	Production Quantity Nitrogen Fertilizers (N total nutrients)/ha	1	2.2%
		Fertilizers trade	RTA Net trade advantage for fertilizers	1	2.2%
		Plant protection net trade	RTA Net trade advantage for plant protection	1	2.2%
		Machinery trade	RTA Net trade advantage for machinery	1	2.2%
		Sector specific machinery trade	RTA Net trade advantage for oilseeds machinery	1	2.2%
	Related industry	Transportation	Logistics performance index	1	5.6%
		Communications	ICT Development Index (IDI)	1	5.6%
Firm strategy, structure and rivalry	Strat. and structure	-	Ease of doing business (EoDB)	1	7.4%
	Domestic rivalry	Domestic competition.	Price of products	-1	7.4%
	Foreign competition	Productivity	yield/ha or yield/animal	1	1.9%
		New business formation	Starting a business	1	1.9%
		Foreign suppliers processed food	Relative Net Advantage (RTA) index, processed food	1	1.9%
		Foreign suppliers raw material	Relative Net Advantage (RTA) index, raw material	1	1.9%
The role of government		-	Voice and Accountability	1	1.9%
		-	Political Stability and Absence of Violence	1	1.9%
		-	Government Effectiveness	1	1.9%
		-	Regulatory Quality	1	1.9%
		-	Rule of Law	1	1.9%
		-	Control of Corruption	1	1.9%