NATIONAL BANK OF GREECE

SECTORAL REPORT

December 2015

Unlocking the potential of Greek agro-food industry

Paul Mylonas, PhD

NBG Group
+30 210-3341521,
e-mail: pmylonas@nbg.gr

- Supported by exceptional climatic conditions, agriculture is a key sector for the Greek economy, comprising 2.9 per cent of GDP and 14 per cent of employment (compared with an EU average of 1.2 per cent and 5 per cent, respectively).
- However, the lack of a clear agricultural strategy has led the sector to rely heavily on European subsidies, incapable of exploiting the dynamics of the rapidly-expanding international market. Greek agricultural production increased by less than 20 per cent during the past 25 years (compared with 220 per cent globally and 86 per cent in Europe). In fact, Greek agricultural value added, excluding subsidies, dropped by 13 per cent during the past 20 years, while other Mediterranean countries (Spain, Italy, France) managed to increase value added, excluding subsidies, by about 15 per cent during the same period.
- Moreover, the food supply chain has a relatively small manufacturing component (adding just 40 per cent to the agricultural production versus 70 per cent in Western Europe), as most Greek agro-food products are consumed or exported in bulk form.
- On the other hand, ¼ of Greek food exports have exploited Greece's comparative advantages and gained significant shares in the international market (e.g. olives, yogurt and honey). Their common strategy is to target high-income countries (such as the euro area, UK, US, Japan), with branded products in packaged forms.
- Aiming to quantify the unexploited dynamics of the Greek agro-food sector, NBG Research focused on: (i) the potential for higher agricultural production (by following the high R&D and high vertical integration examples of countries like New Zealand, The Netherlands, Israel); as well as (ii) the development of a larger food manufacturing sector (i.e. transform bulk production to high-value-added products).
- According to our estimates, there is potential for extra value added from the agro-food sector to the Greek economy of about €12.2bn per year, equivalent to 6.9 per cent of GDP (€9.1bn directly and €3.1bn through the indirect boost to the agricultural inputs and packaging industries). However, this requires the formation of an efficient food value chain:
  - ✓ Agricultural production should become more technologically sophisticated. In fact, the reformed CAP offers opportunities for a more professional approach to agricultural activity, with less dependence on income subsidies and more focus on upgrading the production process.
  - ✓ The limitation of small-sized farms could be overcome by a business-oriented operation of agricultural cooperatives, with managing boards including producers, marketers and researchers.
  - ✓ The vertical integration in the food supply chain should also aim towards the development of strong brands. In this context, the promotion of PDO products should be encouraged and synergies from sectors such as tourism for the successful branding of Greek agro-food products should be developed.

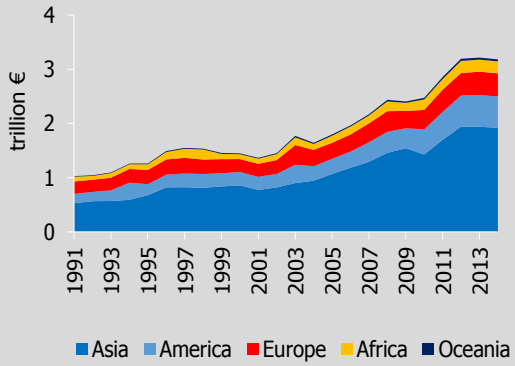
Research Coordinator:
Jessie Voumvaki, Senior Economist
+30 210 3341549
e-mail: fvoumv@nbg.gr

Analysts:
Athanasia Koutouzou, Economist
+30 210 3341528
e-mail: koutouzou.ath@nbg.gr

Georgios Sakkas, Economist
+30 210 3341547
e-mail: sakkas.georgios@nbg.gr

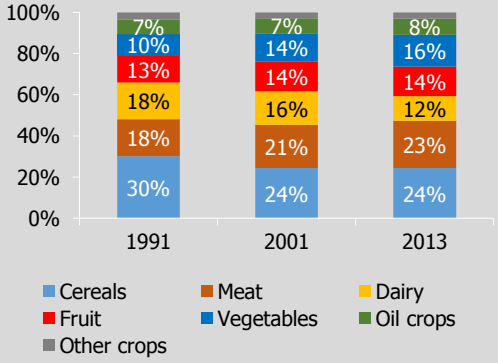
Eirini Zampeti, Economist
+30 210 3341646
e-mail: zabeti.eirini@nbg.gr

World food production value



Source: Faostat, NBG estimates

Disaggregation of world agricultural production value



Source: Faostat, NBG estimates

Supported by exceptional natural conditions, agriculture is a key sector for the Greek economy, covering 2.9 per cent of GDP and 14 per cent of employment (compared with an EU average of about 1.4 per cent and 5 per cent, respectively). However, the lack of a clear agricultural strategy led the sector to rely heavily on European subsidies, which to a large extent determined the level (and in some cases the type) of production. Specifically, subsidies amount to about 22 per cent of the value of agricultural output in Greece, compared with 12 per cent, on average, for Mediterranean countries. These structural deficiencies have undermined the sector's natural competitive advantages and have crippled its export capacity (currently demonstrating a trade deficit of €1.2bn, compared with a cumulative surplus of €18bn for other European Mediterranean countries).

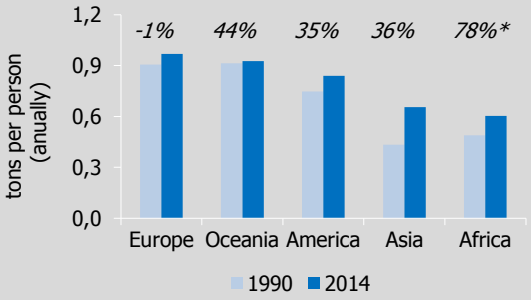
Moreover, forces acting on the sector are also leading to change, including: (i) the recent reform in the Common Agricultural Policy (CAP) that implements stricter rules in terms of production quality and use of funds; (ii) the critical importance of exports to revive the Greek economy; and (iii) the increased competition in world markets. The production of higher value-added food products as well as their efficient promotion is the only way forward for the Greek agro-food industry. Successful implementation of the above would create an efficient food value chain, covering all stages of production (from agricultural research, to the production and packaging of differentiated products as well as strategic marketing/branding). Such a strategy would generate food products that are national champions, able to access niche markets in high-income countries.

CURRENT SITUATION OF AGRO-FOOD INDUSTRY

1. A rapidly-changing world market

With Asia as the driving force, food production more than tripled in value terms during the past 25 years – reaching €3.2 trillion in 2014 from about €1 trillion in 1991. This development reflects both: (i) higher volumes (approximately 75 per cent); as well as (ii) higher prices (approximately 80 per cent) due to low stock levels, high oil prices and a weak US dollar exchange rate (especially during the

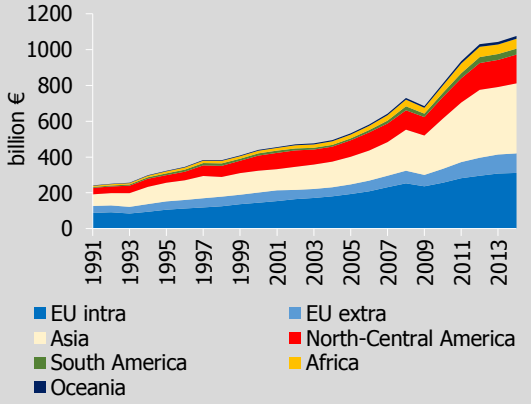
Per capita food consumption



**growth rate of population*

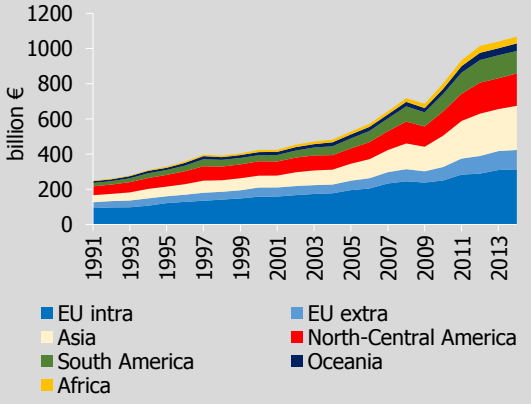
Source: Faostat, NBG estimates

International food imports



Source: Eurostat, World Trade Organization, NBG estimates

International food exports



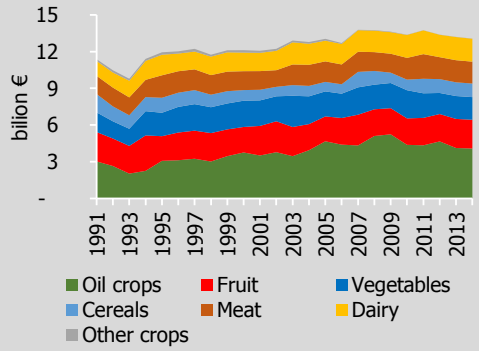
Source: Eurostat, World Trade Organization, NBG estimates

past decade). During the past two years, however, the strengthening of the dollar, lower oil prices and the catching up of production to higher consumption have exerted downward pressure on food prices. This development has in fact counterbalanced the volume increase (6 per cent during the past two years) and thus has broadly stabilized the value of world food production. Looking forward, the recent sharp decline in world food prices (by 20 per cent) is expected to exert a significant brake on food production.

Within this dynamic environment, Asia currently covers more than 60 per cent of global production, from 51 per cent in 1991 (with Chinese production growing at an average annual rate of 30 per cent, and thus contributing 50 per cent of Asia's production in 2014). Moreover, Asia holds a dominant position in the production of all food categories, covering up to 65 per cent of cereals, fruit and vegetables production and 50 per cent of meat and dairy production. In this context, Europe supplies 13 per cent of global food production (from 22 per cent in 1991), while the Western hemisphere accounts for about 18 per cent during the past two decades (with the US and Brazil contributing 43 per cent and 25 per cent, respectively, of the Western hemisphere's production). At this point, it is important to note that the global increase in food production was not uniform across all product categories. Specifically, vegetables and meat production have soared during 1991-2013 (posting an average annual growth of 18 per cent and 15 per cent, respectively), while dairy products and cereals have increased by less (posting an average annual growth of 6 per cent and 8 per cent, respectively).

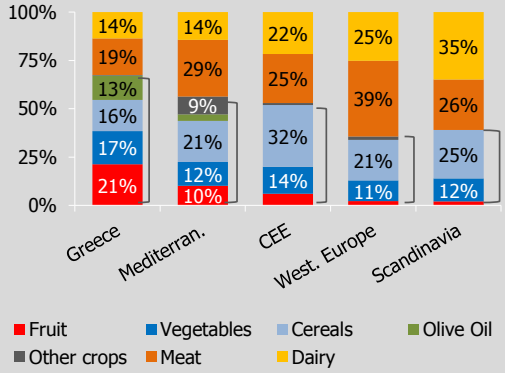
Turning to the demand side, the higher production has been absorbed by greater food demand as: (i) the world population increased by 37 per cent during the past 25 years; and (ii) per capita food consumption increased by 27 per cent. Specifically, Asia more than doubled its food consumption volume - reflecting both a population growth of 36 per cent and a higher per capita consumption by 51 per cent during the past 25 years. Also noteworthy is the case of Africa, where an astonishing population growth (78 per cent during the past 25 years), combined with higher per capita consumption (by 23 per cent), increased consumption in volume terms by 120 per cent. On the other hand,

Greek agricultural production value



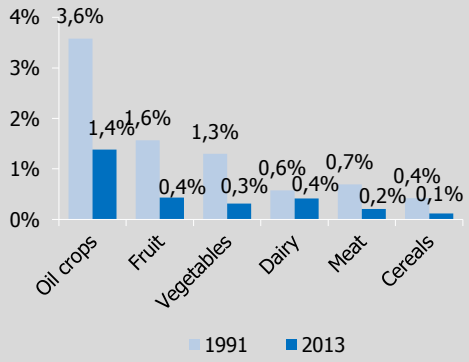
Source: Faostat, Eurostat, NBG estimates

Disaggregation of agricultural production value



Source: Eurostat, NBG estimates

Share of Greek production to world production



Source: Faostat, NBG estimates

European consumption remained broadly stable in volume terms during the past 25 years, as the small increase in per capita food consumption – which in fact remains the highest in the world (970 kg per capita per year compared with a world average of 800 kg) – was counterbalanced by a 1 per cent population decline.

Unsurprisingly, food exports have also flourished (registering an annual average growth of 15 per cent during the past 25 years) and thus currently cover 34 per cent of global production (from 24 per cent in 1991). While Asia is the leader in global production, Europe is the main region of origin - accounting for more than 40 per cent of international exports in 2014 (with ¾ covering intra-EU trade). Africa presented a significant increase in food exports, posting annual average growth of 23 per cent during the past 25 years, but its market share remained extremely low (covering 4 per cent of the world exports in 2014). Turning to the destination regions, the Asian market is the leader, covering more than ⅓ of total imports (or ½ if we exclude the intra-EU trade) – with 41 per cent of its imports originating in countries of the Western hemisphere. In this context, the Western hemisphere has a huge trade surplus (approximately €125bn in 2014) and Asia a matching trade deficit, while other regions have broadly balanced food trade flows.

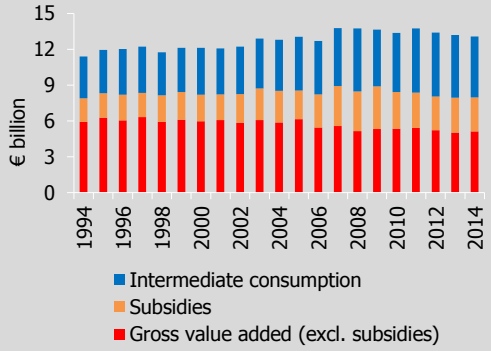
2. A key sector for Greece, posting disappointing growth in terms of: (i) production …

Greek production failed to exploit the surge of the global sector, increasing by less than 20 per cent during the past 25 years (compared with 220 per cent globally and 86 per cent in Europe). More importantly, there are important caveats to even these poor results, since the production increase mainly reflects:

- ✓ higher input prices (mainly energy), as intermediate consumption covered 39 per cent of output in 2014 from 31 per cent in 1994; and
- ✓ higher contribution of agricultural subsidies (to 22 per cent of output in 2014 from 17 per cent in 1994).

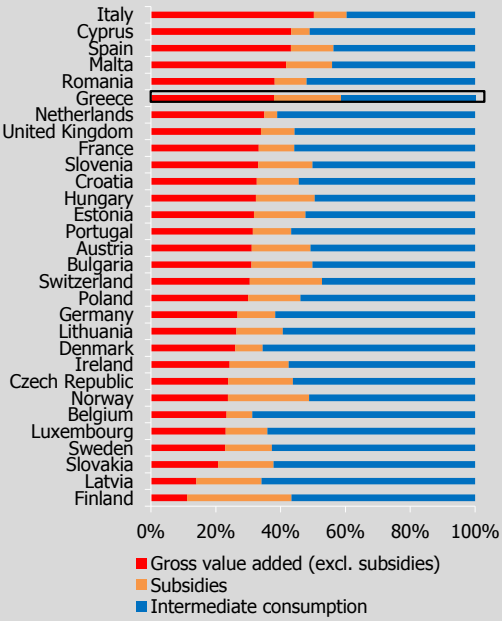
On the contrary, agricultural value added in Greece posted a drop of about 13 per cent during 1994-2014 (versus an increase of 26

Greece: Agricultural sector output



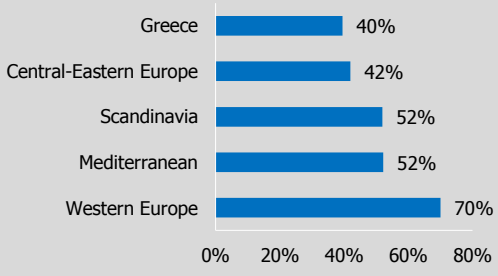
Source: Eurostat/Economic Accounts of Agriculture, NBG estimates

Agricultural sector output



Source: Eurostat/Economic Accounts of Agriculture, NBG estimates

Manufacturing value added of agricultural products (% agricultural output*)



** excluding subsidies*

Source: Eurostat, NBG estimates

per cent on average in EU) - covering 2.9 per cent of GDP in 2014, from 6.4 per cent in 1994 (but still higher than the EU average of 1.2 per cent of GDP in 2014). However, agricultural value added accounts for a large share of agricultural production in Greece compared with the EU average (39 per cent and 30 per cent, respectively) mainly reflecting the fact that Greece has a relatively high contribution of permanent crops (e.g. olive trees), covering 30 per cent of total agricultural production versus 9 per cent in the EU and thus has lower seeds and forage needs.

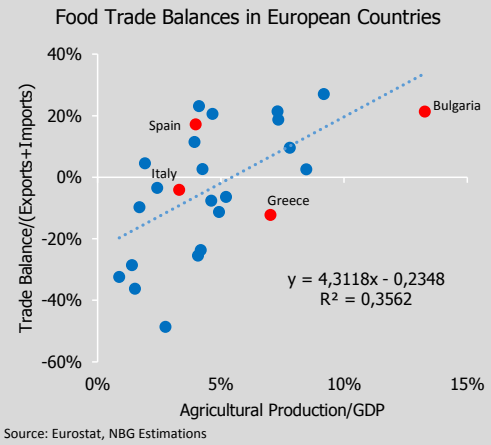
Against this background, Greek agricultural products lost market share both in the world (from 0.8 per cent in 1993 to 0.3 per cent in 2013) as well as in Europe (from 4.5 per cent in 1993 to 2.8 per cent in 2013). Specifically, all subsectors of the Greek food market lost considerable ground in the international market – with Greece's main exports posting the largest drops (with oil crops losing 2.2 pps of the world market, and fruit and vegetables losing more than 1 pp). Dairy products proved to be the most resilient, posting a reduction of about 0.2 pps (covering 0.4 per cent of the world production in 2013 from 0.6 per cent in 1991).

…(ii) manufacturing value added …

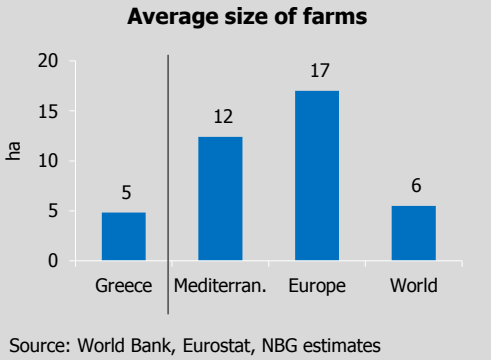
Indicative of the sector's disappointing strategy is the fact that the food supply chain in Greece appears to have a limited manufacturing component compared with other European regions. Specifically, the ratio of food manufacturing value added to agricultural production (excluding subsidies) is 40 per cent in Greece compared with 70 per cent, on average, in Western Europe. This development pinpoints the fact that a large share of Greek agricultural products is actually consumed or exported in bulk form (e.g. 73 per cent of olive oil versus 20 per cent in Italy), and thus there is substantial unexploited potential for further value added creation by the Greek agro-food industry.

… and (iii) performance in international markets

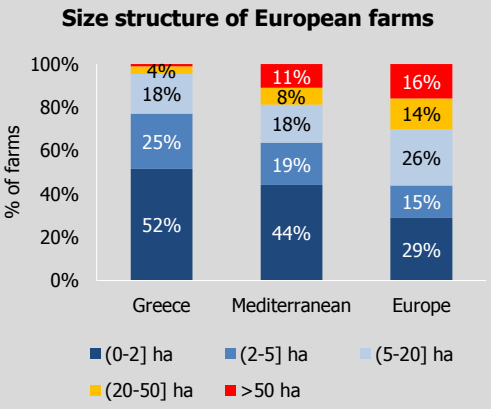
While devoting a large share of its resources to the agricultural sector (equivalent in value-added terms to 2.9 per cent of GDP compared with an EU average of about 1.2 per cent), Greece is a net importer of food products posting a trade deficit of €1.2bn in



Source: Eurostat, NBG Estimations



Source: World Bank, Eurostat, NBG estimates



Source: Eurostat, NBG estimates

2014 (from €1.7bn in 2005)[1] versus a trade surplus of €9bn for the EU as a whole. Also note that if we take into account the inputs for agricultural production (e.g. seeds, animal feed, fertilizers), the food trade deficit widens by about €1.1bn (thus reaching €2.3bn in 2014)[2]. The problem is that, while the import-dependency in the Greek food sector is relatively low (27 per cent vs 46 per cent in the EU), the extroversion of the agro-food industry is even lower (21 per cent of production value vs 47 per cent in the EU). Note that import dependency is proxied by the ratio of the value of food imports to the food production value (agricultural production+0.5*food manufacturing production), while the degree of extroversion is proxied by the ratio of the value of food exports to the food production value (agricultural production+0.5*food manufacturing production).

IDENTIFYING THE STRUCTURAL PROBLEMS OF THE GREEK AGRICULTURAL SECTOR

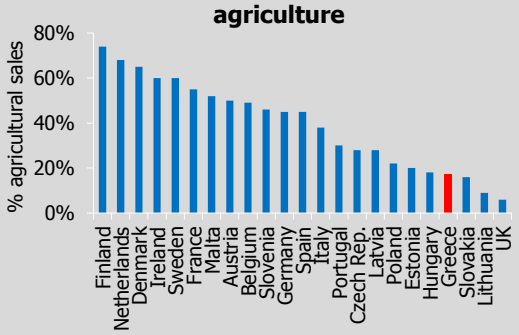
Against this background, the focus of our analysis turns towards investigating the reasons why Greece has proven unable to exploit the flourishing global demand for food products. This fact is frustrating considering that Greece's climate is extremely favorable for the production of several agricultural products. In particular, the sunny weather conditions and the existence of an extended coastline provide natural competitive advantages for growing high quality products, especially fruit and vegetables. Therefore, the factors that hinder the growth of Greek agricultural sector must be sought in structural inefficiencies, restricting it from realizing its potential.

The sector is characterized by small and fragmented agricultural holdings…

Most agricultural units in Greece are small, family-owned holdings. Specifically, the average farm is about 4.8 ha (compared with 12.5 ha on average in other Mediterranean countries), with more than ½ being extremely small, i.e. smaller than 2 ha (versus 44 per cent in other Mediterranean countries). Sole holders and other family members cover 83 per cent of employment (in terms of annual working units (AWU)), slightly higher than the Mediterranean

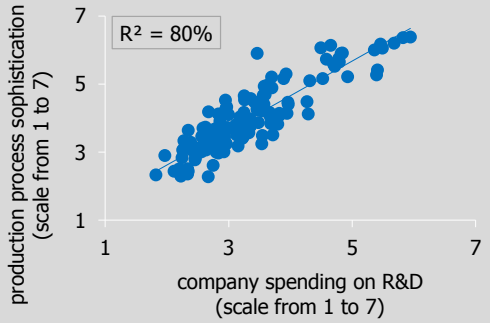
[1] Note that this analysis concerns the period between 2005-2006 and 2013-2014 (due to volatilities in annual agricultural production).
[2] Greece is a net importer of agricultural inputs (€0.2bn total exports and €1.3bn total imports). It should be noted that most European countries are net importers of agricultural inputs (with the exception of The Netherlands and Belgium).

Market share of cooperatives in agriculture



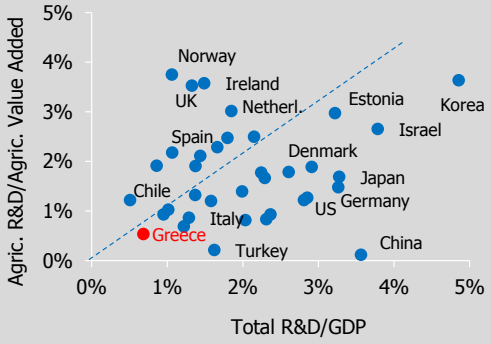
Source: European Commission: "Support for Farmers' Cooperatives", November 2012

Technology and business sophistication



Source: WEF/Global Competitiveness Report 2014-15, NBG estimates

R&D expenditure/ Added Value Agriculture vs. Total Economy



Source: OECD, Faostat, NBG estimates

average (74 per cent). The most important effect of small holdings is the cost disadvantage since Greek farmers cannot benefit from economies of scale like many of their competitors.

… inefficient organization

The organization of farmers in cooperatives is a common practice in agriculture, aiming to limit the negative consequences of fragmented production and increase the bargaining power of smaller farmers. However, agricultural cooperatives have a small market share of about ⅕ in the Greek market, compared with 40 per cent on average in Europe[3]. Moreover, Greek cooperatives face problems regarding their efficiency, including quality control and traceability, hindering the promotion of premium products. Therefore, their operation is often limited to the distribution of production subsidies to farm owners and other administrational activities for production of products in bulk, instead of acting as an organized enterprise with a clear business strategy.

… and low technological and knowledge sophistication…

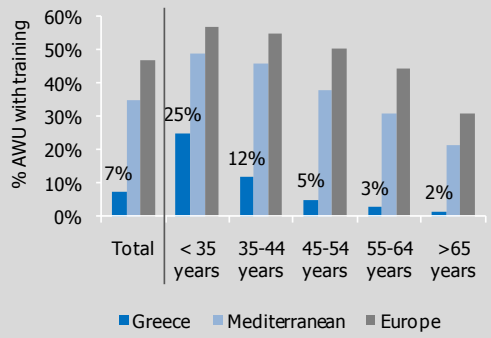
In addition, the technological sophistication of agricultural production is inferior compared with other EU countries. Specifically, while global expenditure on agricultural R&D has doubled during the past two decades, reaching €27bn in 2012 (in PPP terms)[4], Greece remained a laggard in this field. In fact, R&D investments in Greek agriculture amount to just €38mn annually or €11/ha (compared with €33/ha on average in the EU and €19/ha globally). An important factor hindering R&D is the poor links with research institutions. As a result, Greece has not taken advantage of the global trend for a more sophisticated and efficient agricultural production (e.g. improve production yield and quality as well as resistance to disease).

A secondary explanation for the low usage of technological advancement is the fact that only 7 per cent of employees have professional training (partly due to the family-nature of Greek farms), compared with 50 per cent in Europe. To understand this training gap, one should examine training by age group, since the average age of agricultural employees is correlated to the use of

[3] Finland, The Netherlands and Belgium are the countries where cooperatives have the highest market share, covering 65-75 per cent of the respective markets, mainly concerning dairy production.

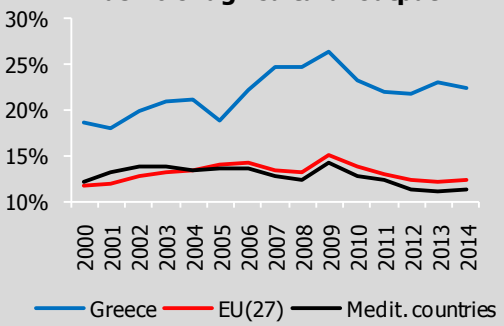
[4] Indicative of the increase in R&D activity in the global agricultural sector is the growing use of genetically modified seeds. Specifically, the global market for genetically modified seeds has posted an average annual growth of about 15 per cent during the past 5 years, reaching a value of €23bn in 2012, which is equivalent to ⅓ of the global seed market (from 25 per cent in 2008).

Farmers' training per age group



Source: Eurostat

Subsidies as % of agricultural output



Source: Eurostat, NBG estimates

Use of agricultural water

Country	Irrigated land (%of arable)	Annual water withdrawal per area (m3/ha)	Private irrigation (%area)	Total cost* recovery
Greece	51%	2.432	60%	54%
Italy	39%	1.003	50%	50%
Spain	25%	827	30%	50%
France	8%	113	76%	85%
EU (28)	10%	278		

** Total cost includes financial (operation, investment), environmental and resource (opportunity) costs.*

Source: Aquastat, European Commission/Arcadis: "The role of water pricing and water allocation in agriculture in delivering sustainable water use in Europe", Feb.2012, NBG estimates

technology and knowledge-intensive processes to achieve higher efficiency in agricultural production (e.g. higher yields, lower costs, effective promotion strategies). Not only are Greek farmers less trained in all age groups, but Greece also has a low share of young farmers, i.e. farmers less than 40 years old (24 per cent of agricultural labor vs 31 per cent in EU). A striking fact is that even Greece's young farmers have much less training than their peers in Europe. This can be attributed to the family-nature of Greek farms, allowing the younger generation to gain practical knowledge on agricultural practices and having no significant motivation for professional training, as well as the high percentage of seasonal workers on Greek farms (13 per cent compared with 6 per cent in Europe), which to a large extent are non-EU citizens.

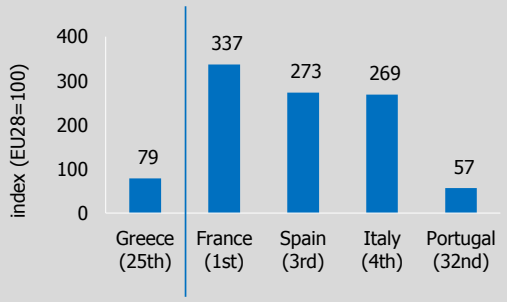
Against this background, Greek agriculture has become heavily dependent on subsidies…

Instead of finding ways to increase their productivity, many farmers often relied on CAP subsidies to sustain loss-making operations, especially concerning very small farms. Greece is among the EU countries with the highest dependence on subsidies, with direct CAP payments (farmers' income support) about €384/ha for Greece in 2013, compared with €293/ha on average in Europe (see Appendix B). As a result, subsidies cover about ⅕ of Greek agricultural production, compared with 12 per cent on average in Europe and the Mediterranean. The inefficiencies stemming from this high dependence on subsidies are evident: Greek agricultural value added excluding subsidies dropped by 13 per cent during the past 20 years, while other Mediterranean countries (Spain, Italy, France) managed to increase value added excluding subsidies by about 15 per cent during the same period.

It is also important to note that most EU Mediterranean countries take advantage of a highly subsidized[5] resource: water (with pricing resulting in an estimated cost recovery of around 50 per cent in Greece, Italy and Spain). With ½ of its arable land being irrigated (versus 39 per cent in Italy and 25 per cent in Spain), Greece exploits this cost advantage the most. As the pricing of agricultural water in Greece is area-based (versus volume-based), there is no incentive for controlling water consumption and thus Greece has very high water consumption per area (2432 m^3/ha vs 1003 m^3/ha

[5] Water subsidies can take the form of subsidized prices regarding public networks as well as subsidized energy prices regarding private water abstraction systems.

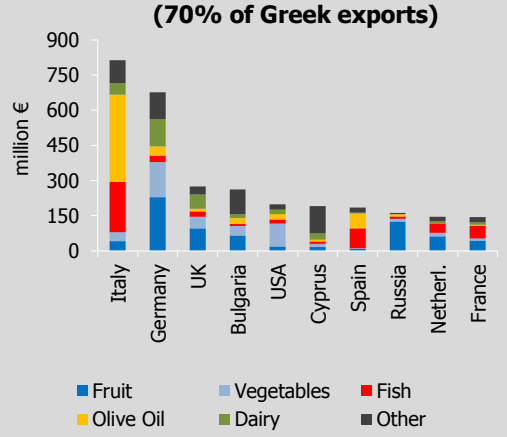
Branding Index for agricultural products



** the branding index is based on the relative export price of agricultural products (taking into account the market share of each product)*

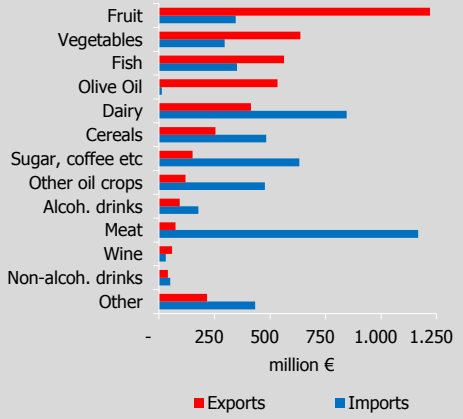
Source: Eurostat, NBG estimates

Top 10 export markets (70% of Greek exports)



Source: Eurostat, NBG calculations

Value of Greek food trade by product



Source: Eurostat (2013), NBG calculations

in Italy and 827 m^3/ha in Spain). Excluding water subsidies, the value added of agriculture is reduced considerably.

… without strategic focus on the efficient promotion and branding of Greek agri-food products

Even though Greek land offers great opportunities for high-quality production, a large share of products are promoted to the final consumer in bulk form, thus losing potential value added from packaging and, most importantly, branding. An indicative example of a lost opportunity for branding is that of Greek olive oil, a product often praised for its premium quality and benefits for human health. However, due to lack of proper strategy, it is mainly exported in bulk form to Italy, where – after it is blended with olive oil of different origins – it is marketed as Italian branded olive oil, leaving most of the value added to Italian companies. As a result, only 27 per cent of Greek olive oil production reaches the stage of labeling/branding, compared with 50 per cent in Spain and 80 per cent in Italy *("Olive oil: Establishing the Greek brand", NBG Sectoral Report, May 2015*).

In order to quantify the impact of a brand name for a country's food products, we have constructed an indicator based on relative export prices of fresh unprocessed products (fruit, vegetables, meat, milk etc.)[6]. A higher relative price implies a stronger brand name. Based on this indicator, Greece's main competitors in the Mediterranean (France, Italy, Spain) rank in the top 10 worldwide, along with the US, Germany and The Netherlands, while Greece ranks 25th.

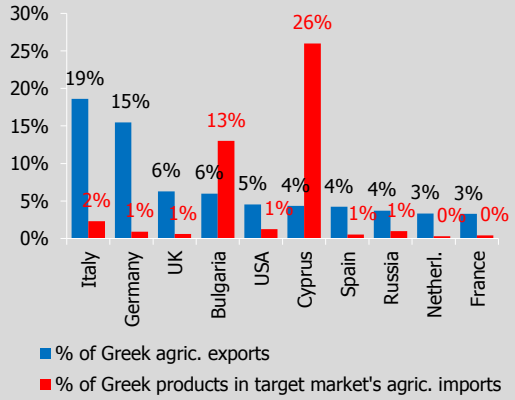
EXPLORING THE COMPARATIVE ADVANTAGE OF GREEK AGRO-FOOD PRODUCTS

Despite the above-mentioned inefficiencies, there are also exist success stories in the Greek agro-food sector – i.e. Greek products that have exploited the country's comparative advantages and gained significant shares of the international market. In this section, we will perform an analysis aiming to identify the common key factors behind these accomplishments.

Most of the trade concerning Greek agri-food products is conducted within the EU region (about 75 per cent of exports and 80 per cent

[6] To estimate the branding index, we used as a proxy the relative export prices for each country, as a weighted average of distinct fresh agricultural products (having a share of over 0.5 per cent in international markets).

Main export partners and Greek products' penetration



Source: Eurostat

Greek food exports per region

Regions	Share of Region in Greek Exports 2013 ↓	Greek Exports/Region's Food Imports 2013	Change of the Share of Greek Exports/Region's Food Imports*
European Union	76,5%	0,8%	-0,1%
Eurozone	*56,7%*	*0,8%*	*-0,2%*
Germany	*15,3%*	*0,9%*	*-0,2%*
France	*3,3%*	*0,3%*	*0,0%*
U.K.	*6,2%*	*0,6%*	*-0,1%*
Netherlands	*3,3%*	*0,3%*	*-0,1%*
Italy	*18,5%*	*2,2%*	*-0,6%*
Spain	*4,2%*	*0,7%*	*-0,1%*
Scandinavia	*3,0%*	*0,5%*	*0,1%*
S.E.Europe	*14,5%*	*3,5%*	*1,2%*
Asia	4,1%	0,1%	0,0%
China	*0,5%*	*0,0%*	*0,0%*
India	*0,1%*	*0,0%*	*0,0%*
Japan	*0,5%*	*0,0%*	*0,0%*
Arab Countries	*1,8%*	*0,1%*	*-0,1%*
Rest Europe	10,7%	0,7%	0,0%
Russia	*3,6%*	*0,5%*	*0,2%*
Turkey	*0,9%*	*0,5%*	*-0,5%*
North America	5,6%	0,2%	0,0%
Africa	1,3%	0,1%	0,0%
Egypt	*0,6%*	*0,3%*	*0,2%*
Latin America	0,5%	0,0%	0,0%
Brazil	*0,1%*	*0,0%*	*0,0%*
Mexico	*0,2%*	*0,0%*	*0,0%*
Oceania	1,3%	0,4%	-0,2%
Total World	**100,0%**	**0,4%**	**-0,1%**

*Period 2005 - 2013

Source: Eurostat, WTO, NBG Estimates

of imports). There is also a significant concentration of trade within specific countries, with the top 10 trade partners covering about 70 per cent of both imports and exports. Specifically, 35 per cent of export value is directed to Italy (mainly olive oil and fish) and Germany (fruit, vegetables, dairy). Other important markets are the UK, Bulgaria, the US and Cyprus, contributing about 21 per cent (or 5-6 per cent each). The penetration of Greek products in most of these markets (contribution to total agricultural imports of the destination country) is generally low (less than 1-2 per cent for most countries), with the exception of Cyprus (¼ of imports) and Bulgaria (13 per cent of total imports and about ⅓ of fruit, vegetables and olive oil), where Greece is the most important exporter of food products.

Concerning the structure of agricultural trade, both the product mix, as well as the destination markets, have remained relatively unchanged during the past decade. Specifically, the main exporting product category is fruit (mainly apricots, cherries and citrus fruit – including juices) covering 28 per cent of agri-food exports, followed by vegetables (15 per cent of export value) and fish (13 per cent of export value), which are the only products, along with olive oil, where Greece is a net exporter. On the other hand, the most commonly imported products are meat (€1.2bn and 22 per cent of imports), dairy (16 per cent of imports) and products such as sugar, coffee, tea and sweets (12 per cent of imports). We note that while the structure of Greek imports is similar to that of other Mediterranean countries, exports present more differences, with Greece having an advantage in exports of fruit, vegetables and olive oil, while other Mediterranean countries export relatively more wine, meat and cereals.

Bearing in mind that Greece is a small country and exporting is a business requiring scale, we need to distinguish both the countries and the products for which there is a comparative advantage. With that aim, we turn to an analysis of the dynamics of Greek food products in the international market during the past decade.

1. Market analysis: Traditional and new customers for Greek products

An analysis of the dynamics of Greek exports of food products revealed three distinct categories of markets:

Italian food exports per region

Regions	Share of Region in Italian Exports 2013 ↓	Italian Exports/Region's Food Imports 2013	Change of the Share of Italian Exports/Region's Food Imports*
European Union	67,3%	5,1%	-0,3%
Eurozone	*52,4%*	*5,1%*	*-0,4%*
Germany	*19,2%*	*8,5%*	*-1,3%*
France	*11,9%*	*8,4%*	*0,0%*
U.K.	*8,5%*	*5,7%*	*0,3%*
Netherlands	*3,5%*	*2,3%*	*-0,1%*
Italy	*0,0%*	*0,0%*	*0,0%*
Spain	*3,5%*	*4,0%*	*-0,8%*
Scandinavia	*3,6%*	*4,1%*	*0,1%*
S.E.Europe	*4,5%*	*7,9%*	*-1,8%*
Asia	7,7%	0,7%	0,0%
China	*1,4%*	*0,5%*	*0,2%*
India	*0,2%*	*0,4%*	*0,2%*
Japan	*2,2%*	*1,3%*	*0,2%*
Arab Countries	*1,8%*	*1,0%*	*0,1%*
Rest Europe	8,4%	3,9%	-1,1%
Russia	*2,0%*	*2,1%*	*0,0%*
Turkey	*0,5%*	*1,9%*	*-0,8%*
North America	10,8%	2,9%	-0,4%
Africa	3,0%	2,0%	-0,1%
Egypt	*0,2%*	*0,7%*	*0,0%*
Latin America	1,4%	0,7%	0,0%
Brazil	*0,5%*	*1,8%*	*-0,1%*
Mexico	*0,3%*	*0,5%*	*0,1%*
Oceania	1,4%	3,2%	-0,2%
Total World	**100,0%**	**3,0%**	**-0,6%**

*Period 2005 - 2013

Source: Eurostat, WTO, NBG Estimates

Annual Growth Rates

Regions	Annual Growth of Country's Exports*			Annual Growth Rates of the Region's Food Imports*
	Greece	Italy	EU28	
European Union	5,0%	6,1%	7,3%	7,3%
Eurozone	*3,4%*	*5,6%*	*6,7%*	*7,2%*
Germany	*4,2%*	*4,9%*	*6,8%*	*7,5%*
France	*4,4%*	*6,6%*	*6,3%*	*6,7%*
U.K.	*1,9%*	*5,5%*	*5,1%*	*4,6%*
Netherlands	*3,9%*	*8,6%*	*8,4%*	*9,8%*
Italy	*1,1%*	*-*	*3,8%*	*4,6%*
Spain	*2,6%*	*1,1%*	*3,2%*	*3,9%*
Scandinavia	*13,8%*	*8,9%*	*8,6%*	*8,6%*
S.E.Europe	*20,2%*	*5,4%*	*12,1%*	*9,6%*
Asia	10,6%	19,6%	16,6%	18,1%
China	*38,7%*	*72,8%*	*55,3%*	*34,9%*
India	*121,7%*	*54,5%*	*20,3%*	*28,7%*
Japan	*6,1%*	*6,5%*	*2,1%*	*3,2%*
Arab Countries	*9,5%*	*29,7%*	*16,5%*	*25,6%*
Rest Europe	14,9%	9,4%	13,6%	15,6%
Russia	*36,9%*	*17,7%*	*16,5%*	*18,3%*
Turkey	*7,7%*	*15,1%*	*17,0%*	*26,1%*
North America	7,8%	5,2%	4,6%	7,9%
Africa	16,8%	13,9%	18,6%	15,6%
Egypt	*97,1%*	*24,3%*	*20,5%*	*21,9%*
Latin America	55,6%	16,1%	12,7%	15,5%
Brazil	*58,3%*	*28,4%*	*28,4%*	*30,2%*
Mexico	*101,2%*	*13,2%*	*8,1%*	*9,6%*
Oceania	5,4%	12,5%	13,2%	13,8%
Total World	**6,2%**	**7,2%**	**8,5%**	**11,3%**

*Period 2005 - 2013

Source: Eurostat, WTO, NBG Estimates

i. Traditional Markets (mainly euro area countries)

While euro-area countries are the main export markets for Greek food products (absorbing more than half of Greek exports), Greece has actually lost market share in these markets over the past decade (covering 0.8 per cent of region's food imports in 2013 versus 1 per cent in 2005).

ii. High-growth markets (mainly SEE countries and Russia)

On the other hand, the export destinations presenting the most growth over the past decade, leading to slightly higher penetration of Greek exports (as a share of each region's imports) seem to be countries in South-East Europe[7]. In particular, Greek food exports to the region have been growing over the past decade by 20 per cent annually – with special focus to Russia (annual growth 37 per cent) and Egypt (annual growth 97 per cent) – while Greek food exports to all other regions have been growing over the past decade by 4.3 per cent annually. Note, however, that the Russian food embargo will be a drag on Greece's export growth (see Appendix A).

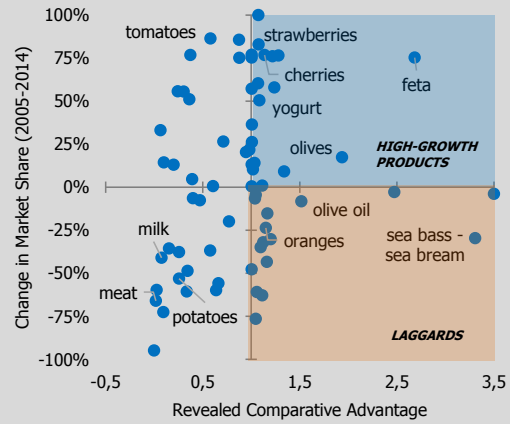
Another interesting region is that of Scandinavian countries, where Greek exports grew by 14 per cent annually, posting a small increase in penetration, which although still low (0.5 per cent of the region's imports) could be promising, considering the region's high income level.

iii. High-potential markets (mainly Japan and US)

It should be noted that Greek exports could benefit from further expansion in other markets with high potential. The most promising market is Asia, absorbing over 40 per cent of the increase in global imports during the past decade. In particular, China and India posted annual import growth of about 30 per cent, suggesting great potential for Greek exports - especially considering the size of these markets and the small penetration by Greek exports (0.02 per cent). Focusing on the more mature market of Japan, this market absorbs only 0.5 per cent of Greek agricultural exports, compared with 2.2 per cent of Italian exports (a Mediterranean country with an agricultural production structure similar to Greece). Italy has better positioned itself in the growing market of Asia, while Greece has focused more on neighboring regions.

[7] Bulgaria, Romania, Slovenia, Croatia, Cyprus.

Food Products: Greek Exports



*Rescale has been done in order to show all the products.
Sources: Eurostat, Comtrade, Faostat, NBG Estimates

Mapping of Greek food products with comparative advantage (69% of Greek food exports)	
A. High-Growth Products	
i) gained market share *(24% of Greek food exports)*	
Olives	Sesame
Dairy products	Snails
White wine	Fruit & vegetables
Honey	preserved in vinegar
ii) bought market share *(12% of Greek food exports)*	
Apples	Marmalades
Cherries	Rice
Clementines	Tomatoes
Strawberries	Kiwis
B. Laggards	
iii) lost market share *(33% of Greek food exports)*	
Olive oil	Oranges
Sea bass/bream	Peaches
Grapes	Apricots
Currants	Watermelons
Figs	Cucumbers
Prepared tomatoes	
Asparagus	

Source: Eurostat, Comtrade, Faostat, NBG estimates

2. Products' analysis: High-growth products and laggards

With a view to identify specific products with a successful export strategy, we have performed a relative comparative advantage analysis using 68 products covering 81 per cent of Greek food export value in 2014. Specifically, the product classification was based on the following criteria:

- ✓ *Revealed Comparative Advantage* [8]: If a country's share in world exports of a specific commodity is greater than the country's overall share in total world exports, then the country enjoys a comparative advantage in exporting that commodity.
- ✓ *Change in penetration* [9]: Measuring the gain or loss of Greek market share in world exports of a specific product between 2005 and 2014[10].

Based on the combination of these criteria, we distinguished two product categories in which Greece has a comparative advantage in the world markets:

A. *High-growth products* that have gained market share in the international market during the past decade (covering 36 per cent of total Greek food exports in 2014 from 25 per cent in 2005).

B. *Laggards* that have lost market share in the international market during the past decade (covering 33 per cent of total Greek food exports in 2014 from 38 per cent in 2005).

A. High-growth products

These products seem to have achieved their growth on two types of strategies:

- ✓ There are those which *gained market share* through a quality promotion strategy and advanced production procedures, remaining about 1.5 times more expensive than their competitors. These products (covering about 27 per cent of Greek exports) have managed to exploit their special attributes and create high consumer awareness in

[8] The RCA of a specific product (i) is calculated as $RCA = \frac{X_{gr(i)}}{Total\ X_{gr}} \Big/ \frac{X_{world(i)}}{Total\ X_{world}}$, where X represents export value.

[9] The penetration of a specific product (i) in the world market is calculated as $Penetration = X_{gr(i)} \Big/ X_{world(i)}$, where X represents export value.

[10] We note that this analysis concerns the period between 2005-2006 and 2013-2014 (due to volatilities in annual agricultural production).

Strategies of Greek agro-food exports	
A. High-Growth Products	
i) gained market share	
Product form:	Packaged/branded
Market penetration:	High
Destination Market:	High Income
ii) bought market share	
Product form:	Bulk
Market penetration:	Low
Destination Market:	Low Income
B. Laggards	
iii) lost market share	
Product form:	Bulk
Market penetration:	High
Destination Market:	Low Income & Italy

Source: Eurostat, Comtrade, Faostat, NBG estimates

international markets. They are mainly dairy products (cheese and yogurt), olives, natural sweets and honey. The most typical case of such a product is the Greek feta cheese, which is recognized as a PDO product (protected designation of origin) in the EU and increase its penetration by 17 percentage points while increasing its relative price by about 5 per cent between 2005 and 2014.

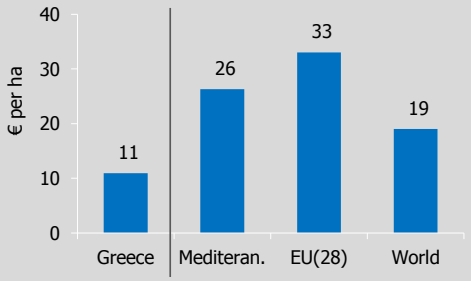
- ✓ On the other hand there are products that *bought their market share* (covering about 9 per cent of Greek food exports). Specifically, they managed to increase their market share by 0.8 percentage points on average, by equally lowering their relative prices (0.8 per cent on average lower than their competitors). These products mainly include fresh fruit such as apples, cherries, clementines, strawberries and kiwis. We note that, to a large extent, they were newcomers to the international market (as the average penetration of those Greek products was below 1 per cent in 2005) and they used their low-price strategy to target low-income markets of Eastern Europe (including Russia).

B. Laggards

The products that lost market share despite their competitive advantage covered ⅓ of Greek food exports. These include products like olive oil, sea bass/sea bream, oranges, peaches and apricots, cucumbers and watermelons. Their common characteristic seems to be that they are exported in bulk form and that they have a relatively high penetration in the global market (about 4-5 per cent), suggesting that they have exhausted the limits of buying market share.

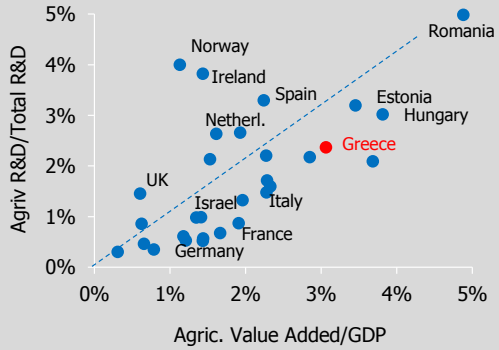
This analysis suggests that the most effective exporting strategy is to target high-income countries with branded Greek products in packaged forms. On the other hand, exporting bulk products to low-income countries has a clear growth ceiling and it can only be sustained by continuously lowering prices.

Agricultural R&D



Source: World Bank, Faostat, NBG estimates

Agricultural sector contribution in total Value Added and R&D



Source: OECD, Faostat, NBG estimates

WHAT NEEDS TO BE DONE

Our analysis so far has led to two main conclusions for the performance of Greek agricultural exports:

i. On the one hand, despite growing global agricultural production and trade, Greece lost market share, even in traditional export markets such as Germany and Italy. In fact, the small size of agricultural farms (along with the weak organizational capacity of cooperatives) places them at a disadvantage in terms of cost and branding, and therefore makes them more vulnerable to rising international competition.

ii. On the other hand, there are undeniable success stories of Greek agro-food products that have stood out in the international market during the past decade.

Policy should focus on the actions that will combine Greece's comparative advantages with best practices applied in other countries (see Box).

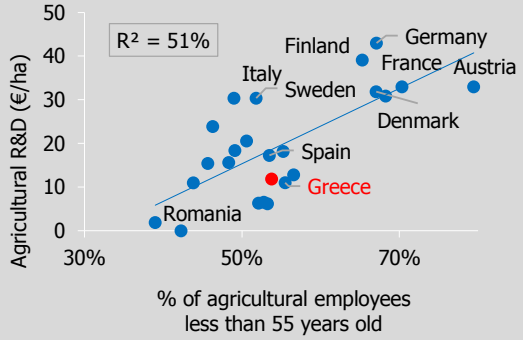
In that light, especially as agricultural production is highly segmented in Greece, the establishment of a well-functioning food value chain is a necessity, i.e. a strategic alliance between farmers and other supply-chain partners to produce and distribute significant volumes of high-quality, differentiated food products[11]. Against this background, it seems fortunate that the current juncture – with the new CAP focusing on supporting innovative efforts, rather than offering direct subsidies, as well as the new Horizon2020 initiative under the National Strategic Reference Framework (NSRF) – is very supportive of such a change in strategy.

Indeed, the building blocks of the new growth model of the Greek agro-food sector should comprise:

✓ The moderation of negative effects from the small size of agricultural properties through the implementation of initiatives to unite individual farmers in a common purpose within some form of organization. Such an entity would allow a much needed increase in bargaining power,

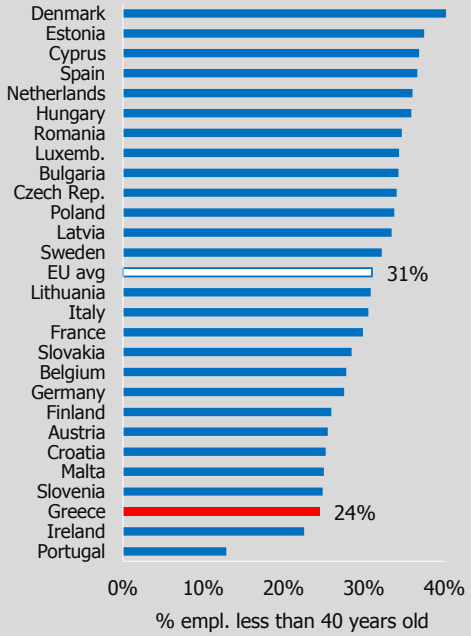
[11] Food value chains exemplify "creating shared value" concept, introduced by Porter and Kramer. [Porter M. and Kramer, M. (2011), "Creating shared value: How to reinvent capitalism and unleash a wave of innovation and growth", Harvard Business Review, 6-77.]

Young farmers and business sophistication



Source: Eurostat, Faostat, NBG estimates

Young employment in agriculture



Source: Eurostat

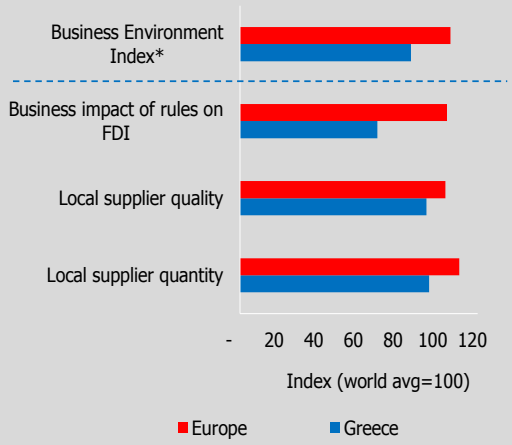
considering the fact that both suppliers of seeds and food distributors are highly concentrated and large players control the international food market.

i. One way to accomplish this would be through a more business-oriented operation of agricultural cooperatives (which – despite a few exceptions - focus on administrative activities instead of unifying farmers and promoting agricultural products under a single label). To this end, managing boards including producers, marketers and researchers should be formed. A successful example of a Greek cooperative is Chios Mastiha Growers Association. Apart from the collection of the local production, this cooperative has taken considerable actions to promote the product (through its subsidiary shop chains, Mastiha Shops), to enhance its promotion strategy by collaborating with universities and research centers, and recently to recognize its medicinal properties (and consequently sign a contract with an international pharmaceutical company, GNC).

ii. Another way to enhance efficiency would be through the creation of supply chain agreements between manufacturers and farmers[12]. In fact, the examination of successful cases of branded products with high export market shares reveal that agricultural product promotion is more effective through vertical integration. This usually involves a manufacturing company or distributor organizing smaller producers, taking measures to guarantee stability in quality and quantity and promoting agricultural production (achieving a critical mass) under a common brand. Indicatively, about 14 per cent of Greek farmers have benefited from contract farming, while another 25 per cent are willing to try it in the future, based on a survey of the Aristotle

[12] Manufacturers form an agreement with farmers (or cooperatives) of their choosing for the delivery on a specific date of a certain volume of production fulfilling certain criteria (product quality, method of production, viability of enterprise). The manufacturers often support the farmers through technical assistance. That process is often moderated by a financial institution which brings together the interested parties and provides financing under specific criteria. As a result, farmers cover their needs in working capital, minimize the uncertainty of demand and raise their bargaining power when purchasing supplies.

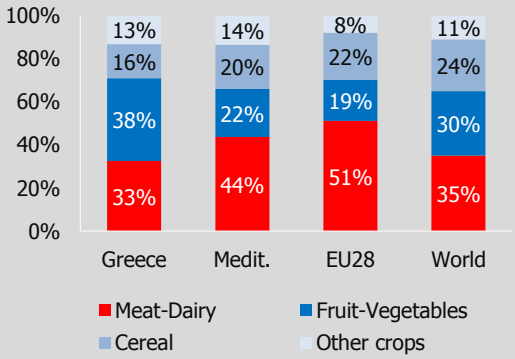
Business Environment Index



** The Business Environment Index is calculated as the average of the three subcomponents.*

Source: WEF (Global Competitiveness Report 2015), World Bank (Doing Business report 2015), NBG estimates

Structure of agricultural production value



Source: Eurostat, Faostat, NBG estimates

University of Thessaloniki. Successful examples in several EU countries include: i) brewing companies with barley growers; ii) milk companies with livestock breeders; and iii) wine companies with grape growers.

- ✓ Concerning the technological upgrade of the production process, R&D could be promoted through the cooperation of public institutions, research centers (e.g. universities) and private companies, with the acquired knowledge and research being managed and accessed through a single entity. It should be noted that investment in technology does not necessarily mean new inventions or discoveries. It could also involve adaptation of available technology to the needs of specific products or regions (e.g. tailor-made seeds) – especially in light of climatic change challenges. Moreover, taking into account the biodiversity of its natural environment, Greece could invest in the research of the medicinal properties of unique domestic plants and promote them to the high-growth natural pharmaceutical and healthcare global industry.
- ✓ Complimentary to this effort would be concerted actions to undertake workforce development (training programs) as well as introduction of incentives (through targeted use of EU funds) in order to attract more young farmers to the agricultural sector, which would better fit to promote modernized production and targeted business strategies. We note that young farmers (less than 40 years old) cover about 24 per cent of Greek agricultural employment, compared with 31 per cent in Europe.
- ✓ Increasing production efficiency and producing a technically superior product is not sufficient for agribusinesses to develop competitive advantage, they also need to adopt strategic planning models. In particular, they need to develop strong brands, close relationships throughout the supply chain and market orientation. The creation and promotion of a national brand (or regional brands) with specific characteristics as well as product certification (PDO, PGI and certified seeds) could be helpful to that direction.
- ✓ Apart from policy measures to attract FDI in food manufacturing, it is also important to build infrastructure in

order to promote efficiently our fresh products (note that 38 per cent of our agricultural production are fruit and vegetables compared with 19 per cent on average in EU). Due to the fragile and perishable nature of the product, this subsector requires a high degree of coordination between the different actors along the value chain. In particular, the key supporting activities for the fresh products to reach their destination in good condition are:

i. a packaging industry to supply the appropriate containers and cold storage units on a regular and reliable basis, and

ii. logistics and transportation services to ensure timely delivery.

BOX: INCREASING AGRICULTURAL PRODUCTIVITY – CASE STUDIES FROM OTHER COUNTRIES

Drawing from best international practice, the analysis that follows discusses the three main drivers of agricultural TFP (cooperatives, branding and R&D) in order to provide practical guidance on how to facilitate the adoption of efficient solutions in the agro-food sector.

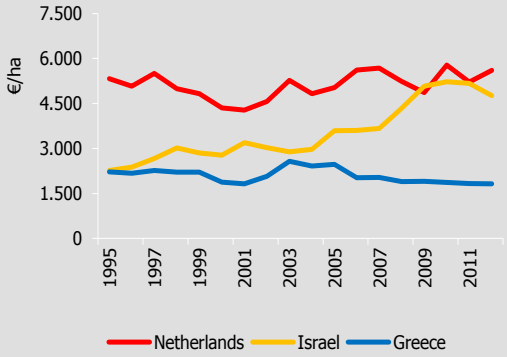
1. Agricultural R&D

During 1992-2012, agricultural R&D expenditure doubled - with America, Japan, Germany and China covering about ½ of the world agricultural research expenses. Agricultural R&D has various applications such as seeds, greenhouses, agricultural engineering and irrigation systems. Most notable is the experience of two countries: The Netherlands (the traditional agri-innovator) and Israel (the new player in the innovation field):

- ✓ **The Netherlands** has a strong agricultural sector, as the country is characterized by fertile soil in a flat landscape and a coherent strategy of high R&D investment (more than €200/ha annually vs a world average of around €20/ha) – boosting its land productivity to over €5.500/ha (vs a world average of approximately €1.200/ha). Agricultural R&D in The Netherlands is mainly promoted through the Dutch Agricultural Knowledge & Innovation System (NL-AKIS), which is an integrated complex that coordinates research with the participation of universities, schools for higher education and the Stichting DLO organization (which is a public-private partnership (PPP)). Through that system, knowledge and experience is gathered by government, research institutes and the private sector (combining access to funds, knowledge and flexibility), with a view to make The Netherlands a hub for the agri-food industry and R&D projects. With the main objective to upgrade the quality of its agricultural products (e.g. organic farming and energy saving), this strategy seems to lead to high-cost production (with inputs covering 67 per cent of agricultural production vs a world average of around 50 per cent).

- ✓ **Israel** has a strong and high-growing innovation sector (with R&D covering 4 per cent of its GDP), which has boosted the

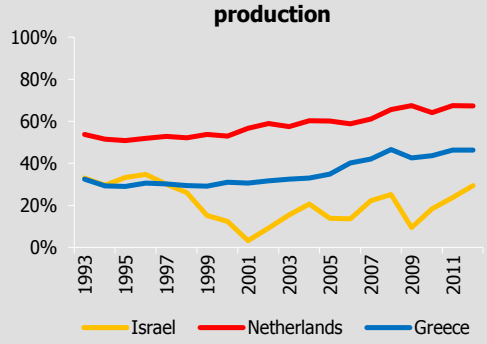
Agricultural land productivity*



** Agricultural value added/ Agricultural area*

Source: Faostat, World Bank, Kushnirs

Cost share in agricultural production



Source: Eurostat, Faostat, NBG estimates

R&D expenses			
	Greece	Netherlands	Israel
Agricultural R&D expenses/Agricultural value added	0,5%	3,0%	2,8%
Total R&D expenses/GDP	0,8%	1,8%	4,1%

Source: Faostat, OECD

productivity of almost every segment of its economy. Regarding agriculture, the main objective of Israel's R&D initiatives is to provide solutions to the problem of scarcity of natural resources (particularly water), considering that over half of the country is arid or semi-arid. Facing those adverse natural conditions, it is remarkable that Israel has raised its land productivity to the level of the rich-in-natural-resources Netherlands. Agricultural R&D in Israel is mainly promoted through public authorities and specifically the Israeli Agricultural Research Organization (ARO), which is responsible for about ¾ of the county's agricultural research and acts as the link between the research centers and the farmers. With applications in several areas of agriculture (from engineering agriculture and irrigation systems to resistant seeds and productive cows), Israel has not only managed to raise its agricultural land productivity significantly but also succeeded to lower its production costs (29 per cent of production value vs 67 per cent in The Netherlands).

Agricultural land productivity: Main factors*

	Greece	Netherlands	Israel	EU28
Inputs Index	161	123	148	100
Natural Attributes	164	96	89	100
Technology Index	33	525	380	100
Brand Index	79	262	24	100
Cooperatives Index	44	174	105	100

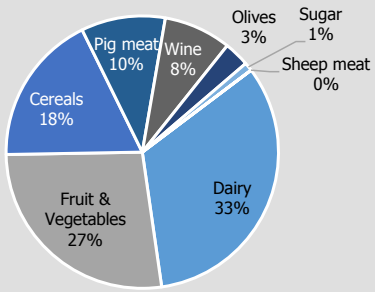
** for index definitions see appendix*

Source: World Databank, WEF, Eurostat, Faostat, NBG estimates

2. Agricultural Cooperatives

EU agricultural cooperatives are mainly concentrated on the dairy and the fruit and vegetables segments (covering 60 per cent of the total cooperatives' production) and have substantially different development in each country (covering more than 60 per cent of production in Finland, Denmark and The Netherlands and less than 5 per cent in Romania, Bulgaria and Cyprus).

Value of Produce Marketed by Cooperatives in EU, 2010

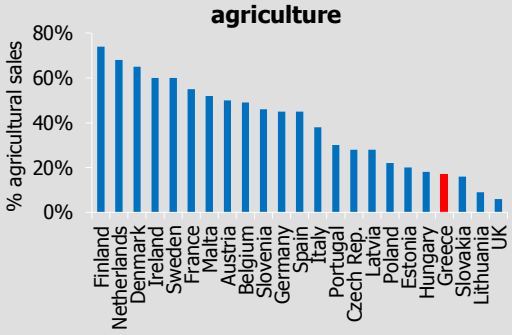


Source: Support for Farmers' Cooperatives, European Commission Final Report

✓ Company-cooperatives

After numerous mergers between smaller cooperatives, some of the North European cooperatives have become large international companies ranking among the top companies of their sector, like the Dutch Friesland Campina and the Danish Arla Foods (with their annual turnover exceeding €10bn in 2014). At this point it is important to note that large cooperatives are not a European phenomenon. A typical non-EU example is Fonterra – a company-cooperative in New Zealand, consisting of approximately 11,000 dairy producers (95 per cent of country's dairy production). The creation of this cooperative improved both the production volume and the exports of milk and dairy products[13].

Market share of cooperatives in agriculture

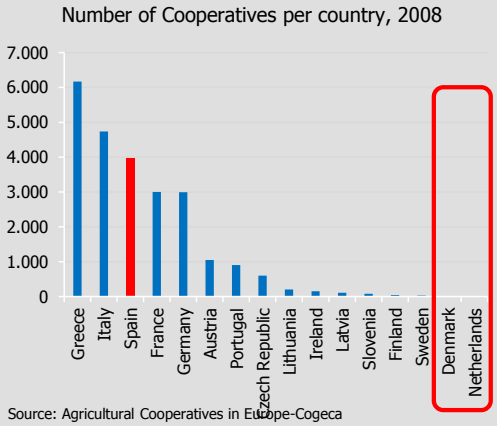


Source: European Commission: "Support for Farmers' Cooperatives", November 2012

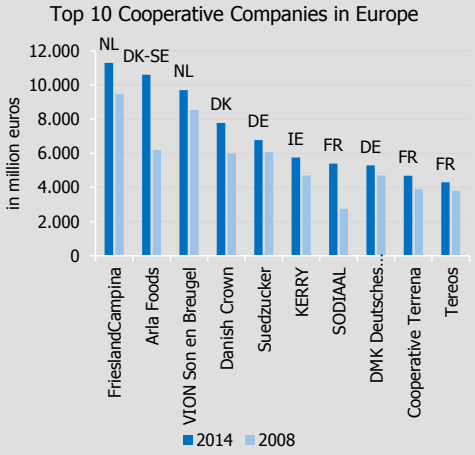
[13] After the dairy industry restructuring act 2001 in New Zealand, the milk production increased by 67 per cent during 2001-2014. Simultaneously, the increase in production led to an annual average export growth of about 28% during 2001-2014 stemming from both the price and the production volume increase (while the annual average export growth was only 4% during 1994-2000).

✓ Value-chain cooperatives

Other interesting agricultural cooperatives are those that facilitated the establishment of an efficient food value chain. For example, the Italian province of South Tyrol's apple industry supplies about half the Italian apple market, up to 15 per cent of the European market and about 2 per cent of the world market. The distinctive characteristic of this cooperative is its many-layered structure: The first layer is formed by the growers (roughly 8,000), who own the cooperatives. The second layer handles duties like storage and packing for their members. The cooperatives, in turn, own two associations, which handle sales for them, and on top of the associations is the South Tyrolean Apple Consortium, which focuses on branding and marketing all of the province's apples. There also are institutions which conduct applied research and disseminate useful information to growers (e.g. Extension and the government-supported Laimburg Research Centre for Agriculture and Forestry). In addition, the local government's decision to provide rural subsidies only to cooperatives with a critical size enforced a concentration process that led up to fewer but larger and more economically robust cooperatives which were able to invest in modernization of the infrastructure, improving in this way their competitiveness.



Source: Agricultural Cooperatives in Europe-Cogeca



Source: Corega Agricultural Cooperatives in Europe & Annual Reports

3. *Branding of Fresh Food Products*

A brand comprises all the features that distinguish one product from similar competitors (ranging from advertising and packaging to unique product characteristics and nutritional value). Establishing effective agricultural brands can gain farmers a competitive advantage and leverage vis-a-vis both global retailers as well as larger competitors. In particular, the three distinct branding strategies of fresh products are:

✓ Company brands

Traditional branding in fresh agricultural products comes from large packing companies that gather products from several producers. Chiquita bananas is a good example of how a product with low actual differentiation has built high awareness and loyalty from consumers. Although there is little physical difference between bananas, Chiquita bananas are considered of higher

Top 15 Largest Co-operatives in Agri-food sector

Cooperative	Country	2014 Turnover (in bil. euros)
Zen-Noh (National Federation of Agricultural Co-operatives)	Japan	37,0
Fonterra Co-operative Group	New Zealand	13,9
Dairy Farmers of America	USA	13,5
Royal Friesland Campina	Netherlands	11,3
Land O'Lakes	USA	11,3
Arla Foods	Denmark	10,6
Vion, Son en Breugel (2012)	Netherlands	9,7
National Agricultural Cooperative Federation	Korea	8,9
Danish Crown	Denmark	7,8
Suedzucker	Germany	6,8
Kerry	Ireland	5,8
Sodiaal	France	5,4
Nordmilch (DMK)	Germany	5,3
Cooperative Terrena Group	France	4,7
Tereos	France	4,3

Sources: Annual Reports

quality. All this is a result of a very well-organized distribution network and a sustained promotional effort (the company spent $28mn on advertising in 2014). Other examples of this branding strategy include Rooster potatoes (Bartlett Ltd), Jablum coffee and Bolthouse farms juices.

✓ **Varietal brands**

Another business model of food branding is based on the development of a distinct variety of a common product. In this case, a company develops, under specific standards, a special variety of a high-quality product. Then the company provides technical support throughout the cultivation period of the product and finally undertakes the promotion under its own brand or trademark. The branded products must follow a consistent look and feel, as well as meet certain quality specifications, in order to capture and maintain consumer loyalty. Some well-known examples of this type of branding are:

- The Certified Angus Beef trademark (CAB, a USDA certified brand): All CAB products are of high-quality and receive above average prices as they are produced under 10 strict exacting standards in order to meet specific flavor, juiciness, tenderness and nutrition ingredients. Moreover, all meat packers, distributors and retailers who use CAB brand must fulfill licensing agreements and audit requirements to maintain their right to participate.
- Pink Lady apples: Pink lady is a world-wide recognized protected trademark through which is traded a very special and high quality apple variety from Australia. The International Pink Lady Alliance (IPLA) is an international organization of producers, marketers and propagators that promote pink lady as "so much more than an apple". Star Fruit in France is the owner of the operating rights of this trademark within the EU.
- Summerkiwi: The firm Summerkiwi promotes an early-ripening kiwi variety founded by an Italian research center (Caldesi School). The producers choosing this brand (i) are overseen by the company's technicians from the first phases of installation until the plants begin to grow and (ii) make use of a preferential marketing run by commercial agents collecting the product and selling it under the summerkiwi trademark.

Banana prices* in Greek market

Duolce Buona bananas	Dole bananas	Chiquita bananas
1.39	1.70	1.89

**prices (€/kg) in supermarkets 2015*

Apple prices* in UK market

Cox apples	Braebum apples	Pink Lady apples
2.12	2.40	4.22

**prices (€/kg) in supermarkets 2013*

Beef meat prices* in Greek market

	Greek beef	Angus beef (US)	Relative price
Minced meat	10	22	2.2
Meat**	14	32	2.3
Fillet	29	65	2.2

**prices (€/kg) in online market*
***rump meat-picanha*

✓ **Geographical brands**

Chile has recently strengthened its fruit sector by implementing an extensive branding strategy. In particular, the Chilean Fruit Exporters Association (ASOEX) along with many producers developed the campaign "Foods from Chile, Source of Life" which helped the fruit industry in establishing its reputation and position around the world. Each fruit has become recognizable with its own logo and is now considered of high-quality in international markets. Another example is the Plantation Reserve sugar - a product produced in Barbados that stands out in the international market because of its natural taste and aroma combined with a distinctive color and texture. The product was developed by the contribution of Barbados government and the West Indies Sugar & Trading Company of Barbados which undertook its promotion under the brand "Plantation Reserve". The brand can be seen in retail stores in Barbados, the Caribbean and EU receiving approximately three times the average world price. Note that the same branding strategy can be accomplished for a particular geographical region of a country (as can be the case with the PDO system). An example of this strategy is the Darjeeling Tea - a tea produced in the Darjeeling region of India that has achieved "Geographical Indication" status. The Tea Board of India has managed to ensure its proper production and guarantee its geographical indication, and thus the Darjeeling Tea has become widely known as the "Champagne of teas", achieving premium prices.

Branding in agri-food products

	Chile		Greece	
	Relative price[1]	Market share[2]	Relative price[1]	Market share[2]
Grapes	1.1	*19%*	1.0	*2%*
Apples	1.1	*10%*	0.7	*0.4%*
Pears	1.1	*6%*	0.6	*0.1%*
Mandarins	1.4	*2%*	0.7	*1%*

	Chile	Greece
GDP (bil.€)	194.3	178.8
Agr. Value Added (%GDP)	3.3%	3.8%
Population (millions)	17.8	11

[1] *Export price for each product, relative to the average world export price for the same product*

[2] *Market share in the international market*

Source: Comtrade, World Bank, NBG estimates

Bringing it all together – The case of New Zealand

New Zealand is characterized by a mild temperate climate, many kilometers of coastline and fertile soils. All these factors led to a strong agricultural sector which contributes 6.9 per cent to New Zealand's GDP. In view of the fact that New Zealand is the only developed country where farmers don't receive any kind of subsidies, it is remarkable achievement that this small country, far from the large consumer markets, is an important player in the international market of premium fresh agricultural products. Its strategy seems to be grounded around three main building blocks: business-oriented cooperatives, applied research and a multi-layer branding strategy.

Tea prices*

Black tea	Green tea	Darjeeling tea
2.3	6.4	9.8

**prices (€/100g) in online market*

New Zealand has established a company - "The New Zealand Way

Limited" owned by the public development agencies for trade and tourism - that manages the country brand. With a fern (a native plant) as a logo and the "100 per cent pure" as a slogan, New Zealand has built its overall brand personality as a "clean, green and smart" country. Through a Brand Partner Program, domestic companies are permitted to use the country brand on their products. This has increased awareness for products from New Zealand in the international markets and has set the stage for the cooperatives to add a second layer of branding – a product specific one.

Dairy products, kiwis, honey, lamb and wine are some of the subsectors that have benefited from the country branding strategy and have emerged as global leaders. Specifically, one of New Zealand's well-known cooperative is Fonterra - a company-cooperative consisting of approximately 11,000 dairy producers (95 per cent of country's dairy production). The creation of this cooperative in 2001 improved both the production volume and the exports of milk and dairy products. Specifically, the milk production increased by 67 per cent during 2001-2014, while exports grew in value terms by 28 per cent annually during the same period (vs an annual growth rate of around 4 per cent during 1994-2000). In fact, Fonterra by investing in IT resources (e.g. virtualization and cloud infrastructure) and extensive applied R&D (with annual expenses of $50mn for innovation centers, a biotechnology subsidiary as well as funding research in Auckland university) has emerged as the world's largest dairy exporter. Another large cooperative is Kiwifruit New Zealand that (under the competitive pressures of Chinean and Italian kiwis) has successfully introduced the distinct brand of Zespri, which through both R&D efforts (to introduce new varieties) and global marketing campaigns managed to create consumer awareness and receive premium prices. Similarly, the honey producers' cooperative has succeeded to differentiate their product by registering a special ingredient of New Zealand's honey (under the Unique Manuka Factor trademark) and thus establishing the premium Manuka honey brand.

Branding in agri-food products

	New Zealand		Greece	
	Relative price[1]	Market share[2]	Relative price[1]	Market share[2]
Kiwis	1.3	*37%*	0.6	*5%*
Honey	4.7	*8%*	1.7	*0.5%*
Apples	1.2	*5%*	0.7	*0.4%*
Wine	1.2	*3%*	0.9	*0.2%*

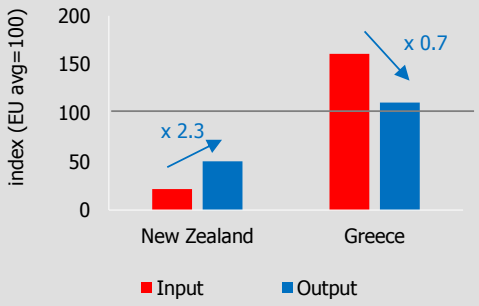
	New Zealand	Greece
GDP (bil.€)	141.8	178.8
Agr. Value added (%GDP)	6.9%	3.8%
Population (millions)	4.5	11

[1] *Export price for each product, relative to the average world export price for the same product*

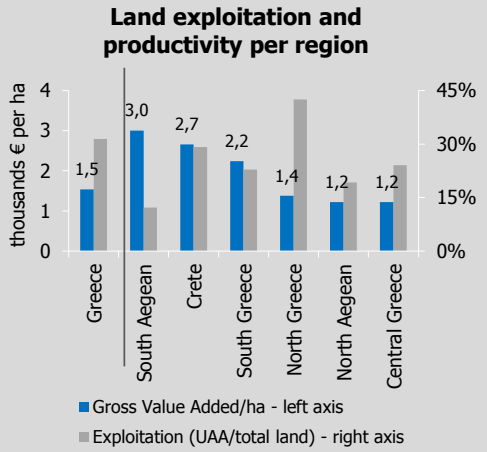
[2] *Market share in the international market*

Source: Comtrade, World Bank, NBG estimates

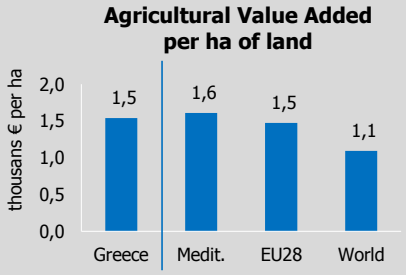
Agriculture: Total Factor Productivity



Source: World Bank, WEF, Eurostat, Faostat, NBG estimates



Source: Eurostat, NBG estimates



Source: World Databank, Eurostat, NBG estimates

Natural Attributes of Agricultural Land*

		Greece	Medit.	EU28	World
(i)	Coastline per area (m/sq.km.)	104	16	40	26
(ii)	Sunshine (,000 hours/year)	2,8	2,6	2,0	2,5
(iii)	Precipitation volume (10^9 m3/area)	11	17	25	85
(iv)	Soil Quality**				
	a. Carbon content in topsoil (% weight)	*1,1%*	*1,3%*	*2,9%*	*1,7%*
	b. Land degradation (% severe degr.)	*48%*	*23%*	*44%*	*37%*
	c. Land erosion	*65%*	*31%*	*23%*	*24%*

*The Natural Attributes Index consists of equally weighted components i-iv (after turned into indices).
**The Soil Quality Index consists of equally weighted components a-c (b-c inverse), after turned into indices.

Source: World Bank, Aquastat, NBG estimates

WHAT CAN BE ACCOMPLISHED

Having outlined the critical policies, the analysis turns to investigating the sector's potential. Aiming to quantify the unexploited dynamics of the Greek agro-food sector, NBG Research focuses on the two main links of the food supply chain:

- ✓ the potential for higher agricultural productivity and
- ✓ the development of a larger food manufacturing sector.

1. Increasing the productivity of agricultural land

The utilized agricultural area (UAA) in Greece covers about 26 per cent of total land (or 3.5mn ha) compared with 35 per cent in the Mediterranean (including African regions) and 37 per cent globally. Land productivity is about €1,500 of gross value added per ha of utilized agricultural area, close to the EU average and slightly less than that of Mediterranean (EU-med) countries. We note that the level of agricultural value added does not include subsidies on agricultural production. As expected, there are significant differences per region, with productivity ranging from €1,200/ha in Central Greece (18 per cent of agricultural land) to €3,000/ha in the South Aegean (2 per cent of agricultural land).

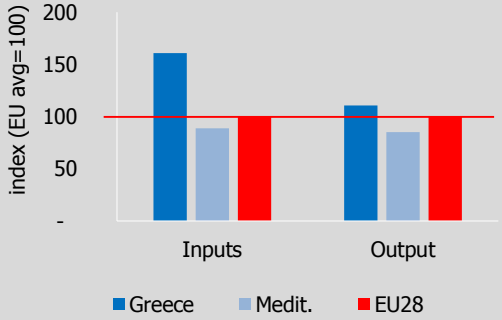
With a view to quantifying the determinants of agricultural land productivity, we have constructed a cross-sectional model based on a worldwide sample of 167 countries. Based on the Total Factor Productivity (TFP) literature[14], we establish a two-step approach. First, we estimate a Cobb-Douglas production function which includes the three conventional inputs: labour, capital and materials (water, seeds, fertilizers and forage)[15]. Second, we construct a TFP index (proxied by the residual of the above-mentioned production function). Though the drivers of TFP are complex, we have distinguished four main parameters:

- ✓ Technology level (proxied by agricultural R&D expenditures, source: Faostat)
- ✓ Efficiency gains stemming from economies of scale

[14] Ball, V., Butault, J., Mesonada, C. and Mora, R. (2010), "Productivity and international competitiveness of agriculture in the EU and the US", Agricultural Economics, 41, 611-627. Capalbo, S., Ball, V., and Denny, M. (1990), "International comparisons of agricultural productivity: Development and usefulness", American Journal of Agricultural Economics, 72, 1292-1297. Coelli, T. and Rao D. (2005), "Total factor productivity growth in agriculture: A malmquist index analysis of 93 countries, 1980-2000", Agricultural Economics, 32, 115-134.

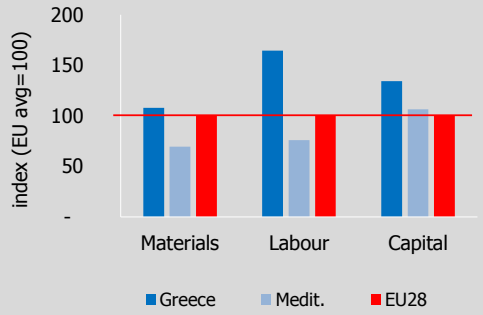
[15] In order to take account for the effect of the different size of each country's agricultural land, we have expressed the variables in terms of their level per hectare of agricultural land.

Agricultural value added: Inputs - Output



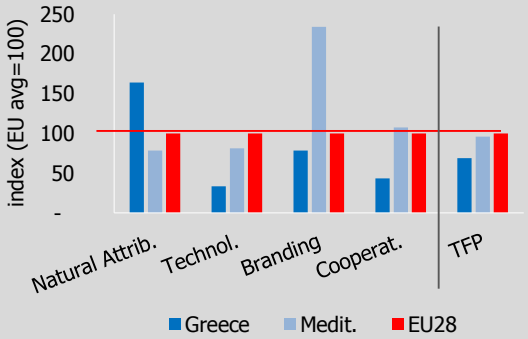
Source: World Databank, WEF, Eurostat, Faostat, NBG estimates

Agricultural Inputs



Source: World Databank, WEF, Eurostat, Faostat, NBG estimates

Total factor productivity (TFP) determinants



Source: World Databank, WEF, Eurostat, Faostat, NBG estimates

(proxied by the share of output produced by cooperatives)

- ✓ Branding capital (proxied by a branding index, see p.8)
- ✓ Natural factors (climate and soil attributes)

Estimating Greece's potential for agricultural land productivity

Based on our analysis, Greece uses its agricultural land inefficiently - 70 per cent more inputs per ha compared with the EU average in order to produce just 11 per cent higher value added per ha compared to the EU average. According to NBG Research's model (see Appendix D), while Greek agricultural TFP is inherently boosted by the natural characteristics of Greece, it remains at low levels; as it is hindered by the lack of economies of scale (due to low share of cooperatives in agricultural production), inefficient branding and low technological level of production. Specifically, if the degree of technological sophistication in agriculture reached the EU average and a similar improvement was made in terms of branding and operation of cooperatives (i.e. TFP at European levels), the value added of Greek agriculture would increase by about 70 per cent (or €3.6bn), reaching €2.5/ha or €8.8bn (compared with €5.2bn in 2014).

2. Adding manufacturing value added

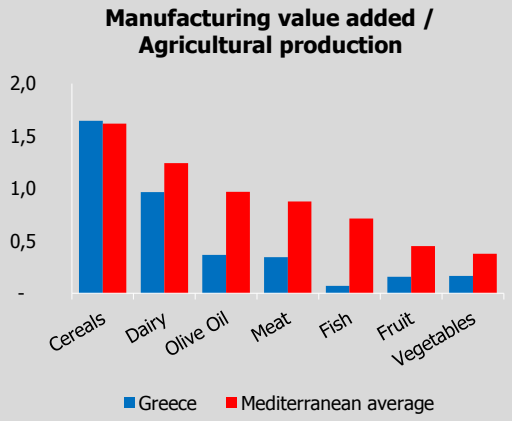
The possibility for higher value added products is much more significant for the food manufacturing subsectors, as the degree of processing in Greece is much lower than the Mediterranean average (40 per cent of agricultural output excluding subsidies compared with 52 per cent in the Mediterranean and 70 per cent for Western Europe). With a view to estimate this potential, we constructed a cross-sectional model based on a worldwide sample of 87 countries in order to examine the factors affecting the ratio of manufacturing value added over agricultural output.

Based on the literature regarding factors attracting investment to the food industry[16] and after controlling for the effect of different agricultural production structure[17] as well as for the effect of general business environment[18], it is noteworthy that the two main

[16] Henderson, D., Handy, C., and Neff S. (1997), "Globalization of the Processed Foods Market", Agricultural Economic Report 742, U.S.Department of Agriculture. Porter, M.E (1990), "The Competitive Advantage of Nations", New York: The Free Press

[17] We have included a product mix variable in the model, given that some types of products are more suitable for further processing (such as cereals) while other are less suitable (such as fruit and vegetables).

[18] We have used the WEF Global Competitiveness sub-indices with the higher correlation with the food manufacturing production (i.e. the quality of suppliers' network and the FDI policy).



Source: Eurostat, EL.STAT., NBG estimates

Greek Food Manufacturing Value Added: Assumpitons and Estimates

	Current	Potential
Assumptions		
Technology Index*	33	100
Brand Index*	79	234
Product mix (crops/livestock)	3.2	3.2
Business Environment Index*	81	100
Estimates		
Food manuf. Value Added (% of agricultural output)	40%	54%
Food manuf. Value Added (mil. €)	4	9.5

** Indices: EUavg=100*

*** excl. subsidies*

factors affecting the manufacturing intensity of a country's agro-food sector are two of the factors that also determine agricultural productivity (i.e. branding and R&D). This fact suggests that branding and R&D provide a double benefit to agri-food sector: increasing agricultural production as well as the share of manufacturing on agricultural production.

Estimating Greece's potential for food manufacturing value added

Based on our model, Greece – with its special characteristics and current business environment – should create food manufacturing value added in the range of 40 per cent of the agricultural production value, close to its realized level.

However, there is significant upside. In case Greece could achieve European R&D levels[19] and Mediterranean level of branding[20], food manufacturing value added could increase by €2.5bn annually (€1.7bn through branding and €0.8 through technological upgrade)[21]. Importantly, an improvement of the business environment to achieve similar conditions with the EU average would bring a further increase in manufacturing – with the ratio of manufacturing reaching 54 per cent of agricultural output (from 40 per cent currently).

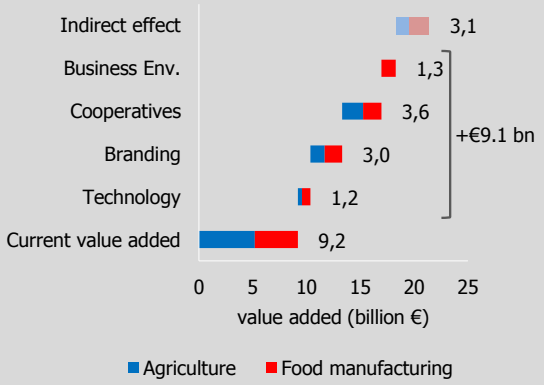
Taking into account the potential increase of agricultural production (as described in the previous section), it results in a total increase of €5.5bn in food manufacturing value added (from €4bn to €9.5bn).

Summing up

Our estimates: (i) confirm the significance of the factors outlined by analyzing case studies of other countries; and (ii) point to potential considerable gains. In particular, critical changes in branding strategy, cooperatives' network, production technology and business environment could provide an annual benefit of about €9.1bn in terms of value added (€3.6bn from agriculture and €5.5bn through food manufacturing processing), equivalent to 5.1 per cent of GDP. There will also be indirect effects through higher domestically produced inputs for the agricultural production

[19] This translates in the increase of agricultural R&D from €11/ha to €33/ha (EU average).
[20] This translates in the increase of branding index from 79 to 234 (Mediterranean average).
[21] We note that these variables affect both the agricultural value added (per ha of land) as well as the degree of manufacturing processing (from 38 to 46 per cent of agricultural output).

Total agro-food sector potential



Source: World Bank, Eurostat, NBG estimates

(about €1.3bn[22]) as well as domestically produced packaging inputs for the food manufacturing sector (about €1.8bn[23]), bringing the total effect for the Greek economy to €12.2bn (or 6.9 per cent of GDP).

All in all, it is evident that there is need for concerted efforts by both the private and public sectors (with private sector leading the development and the public sector acting as a facilitator) to increase coordination between different stakeholders through the food supply chain. Note that there could be also significant synergies with other sectors to facilitate the promotion of Greek agricultural and food products. The most significant is the tourism sector, allowing the contact with millions of tourists each year through hotels and restaurants, who could be potential buyers in the future. The strategic goal should be to brand Greek food products as premium, shifting them from the category of perishable commodities to the high-priced consumer goods category.

[22] Based on our model, the estimated increase in agricultural value added will be achieved through increased productivity and without additional inputs. However there is potential for import substitution of about €1.3bn, as part of the higher R&D expenditures will be channeled towards the cultivation of certified inputs (especially seeds).

[23] As the domestic packaging industry currently adds ⅓ over the food manufacturing value added, the higher food manufacturing activity will boost the turnover of packaging industry by about €1.8bn.

Appendix A: The effects of the Russian embargo to the EU food sector

The conquest of the Ukrainian province of Crimea led many western Governments to implement financial sanctions against Russia and Russian companies. As a response, the Russian Government implemented, in August 2013, certain countermeasures aiming to reduce Russia's dependence on food imports from the EU, US, Norway, Canada and Australia, while simultaneously signing a series of interstate agreements with South American, African and Asian countries to substitute for the embargoed food imports. The Russian Government has recently announced that the embargo on food imports will continue at least until July 2016.

EU-Russia trade before the embargo

EU exports to Russia had reached €120bn in 2013 (i.e. the year before the embargo), of which almost 10 per cent were agro-food products. While the EU exports' dependence in the Russian market is low (2.7 per cent of EU food exports), there are neighboring-to-Russia countries (like Lithuania, Latvia, Finland and Estonia) with food export dependence in the range of 20-30 per cent. As far as specific products are concerned, EU exports to Russia comprise mainly meat (15 per cent), beverages (14 per cent), dairy (13 per cent) and fruit (11 per cent).

Russian Embargo's Losses for EU member states

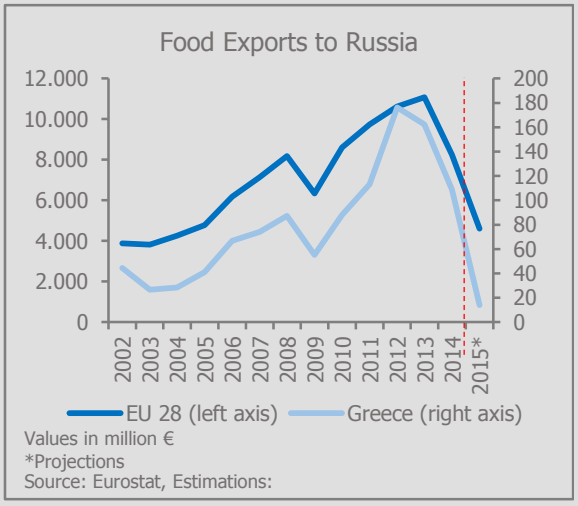
Country	Total Food Exports to Russia* (in million euros)	Share in EU 28 Food Exports to Russia*	Dependence of Food Exports from Russia* ↓	Losses from Russian Embargo** (in million euros)	Losses/Total Exports**
Lithuania	1.362	12,3%	32,9%	-772	-18,4%
Latvia	651	5,9%	30,2%	-116	-5,2%
Finland	411	3,7%	26,3%	-296	-18,9%
Estonia	240	2,2%	19,6%	-110	-8,8%
Poland	1.227	11,1%	6,8%	-746	-4,1%
Cyprus	14	0,1%	5,0%	-10	-3,8%
Denmark	600	5,4%	3,7%	-376	-2,3%
Greece	*162*	*1,5%*	*3,6%*	*-128*	*-2,9%*
Hungary	231	2,1%	3,2%	-45	-0,6%
Slovenia	32	0,3%	2,9%	-7	-0,7%
Germany	1.475	13,3%	2,4%	-599	-1,0%
Austria	230	2,1%	2,4%	-83	-0,9%
Ireland	223	2,0%	2,3%	-151	-1,5%
Italy	653	5,9%	2,0%	-217	-0,7%
Netherlands	1.386	12,5%	1,9%	-516	-0,7%
Spain	571	5,2%	1,6%	-345	-0,9%
Czech Rep.	84	0,8%	1,5%	-12	-0,2%
Belgium	454	4,1%	1,5%	-269	-0,9%
Croatia	15	0,1%	1,4%	-2	-0,2%
Sweden	95	0,9%	1,3%	-22	-0,3%
Bulgaria	42	0,4%	1,2%	-1	0,0%
France	662	6,0%	1,2%	-303	-0,5%
Portugal	48	0,4%	1,0%	-13	-0,3%
Luxembourg	8	0,1%	0,9%	-2	-0,2%
Romania	41	0,4%	0,9%	-8	-0,2%
Slovakia	24	0,2%	0,8%	-2	-0,1%
U.K.	132	1,2%	0,6%	-66	-0,3%
Malta	0	0,0%	0,0%	0	0,0%
EU28	**11.072**		**2,7%**	**-5.217**	**-1,2%**

** 2013, **Aug.'14 - Jul.'15*
Source: Eurostat, Calculations NBG

Greek food exports to Russia amounted to approximately €160mn in 2013 - covering 1.5 per cent of total EU food exports to Russia and 3.6 per cent of Greek food exports. However, the Greek exports' dependence to Russia in certain products – mainly fruit (such as strawberries, kiwis, apricots, cherries, peaches and nectarines) was relatively high (around ⅓ of Greek exports in 2013), and the estimated drop in exports is €155mn on an annual basis (equivalent to 3.2 per cent of total Greek food exports).

Consequences of the embargo for EU and Greece

In the 12-month period after the embargo (August 2014-July 2015), European exports suffered losses of about €5.2bn (1.2 per cent of European food exports). The effect varied based on the dependence of each country on the Russian market. Indicatively, Finland and Lithuania lost about 19 per cent and 18 per cent of their total food export value respectively (through both lower quantities and export prices). During the same period, Greek food exports to Russia decreased by €128mn (2.9 per cent of Greek food exports). Assuming that the affected products will not achieve a swift repositioning in global markets, we estimate that the annual losses are in the range of €6.2bn for EU and €155mn for Greece.



Focusing on the **Greek products** with high exposure to the Russian market, we observe that they have adopted various action plans in order to redirect their export flows. In particular, we distinguish three strategies:

- ✓ Efficient Repositioning to high-income markets, i.e. higher export volume and price (kiwis, apricots, olive oil, olives)
- ✓ Successful re-direction to low-income countries, mainly SEE, i.e. higher export volume but lower price (peaches, nectarines, cherries and marmalades)
- ✓ Incomplete re-direction, i.e. lower export volume and higher price (strawberries)

Kiwis: Greek Exports

Exports in tonnes	Current Annual Level*	Change in Annual Level After Embargo**	Export Price After Embargo***	%Δ in Export Price
Germany	13.084	5.894	1.049	10,7%
Spain	12.033	8.714	878	-3,8%
Lithuania	10.270	8.539	736	5,7%
Poland	8.135	3.464	775	6,1%
Italy	7.992	4.803	749	13,0%
Romania	7.311	1.340	629	11,7%
Bulgaria	5.560	1.509	292	-29,1%
Netherlands	4.222	1.543	1.002	9,0%
U.K.	4.173	1.823	1.083	-6,3%
Egypt	2.515	1.252	546	12,5%
Subtotal	75.294	38.880		
Russia	0	-28.470	No Exports	
Total Exports	*116.014*	*16.729*	*803*	*3,6%*

**After embargo: Aug.'14-Jul.'15*
***Prior embargo:Average Aug.'12-Jul.'13 & Aug.'13-Jul.'14*
****Euros/tonne*
Source: Eurostat, Calculations: NBG

Peaches: Greek Exports

Exports in tonnes	Current Annual Level*	Change in Annual Level After Embargo**	Export Price After Embargo***	%Δ in Export Price
Bulgaria	11.962	3.810	232	-30,3%
Lithuania	9.224	8.070	644	2,0%
Turkey	5.627	4.105	410	-6,9%
Germany	5.192	1.337	528	-32,5%
Moldova	5.169	1.931	675	-16,7%
Poland	4.621	884	521	-22,7%
Latvia	3.305	3.195	577	-32,7%
Egypt	2.638	1.198	406	-15,4%
Spain	1.508	1.072	459	-48,3%
Serbia	1.259	882	358	-55,4%
Subtotal	50.504	26.483		
Russia	1.961	-27.678	730	
Total Exports	*79.505*	*-6.006*	*473*	*-28,6%*

**After embargo: Aug.'14-Jul.'15*
***Prior embargo:Average Aug.'12-Jul.'13 & Aug.'13-Jul.'14*
****Euros/tonne*
Source: Eurostat, Calculations: NBG

Strawberries: Greek Exports

Exports in tonnes	Current Annual Level*	Change in Annual Level After Embargo**	Export Price After Embargo***	%Δ in Export Price
Moldova	6.954	4.678	1.192	2,9%
Cyprus	1.882	1.110	1.431	25,0%
Latvia	1.315	1.193	1.337	19,0%
Lithuania	1.285	1.050	1.837	53,7%
Czech Rep.	639	238	1.535	9,5%
Estonia	303	295	1.714	22,4%
U.A.E.	184	184	4.143	na
Kuwait	67	46	5.222	19,0%
Sweden	42	40	1.438	-46,1%
Ireland	33	33	999	na
Subtotal	12.703	8.867		
Russia	0	-14.863	No Exports	
Total Exports	*19.960*	*-14.119*	*1.476*	*12,2%*

**After embargo: Aug.'14-Jul.'15*
***Prior embargo:Average Aug.'12-Jul.'13 & Aug.'13-Jul.'14*
****Euros/tonne*
Source: Eurostat, Calculations: NBG

Appendix B: Common Agricultural Policy

Since 1962, the European agricultural sector receives financial support through the Common Agricultural Policy (CAP). Although the EU CAP budget has followed a downward trend, from 50 per cent of the EU budget in 2007 to 42 per cent in 2013 to an estimated 35 per cent in 2020, it is still the largest segment of the EU budget, absorbing about €55.5bn annually during 2014-2020.

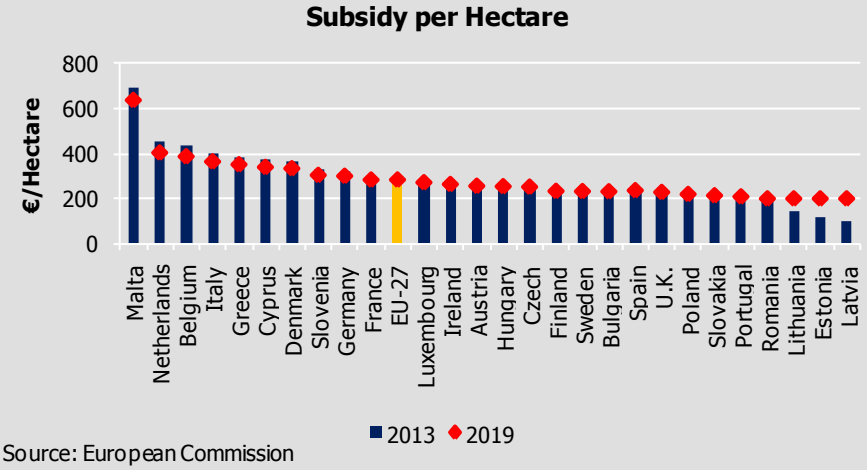
In particular, under the new program period of 2014-2020, there are two main pillars of funds:

- ✓ **Pillar I** mostly concerns direct payments to farm owners as income support and – to a smaller degree – market intervention measures, such as export refunds and private storage aid, which mainly serve as a safety net tool when markets are unexpectedly destabilized (e.g. adverse weather conditions).
- ✓ **Pillar II** provides support for long term rural development, helping farm owners modernize their farms and become more competitive, while protecting the environment. These payments are part-financed by the member countries as a part of their respective multiannual financial frameworks.

Moreover, the new CAP program (2014-2020) promotes measures aiming mainly towards:

- ✓ greener (more sustainable) agriculture, through (i) the concept of "cross-compliance" and (ii) the introduction of the "Green Direct Payment", as well as
- ✓ more efficient agricultural activity, through: i) stricter regulations for the determination of active farm owners eligible for support; ii) administrational improvements; and iii) more flexibility for member states concerning the allocation of CAP funding between the two pillars and the allocation of direct payments to promote their individual agricultural strategy.

More importantly, the new CAP aims to the gradual convergence in the allocation of direct payments per hectare among member states (external convergence) in order to diminish several disparities brought about by: i) historic allocation systems; and ii) the introduction of new member states in the EU. Specifically, the target is to close ⅓of the gap between the current level of subsidy in each member state and 90 per cent of the EU average by 2020.



Source: European Commission

Implementation of CAP reforms in Greece

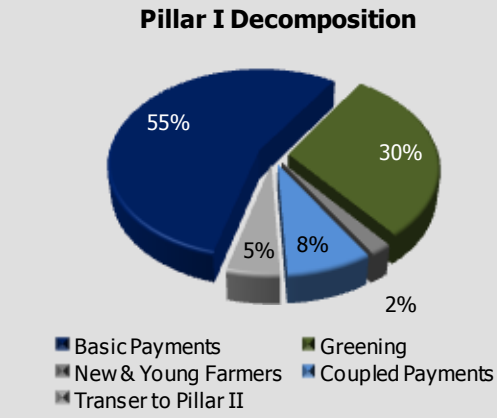
As Greece is one of the member states with a high direct subsidy per cultivated land (€384/ha in 2013 vs. an EU average of €293/ha), its share in the EU CAP budget is expected to fall to 3.5 per cent in 2019 from 5.6 per cent in 2007 (about €2bn annually for the period 2014-2020 compared with €2.5bn during 2007-2013).

Against the background of the main principles of the new CAP, Greece has allocated 77 per cent of its available funds in Pillar I and 23 per cent in Pillar II - a structure similar to the previous programming period (2007-2013) but with certain changes, leading to the redistribution of Pillar I funds among Greek farmers:

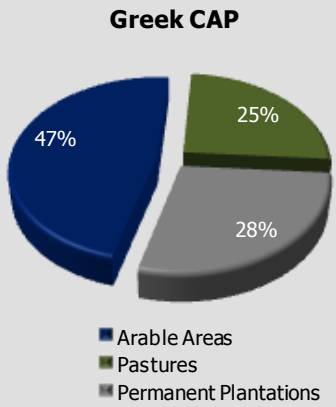
- ✓ Under the previous system, payments were solely based on declared production levels during 2000-2002 (irrespective of current level and type of activity) giving no motivation for new production. While to a large extent direct payments are still decoupled from production (apart from specific products[24] that receive subsidies linked to production – absorbing 8 per cent of direct payments), now there are requirements of minimum activity (e.g. cultivation of at least ½ of declared land per farmer).
- ✓ Additionally, for the first time the greatest part of pillar I (85 per cent) is divided in two distinct categories: i) the Basic Payment (55 per cent of annual payments); and ii) the Green Direct Payment (30 per cent of annual payments) which is only granted under certain environmental criteria. We note that small farmers[25] can obtain the full payment without obligation to fulfill the set criteria.
- ✓ With a view to achieving a gradual convergence of support per type of activity, the level of direct payments per farmer is determined based on the following allocation scheme:
  i) arable land will absorb 47 per cent of funds (€420/ha),
  ii) permanent crops will absorb 28 per cent (€500/ha)
  iii) pastures (for livestock) will absorb 25 per cent (€250/ha), compared with 19 per cent of direct payments during 2007-2013.

  In an effort to moderate the convergence process, there is a provision for a maximum drop of 30 per cent for each farm owner per hectare during 2015-2019.
- ✓ The remaining 7 per cent of Pillar I will be used to support: i) farm owners in areas with natural constraints (e.g. mountainous areas), absorbing 5 per cent of direct payments (transferred to Pillar II); and ii) young farmers (less than 40 years old) absorbing 2 per cent as an incentive to join the sector and modernize the production process.

[24] Products that can be subsidized based on the level of production (coupled payments) are legumes, forage, sugar beet, hard wheat, bovine animals, goats, rice, industrial tomato, seeds, oranges for juice and asparagus.
[25] The "small farmers" scheme concerns about 340,000 Greek farmers (½ of total) receiving annual direct payments lower than €1,250 (9.6 per cent of direct payments).



Source: OPEKEPE

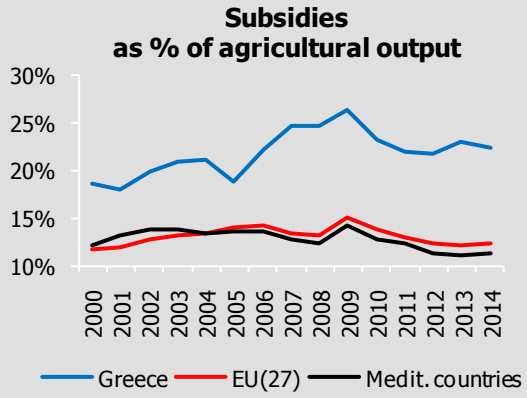


Source: OPEKEPE

As far as Pillar II is concerned, projects for Rural Development during 2014–2020 will absorb €4.7bn of the CAP budget (estimated to reach a total of €6bn including private co-financing). The implementation of the program aspires to modernize the country's agricultural production model and create 50,000 new jobs. The basic priorities of the program are:

- ✓ To enhance the competitiveness and productivity via the introduction of innovations in the production process that will improve the quality, the value added and the extroversion of the products
- ✓ To upgrade human capital and enhance entrepreneurship through young farmers and their organization into agricultural cooperatives
- ✓ The protection of the environment and confrontation of the climate change (30 per cent of the budget)
- ✓ The reinforcement of the population in rural areas via the creation of sustainable job opportunities

Summing up, in light of the expected further reductions of direct payment allocations per area under the convergence process, the sector could be forced to become more competitive and gradually less dependent on direct subsidies to be profitable (subsidies cover about ⅕ of the value of agricultural output in Greece, compared with 12 per cent on average in the Mediterranean). Against this background, the opportunities offered by the new CAP for further investments, R&D, and attracting young farmers should be exploited in order to achieve a more professional attitude regarding agricultural activity.



Source: Eurostat, NBG estimates

Appendix C: Financial Performance of Agro-food companies

Agriculture - Aquaculture

During the past decade, Greek **agricultural** companies (i.e. farming and light manufacturing) posted an average annual growth in turnover of about 8 per cent (compared with 2 per cent in Europe). The Greek sector operates with a similar EBITDA margin as European companies (about 11 per cent) and a similar debt to equity ratio of 1.2. However, the relatively low asset turnover (0.48 compared with 0.65 in Europe) makes the level of debt less sustainable (debt to EBITDA ratio is 6, compared with 4.1 in Europe). Liquidity conditions are also more problematic for the Greek agricultural sector, mainly due to a time gap of about 55 days between receipts from customers and payment of suppliers (while payments for European companies are more balanced).

We note that the financial difficulties are more severe in the sector of **aquaculture**. Both the operating profit margin (4.6 per cent) and net profit margin (-3.4 per cent) were on average lower than those in the Greek agricultural sector as well as the European aquaculture sector. Due to structural characteristics of the sector related to the long gestation period of the main fish types cultivated in Greece (i.e. sea-bass and sea-bream), Greek aquaculture companies need to sustain high levels of stock (live fish) resulting in high working capital needs. During the past decade those structural issues were magnified by inefficient strategies that led to oversupply in the European market. The subsequent pressure on prices lowered the profitability of the sector to the point that its debt level became unsustainable. Specifically, debt to EBITDA ratio was about 19, compared with 5 in Europe.

Agriculture (crops and livestock)	Greece 2004-2013	EU 2004-2013
Annual sales growth	8,0%	2,0%
ROE (before taxes)	-1,2%	5,2%
ROA (before taxes)	-0,5%	2,3%
EBITDA margin	10,4%	11,3%
Net Profit margin	-1,0%	2,6%
Debt/Equity	1,2	1,3
Debt/EBITDA	6,0	4,1
Interest Coverage ratio	0,7	2,7
Asset Turnover	0,48	0,65
Equity Turnover	1,08	1,50
Operating Cycle (days)	168	144
Days payables outstanding	*161*	*120*
Days receivables outstanding	*215*	*113*
Days stock outstanding	*114*	*151*

Source: ICAP data, Bach database, NBG estimates

Aquaculture	Greece 2004-2013	EU 2004-2013
Annual sales growth	9,2%	0,2%
ROE (before taxes)	-18,2%	3,1%
ROA (before taxes)	-1,4%	1,3%
EBITDA margin	4,6%	12,5%
Net Profit margin	-3,4%	1,0%
Debt/Equity	3,3	1,6
Debt/EBITDA	18,9	4,9
Interest Coverage ratio	2,0	1,9
Asset Turnover	0,49	0,64
Equity Turnover	2,18	1,69
Operating Cycle (days)	287	147
Days payables outstanding	*220*	*124*
Days receivables outstanding	*195*	*120*
Days stock outstanding	*312*	*151*

Source: ICAP data, Bach database, NBG estimates

Food manufacturing

Food manufacturing covers 22 per cent of total manufacturing in Greece and 15 per cent of exports (excluding fuel). The sector was more resilient to the economic crisis than the average manufacturing enterprise (since demand for food products is quite inelastic), with increasing sales and profitable operations during 2008-2013. Specifically, the operating profit margin posted a small decrease from 11 per cent during 2004-2007 to 7.8 per cent during 2008-2013. This was, nevertheless, sufficient to lead to a positive net profit margin of 1.2 per cent and to make the increased debt of the sector more sustainable, with a debt to EBITDA ratio of 6.3 (compared with 9 for total manufacturing).

Compared with their **European competitors**, food manufacturing enterprises in Greece have a similar EBITDA margin and debt to equity ratio. However, the lower net profit margin (1.2 per cent compared with 2.8 per cent) and asset turnover (0.84 compared with 1.3) leads to a lower ROA (1.1 per cent compared with 5 per cent). In terms of liquidity, the Greek sector is also at a disadvantage. Specifically, the operating cycle of about 140 days, while similar to other manufacturers (as well as Greek agricultural companies), is much higher than the European average of 47 days. The main reason is the long delays in payments from customers, close to 150 days (compared with 50 days in Europe) which cannot be counterbalanced with equally long delays to suppliers. Specifically, while European food companies collect payments about 20 days sooner than they have to pay their suppliers, Greek companies face a 50 day liquidity gap.

Greece: Manufacturing

	Food manufacturing		Other manufacturing	
	2004-2007	2008-2013	2004-2007	2008-2013
Annual sales growth	6,6%	3,1%	13,5%	-0,02%
ROE (before taxes)	9,6%	2,8%	12,2%	-0,6%
ROA (before taxes)	3,9%	1,1%	5,5%	-0,2%
EBITDA margin	10,9%	7,8%	11,2%	5,5%
Net Profit margin	3,0%	1,2%	4,4%	-0,2%
Debt/Equity	1,4	1,6	1,2	1,6
Debt/EBITDA	3,8	6,3	3,1	9,0
Interest Coverage ratio	3,2	1,6	5,1	1,0
Asset Turnover	0,89	0,84	0,89	0,83
Equity Turnover	2,16	2,19	1,97	2,19
Operating Cycle (days)	138	138	150	135
Days payables outstanding	*89*	*96*	*69*	*78*
Days receivables outstanding	*136*	*146*	*128*	*124*
Days stock outstanding	*91*	*88*	*91*	*89*

Source: ICAP data, NBG estimates

Europe: Manufacturing

	Food manufacturing	Other manufacturing
	2004-2013	
Annual sales growth	1,0%	1,6%
ROE (before taxes)	12,6%	12,6%
ROA (before taxes)	5,0%	4,5%
EBITDA margin	7,9%	8,5%
Net Profit margin	2,8%	2,8%
Debt/Equity	1,5	1,8
Debt/EBITDA	2,9	3,2
Interest Coverage ratio	4,7	4,3
Asset Turnover	1,30	1,10
Equity Turnover	3,24	3,09
Operating Cycle (days)	47	42
Days payables outstanding	*73*	*100*
Days receivables outstanding	*52*	*58*
Days stock outstanding	*68*	*84*

Source: Bach database, NBG estimates

A more detailed analysis shows several differences in the financial performance of each segment of the food manufacturing sector – with alcoholic beverages, cereals and olive oil exhibiting the strongest financial performance

EBITDA margin

	2004-2009	2010-2013	*diff.*
Food Manuf. total	**11%**	**6%**	***-4,4%***
Cereals	12%	10%	*-2,2%*
Fruit,Vegetables	9%	7%	*-1,9%*
Sugar, coffee, sweets	13%	2%	*-11,2%*
Olive oil	6%	7%	*0,1%*
Meat	7%	5%	*-2,9%*
Dairy	9%	4%	*-4,6%*
Wine	16%	9%	*-6,7%*
Alcoholic bev.	22%	16%	*-5,8%*
Non-Alcoholic bev.	12%	4%	*-8,0%*

Source: ICAP data, NBG estimates

Debt to EBITDA

	2004-2009	2010-2013	*diff.*
Food Manuf. total	**3,9**	**7,5**	***3,5***
Cereals	4,0	3,9	*-0,1*
Fruit,Vegetables	5,0	6,9	*1,9*
Sugar, coffee, sweets	3,6	8,0	*4,4*
Olive oil	3,9	4,6	*0,7*
Meat	5,7	10,9	*5,2*
Dairy	5,8	11,4	*5,6*
Wine	6,3	12,7	*6,5*
Alcoholic bev.	1,0	1,3	*0,3*
Non-Alcoholic bev.	2,4	11,0	*8,6*

Source: ICAP data, NBG estimates

ROA (before taxes)

	2004-2009	2010-2013	*diff.*
Food Manuf. total	**3,8%**	**-0,4%**	***-4,2%***
Cereals	3,5%	2,9%	*-0,7%*
Fruit,Vegetables	2,0%	0,0%	*-2,0%*
Sugar, coffee, sweets	6,7%	-2,5%	*-9,2%*
Olive oil	3,7%	2,6%	*-1,0%*
Meat	2,3%	-1,0%	*-3,3%*
Dairy	1,6%	-2,4%	*-4,0%*
Wine	1,7%	-1,7%	*-3,4%*
Alcoholic bev.	12,6%	8,1%	*-4,5%*
Non-Alcoholic bev.	2,6%	-3,8%	*-6,4%*

Source: ICAP data, NBG estimates

Operating Cycle* (days)

	2004-2009	2010-2013	*diff.*
Food Manuf. total	**155**	**135**	***-20***
Cereals	141	138	*-3*
Fruit,Vegetables	186	167	*-19*
Sugar, coffee, sweets	139	113	*-26*
Olive oil	119	146	*27*
Meat	82	95	*13*
Dairy	118	95	*-23*
Wine	471	475	*4*
Alcoholic bev.	83	55	*-28*
Non-Alcoholic bev.	112	125	*14*

Source: ICAP data, NBG estimates

** The operating cycle consists of the time gap between payments from customers and payments to suppliers plus the duration of stock accumulation (inventory).*

Appendix D: Econometric models

A. Agricultural model

NBG Research estimated a global land productivity model to assess the underlying potential of Greece's agricultural value added. The model is based on cross-section data for the world's main agricultural producers.

Our sample consists of 167 countries, accounting for more than 90 per cent of global agricultural production. In order to take account for the effect of the different size of each country, we have expressed the variables in terms of their level per unit (ha) of utilized agricultural area. The explanatory variables are the following:

First we examine the land productivity based solely on the inputs of agricultural production. The Inputs Index consists of three main variables:

- ✓ **Materials index,** concerning i) value of seeds purchased (€/ha), ii) value of net imports of forage (€/ha), iii) agricultural water withdrawal (m3/ha) and iv) fertilizers (tonnes/ha)),
- ✓ **Labour** used in agricultural production (employees/ha).
- ✓ **Capital investment** concerning agricultural land development and machinery (€/ha).

Against this background, we calculate a Cobb-Douglas production function:

$$agriVA_i = 0.19\ materials_i + 0.28\ labour_i + 0.63\ capl_i + 0.28\ cape_i$$

(2.87) (5.70) (14.08) (6.31)

$$R^2 = 0.65,\ DW = 2.23$$

where:

$agriVA_i$: the natural logarithm of agricultural value added over the period 2010-2012 for the country i (in USD/ha)

$materials_i$: the natural logarithm of materials index as described above, for country i (index: world average=100)

$labour_i$: the natural logarithm of employees per ha of land for country i (index: world average=100)

$capl_i$: the natural logarithm of investment in land (gross capital stock 2000-2010) for country i (index: world average=100)

$cape_i$: the natural logarithm of investment in equipment (gross capital stock 2000-2010) for country i (index: world average=100)

Second, we examine the factors determining TFP (as measured by the residual of the previous equation:

- ✓ **Natural attributes Index**: It consists of four (equally weighted) variables measuring landscape and climate conditions: (i) length of coastline per area, (ii) annual sunshine hours, (iii) annual volume of rainfall and (iv) quality of the soil. The quality of the soil (fourth component) is measured through three variables: carbon content in the topsoil, degree of land degradation (negative effect) and the degree of land erosion (negative effect).
- ✓ **Technology:** As a proxy for technology used in production we considered agricultural R&D expenditure (€/ha), based on evidence that the two variables are highly correlated.

- ✓ **Brand Index**: The degree of branding is approached using relative export prices per agricultural product. It affects TFP negatively as a higher value index suggests a lower quality brand.
- ✓ **Cooperative Index**: This index describes the degree of agricultural cooperatives development as shown by their share in agricultural products sales. Wherever data was not available, values were estimated based on the evaluation of cluster development (WEF/global competitiveness report).

Based on our model, these five variables determine 92 per cent of the global agricultural value added per area of utilized land.

$$TFP_i = 1.41\ natural_i + 0.64\ technology_i - 0.58\ brand_i + 5.55\ cooperative_i + 0.55\ dummy_i - 2.27$$

(3.07) (3.41) (4.97) (3.01) (3.03) (-3.14)

$$R^2 = 0.67,\ DW = 2.05$$

where:

TFP_i: TFP for the country i

$natural_i$: natural attributes index, for country i (index: world average=100)

$technology_i$: agricultural R&D (in USD/ha) for country i

$brand_i$: brand index for country i (rank from 1 (best) to 122 (worst))

$cooperative_i$: cooperative index for country i (index: world average=100)

$dummy_i$: country size

i: Albania, Argentina, Australia, Azerbaijan, Afghanistan, Angola, Antigua, Armenia, Bahrain, Barbados, Botswana, Brazil, Bangladesh, Belarus, Belize, Benin, Bhutan, Bolivia, Bosnia, Brunei, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Central Africa, Chad, Comoros, Congo, Cote d'Ivoire, Cuba, Djibouti, Chile, China, Colombia, Costa Rica, Cabo Verde, Dominican Republic, Ecuador, El Salvador, Georgia, Guatemala, Guinea, Eritrea, Ethiopia, Fiji, Gabon, Gambia, Ghana, Grenada, Honduras, Iceland, Iraq, Haiti, Hong Kong SAR, India, Indonesia, Iran, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Korea, Kuwait, Laos, Lesotho, Liberia, Libya, FYROM, Madagascar, Malawi, Mali, Mauritania, Moldova, Mongolia, Myanmar, Namibia, Lebanon, Malaysia, Mauritius, Mexico, Serbia, Mozambique, New Zealand, Nicaragua, Nepal, Niger, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Puerto Rico, Rwanda, Sierra Leone, Somalia, Sri Lanka, Suriname, Swaziland, Tajikistan, Tanzania, Timor-Leste, Togo, Trinidad-Tobago, Turkmenistan, Uzbekistan, Venezuela, Yemen, Zambia, Oman, Peru, Philippines, Qatar, Russian Federation, Saudi Arabia, Senegal, South Africa, Thailand, Uganda, Ukraine, United Arab Emirates, United States, Uruguay, Vietnam, Zimbabwe, Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, The Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, United Kingdom, Norway, Switzerland, Turkey, Algeria, Egypt, Israel, Morocco, Syria, Tunisia.

B. Food manufacturing model

NBG Research estimated a food manufacturing value added model in order to assess the Greek sector's potential. The model is based on cross-section data, with a global sample of 96 countries. The explanatory variables are:

- ✓ **Product mix**: The structure of agricultural production and specifically the ratio of Crops/Livestock
- ✓ **Technology:** As a proxy for technology used in production we considered agricultural R&D expenditure (€/ha), based on evidence that the two variables are highly correlated. One of the main objectives of agricultural research is to improve the stability of both the quantity and the quality of agricultural production. This supports the development of standardized products with unique characteristics.
- ✓ **Brand Index**: The degree of branding is approached using relative export prices per agricultural product.
- ✓ **Business Environment Index**, consisting of 3 sub-indices (equally weighted), concerning (i) business impact of rules on FDI, (ii) local suppliers' attention to quality and (iii) local suppliers' attention to quantity (source: Global Competitiveness report 2014-2015)

Based on our model, these variables determine 59 per cent of the global manufacturing value added as a share of agricultural output.

$$manVA_i = -3.21\ cl_i + 0.15\ technology_i - 0.28\ brandi + 0.40\ be_i + 5.29\ dummy_i$$

(-2.94) (5.72) (-4.10) (4.82) (2.24)

$$R^2 = 0.59,\ DW = 2.04$$

where:

$manVA_i$: food manufacturing value added as % of agricultural output for country i

cl_i: ratio of crops vs. livestock agricultural production value for country i

$technology_i$: agricultural R&D for country i (in USD/ha)

$brand_i$: brand index for country i (rank from 1 (best) to 122 (worst))

be_i: business environment index as described above for country i (index, world average=100)

$dummy_i$: 5 regions (from less likely (1) to most likely (5) to develop food manufacturing activities): 1=Africa and Asia (excl. South-East Asia), 2=South-East Asia, 3=Europe (excl. Medit.) and South America, 4=Mediterranean (in EU), 5=North America

i: Albania, Australia, Azerbaijan, Armenia, Botswana, Brazil, Cameroon, Canada, Chile, China, Colombia, Ecuador, Georgia, Ethiopia, Iceland, Hong Kong SAR, India, Indonesia, Iran, Japan, Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Korea, Kuwait, FYROM, Madagascar, Malawi, Moldova, Mongolia, Lebanon, Malaysia, Mauritius, Mexico, Serbia, New Zealand, Nepal, Pakistan, Sri Lanka, Tanzania, Trinidad-Tobago, Yemen, Oman, Peru, Philippines, Qatar, Russian Federation, Senegal, South Africa, Thailand, Ukraine, United States, Uruguay, Vietnam, Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, The Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, United Kingdom, Norway, Switzerland, Turkey, Egypt, Israel, Morocco, Tunisia.

SECTORAL REPORT

December 2015

NATIONAL BANK OF GREECE

This report is provided solely for the information of professional investors who are expected to make their own investment decisions without undue reliance on its contents. Under no circumstances is it to be used or considered as an offer to sell, or a solicitation of any offer to buy. Any data provided in this bulletin has been obtained from sources believed to be reliable. Because of the possibility of error on the part of such sources, National Bank of Greece does not guarantee the accuracy, timeliness or usefulness of any information. The National Bank of Greece and its affiliate companies accept no liability for any direct or consequential loss arising from any use of this report.