

International comparison of product supply chains in the agri-food sector:
determinants of their competitiveness and performance on EU and international markets



WORKING PAPER

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Theoretical background and conceptual framework

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Abstract

Competitiveness is a relative and dynamic concept which can be assessed at various levels (e.g., country, region, industry, supply chain and firm). This working paper reviews the extant literature on competitiveness. It notes that most of the literature regarding agri-food industry competitiveness draws largely on trade, productivity and value added indicators and focuses on the assessment of competitiveness at the farm level, with very few studies adopting an integrated supply chain approach. In consequence, there is little research on the identification of determinants and metrics that characterise agri-food supply chain competitiveness per se. Moreover, there is little (if any) work on what defines and how to measure 'sustainable competitiveness', with most studies ignoring social and environmental considerations. Hence, to define and assess 'sustainable competitiveness' there is a clear need for a framework that combines the effect of economic, social and environmental costs and benefits. Against this background, we propose a set of criteria for selecting indicators and a conceptual framework for measuring sustainable competitiveness of the agri-food sector. Given the complexity of the supply chain, indicators should be 'comprehensive', 'illuminating', verifiable, 'useable' and 'comparable'. They also should be applicable to at least five groups of users: enterprises, policy makers, quality assurance agents, civil society and academics/research community. The conceptual framework covers five areas: sphere of enterprises, policy context, consumers, natural environment and the relationships between the agents and domains.

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Executive Summary

1. Competitiveness is a relative and dynamic concept which can be assessed at various levels (e.g., country, region, industry, supply chain and firm). Given its complexity, it is difficult to encompass it in a single, universally accepted definition. This is particularly the case for national and regional competitiveness.
2. The notion of national competitiveness, as a concept, has its roots in the theories of industrial organisation, particularly the work of Porter (1990). According to Porter (national) competitiveness relies on four pillars: 'factors endowment', 'home-demand conditions', 'related and supporting industries' and 'firm strategy, structure and rivalry' (i.e. Porter's diamond). Porter's work has been severely criticised, particularly by Krugman (1994), who argued that competition between firms is poor analogy for studying national and regional economies. Porter's (national) approach also appears limited when applied to understanding the competitiveness of the European food industries (Traill & Pitts, 1998). In particular it fails to capture the effects of the CAP on competitiveness and the interactions between the sector and the environment.
3. Alongside traditional industrial organisation theory and the work of Porter, Resource Based Theory (RBT) has played a crucial role in explaining competitive advantage at the firm level. RBT focuses on the importance of firm effects, assuming that firms with 'distinctive' and 'superior' (tangible and intangible) resources and capabilities perform better.
4. Firms do not function in isolation, hence, their ability to compete and their competitiveness depends on a variety of inter-linked factors. Given the complexity of the concept it is crucial to distinguish between determinants and indicators of competitiveness and to identify the relationships between them.
5. Two major groups of determinants/drivers of competitiveness are identified within the literature, endogenous and exogenous determinants. Endogenous determinants are, in general, factors that can be controlled by the firm itself, such as ownership structure, factor intensity (e.g. capital-labour ratio and land-labour ratio), characteristics of labour (age, education, gender, and experience), product specialisation and product diversification, and production and marketing strategies. These determinants have been investigated extensively at the farm level.
6. Amongst exogenous determinants (or factors beyond the firm's control) of competitiveness, the literature identifies factor/resources endowment and government intervention. However, the interactions between determinants have received relatively little attention, particularly for the agri-food sector. For example, there is a paucity of studies that apply structural equation modelling to explore path relationships between independent and endogenous variables.
7. Trade measures, such as revealed comparative advantage, the intra-trade industry trade and the unit values of exports and imports have been applied extensively as measures of competitive advantage and competitiveness of countries, industries and

product specialisations. However, the determinants of such trade measures have received far less attention.

8. Most of the literature regarding agri-food industry competitiveness draws largely on trade, productivity and value added indicators and focuses on the assessment of competitiveness at the farm level, with very few studies adopting an integrated supply chain approach. In consequence, there is little research on the identification of determinants and metrics that characterise agri-food supply chain competitiveness *per se*. Moreover, there is little (if any) work on what defines and how to measure 'sustainable competitiveness', with most studies ignoring any social and environmental considerations. Hence, to define and assess 'sustainable competitiveness' there is a clear need for a framework that combines the effect of economic, social and environmental costs and benefits.
9. Against this background, this deliverable proposes a set of criteria for selecting indicators and a conceptual framework for measuring sustainable competitiveness of the agri-food sector. Given the complexity of the supply chain, indicators should be 'comprehensive', 'illuminating', 'verifiable', 'useable' and 'comparable'. They also should be applicable to at least five groups of users: enterprises, policy makers, quality assurance agents, civil society and academics/research community. The conceptual framework covers five areas: sphere of enterprises, policy context, consumers, natural environment and the relationships between the agents and domains.

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List of Abbreviations and Acronyms

CAP	Common Agricultural Policy
CMEF	Common Monitoring and Evaluation Framework
DRC	Domestic Resource Cost ratio
EU	European Union
FADN	Farm Accountancy Data Network
FFV	Fresh Fruit and Vegetables
GCI	Global Competitiveness Index
GHG	Greenhouse Gas Emissions
Ha	Hectare
IIT	Intra-industry trade
KPI	Key Performance Indicators
NGOs	Non-Governmental Organisations
NMS	New Member States
RCA	Revealed Comparative Advantage
RBT	Resource-Based Theory
RBV	Resource-Based View
SCP	Structure Conduct Performance
TIO	Traditional Industrial Organization
VIIT	Vertical intra-industry trade

Theoretical Background and Conceptual Framework

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1 Introduction: Definitions and structure of the paper

Concerns regarding Europe's competitiveness are not new. Spaak et al. (1956) accentuated Europe's lost monopoly in manufacturing industries, declining world influence and weakened trade position. However, today Europe faces unprecedented internal and external economic challenges with record post-war levels of unemployment, bailout crisis affecting several Member States and increasing product sophistication and superior growth characterising emerging economies. The appeal of the European Union (EU), once widely regarded as a model for transitional and aspiring emerging economies (Jacoby, 2006), has dimmed significantly both to its own people and outsiders (Judt, 2007). Regarding competitiveness, particular attention is paid to the agri-food sector, given its continued high share of the EU budget. The agri-food sector has always been at the heart of the European project and the development of 'common policy'. Food remains integral to the cultural identities of most Member States, so that the degree to which Europe delivers safe, affordable food, maintaining traditional specialities and international markets, while at the same time preserving and strengthening rural economies remains an important litmus test of the EU's overall competence. Particular concern surrounds the New Member States (NMS) from Central and Eastern Europe, which typically possess greater numbers of small farms and a larger proportion of the rural workforce depending on agriculture for its livelihood (Sophia Davidova et al., 2013; Zawalińska, 2004).

There is no single, universally accepted definition of competitiveness. In part this reflects that competitiveness has been studied at several different levels (country, region, industry, supply chain and firm) with a correspondingly wide array of indicators or measures. Initial writings on competitiveness largely drew on the international economics and / or industrial organisation literatures. The former principally analyses country and supranational competitiveness, applying trade based measures such as revealed competitive advantage, domestic resource cost ratios and Balassa indexes (Tsakok, 1990). In keeping with this approach, Fajnzylber (1988, p. 12) defines competitiveness as 'country's capacity to sustain and expand its share of international markets and at the same time to improve its people's standard of living'. The industrial organisation approach, reflected in the work of Porter (1998), regards competitiveness as stemming either from relative cost advantages or an ability to produce higher quality goods, compared against competitors, for a given price. Within this framework, gross value added, profitability, labour and total factor productivity and indicators of innovation have been utilised as indicators of competitiveness (O'Mahony & Van Ark, 2003).

Previous assessments of the competitiveness of European agri-food industries have largely drawn on a mixture of trade, productivity and value added indicators (Banse et al., 1999; ECORYS, 2010; LEI, 2011; Puticová & Mezera, 2011; Tacke et al., 2009; Traill & Pitts, 1998; Jo H. M. Wijnands, Bremmers, Van Der Meulen, & Poppe, 2008; J. H. M. Wijnands,

Van der Meulen, & Poppe, 2006; Zawalińska, 2004). These studies recognise that competitiveness is a comparative or relative term (Dwyer et al., 2012), analysing the competitiveness of the EU or specific Member States against leading competitor nations or border prices. Notwithstanding a few notable exceptions (Thelwell & Ritson, 2006), previous studies of agri-food competitiveness rarely adopt a specific supply chain approach.

Studies of the competitiveness of the European food industries, to date, largely ignore social and environmental costs and benefits. This may be limiting, particularly given the industry's innate linkages with the land and the potential for environmentally damaging practices to undermine long-term economic prospects. The European Commission advocates the notion of 'sustainable competitiveness' which incorporates social and environmental considerations, a position also adopted by the World Economic Forum (2012b) which adapted its Global Competitiveness Index (GCI) into a Sustainability-adjusted GCI. Competitiveness is thus taken to incorporate all three pillars of the Lisbon Strategy so that it can be 'measured in terms of its ability to provide its citizens with growing living standards on a sustainable basis and broad access for jobs to those willing to work' (European Commission, 2010, p. 18). In relation to the agri-food sector, the European Commission (2011, p. 2) argues that objective of policy should be 'sustainable competitiveness to achieve an economically viable food production sector, in tandem with sustainable management of the EU's natural land-based resources'. While the term sustainable competitiveness is embedded firmly in policy debates, there is little work, however, on how it can be conceptualised or measured. This is addressed in this deliverable, which considers the sustainable competitiveness of agri-food supply chains.

2 Literature Review of Theories of Competitiveness

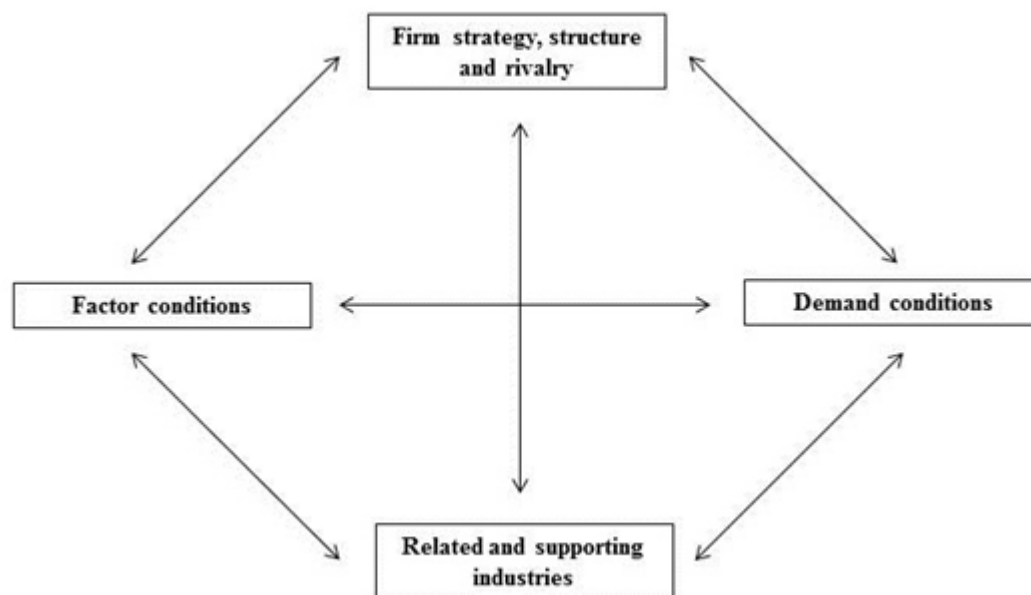
This section reviews four main perspectives on competitiveness: national, supply chain, industry and firm based perspectives. For each, the deliverable documents the main theoretical framework, determinants / drivers studied and metrics used for assessing competitiveness.

2.1 National and supranational theories of competitiveness

National competitiveness has most commonly been defined in term of either trade performance or productivity change. The World Economic Forum (2012a, p. 4) defines national competitiveness as the 'set of institutions, policies, and factors that determine the level of productivity of a country'. The level of productivity is regarded as the main determinant of a country's returns on investment and long-run prosperity.

Arguably Porter (1998) offers the most influential theory of national competitive advantage. He argues that four broad attributes of a nation shape the business environment, which may promote or impede the creation of competitive advantage: factor conditions, demand conditions, related and supporting industries and firm strategy, structure and rivalry. These four sets of determinants are labelled by Porter (1998) as the national "diamond" (see Figure 1).

Figure 1 Porter's Diamond – the Determinants of National Advantage



Source: Porter (1998, p. 72).

Factor conditions relate to the inputs in any industry, divided into five categories: land, labour, capital, knowledge and infrastructure. Demand conditions encompass three characteristics: the composition of home demand (e.g. are sophisticated and demanding buyers present), the size and pattern of growth of home demand, and the mechanism by which a nation's domestic preferences are transmitted to foreign markets. The third aspect of the diamond is the competitiveness of supplier or related industries. So for example Porter (1998) argues that Denmark's competitiveness in industrial enzymes aids the performance of its dairy and brewing industries. Powerful buyers, in particular, may stimulate significant improvements in suppliers' competitiveness and within an agri-food context, Venturini and Boccaletti (1998) argue that international grocery retailers stimulate their suppliers to cut costs, improve product quality and intensify product innovation. The fourth element, firm strategy, structure and rivalry refers to the nature of domestic rivalry and the environment in which enterprises are created, organised and managed.

Porter (1998, p. 617) argues that governments can influence but not fully control national competitive advantage with the central task of economic policy to 'deploy a nation's resources (labour and capital) with high and rising levels of productivity'. While this definition appears interventionist in nature, Porter's prescriptions for improving national competitiveness focus mainly on market liberalisation although 'education and training constitute perhaps the single greatest long-term leverage point available to all levels of government in upgrading industry' (p.628). His prescriptions in this field involve making teaching a prestigious and valued profession, ensuring educational standards are high, improving connections between educational institutions and employers, supporting technical universities and vocational schools and that the majority of students receive education and training with some practical orientation.

Box 1: Standards, enforcement and competitiveness in the milk supply chain – the case of aflatoxins in Serbia

Author: Steve Quarrie (Balkan Security Network, Belgrade, Serbia)

The aflatoxin affair illustrates how a fungal disease can impact through the food chain, affecting feed producers, farmers, milk suppliers, the public, milk analysis laboratories, international trade, officials in the Ministry of Agriculture and government policy. It had its origins in the summer and early autumn of 2012, which were marked by severe drought and high temperatures, ideal conditions for growth of the *Aspergillus* fungus responsible for toxic aflatoxins.

In October 2012 the first warning of aflatoxins in Serbian maize, which was exported to Italy, came from the EU Rapid Alert System for Food and Feed. In November 2012 the exporter announced that test results of 375 samples indicated that more than 70% of Serbian maize was contaminated with aflatoxins and must not be used for cattle feed to prevent contamination of milk. In December 2012 exporters expressed their concern but the Ministry of Agriculture claimed that it had no official information. One problem was that Serbia had until May 2013 no national reference laboratory for the analysis of mycotoxins. However, following urgent inspections, the Minister of Agriculture announced that "not a single sample of milk was found to be contaminated with aflatoxin", adding that everything had been done to prevent the use of contaminated corn.

In the spring of 2013 safety concerns grew. On the 13th February the Ministry of Agriculture finally announced the results of its milk sampling declaring that of 300 samples tested, 272 were completely safe, while in 28 samples aflatoxin was at the permitted limit. However, other actors were unconvinced - a former Minister of Agriculture on her blog proclaimed "don't drink milk" and there was much confusion in the press as to the permitted limit. The upper limit in Serbia for aflatoxins in milk used to be 0.5 *micrograms* per litre, *as it still is in the USA and many other countries*, but to align its regulations with those of the EU, the upper limit was reduced to only 0.05 *micrograms* per litre in 2011. While Serbia in 2011 reduced the level of aflatoxin allowed in milk, it retained older regulations for animal feed. A major problem was that incompatible regulations cover the presence of aflatoxin in milk and animal feed.

On the 18th February tests in Vojvodina suggested that over half the milk sampled had concentrations up to two times the permitted limit. This stimulated widespread media interest and milk sales fell dramatically. Affected milk was withdrawn from retail sale. The response of the Minister of Agriculture was to drink milk on television and announce that the old regulations on maximum aflatoxin levels (0.5 µg/kg) would be re-introduced as "those amounts cannot have a negative effect on people's health and will allow us to export milk to two thirds of the world".

However, milk exports collapsed. The incidence of aflatoxins and lack of effective regulatory systems, preventing the export of milk, dairy products and commercial maize contributed significantly to a worsening of the agri-food trade balance (-61%). As noted by the Serbian Chamber of Commerce "unfortunately, the problem with aflatoxin has not yet been overcome".

Porter (1998, p. 647) argues that governments also play a critical role in the setting of standards, whereby 'stringent standards for product performance, product safety, and environmental impact contribute to creating and upgrading competitive advantage'. They do so by pressuring firms to improve quality, upgrade technology and address customer and societal concerns. Tough domestic standards may be particularly beneficial where they anticipate standards spreading internationally. An important lesson from the Serbian case is that it is not just setting standards that matters but the degree to which they are consistent along the food supply chain, internationally compatible and adequately enforced (see Box 1).

Traill and Pitts (1998) edited a collection of case studies that apply Porter's approach to understanding the competitiveness of European food industries. Having applied Porter's framework each set of authors (Lagnevik & Kola, 1998; Lagnevik & Tjärnemo, 1998; Traill, 1998; Traill & Pitts, 1998; Venturini & Boccaletti, 1998; Viaene & Gellynck, 1998), reflect on its appropriateness in an agri-food context. All agree that Porter (1998) provides a useful checklist for guiding the study of a sector. However, Porter says little about how to undertake research on each factor or specific metrics that can be used to measure competitiveness. In this regard an author's interpretation of the factors is critical and this may be very subjective (Viaene & Gellynck, 1998). A further danger is the analysis becomes purely descriptive and lacks a clear focus on what is driving developments (Lagnevik & Tjärnemo, 1998), particularly where co-operation between actors, rather than competition propel changes in competitiveness (Lagnevik & Kola, 1998). Within the specific context of the agri-food system, Porter's approach is neither suited to capturing the effects of the CAP on competitiveness nor the interactions between agri-food production and the environment. Porter has little say about sustainable competitiveness and is rather weak on the trade-offs between factors (Snowdon, 2012; Spender & Kraaijenbrink, 2012).

Porter (1990) assumes that firms have a distinct home market and mechanisms by which a nation's domestic preferences are transmitted to foreign markets. This fits with stage based models of internationalisation, whereby firms incrementally move away from concentrating solely on the domestic market (Johanson & Vahlne, 1990). It appears less appropriate for 'born global' enterprises that lack a clear home market and seek to service international buyers from the outset (Efrat & Shoham, 2012). This leads Traill (1998, p. 147) to question whether Porter's diamond has been superseded by globalisation in retailing and technology so that 'home base has no real meaning or importance, since sophisticated retail demand is easily translated into imports' so that 'a leading technological edge benefits competitors as much as domestic producers'.

The most fundamental challenge to Porter comes from Krugman (1994, p. 44) who argues that 'competitiveness is a meaningless word applied to national economies' so that 'the obsession with competitiveness is both wrong and dangerous'. Krugman (1994) presents three main arguments. First, countries do not compete with each other in the same manner as companies. While for firms it is possible to label uncompetitive those which are loss making and cannot remain in business, countries do not go out of business. In a national context, while some have defined competitiveness in terms of the trade balance and whether a country exports more than it imports, Krugman (1994) argues that both theoretically and in practice, a trade surplus may be indicator of national weakness and a deficit a sign of strength. Moreover, for those countries which trade little the standard of living will be

determined by domestic factors, primarily changes in productivity and even for trading nations, interdependence is often overstated. Second, international trade is not a zero sum game – the growth of one country's economy is not automatically at the expense of another. Rather, growth in one economy increases the demand for imports, so that 'the major nations of the world are not to any significant degree in economic competition with each other' (Krugman, 1994, p. 35). Thirdly, framing policy debates in terms national competitiveness leads to the dangers of wasteful and misguided public expenditure to enhance a country's competitiveness and a tendency to protectionism and trade wars. The last point has received most criticism – with claims that such fears are overblown (Hay, 2012), with in practice, policy makers linking national competitiveness to liberalisation, rather than protectionist, agendas and the need for domestic, supply side reforms (Reiljan, Hinrikus, & Ivanov, 2000)

While the argument that discussion of national competitiveness tends to protectionism is debatable, Krugman's core point that competition between firms is poor analogy for studying national or regional economies remains. Given this, it is worthwhile to consider the factors that determine the rate of domestic productivity growth. Englander and Gurney (1994) review the drivers of productivity change in OECD countries. The evidence suggests that education positively impacts on national productivity, so that an additional two and half years schooling contributes about 0.4-0.7 percentage points to average annual productivity growth. However, this conclusion depends on the fairly crude measure of years in education as a proxy for human capital formation. Increases in trade intensity appear to stimulate labour productivity growth and subsequent analysis by Edwards (1998) confirmed the positive effect of trade openness on total factor productivity growth. This is consistent with microeconomic data - at the firm level exporters appear to be more productive than their non-exporting counterparts at the outset of exporting, but engagement in trade further increases enterprise productivity (Girma, Greenaway, & Kneller, 2004).

Regarding indicators, the most comprehensive approach is offered by the World Economic Forum (2012a), which over several decades has sought to benchmark national competitiveness, through the construction of its GCI. In calculations for 2012-13, the GCI is based on 12 sets of indicators, termed pillars, relating to: institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labour market efficiency, financial market development, technological readiness, market size, business sophistication and innovation.

The theoretical basis of the GCI is a three stage model of economic development, in which the salience of the different pillars varies. The first four pillars (institutions, infrastructure, macroeconomic environment, health and primary education) are regarded as critical for factor driven economies, pillars 5-10 (higher education and training, goods market efficiency, labour market efficiency, financial market development, technological readiness, market size) key for efficiency driven economies, and business sophistication and innovation central for innovation driven economies. The GCI assumes that for developing countries, economic development is largely factor driven with companies producing commodities and competing on price. Competitiveness for such countries depends on well-functioning public and private institutions (pillar 1), infrastructure (pillar 2), a stable macroeconomic environment (pillar 3), and widespread basic education (pillar 4). In the next stage of economic development, as incomes and prices rise, companies must improve product quality and the efficiency of

production to remain competitive. According to the World Economic Forum (2012a) this depends on higher education and training (pillar 5), efficient goods (pillar 6), labour (pillar 7) and financial markets (pillar 8), technological readiness (pillar 9), and a large domestic or foreign market (pillar 10). In the final phase, high standards of living can only be maintained through a focus on differentiation and innovation, where businesses compete with new and / or unique products, services and processes (pillars 11 and 12).

The GCI considers the stages of development by attributing higher relative weights to those pillars that are regarded as of greater salience for a country's particular stage of development (see Table 1).

Table 1 Weights used for GCI at different stages of development

Sub-index	Stage 1: Factor-driven economy	Stage 2: efficiency-driven economy	Stage 3: innovation-driven economy
Basic requirements (pillars 1-4)	$\alpha_1 = 60$	$\alpha_2 = 40$	$\alpha_3 = 20$
Efficiency enhancers (pillars 5-10)	$\alpha_1 = 35$	$\alpha_2 = 50$	$\alpha_3 = 50$
Innovation and sophistication factors (pillars 11-12)	$\alpha_1 = 5$	$\alpha_2 = 10$	$\alpha_3 = 30$

Source: Snowdon (2012, p. 165).

In its calculations for 2012-13, the World Economic Forum (2012a) compares 144 countries. Five EU Member States were in the top 10 ranked countries (Finland, Sweden, Netherlands, Germany and United Kingdom) (Table 2). A further three EU Member States were in the top 20 (Denmark, Austria and Belgium). The performance of other EU Member States has been very mixed. While the Baltic States, in particular Estonia, has climbed the league table, the Mediterranean countries and France have fallen in recent years. The lowest ranked EU Member State is Greece (96th place), below Moldova, Albania and Mongolia. The CGI pays little direct attention to the agri-food sector, with only one sector specific measure considered, namely agricultural policy costs. This is included as a measure of goods market efficiency (6th pillar), and is based on a subjective rating on a seven-point scale of agricultural policy in each country, where 1 = excessively burdensome for the economy; 7 = balances the interests of taxpayers, consumers, and producers.

Table 2 Top 10 and Selected Other Countries' GCI Scores for 2012-13

	Rank	Score (1-7)	GCI 2009-10 rank
Switzerland	1	5.72	1
Singapore	2	5.67	3
Finland	3	5.55	6
Sweden	4	5.53	4
Netherlands	5	5.50	10
Germany	6	5.48	7
United States	7	5.47	2
United Kingdom	8	5.45	13
Hong Kong SAR	9	5.41	11
Japan	10	5.40	8
Denmark	12	5.29	5
Austria	16	5.22	17
Belgium	17	5.21	18
France	21	5.11	16
Luxembourg	22	5.09	21
Ireland	27	4.91	25
Estonia	34	4.64	35
Spain	36	4.60	33
Czech Republic	39	4.51	31
Poland	41	4.46	46
Italy	42	4.46	48
Lithuania	45	4.41	53
Malta	47	4.41	52
Portugal	49	4.40	43
Latvia	55	4.35	68
Slovenia	56	4.34	37
Cyprus	58	4.32	34
Hungary	60	4.30	58
Bulgaria	62	4.27	76
Slovak Republic	71	4.14	47
Romania	78	4.07	64
Croatia	81	4.04	72
Serbia	95	3.87	93
Greece	96	3.86	71

Source: World Economic Forum (2012a, p. 13) and World Economic Forum (2010, p. 15).

2.2 Supply Chain Theories of Competitiveness

2.2.1 Introduction

The supply chain approach to studying competitiveness reflects that competition increasingly is not between individual firms but complete value chains. As a result the nature of supply chain relations can be a source of competitive advantage or disadvantage (Simatupang & Sridharan, 2002). For researchers in the agri-food sector, this implies that one should not look at agricultural competitiveness in isolation, as efficiency at the farm level may be curtailed by downstream problems. For example, in the mid-1990s, while farm-gate wheat and oilseed prices in Ukraine were significantly below international levels, exports were modest. Weak export performance derived from downstream inefficiencies, namely the

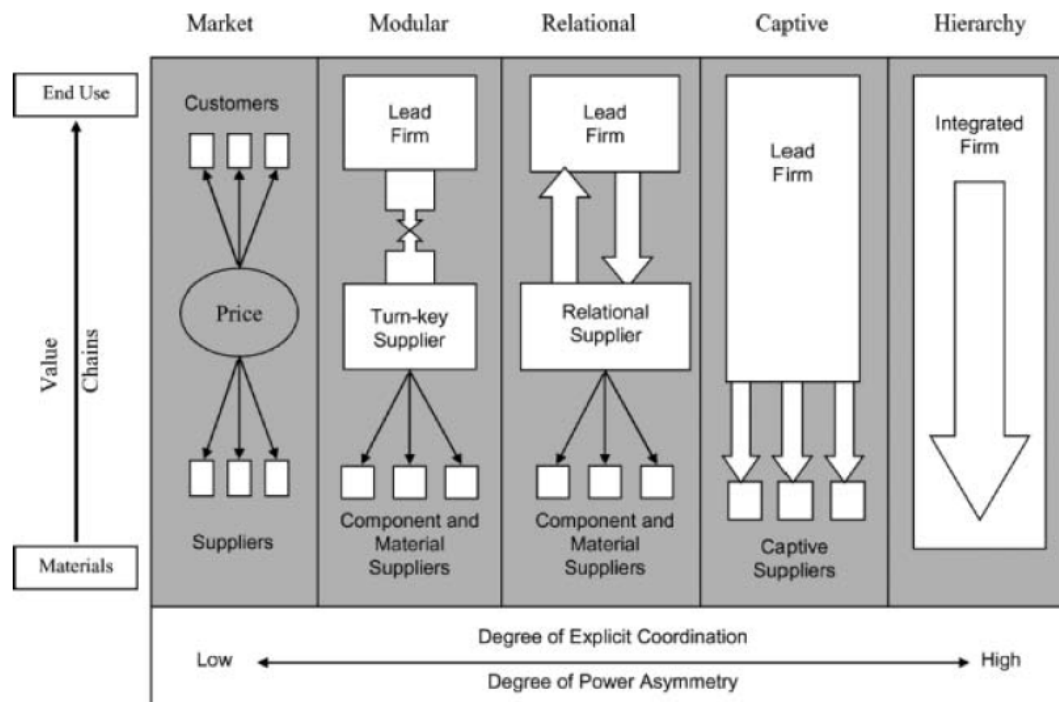
excessive cost and poor reliability of transport and storage (Striwe, 1999). Weaknesses in one part of the supply chain thus adversely affected the international competitiveness of the whole.

A supply chain perspective is particularly salient for studies of agri-food industry competitiveness given the perishable and typically seasonal nature of produce, increasing internationalisation of procurement, and the linkages between food quality and human health (Aramyan, Lansink, Van Der Vorst, & Van Kooten, 2007; Reardon, Barrett, Berdegue, & Swinnen, 2009).

2.2.2 Theoretical framework

Gereffi, Humphrey, and Sturgeon (2005) present a theoretical framework for understanding the governance structure of Global Value Chains. Value chains, can be defined as a set of linked activities that bring a product from initial stage of production to the end consumer. Gereffi et al. (2005) identify five types of value chain governance: markets, modular value chains, relational value chains, captive value chains and hierarchy. Between markets, characterized by low switching costs and often transitory relations, and hierarchy (vertical integration), thus lie three network forms of governance (Figure 2). Markets, as a governance mechanism, offer flexibility to buyers but may give insufficient control over the quantity and quality of goods offered for sale. Vertical integration can reduce these risk and lower transaction costs. However, hierarchical forms of governance may dissipate managerial resources, have higher capital requirements and introduce rigid, and in some cases complacent, organizational structures (Bhuyan, 2005). As a result intermediate forms of governance have become increasingly popular in the agri-food sector as a strategy for buyers to gain greater control over the quantity and quantity of supplies without the downsides of vertical integration (Young & Hobbs, 2002).

Figure 2 Five Types of Value Chain Governance



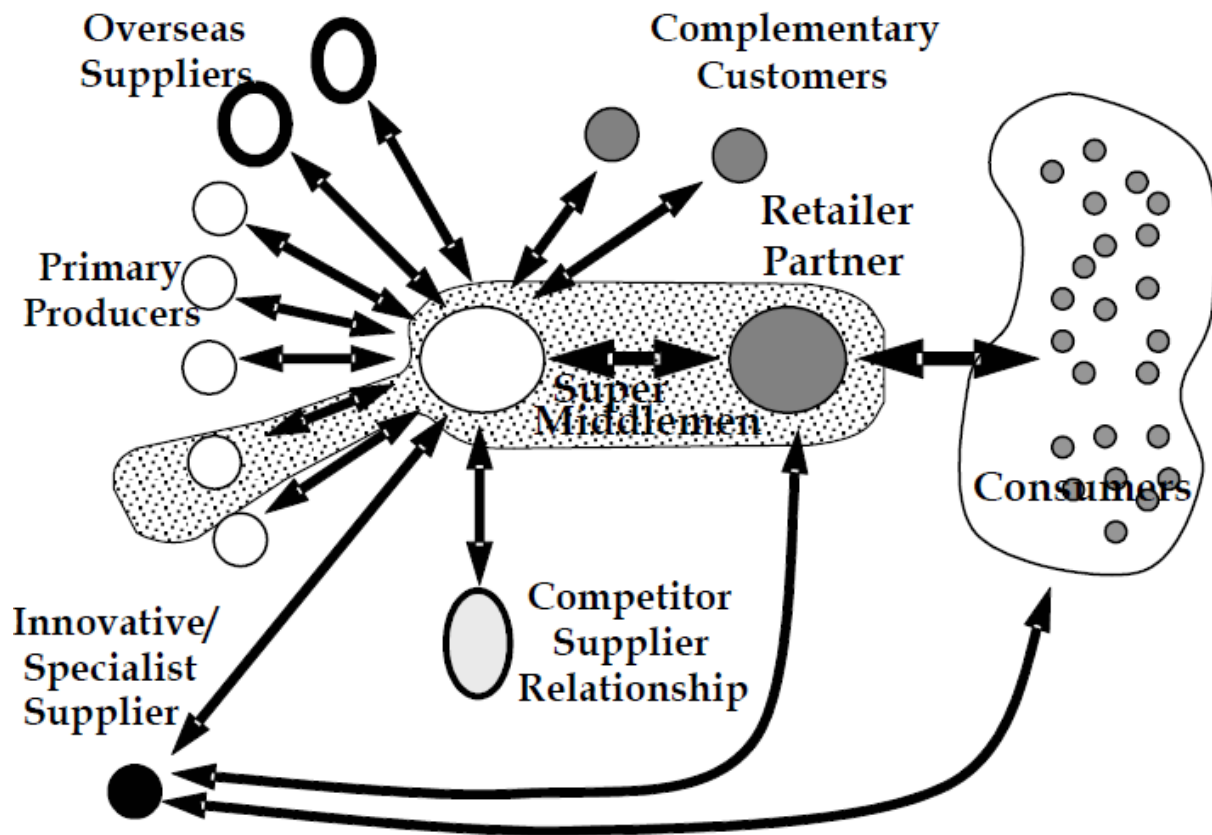
Source: Gereffi et al. (2005, p. 89).

Modular value chains involve 'turn-key' suppliers, which use generic technology, limiting transaction-specific investments. Relational value chains involve high levels of: co-operation between buyers and sellers, asset specificity and mutual dependence. In captive value chains, small suppliers are dependent on much larger and more powerful buyers that lead the supply chain.

Hingley, Lindgreen, and Casswell (2006), in a study of the UK fresh produce chain, characterize farmers as typically being captive suppliers of multiple grocery retailers. Talk of partnerships between retailers and producers masks asymmetric power and an unequal ability to control outcomes. Given the dominance of multiple food retailers in total grocery sales, farmers may have to accept these power imbalances and their 'hostage' status where they lack alternative marketing channels (Fischer & Reynolds, 2010).

Several studies analyse European supply chains for fresh fruit and vegetables (Aramyan et al., 2007; Hingley, 2005; Hingley et al., 2006; O'Keefe & Fearne, 2002; Wilson, 1996). Most Western European multiple retailers have adopted category management where a preferred supplier takes greater responsibility for the entire supply chain of a particular product category (O'Keefe & Fearne, 2002; Wilson, 1996). For Fresh Fruit and Vegetables (FFV), retailers may not deal directly with primary producers or source from wholesale markets, but rather so called 'super middlemen' or consolidators, which are responsible for coordinating the procurement of FFV on behalf of retailers (Figure 3).

Figure 3 Supply Chain Relationships for Multiple Grocery Retailers



Source: Hingley (2005, p. 72).

The super middlemen shoulder much of the administrative cost of procurement and are responsible for fulfilling the orders of supermarkets. Typically the large supermarket chains retain a couple of super middlemen for FFV which compete for a share of the retailer's business. To protect their share one super middleman may procure from another if a particular supplier has failed to deliver (Hingley et al., 2006). While retailers may not maintain direct relationships with producers, they expect a high degree of transparency. Producers and super middlemen are evaluated against set criteria, the most common of which are listed in Table 3.

Table 3 Typical Criteria employed by Multiple Retailers for the evaluation of FFV suppliers

Criterion	Description
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 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 (KPIs).
Standards	Suppliers must meet all relevant public and private standards.
Shelf life	To reduce waste, retailers desire extensions in the shelf life of produce (up to 14 days for FFV).
Differentiation	Retailers desire points of difference competitors are unable to match. This for example, could be the introduction of biodegradable packaging, for which it is the supplier's responsibility to implement.

Source: own construction.

Private standards, set by the retailer, are often more stringent than those required under EU law. For example, Metro, 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). While such practices were developed in Western Europe, they have been exported elsewhere as retailers from this region have aggressively expanded their operations in Central and Eastern Europe and other continents (Dries, Reardon, & Swinnen, 2004).

Upgrading refers to the ability of actors in a supply chain to protect and increase their share of the value added. An important concern, particularly in Central and Eastern Europe, is that small-scale producers, unable to meet the volume and quality standards of multiple retailers, will be locked into dwindling, low value-added wholesale and informal markets (Gorton, Zarić, Lowe, & Quarrie, 2011). Identifying strategies for small-scale producers to improve value added remains an important challenge (see Box 2).

Box 2: Small-scale farms and supply chain competitiveness - the case of Boljevac, Serbia

Authors: Steve Quarrie (Balkan Security Network, Belgrade, Serbia) and Richard Simmons (School of Applied Social Science, University of Stirling, UK)

Serbia's first agricultural census for 50 years, completed in autumn 2012 (Statistical Office of the Republic of Serbia, 2013), showed that the country's 2,497,187 households (Statistical Office of the Republic of Serbia, 2011) include 628,555 family agricultural holdings (25.2% of Serbia's households) with an average of 4.5 ha of land per household. An average family holding owns one tractor and raises one cow, four pigs, three sheep, 26 hens and one colony of bees. Despite continuing urbanisation, still nearly half Serbia's population (46% in 2011) lives in rural communities, so agriculture is a major source of income for many families.

Boljevac is a village community of 125 inhabitants (Statistical Office of the Republic of Serbia, 2011) located on the slopes of the mountain Jastrebac in southern Serbia. It is one of seven villages making up the parish of Ribare, 45 min drive by car south of the county town of Kruševac. Boljevac is only 3 km from Ribare but takes about 15 min by car because there is no asphalt road. This is typical of many rural communities in Serbia.

Such rural communities lack competitiveness and their farmers lack bargaining power. Because there is no good road to the village, buyers do not bother to go to the village. The local agricultural cooperative in Ribare, which most villagers fondly remember, collapsed over 10 years ago, so householders have to make their own arrangements to sell agricultural produce. Nearly all agricultural produce is taken out of the village by tractor and trailer. There used to be an agricultural market at a small town half-way to Kruševac, but that also closed some years ago. Therefore, fruit, vegetables and livestock are usually taken to Kruševac, or if they can afford the extra fuel and time, cattle go to Novi Pazar (about 4 h by car) where they can get better prices as it is a town with a Muslim majority, where cattle are preferred to pigs.

Milk is collected every two days in a tractor-towed tanker and taken to the local dairy in another of Ribare's villages. Although milk yields are often better than average because cows graze on local grass and hay rather than concentrates, milk prices are often below average as the quality is frequently claimed to be poor. Most cows are milked by hand. As there is only one buyer, villagers have to accept whatever they are offered. A major factor determining the wealth of the community is the weather. A drought in 2012 resulted in much of the village's livestock being taken to market because of lack of feed.

The only processed food made by the community used to be kaymak (a traditional salted cream), which was taken to Kruševac. However, the lady making this stopped doing so last year as it proved more trouble than it was worth - keeping all utensils sufficiently sterile, and the inconvenience and expense of getting it to Kruševac market. Although the concept of food processing in the village to give it added value is attractive to many inhabitants, they lack the resources (primarily financial) and skills to set this up as a "Boljevac" brand. Credit co-operatives would be ideal to support such local initiatives, though they are not allowed by Serbian law. A new law was being drafted in 2011-2012 to allow credit cooperatives, but has been stuck in the Ministry for reasons of both politics and business (vested interests not welcoming any competition or changes to the *status quo*). Population drift to the towns continues.

One alternative marketing channel is that of short food supply chains, which can be defined as those having no more than one intermediary between the farm producer and the final consumer e.g. a box delivery service, farmers' market and village shop (Ministère de l'Agriculture de l'Agroalimentaire et de la Forêt, 2009). Typically foods sold are identified by, and traceable to, a specific farm (Kneafsey et al., 2013). Short food supply chains are more prevalent in some Mediterranean countries (e.g. Italy and Greece) and parts of Central and Eastern Europe than Northern Europe (Plewa, 2012). While there are examples of such alternative supply chains offering improved returns to producers, they are not a panacea – a high proportion of consumers prefer the convenience of 'one stop shopping' offered by super- and hypermarkets and not all farmers possess the communication and marketing skills, infrastructure, or time, required for building direct relationships with consumers (Sophia Davidova et al., 2013).

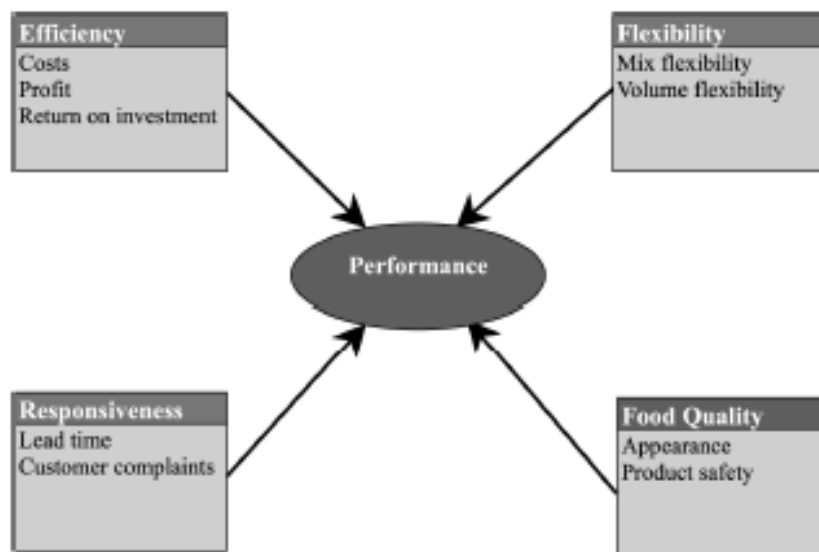
2.2.3 Determinants of competitiveness

Remarkably little research has sought to quantify the determinants of agri-food supply chain performance. One exception is Fischer et al. (2010) who, drawing on survey data of agri-food supply chain actors in six EU Member States (Finland, Germany, Ireland, Poland, Spain and UK), identify the determinants of relationship stability. Relationship stability refers to the relationships which are rewarding and long-lasting for all involved parties (Fischer & Reynolds, 2010). Fischer et al. (2009) found that effective communication between actors, the existence of personal bonds, and equal distribution of power between business partners positively impacted on the success of chain relationships. In models for Finland and Ireland, key people leaving had a significant, negative effect on relationship stability.

2.2.4 Metrics

To measure supply chain competitiveness the main metrics used in the generic supply chain management literature are: order lead times (time between receipt of customer's order and delivery of goods), delivery reliability (% of deliveries on time and without faults) and total inventory costs (Gunasekaran, Patel, & Tirtiroglu, 2001). These metrics are largely derived from studies of electronic and automobile manufacturing and lack adaptation to the agri-food sector. For the latter, Aramyan et al. (2007) offer one of the most sophisticated attempts to develop metrics for measuring supply chain competitiveness, drawing on a case study of tomato supply chains in the Netherlands and Germany. They group agri-food supply chain performance indicators into four categories: efficiency, flexibility, responsiveness, and food quality (Figure 4).

Figure 4 Conceptual framework for agri-food supply performance categories and indicators



Source: Aramyan et al. (2007, p. 313).

Aramyan et al. (2007) assess efficiency based on three measures: costs, profit and return and investment. They propose two indicators of responsiveness: lead time (total amount of time required to produce a particular item) and the total number of customer complaints. Flexibility is more difficult to measure and relates to the ability to change output levels of the products produced (volume flexibility) and alter the variety of products available (mix flexibility). Food quality may be measured in a number of ways but Aramyan et al. (2007) condense this to appearance (inspection of damage, colour, blemishes etc.) and product safety (laboratory checks on pesticide residues and presence of other chemical and biological hazards).

2.3 Industry and Firm

2.3.1 Introduction

The EU remains the largest exporter and importer of food products (Hockmann, Levkovich, & Grau, 2013). It is characterised by a complex value chain which involves farmers, input suppliers, manufacturers, packagers, transporters, exporters, wholesalers and consumers. The sector produces a diversity of products ranging from staple to luxury foods which are provided by both a small number of world leading companies and a very large number of small and medium-sized enterprises (EC, 2007). This corresponds, in economic theory, to a market structure that is partially oligopolistic and almost perfect competition. Globalisation, further liberalisation of international trade and new markets as well as an increased consumers' demand for quality, food safety and more sophisticated and diverse products have triggered changes within the sector. J. H. M. Wijnands et al. (2006) argue that the EU food industry is experiencing a period of structural adjustment arguing that its competitiveness is weakening compared to the US and Canada but at approximately the same level as Australia and Brazil. But what does competitiveness mean for a sector/industry or a firm, and what are its driving forces/determinants? In what sense industries or firms

compete and how competitiveness is measured? This section aims to address these questions by providing a comprehensive literature review of competitiveness at both the industry and the firm level.

2.3.2 Theoretical Framework

As highlighted above, competitiveness is a multidimensional, dynamic, and relative concept. Despite a vast literature on the subject, no universally accepted definition exists in economic theory. This is particularly the case when it comes to define the concept at the macro-economic level (e.g. national competitiveness) or the regional level. In contrast, Domazet (2012, pp. 294-295) considers that from a micro-economic perspective, at the firm level, the concept is more straightforward, with competitiveness defined as “the ability of firms to consistently and profitably produce products that meet the requirements of an open market in terms of price, [and] quality”.

The Aldington Report, conducted for the UK House of Lords (1985), defined competitiveness at the level of the firm as the production of “products and services of superior quality and lower costs than its domestic and international competitors. Competitiveness is synonymous with a firm’s long-run profit performance and its ability to compensate its employees and provide superior returns to its owners” (cited in Buckley *et al.*, 1988, p. 176). Buckley, Pass, and Prescott (1988) note that such a definition implies the inclusion of (at least) two types of indicators when measuring competitiveness at the level of the firm, (i) quantitative measures, such as costs, price and profitability and (ii) qualitative indicators (non-price factors), e.g. quality. Earlier, the European Management Forum (1984) defined competitiveness as “the immediate and future ability of, and opportunities for, entrepreneurs to design, produce and market goods worldwide whose price and non-price qualities form an attractive package than those of foreign and domestic competitors”.

Wijnands *et al.* (2008, p. 3) similarly identify firm competitiveness as the “ability to produce products/services that people will purchase over those of competitors”. These definitions seem also to be used (in the literature) when examining competitiveness at the sector/industry level. Indeed, the literature does not have a sole definition of competitiveness at the industry level *per se*. Martin, Westgren, and van Duren (1991, p. 1456) note that a competitive sector is a sector that possesses ‘the sustained ability to profitability gain and maintain market share’. The latter authors draw on the definition issued by a Canadian Agri-Food Competitiveness Task Force (1990), *i.e.* “Competitiveness is the sustained ability to profitably gain or maintain market share” and which “could be applied to an individual company, an industry, an industrial sector or a national economy (Martin & Stiefelmeyer, 2001, p. 3). The Task Force suggested that the following need to be considered when defining competitiveness: (i) profits, market share and (sustained) time, meaning that competitiveness is achieved when one is profitable with steady or increasing market share over time; (ii) profitability is attained from the market place, not from unfair competition, (iii) alternative competitive strategies and (iv) a company, sector/industry or national economy which has maximum competitiveness will attract resources of production, *i.e.* labour, capital, new ideas and (iv) the term focuses on results, not on (competitive) behaviour (Martin & Stiefelmeyer, 2001).

Sharples and Milham (1990, p. 6) take a different approach, defining competitiveness through (competitive) behaviour, arguing that being competitive is the “ability to deliver goods and services at the time, place and form sought by overseas buyers at prices as good or better than those of other potential suppliers whilst earning at least opportunity costs returns on resources employed”. Sharples and Milham (1990) argue that this definition incorporates two types of competition, competition of a sector on international markets and competition between sectors for domestic market factors. However, Martin and Stiefelmeyer (2001) stress that ‘competitiveness’ is not synonymous with ‘being competitive’ and it is important, when analysing competitiveness, to distinguish between ‘degree of competitiveness’ which is linked to results/outcomes, such as profitability and market share, and ‘competitive behaviour’.

Kim and Marion (1995, p. 5) define international competitiveness (for industries and firms) “as the sustained ability of a nation’s industries or firms to compete with foreign counterparts in foreign markets as well as in domestic markets under conditions of free trade”. However, they stress that market shares in both national and foreign markets (as measures of competitiveness) may not necessarily ‘reflect the true competitiveness if international trade and business is distorted by government intervention’. In their words (p. 28) “The performance of industries and firms in global markets appears to be more closely related to industries characteristics and trade barriers”. This links to the seminal work of Porter (2004) who, despite avoiding defining competitiveness, introduced the concept of ‘market-based view’ (Schiefer, Hirsch, Hartmann, & Gschwandtner, 2013) or ‘competitive advantage’ as the source of competitiveness. Firms can achieve sustainable competitive advantage (above-average profits in the long run) if they positioned themselves within an attractive industry and a market (Schiefer et al., 2013; Jo H. M. Wijnands et al., 2008). Additionally, Porter argued that firms achieve and maintain strategic advantage through ‘improvement, innovation and upgrading’, and placed industry competitiveness as inextricably linked with the national and firm competitiveness (Ronan *et al.*, 2005). Jo H. M. Wijnands et al. (2008, p. 420) note that, following Porter, competitiveness of the EU food industry can be defined as “the sustained ability to achieve profitable gain and market share in domestic and export market in which the industry is active”. Ronan, Sinnadurai, and Taylor (2005) point out that collective competitiveness (national, industry and firm) should influence (positively) standards of living. However, “without reference to sustainability, industry competitiveness remains a deficient concept” (Ronan et al., 2005, p. 6).

2.3.3 Traditional Industrial Organisation (TIO) framework

Within the organisational economics literature, there are two major schools of thought when it comes to assess firm and/or industry performance, *i.e.* (i) the Traditional Industrial Organisation (TIO) framework and (ii) the Resource-based View (RBV).

The TIO framework is based on the paradigm of Structure-Conduct-Performance (SCP), which assumes that the ‘structure of a market (S), determines market conduct (C) which in turn influences market performance’ (Kaiser & Suzuki, 2006). TIO recognises the importance of interdependence among firms and considers the market (industry) structure as the major determinant of firms’ performance (e.g., profitability and sales growth) under the assumption that all firms are profit-maximisers.

Ennew and McDonald (1995) provide a succinct description of the SCP model, focusing mainly on the economics of competition on the UK food and drink industry. They note that market structure refers to those characteristics which determine the links between buyers and sellers, *e.g.*, the number and size of firms, barriers to entry (and barriers to exit) and product differentiation. In their view, the number and size of firms is particularly important as it influences market power, *i.e.* the ability of a firm to set price and output without reference to competition (p.46). Additionally, market structure is defined by concentration, and the TIO theory assumes that concentration is positively correlated with the profitability of all firms within an industry.

Product differentiation (*e.g.*, differences in quality, product design and functionality, availability) can act as a determinant of competitive advantage by making a product distinctive on the market (elasticity of demand for that product decreases) and, hence, influences firm's performance. Barriers to entry are defined as all those factors that make it difficult for any new player/firm to enter the market. They determine the extent to which firms within a market can increase prices above the marginal cost without triggering off potential rivals to enter the industry. Ennew and McDonald (1995, p. 46) identify five types of barriers to entries: (i) where economies of scale are substantial, the new entrant will need to make significant and costly investments in order to compete with existing firms, (ii) cost advantage for existing firms (*e.g.*, preferential access to raw materials), (iii) patents and intellectual property rights may prevent new entrants from adopting the most economically efficient production or sale techniques, (iv) the size of the market may be restricted by demand conditions and (v) product differentiation and consumer loyalty. In contrast, A. Szymanski (2006) clusters barriers to entry into two major types: pricing strategies (*e.g.* predatory pricing when existing firms benefit of a cost advantage in highly concentrated markets) and non-pricing strategies (*e.g.* brand loyalty).

Market conduct relates to a firm's strategy or behaviour in order to achieve its specific objectives, and in the traditional SCP model, the objective of any firm is profit maximisation (Ennew & McDonald, 1995). This is particularly the case in a perfectly competitive market. However, this may not necessarily be the case in other markets, where the firm may choose to take a more 'utilitarian' (satisfactory) approach (*e.g.*, focusing on sales maximisation and managerial benefits as opposed to profit maximisation). However, market performance is more difficult to define, and Ennew and McDonald (1995) stress that this could take place at the market level or the firm, and the terms are not identical except under perfectly competitive market. They argue that firm performance is concerned with the extent to which the firm is satisfied with its objectives, whereas market performance relates to economic efficiency, the benefits and the costs associated with a specific operation of that market.

From an empirical point of view, TIO has been extensively applied for the analysis of imperfectly competitive industries. Work in this vein began with the work of Bain (1951) who examined the impact of concentration on firms' performance using data for 42 industries in the United States (US). This study, reinforced the theoretical framework, *i.e.* industries with higher ratios of concentration (CR) were recorded higher profits as opposed to those with a lower CR. More recently, Sutton (1991) also focused on market structure, examining 20 food and drink industries across six countries. Sutton (1991) considered the role of exogenous and endogenous sunk costs, finding that industries with high endogenous sunk costs (*e.g.*

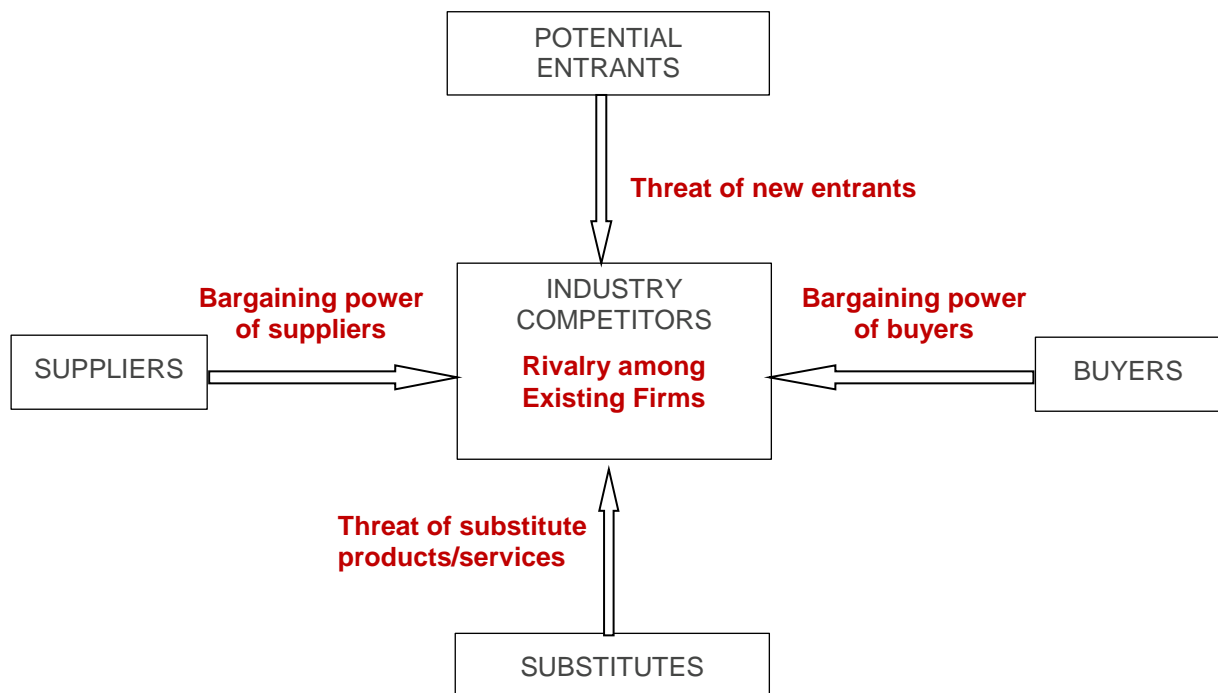
advertising/sale ratio, brand name and consumer loyalty) are subject to higher returns to scale and a higher lower bound of market concentration.

Ennew and McDonald (1995) stress, however, that like any theoretical framework, the traditional SCP approach has its own limitations. Despite recognising the importance of interdependency between firms within an industry, it fails to provide a conceptual framework in which “competitive interactions within an industry, and between industries that are vertically related, can be analysed” (ibid, p. 73). This is particularly the case for food industries, which are characterised by vertically related markets. The traditional SCP model “tends to underestimate the importance of input suppliers and implicitly assumes that input markets are competitive”. While for some industries this may be reasonable, for the food industry given its dependence on agriculture, such a view ignores the impact of government policy and farmers’ marketing strategies (Ennew & McDonald, 1995).

Competitive Strategy: Porter’s Five Forces Driving Industry Competition

Porter (2004) sought to augment the traditional SCP framework by arguing that the performance of a firm is affected not only by the structure of the market in which the firm operates, but by the strategic decisions (conduct) taken by the firm. Moreover, in Porter’s view, the state of competition in an industry depends on five basic competitive forces, i.e. entry, threat of substitution, bargaining power of buyers, bargaining power of suppliers and rivalry among existing competitors (Figure 5). Together these determine the intensity of industry competition and influence profitability. The driving forces (as described by Porter, 2004) are briefly explained below.

Figure 5 Forces Driving Industry Competition



Source: Porter (2004: 4).

New entrants to an industry increase competition which in turn may reduce profitability. Porter (2004) argues that the threat of new entrants depends on the barriers to entry (e.g., economies of scale, product differentiation, capital requirements, switching costs, access to distribution channels, cost (dis)advantages and government policy) and the competitors' reaction to the new entrant. The higher the barriers and/or the retaliation expected by the new entrant the lower the threat to entry.

Rivalry can take place between one or more exiting competitors following an opportunity or the pressure to improve one's position. Price competition and advertising battles are used by Porter (2004) as examples of some forms of competition encountered by firms. However, whereas price cuts could be easily matched by rivals leading to the loss of profitability for the entire industry, advertising may enhance product differentiation and an increased demand for the benefit of all firms. A number of interrelating structural factors may explain the intensity of rivalry between existing firms, such as numerous or equally balanced competitors, slow industry growth, high fixed or storage costs, lack of differentiation or switching costs, increasing capacity, diversity amongst competitors and high exit barriers. Porter (2004, p. 18) argues that when an industry is highly concentrated, as is the case with most branches of the food industry, or is dominated by one or few firms 'there is little mistaking relative strength, and the leader or leaders can impose discipline as well as play a coordinative role in the industry through devices like price leadership'.

Substitutes: All firms within an industry face pressure from other industries producing substitute products. These affect the industry's overall elasticity of demand, and implicitly the industry's profit. The more attractive the price of substitutes, the higher the ceiling on the prices firms in the industry can profitably charge (Porter, 2004, p. 23).

Bargaining power of buyers: Buyers (e.g., consumers, industrial and commercial buyers, wholesalers and retailers) have a strong influence on the price of products within a market, and hence on the profitability of the industry. They "compete within the industry by forcing down prices, bargaining for higher quality or more services, and playing competitors against each other (Porter, 2004, p. 24). A group of buyers enhances its power if, for example, the buyers control a large share of the seller's volume sales, the products purchased are standard and undifferentiated, the seller faces switching costs and/or the products purchased represent a significant proportion of the buyer's costs or purchases (ibid).

Bargaining power of suppliers: Suppliers can also influence the profitability of an industry by threatening to increase prices or reduce the quality of purchased goods and services. In Porter's view, a supplier group is powerful if, for example, it is dominated by a few companies and is more concentrated than the industry it sells to, the industry is not an important customer of the group, the supplied products are differentiated or the suppliers face lower competition from other substitute products.

As regards the *government* as a force for competition within an industry, Porter stresses that government can influence directly or indirectly (through its adopted policies) the competition between industries (as a buyer or supplier) and can also affect the position of an industry with substitutes through, e.g. regulations or subsidies.

Porter's Generic Competitive Strategy for a Firm

Porter (2004) identifies three potential generic strategic approaches, which individually or together may influence the (successful) position of a firm within an industry: (i) overall cost leadership, (ii) product/service differentiation and (iii) focus on a particular buyer group, product segment or geographical market.

Achieving overall cost leadership in an industry requires a considerable attention to costs controls while maintaining quality and service. A low cost production position within an industry protects the firm against the five competitive driving forces by earning the firm extra revenues (above the average returns in the industry), strengthen its position amongst competitors including substitutes and reducing rivalry, and by providing protection against both powerful buyers and suppliers. However, to reach this position, it requires a high relative market share or other advantages, such as favoured access to raw materials, economies of scales or a substantial investment in high-tech and modern equipment or an aggressive pricing strategy.

Through *product or service differentiation* (uniqueness) a firm distinguishes itself from the rest of competitors within the industry. This usually yields higher margins and lower sensitivity to price. Porter's (2004: 37) argues that a firm differentiates itself along several dimensions, e.g., design or brand image, technology, features, customer service and dealer network.

By *focusing on a particular buyer, segment of the product line or geography*, a firm distinguishes itself from its competitors by achieving a competitive advantage, through differentiation or a low cost position or both, in a narrow strategic target (niche market). Porter (2004, p. 40) stresses that 'focusing' involves a trade-off between profitability and sales volume.

Overall, according to Porter (2004) these strategic approaches differ, at least in dimensions and, hence, to implement them successfully it requires 'different resources and skills', 'different organizational arrangements', 'control procedures and inventive systems', and 'different styles of leadership'. Porter (2004, p. 41) also highlights that all these strategies are susceptible to risks, however, if a firm fails to develop at least one of them than the firm is "stuck in the middle" and is "almost guaranteed low profitability".

2.3.4 Resource-Based View and Resource-Based Theories of Competitive Advantage

Alongside the SCP-based theory of competitive advantage (Porter, 2004), the resource-based view (RBV) is the second dominant model in strategic management, which aims to explain competitive advantage, in particular sustainable advantage. In contrast with the TIO-SCP, which concentrates on industry effects, by assuming that the performance (profitability) of a firm is influenced by structure of the market (or external forces), the RBV focuses on the importance of firm effects (A Szymanski, Gorton, & Hubbard, 2007). Based on the influential work of J. Barney (1991), the RBV assumes that distinctive and superior (valuable, rare, inimitable and non-substitutable) resources (and capabilities) are essential for firms to achieve a sustained competitive advantage. These (resources and capabilities) can be defined "as bundles of tangible and intangible assets, including a firm's management skills, its organisational processes and routines, and the information and knowledge it controls that can be used by firms to help choose and implement strategies" (J. B. Barney, Ketchen, & Wright, 2011, p. 1300). They form the basis for competitive advantage. Broadly, "a resource

is something that a firm possesses, whereas a capability is something a firm is able to perform” (Hart & Dowell, 2011, p. 1465). In Barney’s words (2001, p. 648), research based on the RBV demonstrates that “firms that build their strategy on path dependent, causally ambiguous, socially complex, and intangible assets outperform firms that build their strategies only on tangible assets”.

The link between the RBV and SCP has been empirically tested by several authors. For example, McGahan and Porter (1997) and Rumelt (1991) focused on the determinants of performance by estimating industry and firm effects on the performance of the firm. These studies show that despite variance across industries, firm effects are larger than industry effects.

In their paper “The Future of Resource-Based Theory: Revitalization or Decline?”, J. B. Barney et al. (2011) undertake a retrospective analysis of the resource-based view of the firm, by providing a succinct description of the major work and contributors. In their view, over the last 20 years, the RBV has matured and transformed from a ‘view’ into the resource-based theory (RBT), which has become ‘one of the most prominent and powerful theories of understanding organisations’ (ibid, p. 1299). This is reflected in the increasing use of the term RBT as opposed to RBV. However, Hart and Dowell (2011, p. 1465) stress that the core element of the RBT remains “its focus on factors internal to the firm that lead to sustained competitive advantage”.

The resource-based theory and sustainability

Barney *et al.*, (2011) also review the literature which focuses on the link between *the resource-based theory and sustainability*. They highlight particularly the work of Hart (1995), who developed a new concept, that of ‘natural-resource-based view of the firm (NRBV)’. Hart (1995) argued that the initial theory ignored two important issues (i) the link between the firm’s resources and capabilities and its natural environment and (ii) how this link influences the firm’s competitive advantage. Through his NRBV, Hart (1995) proposed three key strategic capabilities/stages of environmental strategy: pollution prevention, product stewardship and sustainable development. Hart and Dowell (2011) revisited this work in the light of a number of important developments that emerged over the years in both the RBV literature and research on sustainable enterprise. First, they considered how the NRBV can benefit from research into dynamic capabilities and second, how the NRBV can extend and improve our understanding of how firms incorporate environmental sustainability in their search for a sustainable competitive advantage. They concluded that as the environmental, economic and social challenges have multiplied since the publication of the NRBV, ‘the argument contained in the original work has only become stronger and more relevant’ (ibid, p. 1476). They also note that due to the difficulty of defining sustainable development in a business context, research into the relationship between sustainable development and strategies and firm performance is almost non-existent.

Nevertheless, like with any theoretical framework, the RBV has its own limitations. For example, Priem and Butler (2001, p. 63) criticised it by arguing that the main assumption of RBV (the uniqueness of a firm’s resources) is tautological, and “the RBV has had little to contribute to the explanation and or prediction of competitive advantage”. In Sheehan and Foss (2007, p. 459) words the RBV “lack[s] managerial guidance”. Cockburn et al. (2000)

stress the need for an ex-ante understanding of the sources of competitive advantage, i.e. how firms can organise to create these sources.

2.3.5 Determinants of competitiveness at the agri-food level

Given the complexity of competitiveness it is important to make a distinction between determinants and indicators of competitiveness and to identify what are the relationships between them. This is important for both the firm or the industry (from a strategic point of view) and policy makers. Whereas indicators describe/measure the economic result or the “output”, determinants focus on the “process” or the inputs necessary to achieve that result (Fischer & Schornberg, 2007). However, the literature is rather fuzzy in this respect and within the literature there is no consensus when it comes to distinguish between determinants/drivers and indicators of competitiveness (Laure Latruffe, 2010).

Laure Latruffe (2010) and OECD (2011) provide comprehensive reviews regarding competitiveness and productivity in the agricultural sector, focusing, *inter alia*, on determinants of competitiveness (and productivity growth). Latruffe (2010) clusters the determinants or drivers of competitiveness into two major groups: (i) determinants controlled by firms/farms (or endogenous determinants) and (ii) determinants beyond the firms/farms control (or exogenous determinants) (Table 4). Some these factors are briefly discussed below drawing heavily on these two reports.

Table 4 *Determinants of Competitiveness in Agriculture*

Endogenous Determinants (controlled by firms)	Exogenous Determinants (beyond the firm)
<ul style="list-style-type: none"> • size of the businesses • legal status (ownership) • factor intensity (e.g., capital-labour ratio and land-labour ratio) • product specialisation vs diversification • production and marketing practices • structure of factors of production (land, labour and capital) • characteristics of (farm) labour 	<ul style="list-style-type: none"> • factor endowment (e.g., resources in labour, capital and land) • consumer demand • government intervention in agriculture (e.g., policies, regulations, taxation) • research and development • investment in infrastructure • firm location

Source: Latruffe (2010) and OECD (2011).

Does size matter for a firm or industry competitiveness? Size of business/farm size as a determinant of competitiveness remains a controversial issue within the literature, and the answer to the question is, it depends on the circumstances, the farm type, the criteria used to define and measure size and the benchmarking (competitiveness relative to what) (OECD, 2011). Moreover, most of the studies which examined the relationship between size and competitiveness, focused on the farm level, *i.e.*, how farm size influences farm performance (Bakucs, Latruffe, Fertő, & Fogarasi, 2010; S. Bojnec & Latruffe, 2009; L. Latruffe, Balcombe, Davidova, & Zawalinska, 2004; Munroe, 2001; O'Neill & Matthews, 2001; Zhu & Lansink, 2010) with only a few looking at the relationship between farm size and international competitiveness (e.g. Gorton & Davidova, 2001) or between size and the performance of the wider agri-food sector (Skuras, Tsekouras, Dimara, & Tzelepis, 2006). The general finding is that the larger the farm the better the farm performance, as the farm can benefit from economies of scale, improved access to input and output markets, and suffers less hidden unemployment. However, in certain contexts, some studies (Munroe, 2001; O'Neill &

Matthews, 2001; Zhu & Lansink, 2010) indicate that small farms perform better than the large ones, and this is due mainly to a highly motivated and more resilient (family) labour force and a lower dependence on external capital than larger farms. Latruffe (2010) and OECD (2011) also highlight that in the agri-food sector, the size effect is not necessarily an issue, although small farms may be constrained by labour intensive-technologies and face higher input prices.

The results also vary across studies when examining the relationships between factor intensity, farm specialisation and human capital and competitiveness, or in this case the link between each of these factors and technical efficiency. For example, hired labour may imply skilled labour but may result in supervision problems, whereas renting land lead to higher productivity in short-run but may prevent long-term investments/improvements to the farm. Latruffe (2010) highlights here a number of studies such as for example, Tonsor and Featherstone (2009), Zhu and Lansink (2010) and L. Latruffe et al. (2004). There is a positive relationship between financial indebtedness and technical efficiency (Sophia Davidova & Latruffe, 2007), although high level of debts may attract high credit costs which in turn will reduce efficiency. Farm specialisation might be beneficial for technical efficiency (Carroll, Greene, O'Donoghue, Newman, & Thorne, 2009; Mathijs & Vranken, 2001; Zhu & Lansink, 2010) but diversification may also improve efficiency (S. Bojnec & Latruffe, 2009; Carroll et al., 2009; Hadley, 2006; Mathijs & Vranken, 2001). The relationship between characteristics of farm labour (e.g. gender, age and education and time spent on the farm) and technical efficiency may be positive or negative (Latruffe, 2010).

There are a large number of studies (e.g. Bakucs et al., 2010; S. Bojnec & Latruffe, 2009; Š. Bojnec & Latruffe, 2013; Hadley, 2006; Zhu & Lansink, 2010) which examine the relationship between farm competitiveness and government intervention/public support, indicating mixed results. Bojnec and Latruffe (2013) find that the level of subsidies received by Slovenian farms is negatively related to farms' technical efficiency but positively associated with profitability. At the sector level, Skuras et al. (2006) investigating the regional capital subsidies on technical efficiency of food and drinks producers in Greece, found a negative impact. Jo H. M. Wijnands et al. (2008) find also that EU regulations have a small impact on the competitiveness of (EU15) food sector.

While acknowledging the crucial role of R&D in fostering productivity growth, the OECD report (2011) highlights the limited research of R&D on productivity and competitiveness in the agri-food sector industry and its determinants. In addition, the impact of other types of interventions such as environmental, labour and fiscal policies on the competitiveness of the agri-food sector has not been assessed" (ibid, p. 80). Moreover, innovation (beyond patents and R&D) and "innovation systems" (viewed as networks for knowledge exchange) are also revealed as crucial for fostering agricultural productivity growth and competitiveness. "The process of innovation and productivity growth includes not only knowledge creation, but also the whole system of technological diffusion, adoption process, interactions and market adjustments" (OECD, 2011, p. 80).

2.4 Trade performance and export competitiveness

Exports are usually considered to be good for economic growth. There is a wealth of literature on the relationship between exports and economic growth. Foster (2006) provides a recent overview of this literature and discusses why exports are good for growth. Thus, analysing trade growth relates to trade competitiveness. Assessing trade competitiveness is usually based on absolute and relative outcomes revealing various aspects of trade growth. The most common outcome measures include: the level (volume, share) and growth of exports; relative trade performances, variety and diversification of exports; and quality or sophistication of exports. Farole *et al.* (2010) suggest a comprehensive framework to analyse export competitiveness encompassing different dimensions of trade based on a growth diagnostic approach. The main elements of the concepts and related indicators are briefly reviewed in the remainder of this section.

2.4.1 Measuring relative trade competitiveness

Trade measures traditionally have been at the core of measuring comparative advantages and competitiveness of nations, industries and product specializations. During the last half of the century the applied trade literature developed three main groups of indices for measuring comparative advantage, trade specialization, and trade competitiveness. The first group of indices focus on revealed comparative trade advantage, based on the early works of Liesner (1958) and Balassa (1965) which help to identify strong export or trade sectors/products in an economy. The original approach was, however, criticised for several reasons including neglecting the import side and trade policy measures (Vollrath, 1991). Despite these criticisms and alternative approaches (Lafay, 1992, Zaghini 2005) the revealed comparative advantage approach and its variants are still widely used in empirical trade analysis.

The second group of trade indices relate to the intra-industry trade (IIT). The basis for the various measures of IIT is the Grubel–Lloyd index (Grubel and Lloyd, 1975). Theoretical developments in the IIT literature suggest several options to disentangle horizontal and vertical IIT. Greenaway *et al.* (1995) developed the following approach, whereby a product is horizontally differentiated if the unit value of export compared to the unit value of import lies within a 15% range, otherwise they are defined as vertically differentiated products. Furthermore, Greenaway *et al.* (1994) added that results coming from 15% range do not change significantly when the spread is widened to 25%. Blanes and Martín (2000) emphasise the distinction between high and low vertical intra-industry trade (VIIT). They define low VIIT when the relative unit value of a good is below the limit of 0.85, while a unit value above 1.15 indicates high VIIT. Fontagné and Freudenberg (1997) propose a different method categorizing trade flows and computing the share of each category in total trade. They defined trade to be "two-way" when the value of the minority flow represents at least 10% of the majority flow.

The third approach utilises the unit values of exports and imports by products for assessing price competition and product quality in two-way matched trade (e.g. Aiginger, 1997 and 1998). Aiginger (1997, 1998), Gehlhar and Pick (2002) and Bojnec and Fertő (2009; 2012) employ the unit value difference and trade balance by product to categorize trade flows in four categories. Trade balances indicate successful or unsuccessful competition in trade and export-import unit values determine price or quality competition. The price and quality

competition approach is applied on matched *two-way* trade flows satisfying the simultaneous conditions of the unit value difference and the trade balance by the product. In the matched two-way trade flows, the home country *i* is successful in price competition (trade surplus at lower export than import unit value) and in quality competition (trade surplus at higher export than import unit value), respectively. The converse holds for the other categories, in which the home country is unsuccessful in price competition (trade deficit at higher export than import unit value) and in quality competition (trade deficit at lower export than import unit value). In addition, one disentangles the one-way trade from the two-way matched trade. When *one-way* trade occurs then the net direction of trade is either surplus or deficit. Therefore, for *one-way* trade we distinguish two possible ‘one-way non-price competition categories’, i.e. only one-way export category or only one-way import category.

It is known from the literature that measures of relative comparative trade advantages and intra-industry trade are more clearly defined than measures of competitiveness both theoretically and empirically (e.g. Porter, 1990; Krugman, 1994). The theory of relative comparative trade advantage predicts that trade flows exist as a result of relative cost differences between trading partners. It suggests that countries are relatively competitive in goods and services in which they have a relative cost advantage. The relative comparative trade advantage captures structural features of the sector and economy, which are more stable in long-run. Competitiveness in short-run changes due to sector-specific, macroeconomic and other influences that can be related to market and policy distortions with associated transfers such as from the use of agricultural subsidies.

Lafay (1992) outlines two significant differences between relative comparative trade advantage and trade competitiveness. First, competitiveness usually involves a cross-country comparison for a particular product, whilst comparative advantage is measured between products within a country. Second, competitiveness is subject to changes in macroeconomic variables, whereas comparative advantage is structural in nature. Thus, empirical analysis that focuses on relative comparative trade advantage and trade competitiveness measures may lead different results (e.g., Fertő and Hubbard, 2003). However, comparative advantage and competitiveness measures share all the interdependencies and dynamic aspects of an economy. Bojnec and Fertő (2012) confirm that trade advantage measures are consistent with one way export and successful price and successful quality competition categories in two way trade on one side, and relative trade disadvantage with one way import and unsuccessful price and unsuccessful quality competition on the other.

2.4.2 Export variety and diversification

The importance of international trade in differentiated products is highlighted in the theory and evidence on intra-industry trade (IIT), which explains the occurrence of trade within the same industry. Gains from IIT reflect economies of scale with lower costs and wider consumer choice. Product differentiation is likely to lead to monopolistic competition in producing differentiated goods that are exported to a greater extent than imported, and demands by consumers for product variety, whereby international trade increases welfare by increasing consumers' utility.

There are several studies that investigate the role of product variety in exports (e.g. Funke and Ruhwedel 2001, 2002; Hummels and Klenow 2005; Broda and Weinstein 2006; Feenstra and Kee, 2004, 2007). These studies confirm the importance of product variety in export growth. A range of measures of product variety are documented in the literature. These range from simple ones, such as the number of product categories exported to more sophisticated measures such as those developed by for example Feenstra (1994), Funke and Ruhwedel (2001) and Hummels and Klenow 2005).

Export diversification, both in terms of products and markets, is strongly associated with economic growth (e.g. Lederman & Maloney, 2009), particularly for developing countries. Contrary to traditional Ricardian and Heckscher-Ohlin models, which suggest that countries should specialize, recent literature suggests that export diversification is desirable for developing countries because commodity dependence is frequently associated with lower growth rates over the long run, and stagnation at relatively low levels of per capita income (Naudé et al. 2010). Cadot et al. (2009) finds similar results for exports, and provides some indications that the link might be causal. However, it is important to note that empirical work on export diversification uses intuitively appealing, but theoretically ad hoc, measures of diversification, such as a Herfindahl–Hirschman and Theil index or Gini coefficients of export values across a given range of products or sectors (Dennis and Shepherd, 2011).

Quality and sophistication

There is a growing literature on the importance of export quality or sophistication in contributing to competitiveness (e.g. Schott, 2004; Hummels and Klenow, 2005; Hallak, 2006). While there is no consensus on the foundations of quality, using various measures, (e.g. Hausman et al., 2007; Khandelwal 2010; Lall et al., 2006; Schott, 2004), most research suggests there is a strong relationship between the forces that contribute to quality upgrading and those that contribute to productivity growth – in particular human capital, innovation and knowledge diffusion. The key question, however, is whether competitiveness is best achieved by following comparative advantage or in actively defying it (Lin and Chang, 2009). The empirical research for developing countries is rather inconclusive. Hausman et al. (2007) and Hidalgo et al. (2009) argue that certain goods provide greater opportunities for growth, because of their greater potential to upgrade vertically within the industry and to benefit from inter-industry spillovers of knowledge to redeploy resources horizontally into more sophisticated industries. However, counter evidence suggest that competitiveness and growth are achieved by having innovative firms not necessarily by participating in sophisticated sectors (e.g. Harrison and Rodriguez-Clare 2009).

3 Conceptual framework and selection of competitiveness indicators

3.1 Criteria for Selecting Indicators of Sustainable Competitiveness of Product Chains

Indicators are measures that provide insight into ‘a matter of larger significance or makes perceptible a trend or phenomenon that is not immediately detectable’, so an indicator’s significance ‘extends beyond what is actually measured to a larger phenomenon of interest’ (Hammond, Adriaanse, Rodenburg, Bryant, & Woodward, 1995, p. 1). Indicators thus quantify and simplify information about complex systems. Hezri and Dovers (2006) identify five purposes for indicators:

- i) to discriminate between competing hypotheses (for scientific exploration);
- ii) to structure understanding of issues and conceptualise solutions;
- iii) to track performance;
- iv) to discriminate between alternative policies either for specific decisions or general policy directions; and
- v) to inform general users (public, stakeholders, community).

There are a number of guides as to what indicators should look like (e.g. SMART objectives) but these lack consideration of the specific nature of the agri-food sector. For example, verification of indicators is essential in the food sector where the ability to check and confirm claims is vital for maintaining consumer and industry confidence.

Considering the COMPETE project, we require set of indicators that are:

Comprehensive: covering the main dimensions of an issue while also being parsimonious, avoiding excessive complexity, duplication and confusion.

Illuminating: provide insight for users and policy makers. In this regard, indicators should “help you understand where you are, which way you are going, and how far you are from where you want to be” (Flint, 2013, p. 280).

Verifiable: in other words it is possible to check the consistency and validity of measures and the robustness of reporting systems.

Useable: Indicators have to be measurable and aid effective decision making. The development of indicators has to be guided by what is possible (Stapleton & Garrod, 2008).

Comparable: Indicators must be applied consistently, allowing for comparison across units, and ideally over time.

In agri-food research one particular problem has been that available data have often been insufficient, in certain domains, to calculate meaningful indicators. For example, it has proved difficult from existing sources to accurately derive indicators of farm incomes in the EU and consequently problematic to assess the performance of the Common Agricultural Policy (CAP) against one of its main objectives (Hill, 2012).

In helping select indicators of sustainable competitiveness, it is useful to consider the main users and how they may use measures. Users can be grouped into five categories:

enterprises, policy makers, quality assurance agencies, Non-Governmental Organisations (NGOs) and wider publics, researchers (Table 4).

Table 5 Users of Product Chain Competitiveness Indicators

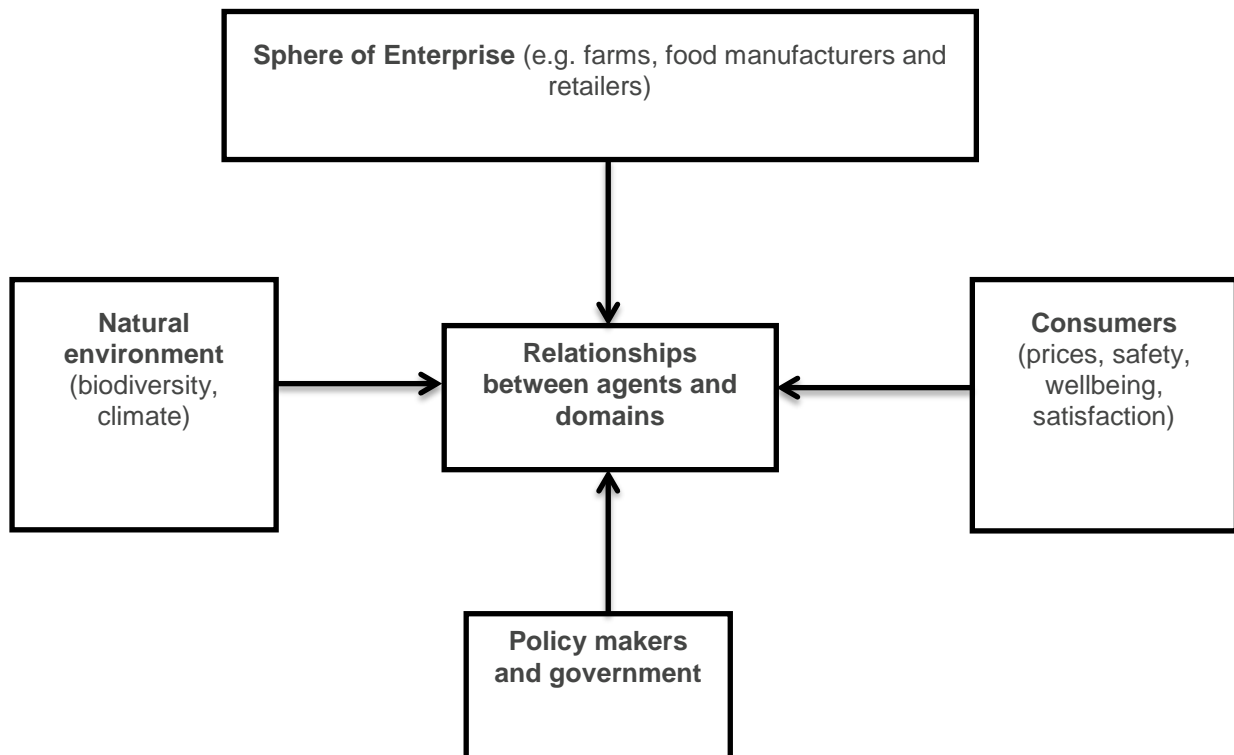
Group	Purpose
Enterprises	Compare performance against competitors (benchmarking); Construct / refine business strategy (aid market responsiveness).
Policy makers	Identify instances of market failure; Identify whether policies and measures are meeting objectives (impact assessment / policy evaluation); Reform of policy.
Quality assurance agencies (e.g. GLOBALGAP)	Monitor actors' actions; Assess whether actions taken are meeting long-term objectives.
Civil Society (NGOs/pressure groups and public)	Assess current situation and identify where outcomes are out of keeping with objectives / desired outcomes.
Academics/researchers	Characterise current situation; Test the robustness of current 'state of the art', existing theories and methodologies; Analyse the impact of policy interventions; Identify recommendations for action.

Source: own construction.

3.2 Conceptual Framework and Indicators

The proposed conceptual framework for considering the sustainable competitiveness of agri-food supply chains has five domains: enterprises, policy, consumers, natural environment and the linkages between the four elements. Figure 6 summarises the five domains.

Figure 6 *Conceptual Framework for Analysing Sustainable Product Chain Competitiveness*



Source: own construction.

- a) *Sphere of enterprises*: This sphere consists of firms and the main measures for this domain are profitability, productivity, return on assets, R&D investment and financial stress (Damijan, Knell, Majcen, & Rojec, 2003; Dwyer et al., 2012; Franks, 1998; Olsson et al., 2009). These measures can be calculated for individual units (e.g. farms and firms) or aggregated for sector and country level analysis. The main data sources that can be used are AMADEUS and Farm Accountancy Data Network (FADN). An important element at the enterprise level is develop indicators that allow for benchmarking performance – so that a firm can compare its own performance against others in the same industry or leaders in other fields.
- b) *Policy context*: Relating to the agri-food industry, policy indicators should be attuned to evaluating the effects of the CAP and the degree to which outcomes match objectives. This will include an assessment of patterns of trade. The main trade based indicators of competitiveness relate to: revealed comparative advantage, domestic resource cost ratios, intra-industry trade (Fertö & Hubbard, 2003; Tsakok, 1990). The European Commission (2006), as part of the Monitoring and Evaluation Framework (CMEF), outlines a set of baseline and impact indicators for assessing the

effect of measures within the Second Pillar of the CAP. For Axis 1 the Second Pillar (competitiveness), the main impact indicators documented in the CMEF are gross value added in the primary and food processing sectors. However many factors, not directly related to CAP, such as macroeconomic fortunes, can affect scores for these indicators. Effective policy analysis requires more rigorous assessment of the beneficiaries and non-beneficiaries of support measures, for example through the application of propensity score matching techniques (Abadie & Imbens, 2011).

- c) *Consumers*: From a consumer perspective, sustainable product chain competitiveness relates to customer satisfaction with the goods available for sale, experienced quality, prices and food safety. In assessing whether a particular country's agri-food sector acts in the interests of consumers, the Competition Commission (2000) used the following key metrics: international comparison of retail prices, consumer satisfaction / service quality scales, farm gate – retail price spreads. Such analysis could be expanded to consider food safety and the availability of healthy food options.
- d) *Natural environment*: An extensive literature considers the impact of agriculture on the natural environment, with related sets of indicators (van der Werf & Petit, 2002). The main indicators used include emissions of N, P and K and heavy metals to soil and water (kg/ha), length of hedgerows (m/ha), number of threatened and characteristic species per ha and Greenhouse Gas Emissions (GHG) per ha (Hammond et al., 1995; van der Werf & Petit, 2002). To date, this analysis has typically focused solely on farming rather than taking a chain perspective. The latter would be more comprehensive, since the assessment would consider impacts from primary production to final consumers (Linton, Klassen, & Jayaraman, 2007).
- e) *Relationships between elements*: This domain relates to how the previous four interact. Research on global value chains considers the relationships between actors in supply chains (Gereffi et al., 2005). It focuses on understanding the governance of supply chains, which is divided into five main types: market, modular, relational, captive and hierarchical (Gereffi, 2013). Particular attention is given to the prospects for upgrading (strategies used by countries, regions and firms to maintain or improve their positions within a supply chain). This is of particular interest to the agri-food sector where there is widespread concern that farmers and processors are 'captive' suppliers of retailers and the opportunities for small-scale farms to upgrade are weak. The main indicators used have been profits, value added, and mark ups at each stage of the supply chain (Gereffi, Humphrey, Kaplinsky, & Sturgeon, 2001), although the development of a set of robust value chain metrics remains an important task (Sturgeon, 2009).

Table 6 summarises the main metrics which can be used for assessing sustainable competitiveness.

Table 6 Metrics for Measuring Sustainable Competitiveness by Domains

Domain	Core Metrics
Sphere of Enterprise	Profitability Return on Assets (RoA) Total Factor Productivity (TFP) and technical efficiency Financial stress and indebtedness
Policy makers and government	Revealed comparable advantage (RCA) Domestic Resource Cost (DRC) ratios Intra-industry Trade (IIT) Comparative analysis of performance of beneficiaries and non-beneficiaries of support (using propensity score matching techniques)
Consumers	International comparison of retail prices Consumer satisfaction Farm-gate-retail price spreads Consumer health (e.g. prevalence of obesity, incidence of food-borne illnesses per 1,000 of the population per annum)
Natural environment	Emissions of N,P,K and heavy metals to soil and water (kg/ha) Length of hedgerows (m/ha) Number of threatened and characteristic species per ha Greenhouse Gas Emissions (GHG) per ha
Relationships between agents and domains	Value added / mark up at each stage of the supply chain Default rates on contracts between buyers and suppliers Shrinkage / perishability rates

Source: own construction.

4 Concluding Remarks

This deliverable aims to provide a succinct overview of the relevant theories of competitiveness and to identify the determinants of competitive advantage and their interactions. It also focused on the identification of major criteria and indicators for comparative analysis of (the agri-food industry) competitiveness which in turn contributes to the development of a conceptual framework for sustainable competitiveness. It is clear from the literature that competitiveness is a relative and dynamic concept which can be assessed at various levels (*e.g.*, country, region, industry, supply chain and firm). Given its complexity, it is difficult to encompass it in a single, universally accepted definition. This is particularly the case for national and regional competitiveness.

Discussion of national competitiveness, as a concept, has its roots in the theories of industrial organisation, particularly the work of Michael Porter. According to Porter (national) competitiveness relies on four pillars: ‘factors endowment’, ‘home-demand conditions’, ‘related and supporting industries’ and ‘firm strategy, structure and rivalry’ (*i.e.* Porter’s diamond). Porter (1990) recognises that the quality and extent of education and training can influence national competitive advantage but otherwise advocates limited government intervention. Porter’s work has been severely criticised, particularly by Krugman (1994), who argued that competition between firms is a poor analogy for studying national and regional economies. Porter’s (national) approach has also appeared limited when applied to understanding the competitiveness of European food industries (Traill & Pitts, 1998). Within the specific context of the agri-food system, it fails to capture the effects of the CAP on competitiveness and the interactions between the sector and the environment.

Alongside TIO theory and the work of Porter, RBT has played a crucial role in explaining competitive advantage at the firm level. Although originating from neoclassical economics, RBT theory focuses on the importance of firm effects, by assuming that firms should possess ‘distinctive’ and ‘superior’ (tangible and intangible) resources and capabilities, which are not easily replicated, for achieving a sustained competitive advantage.

Given the complexity of the concept it is crucial to distinguish between determinants and indicators of competitiveness and to identify the relationships between them. However, this is not always followed in the literature. Two major groups of determinants/drivers of competitiveness are identified within the literature, endogenous and exogenous determinants. Endogenous determinants are, in general, factors that can be controlled by the firm itself, such as ownership structure, factor intensity (*e.g.* capital-labour ratio and land-labour ratio), characteristics of labour (age, education, gender, and experience), product specialisation and product diversification, and production and marketing strategies. These determinants have been considered extensively at the farm level.

Amongst exogenous determinants (or factors beyond the firm’s control) of competitiveness, the literature focuses particularly on factor/resources endowment and government intervention. However, the interactions between determinants have received relatively little attention, particularly for the agri-food sector. For example, there is a paucity of studies that apply structural equation modelling to explore path relationships between independent and endogenous variables.

Trade measures, such as revealed comparative advantage, the intra-trade industry trade and the unit values of exports and imports, have been applied extensively as measures of competitive advantage and competitiveness of countries, industries and product specialisations. However, the determinants of such trade measures have received far less attention.

Most of the literature regarding agri-food industry competitiveness draws largely on trade, productivity and value added indicators and focuses on the assessment of competitiveness at the farm, agricultural sector or food industry levels, with very few studies adopting an integrated supply chain approach. In consequence, there is little research on the identification of determinants and metrics that characterise agri-food supply chain competitiveness per se. Subsequent work packages in the COMPETE project will address this.

Against this background, this deliverable proposes a set of criteria for selecting indicators and a conceptual framework for measuring sustainable competitiveness of the agri-food sector. Given the complexity of the supply chain, indicators should be 'comprehensive', 'illuminating', 'verifiable', 'useable' and 'comparable'. They also should be applicable to at least five groups of users: enterprises, policy makers, quality assurance agents, civil society and academics/research community. The conceptual framework covers five areas: sphere of enterprises, policy context, consumers, natural environment and the relationships between the agents and domains.

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Project information

- Title:** International comparisons of product supply chains in the agri-food sectors: determinants of their competitiveness and performance on EU and international markets (COMPETE)
- Funding:** Collaborative research project (small or medium-scale focused research project), FP-7-KBBE.2012.1.4-09, total EU contribution is 2,422,725 €
- 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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