FOUNDATION FOR ECONOMIC & INDUSTRIAL RESEARCH

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The Refining Sector in Greece:

Contribution to the Economy and Prospects

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Executive Summary

The present study analyses the market environment of the Greek refineries, examines the sector's contribution to the Greek economy and assesses its outlook. In addition, it evaluates the impact of the regulatory framework on the sector's competitiveness and outlines policy proposals to ensure the viability of the enterprises in the sector in the intensely competitive environment of the global energy markets.

The environment in which the Greek refineries operate

The crisis of the Greek economy, together with the recession in Europe, has had catalytic effects on the refinery sector in Greece, changing significantly the environment in which the Greek refineries operate. Due to the conditions prevailing in the domestic and global environment in the past few years, the refinery sector is facing high cost of crude oil supply, low margins, sharp drop in the domestic demand and high financing and energy cost.

The turn to exports provided an outlet for the Greek refineries, which following the contraction in the domestic market faced the risk of low capacity utilization, falling below the minimum efficient scale of production threshold that would have worsened further their financial results. Thus, after a period of significant investments to modernize and upgrade their capacity and under the pressure from low domestic demand and its weak outlook, the Greek refineries have sought new markets and have expanded in existing markets abroad, mainly in countries outside the EU.

The choice for stronger export orientation should overcome several challenges and considerable commercial risks in order to prove its viability. The competitive pressures faced by the Greek refineries today are particularly strong and are expected to intensify further, driven by the excess capacity at global level and the development and modernisation of refining capacity in the Middle East and Asia Pacific. From 2008 to 2012 the refining capacity in Asia Pacific grew by 15%; in the Middle East by 8% and in Russia by 6%. The new refineries have increased complexity that enables them to produce high value products, while their size allows them to achieve economies of scale. In the EU the refining capacity fell by 5.5% in 2012 compared with 2008, while further reduction occurred in 2013. Thus, several refineries remain idle or underutilized. At the same time, the composition of international trade of oil products has changed. Diesel and jet fuel imports from the U.S. and Asia are required to meet the supply deficit in Europe, while demand for gasoline in the EU is shrinking. The most vulnerable refineries in Europe are the older ones that have not been upgraded and rely more on exports of gasoline.

In addition, the non-EU refineries are not burdened with the cost to comply with the product quality requirements and the environmental standards of production that are applied in the EU. This fact, coupled with the absence of similar standards in non-EU markets, where the bulk of the domestic oil products is directed, sets the Greek refineries at a competitive disadvantage with the possibility for this position to deteriorate in the near future. The cost of buying crude oil and electricity, which have greatly increased in recent years, and the backlog of pending secondary legislation to implement the relevant EU Directives, such as the Directive 2010/75/EU for industrial emissions, put an additional burden on the sector. The implementation of the Directive increases significantly the investment risk and entails additional costs of compliance with new environmental standards.

Meanwhile, the EU policy to tackle climate change imposes additional costs on the sector, through the EU Emissions Trading System (EU ETS) from: a) the CO_2 emissions of the sector itself (direct emission costs) and b) an increase of the prices of electricity consumed by the sector, which

incorporate the cost of CO_2 emissions in electricity generation (indirect emission cost). Furthermore, the protection of the sector from the risk of "carbon leakage" in the medium and long term is clouded with uncertainty. The carbon leakage can lead to reduced economic activity, lower income and fewer jobs, not only in the sector, but in the wider economy as well.

The European Commission, acknowledging the economic contribution and the strategic importance of the refining industry for energy security in the EU, as well as the significant challenges that it faces and in which it is expected to continue to be exposed in the coming years, is conducting a fitness check of the regulatory framework governing the sector and in particular the impact of the framework on the competitiveness of EU refineries. The fitness check will be completed in September 2014, accompanied by proposals for policy measures and actions towards ensuring the competitiveness and the contribution of the sector to the European economy.

The contribution of the refining sector to the Greek economy

The contribution of the Greek refineries to the domestic economy, albeit particularly significant, is not widely recognised. In particular:

- With more than €1 billion gross value added in 2011, which corresponds to 0.5% of Greek GDP, the refinery sector ranks third among the manufacturing branches, with its share increasing significantly over the past few years.
- The human capital in the sector is highly skilled, maintaining better-paid jobs compared with other industrial branches. About 4,100 people are employed in the sector.
- The sector has a strong investment activity, with investment totalling €2.7 billion in 2009-2012, when GDP contracted by more than 20%.
- The closely linked with the refinery industry sectors of wholesale and retail trade of petroleum products (including third-party fuel transportation) contributed directly to the Greek economy €500 million value added and at least 23,000 jobs.

According to our estimates, the total impact of the refinery sector on the Greek economy is considerably stronger. If we also take into consideration the indirect and induced effects, alongside the direct impact of the sector, it is estimated that the refining activity contributed about €3.8 billion (2% of GDP) and more than 40,000 jobs to the domestic economy. The contribution of the sector to tax and social security revenues is also significant.

A less obvious impact from the activity of the Greek refineries comes from their contribution to the reduction of the trade deficit. With the exports of petroleum products reaching €10.3 billion in 2012, most of which (86%) going to non-EU countries, the Greek refineries contributed 37.5% of the total exports of the country, from 8.4% a decade earlier, while imports remained relatively stable. As a result, according to Bank of Greece data, the import coverage ratio of crude oil and petroleum products with exports increased from 25% in 2005 to 42% in 2012.

The significant contribution of the Greek refineries to the Greek economy underlines the need to preserve their competitiveness, so that the refining industry continues to contribute to the recovery efforts and the sustainable development of the Greek economy.

EU policies and impact on sector's competitiveness

A number of European directives and guidelines regulate every aspect of the refining activity. Currently the sector expects decisions and policy changes that could have an impact on its competitiveness:

- In the short term, within 2014, the formulation of the new carbon leakage list (2015-2019) and the recognition that the sector continues to be exposed to the risk of carbon leakage, i.e. that it has high direct and indirect CO_2 emission costs and high intensity of trade with third countries, are of paramount importance.
- The finalisation of the emission levels linked to the Best Available Techniques (BAT) as part of the Industrial Emissions Directive, with which the refineries are obliged to comply, will also have a significant effect on the sector.
- The Fuel Quality Directive, which enforces the reduction of the carbon footprint of fuels used in transport, also comes with a compliance cost.

The existing EU legislative framework takes into account the risk of carbon leakage and protects the industries that are exposed to it, such as the refinery sector, with free emission allowances. Nevertheless, for a number of reasons the European refineries are not receiving all of the required allowances and as a consequence the protection is only partial and in fact falling over time.

At the same time, due to geographic particularities, the carbon leakage risk for the Greek refineries is significantly higher compared with the refineries in other EU member-states. The trade intensity with third countries – one of the criteria for being on the carbon leakage list – reached 52% in Greece in 2012 (38% in EU27) from 24% in 2005 (18% in EU27). In addition, the availability of cheaper natural gas in Northern Europe allows the refineries to use in the production process natural gas and electricity instead of own produced fuels, reducing considerably their emissions and as a result increasing the distance of the Greek refineries from the emission benchmarks, without this being due to a technological lag.

Hence, dropping from the carbon leakage list would have a significant impact on the Greek refineries. The likelihood of this, following the recent announcements by the European Commission, seems rather distant for the time being. However, this uncertainty is reduced only temporarily, as the new list is in force for five years, while it is not clear whether the sector will continue to receive beyond 2020 even the partial protection that it enjoys today. The carbon leakage list that will be in force after 2020 should be clarified by the EC well in advance, as it constitutes a crucial parameter in the investment planning of the refineries.

The compulsory compliance with the Best Available Techniques (BAT) as part of the Industrial Emissions Directive brings about a high cost of emissions reduction for the refineries. If no flexibility is provided for meeting the emission targets, the compliance cost will drastically increase, deteriorating significantly the competitiveness of the sector. In particular, the impact on the competitiveness of the refineries will be important if the BAT provisions: a) do not recognise the differences in the configuration of the refineries and in the usage of raw materials, b) do not distinguish between existing and new facilities, c) do not provide flexibility in achieving the environmental standards. As a result, the refineries will be required to undertake investments that will reduce the externalities from their activities, but without investment return. In the current conditions, where the financing of investment programs is difficult, it will not be easy to finance such investments. Coupled with the need for upgrading in order to reduce the imbalance between supply and demand for petroleum products in the EU, such a development would undermine the competitive position of the European refineries against refineries outside the EU. It is estimated that the compliance costs will be ranging from € 70 to € 300 million per refinery in the absence of the necessary flexibility to achieve the emission objectives.

The Fuel Quality Directive imposes a reduction of the carbon footprint of fuels used in the transport sector. In particular, it places an obligation on Member States to require from fuel suppliers to

progressively reduce their greenhouse gas emissions per unit of energy of fuels they supply by 10% until December 31, 2020 compared to a pan-European low carbon fuel standard. The Directive includes additional measures regarding fuels specifications (such as the reduction of sulfur content) which will incur additional adjustment costs for the refineries. The changes in the acceptable fuel quality introduce additional processing requirements and/or changes in the choice of crude oil, which raises the required investment and the operating cost of the refineries, potentially leading to higher CO_2 emissions during the fuel production process and thus the need for more emission allowances.

Policy implications

The competitiveness of the Greek refineries, which constitutes a necessary condition for their viability in order to preserve their significant contribution to the Greek economy, is not secured, as it is affected by a multitude of exogenous (for the companies in the sector) factors. The current EU legislation and the planned EU policies create an additional burden and uncertainty for the refining industry, while at national level a number of factors increase the production cost through the electricity tariffs. Therefore, the preservation of the viability prospects of the sector indicatively requires the following:

- A balanced approach in the implementation of policy measures in the fields of Energy and Environment, so that the impact on the industry competitiveness is taken into account alongside the impact on the environment. This constitutes a key requirement for the sustainable development and the preservation of thousands of jobs in the economy. In this regard, it is important to secure the protection of the refining sector against the risk of carbon leakage before and after 2020, particularly taking into account the geographical differences between Greece and the other EU countries, and their implication on the risk of carbon leakage for the refineries.
- Change of focus of the EU climate policy, from unilateral measures to the achievement of a global agreement on the reduction of greenhouse gases.
- Completion of the fitness check by the European Commission, regarding the regulatory framework of the refinery industry, particularly in relation to its impact on the competitiveness of the refineries, prior to making any further significant decisions for the implementation of current legislation or the passing of new measures. It is also very important to stress that the fitness checks should include planned revisions of the current European legislation as well.
- Interventions in relation to the national industrial policy that will reduce the energy costs, on top of the already announced measures, such as for example reduction of the excise duty of electricity and natural gas, of the surcharges in the electricity tariffs for public service obligations and of the special levy for the reduction of greenhouse gas emissions for industrial enterprises.
- Interventions in the tightly linked trade of petroleum products sector, such as allowing for a credit period for collecting the excise tax on liquid fuels and implementation of the adopted measures for the elimination of the illicit fuel trade, in order to boost the liquidity in the sector and its competitiveness in the domestic market.

In conclusion, the significant and increasing contribution of the refining industry to the Greek economy is not secured. The institutional interventions that serve important objectives for an environmentally sustainable future must take into account the needs of the country for jobs by ensuring the competitiveness of Greek industry.

1. Introduction

The crisis of the Greek economy, together with the recession in Europe, has had catalytic effects on the refinery sector in Greece, changing significantly the environment in which the Greek refineries operate.

The decline in demand together with the change in the composition of petroleum products demanded in the developed economies has created imbalances between supply and demand, which are reflected in low level of utilisation of the refining capacity – particularly in Europe – and thin refining margins. At the same time the evolution of fuel prices in Greece, which is largely influenced by the applied tax policy, has accelerated the trend of substitution of petroleum products by other energy sources such as natural gas, electricity, biomass for heating and alternative fuels in transportation. Thus, after a period of significant investments to modernise and upgrade their capacity, the Greek refineries face intense competitive pressures in the markets they operate, which are reinforced by other factors, such as the European Union's policies for tackling climate change, reducing industrial emissions and improving fuel quality.

These issues obviously affect the outlook of the refinery sector and the extent to which it will continue to contribute with its activity initially to the recovery and later to the stable and sustainable development of the Greek economy. In this regard, it is of interest to determine both the contribution of the sector and the policies that will enable the sector's full participation in this national effort.

In the present study we examine the sector's contribution to the Greek economy, we assess the impact of the regulatory framework on the sector's competitiveness and we outline policy proposals to ensure the viability of the enterprises in the sector in the intensely competitive environment of the global energy markets.

In particular, in the second chapter we briefly discuss the main trends in the refining industry in Europe and worldwide. We also analyse the factors that shape the domestic environment in which the Greek refineries operate. In the third chapter we determine the contribution of the refining industry to the Greek economy through the assessment of the direct, indirect and induced effects of the industry in terms of gross value added, employment, labour income, investment, exports and tax revenues. In the fourth chapter we present the main EU directives that regulate important aspects of the refineries' operation and we assess their impact on the competitiveness of the sector. Finally, in the fifth chapter we assess the prospects of the sector and we make recommendations aimed to ensure its sustainability and preserve and enhance its contribution to the Greek economy.

2. Market environment

Companies in the oil refining sector are fully familiar with price volatility both in markets where they buy raw materials (different types of crude oil and feedstocks) and in markets in which they supply their products (gasoline, diesel oil, fuel oil, jet fuel oil, etc.). As many factors (economic, geopolitical, regulatory, technological, weather conditions, etc.) affect the supply and demand conditions in oil and refined product markets, oil companies have developed risk management systems to hedge -at least in the short run and to the degree possible- against business risks arising from frequent price movements. However, it is not easy to adjust and hedge against risks arising from wider changes in their external environment, such as those affecting the degree of capacity utilisation or their ability to compete in the global oil product markets.

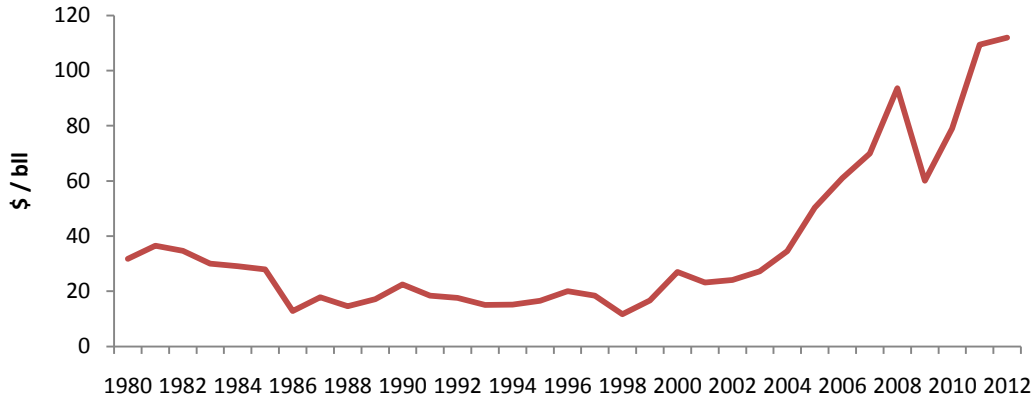
Since 2008, the Greek refineries have faced the deep crisis of the Greek economy. At the same time changes in demand and low energy costs in some regions of the world have triggered a rearrangement of the industry globally. These developments combined with the recession in Europe and other factors have radically altered the environment in which the refineries operate.

In the current situation the industry is facing high cost of crude oil supplies, substantial changes in global refining capacity, sharp decline in demand both domestically and in the wider South Europe region, low refining margins and increased financing and energy costs. This chapter briefly examines these important developments in order to provide a comprehensive picture of the current environment in which the Greek refineries operate. The equally significant changes in the regulatory framework at EU level, which directly affect the refining industry and play a crucial role for its future, are analysed in the fourth chapter of the study.

2.1. The cost of crude oil supplies

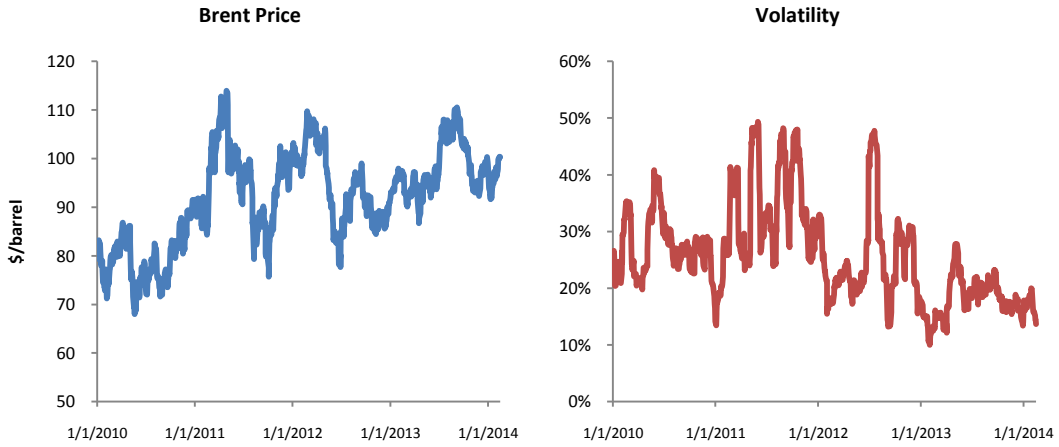
Crude oil prices are influenced by a wide variety of economic and geopolitical events. During the 2000s the cost of importing crude oil in Greece rose sharply because of an equally significant rise in international prices (Figure 2.1). However, the global financial crisis led to a dramatic fall in prices in 2008 due to the weakening of global demand. The restraint of OPEC members' production in 2010 contained the fall in prices and, in conjunction with the gradual recovery of the global economy, prices began growing again.

Figure 2.1: Crude oil import cost in Greece, 1980-2012



Source: IEA.

Figure 2.2: Brent price evolution and volatility, Jan 2010-Jan 2014



Source: Naftemporiki, Data processing IOBE.[1]

The further rise in prices was fuelled by developments in Libya, the embargo on Iran and the unrest in Syria, events in 2011 and 2012 that created serious concerns in the international markets about the uninterrupted supply of crude oil. As a result, uncertainty, as reflected in price volatility, increased significantly in 2011 and during the summer of 2012 (Figure 2.2),

[1] The (rolling) volatility is defined as the standard deviation of percentage changes for a specified period of time. Percentage changes are calculated successively from the price difference in logarithms. This difference approximates the percentage change in prices between the two periods and is independent from units of measurement, thus allowing direct comparison between different time series. The standard deviation is calculated using the following formula: $\sigma = \sqrt{\frac{\sum\left(x-\bar{x}\right)^2}{n}}$, where $\bar{X}$ is the average percentage change for a given period and n the number of observations of the time series. To determine the rolling volatility we compute the standard deviation for the first 21 days for the 2nd to the 22nd day, the 3rd to the 24th day, etc. Finally, to reduce the variability on an annual basis we divide by the square root for the days of the year for which values exist ($\sqrt{252}$).

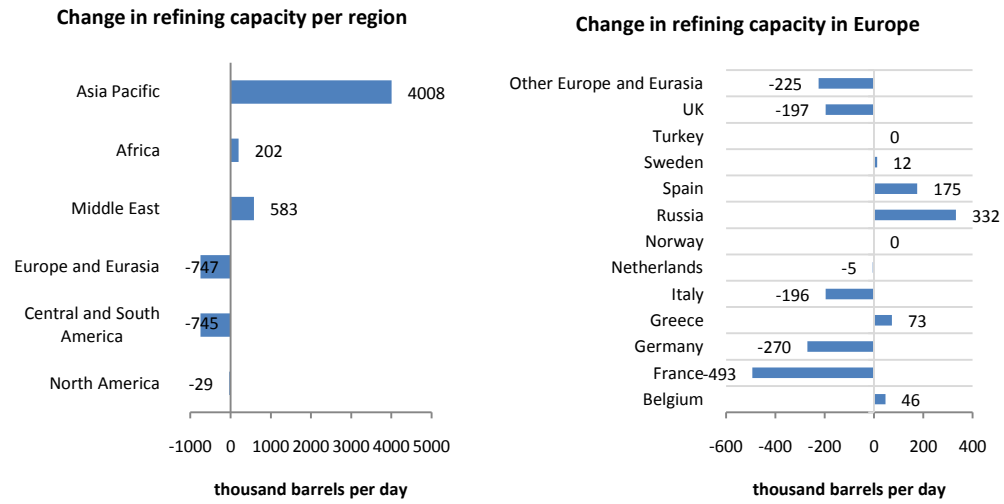
while the import prices of crude oil in Greece fluctuated around $ 111 / barrel on average in 2012.

Price fluctuations also occurred in 2013, but with less intensity, since increases in crude oil production in the U.S. offset the significant decline in supply from Libya and Iran. However, international prices and therefore the cost of crude oil supplies in Greece have remained high, increasing the refineries operating costs.

2.2. Refining capacity

In recent years there have been significant changes in the refining capacity at international level. The growing energy needs of the developing countries have led to the construction of new or to the upgrading of existing refining capacity. From 2008 to 2012 the refining capacity in Asia Pacific grew by 15%; in the Middle East by 8% and in Russia by 6% (Figure 2.3). The new refineries have complexity factors that enable them to produce high value products, while their size allows them to achieve economies of scale. Furthermore, they have strong export orientation, since local demand is still less than their capacity, while lower sea transport costs (compared to the past), lower or lack of compliance costs with environmental regulations, and lower labour costs allow them to competitively price their products.

Figure 2.3: Change in refining capacity, 2008-2012 (in thousand barrels per day)



Source: BP Statistical Review of World Energy June 2013. Data processing IOBE.

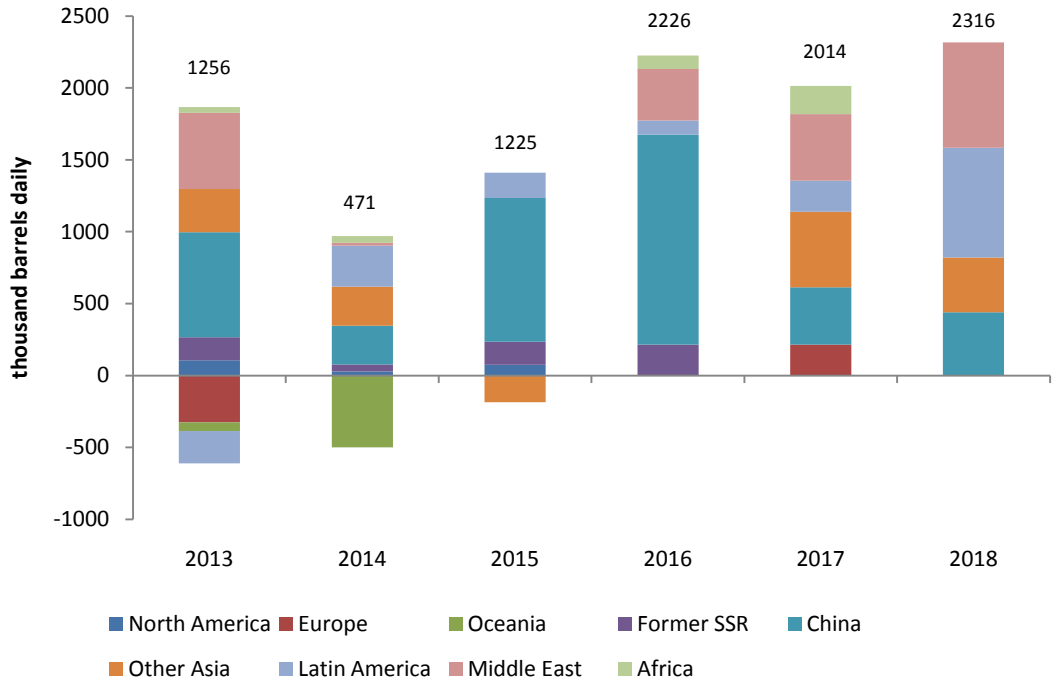
In contrast, in Europe, the USA and Japan a significant number of refineries have closed, while others face the risk of premature closure, as developing countries are expanding their own refining capacity and alternative fuels are penetrating the markets. In the EU the refining capacity fell by 5.5% in 2012 compared with 2008, while further reduction occurred in 2013. Thus, several refineries have remained idle or underutilised as major consumers like China and India prefer to import crude oil instead of refined products and produce their own finished products, while producers in the Middle East prefer to export refined products

rather than crude oil. In addition, an increasing share of liquid fuels from extracting gas (natural gas liquids) is available directly to the markets as by-products that substitute refined fuels.

These conditions expose many refineries to the risk of decommissioning, with the largest proportion of the capacity under threat being in Europe. At the same time, the structure of oil product international trade has changed. Diesel and jet fuel imports from the U.S. and Asia are required to meet the supply deficit in Europe, while demand for gasoline in the EU is shrinking. The most vulnerable refineries in Europe are the older ones that have not been upgraded and rely more on exports of gasoline.

There are no signs that these pressures will mitigate in the medium term. Projections about refining capacity additions in the coming years show that the rearrangement of worldwide capacity will continue. Expansion is expected mainly in China, India, Middle East and Russia and reduction in Europe and Oceania (Figure 2.4).

Figure 2.4: Refining capacity additions worldwide, 2013-2018 (in thousand barrels daily)



Source: IEA.

2.3. Demand of petroleum products in Europe

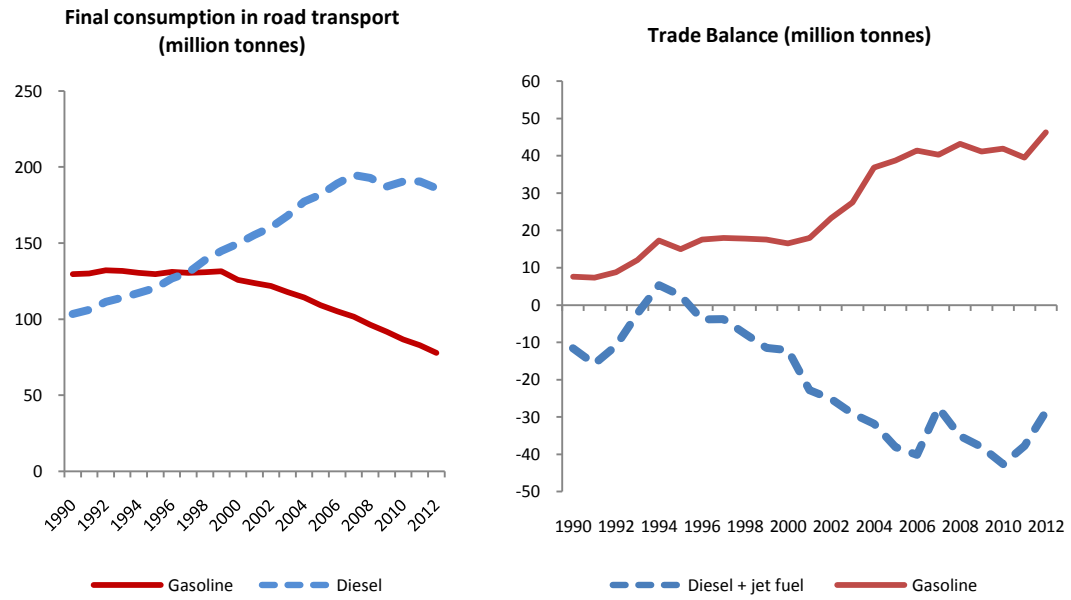
As transport costs considerably affect the competitiveness of refined petroleum products, developments and trends in demand in the vicinity of Greece play a crucial role in determining the competitive pressures on the Greek refineries.

In Europe the market for petroleum products has changed significantly over the past decade (Figure 2.5). Apart from the overall downward trend, the main changes include the reduction of gasoline and fuel oil demand and the rising demand for diesel and jet fuel oil.

The rise in demand for diesel oil has been fuelled by rising consumption in freight transportation and the growing trend towards diesel engines in private road transportation. The latter is due both to the lower price of diesel fuel compared with gasoline due to better tax treatment, and the availability of diesel cars that achieve more fuel savings. The efficiency of diesel cars leads to further reduction of CO_2 emissions per km helping the car industry to achieve the stringent efficiency targets set in the EU.

The demand for fuel oil in power generation has significantly declined, while the European industry confronted with stringent environmental regulations has turned to cleaner alternative fuels.

Figure 2.5: Gasoline and diesel oil demand in the European Union



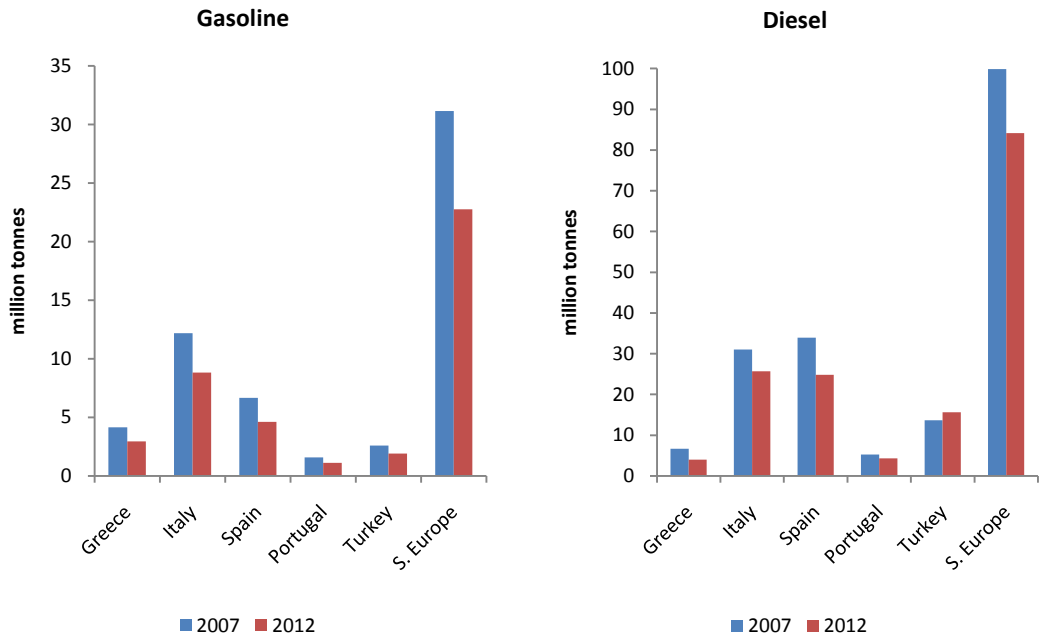
Source: Eurostat.

These changes took place with a speed that surpassed the industry's ability to respond. The older European refineries were built in a different market environment, in which demand for gasoline and heavy fuel oil was significantly higher than the demand for middle distillates. Thus, current trends created an imbalance between production capacity and demand requirements, which is balanced through international trade. Europe, therefore, displays excess supply in gasoline and shortage in middle distillates, which are expected to continue to expand (Figure 2.5). However, the ability of the European refineries to utilise excess capacity through gasoline exports has been limited after a) the drastic changes in the US market – a key market for European exports – due to the exploitation of light tight oil (LTO) – and the subsequent increase in US oil supply, b) the increased use of biofuels and c) the improved fuel efficiency in cars. These developments have created additional pressure on several European refineries.

Developments in neighbouring to Greece markets have also been unfavourable. With the exception of Turkey in the case of diesel, all other markets have seen a significant drop in

demand. Overall, the demand for diesel between 2007 and 2012 has declined in Southern Europe by 15.7%. Even more significant is the reduction in gasoline demand (26.9%).

Figure 2.6: Demand for gasoline and diesel oil in countries of South Europe



Source: Eurostat and Petder (Turkey).
*South Europe includes Greece, Italy, Spain, Portugal, Turkey, Cyprus, Malta, Bulgaria, Romania, Slovenia and Croatia.

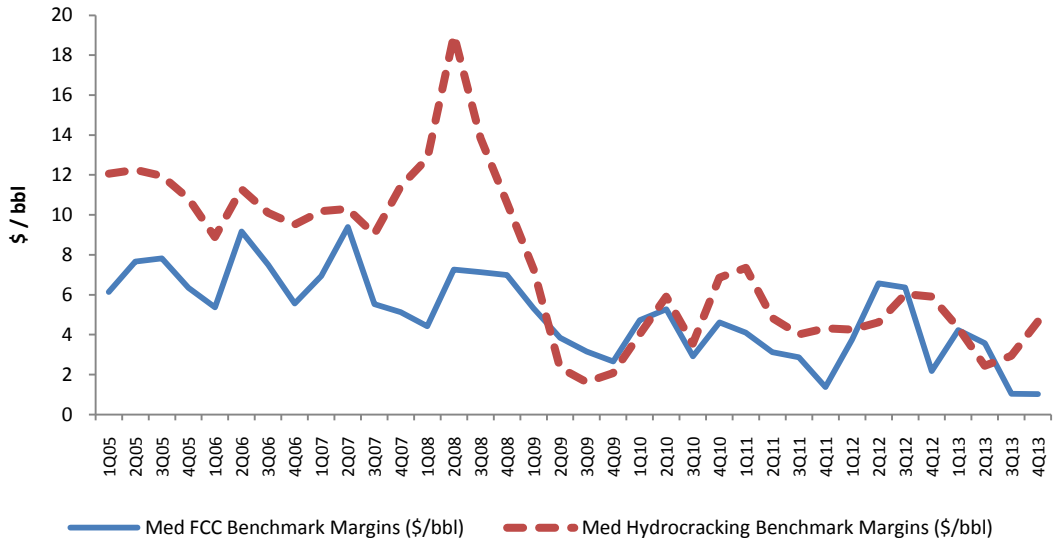
2.4. Refining margins

Refining margins reflect the difference between the value of the product mix produced by a typical refinery and the cost of crude oil used as an input, including the operating costs during the refining process. Therefore, they are a key measure of profitability resulting from processing a barrel of crude oil. Benchmark refining margins are determined for specific regions depending on the typical crude oil supplies and the configuration of refineries in each region. So, for example, for the Mediterranean region benchmark refining margins are determined for hydroskimming (simple) refineries but also for more complex ones (FCC and hydrocracking). In fact, every refinery has its own refining margin, which is determined by its own configuration, although it follows the trends resulting from changes in crude oil and refined product prices.

The economic conditions in Europe and in the Mediterranean region have led, as mentioned before, to a drop in the demand for petroleum products. The faster decline in demand compared to the refining capacity has led in turn to lower refining margins (Figure 2.7). The impact of the economic crisis has been particularly important, as the refining margins fell sharply in 2009 and remained at low levels since then. The competitive pressures from refineries in developing countries, lower transportation costs, utilisation of LTO in the U.S. and the high cost of crude oil supplies have affected further the operating environment for the European refineries.

It is notable that in the last quarter of 2013 the average benchmark refining margin for refineries with catalytic crackers (FCC) in the Mediterranean region stood at $ 1.02 / barrel, well below the average for 2005-2013 (5.03 $ / barrel). Similarly, the reference refining margin for complex hydrocracking units amounted to $ 4.65 / bbl (average margin for 2005-2013, $ 7.59 / barrel) affecting substantially the profitability of the industry.

Figure 2.7: Benchmark refining margins, Mediterranean region (Q1:2005 – Q4: 2013)

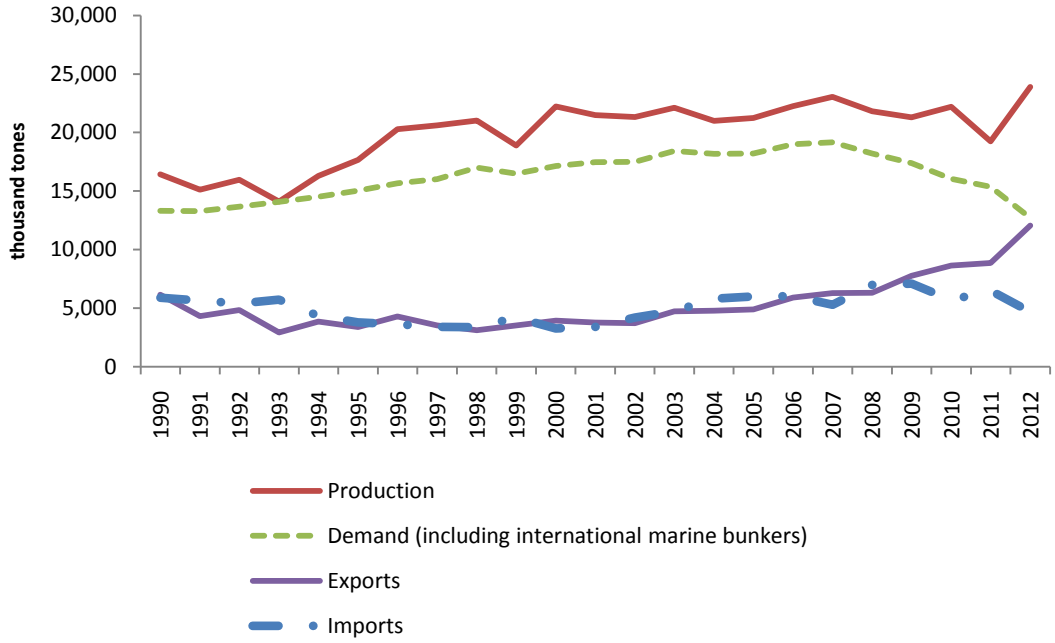


Source: HELPE SA., Quarterly presentations of financial results.

2.5. Domestic demand and production

The demand for petroleum products in the Greek market, after peaking in 2007, has fallen dramatically, reversing a longstanding upward trend, which was closely connected with the growth of the Greek economy (Figure 2.8). In addition to the prolonged recession of the economy, the decline in domestic demand is also attributable to fuel tax hikes, substitution with other fuels and energy sources, the mild climate and energy conservation efforts.

Figure 2.8: Production, demand, imports and exports of petroleum products in Greece, 1990-2012



Source: Eurostat.

From 2008, when the decline of the Greek economy started, until 2013 the sales of petroleum products in the domestic market and the international sales (bunkers and aviation fuels) dropped with rates ranging from -23% for the marine diesel to -70% for heating oil (Table 2.1). Total sales volume decreased by 38% with most of the reduction stemming from products targeted at the domestic market (gasoline, diesel and heating oil), whose sales were particularly affected by increases in the rates of excise duties, VAT and annual car circulation duties that reduced car use.

Table 2.1: Sales of petroleum products in domestic and international markets, 2007-2013p (in thousand tones)

	2007	2008	2009	2010	2011	2012	2013p	2013/12	2013/08
Domestic market								**(%) Μεταβολή**	
Other products	3,759	3,797	3,213	2,490	2,279	2,185	2,238	2%	-41%
Heating oil	3,480	3,017	3,353	2,932	2,883	1,971	915	-54%	-70%
Diesel oil	2,717	2,976	2,837	2,518	2,224	2,063	2,237	8%	-25%
Gasoline	3,956	3,931	4,064	3,722	3,328	2,898	2,666	-8%	-32%
Subtotal	***13,912***	***13,721***	***13,467***	***11,662***	***10,714***	***9,117***	***8,056***	***-12%***	***-41%***
International market									
Marine heavy fuel oil	3,296	3,291	2,988	2,824	2,809	2,392	2,261	-5%	-31%
Marine Diesel	655	581	592	603	490	468	449	-4%	-23%
Jet fuel oil	1,074	1,056	992	883	915	813	786	-3%	-26%
Subtotal	***5,025***	***4,928***	***4,572***	***4,310***	***4,214***	***3,673***	***3,496***	***-5%***	***-29%***
Total	**18,937**	**18,649**	**18,039**	**15,972**	**14,928**	**12,790**	**11,552**	**-10%**	**-38%**

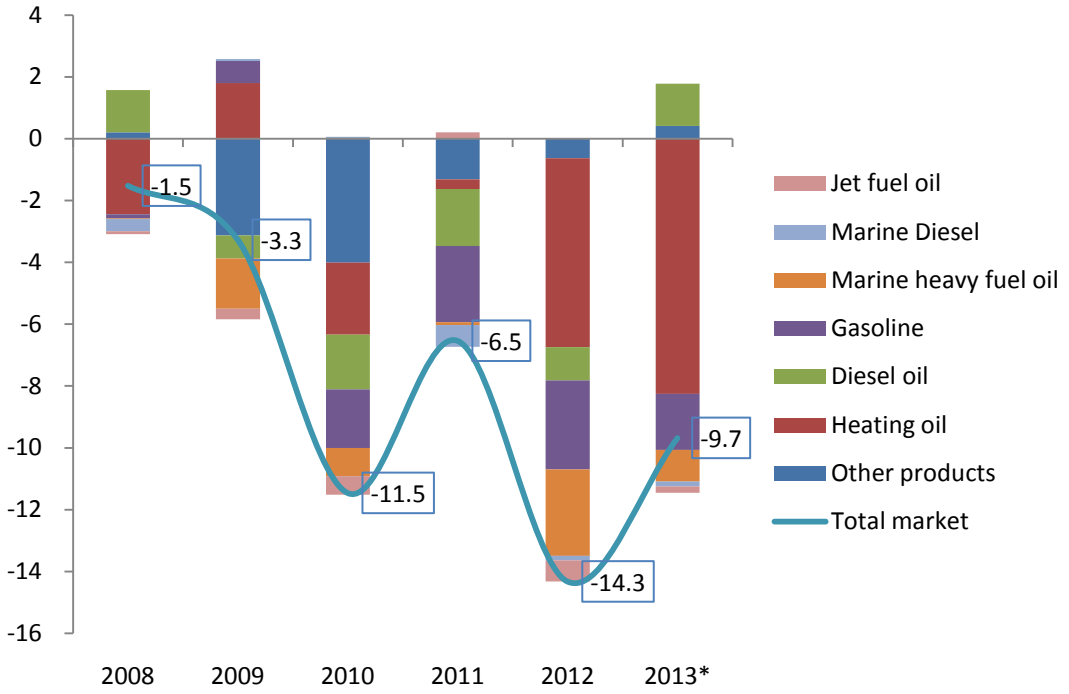
Source: HELPE.

The most significant change occurred in heating oil sales, mainly because of the equation of heating's oil excise duty rate with that of diesel oil in October 2012, which led to a sharp increase in the price of heating oil.[2] However, the resulting reduction in illegal diesel oil

[2] For a detailed analysis of the factors leading to the drastic reduction in the demand for heating oil, see IOBE (2013a).

trade allowed for an increase in diesel oil sales in 2013 by about 8%, which reduced the overall rate of decline in total petroleum products' sales (Figure 2.9). For the rest of the petroleum products, the rate of decline in sales slowed down in 2013, while total demand is expected to stabilise in 2014, provided that the Greek economy also stabilise and the international energy prices and the fuel taxes remain unchanged.

Figure 2.9: Decomposition of the change in petroleum products' sales in domestic and international markets, 2008-2013est. (in percentage points)



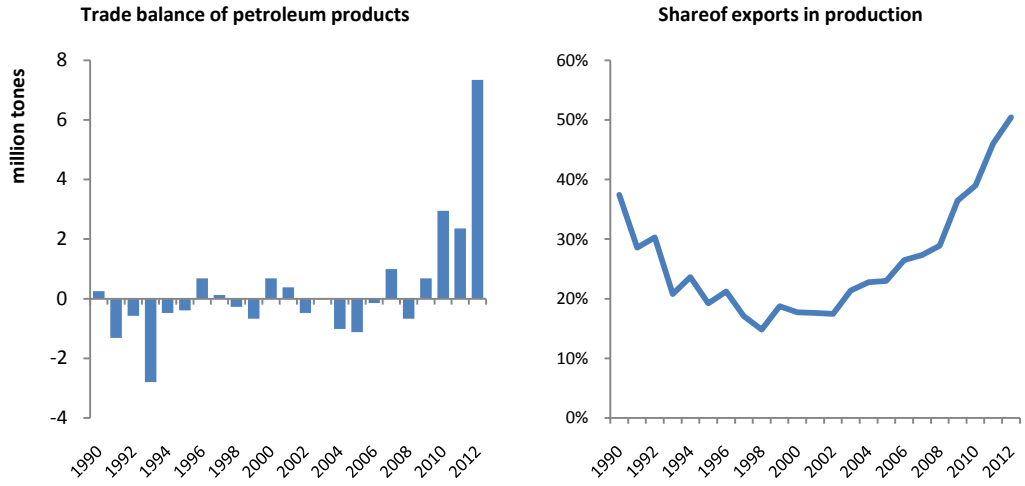
Source: HELPE, Data processing IOBE.

Despite the huge drop in domestic demand, the level of activity of the Greek refineries remained high, with the exception of 2011. The reduction in production in 2011 was temporary and partly due to upgrading works at the Hellenic Petroleum's refinery in Elefsis. Available data show that in 2012, during which domestic demand shrank by 21%, domestic production of petroleum products reached its record high due to the rapid growth of exports, which supplanted even the total domestic final demand (including fuel sales to international bunkers).

The turn to exports provided an outlet for the Greek refineries, which following the contraction in the domestic market faced the risk of low capacity utilisation, falling below the minimum efficient scale of production threshold that would have worsened further their financial results. Thus, after a period of significant investments to modernise and upgrade their capacity and under the pressure from low domestic demand and its weak outlook, the Greek refineries have sought new markets and have expanded in existing markets abroad, mainly in countries outside the EU.

As a result, since 2010 the trade balance (exports minus imports) of petroleum products, after a long period of changes with no clear trend, has shown a strong surplus. In 2012 – a year of drastic reduction in domestic demand – the trade surplus in petroleum products more than doubled and the share of exports in production exceeded 50% (Figure 2.10).

Figure 2.10: Trade balance (in volume) and extroversion of refining sector in Greece, 1990-2012

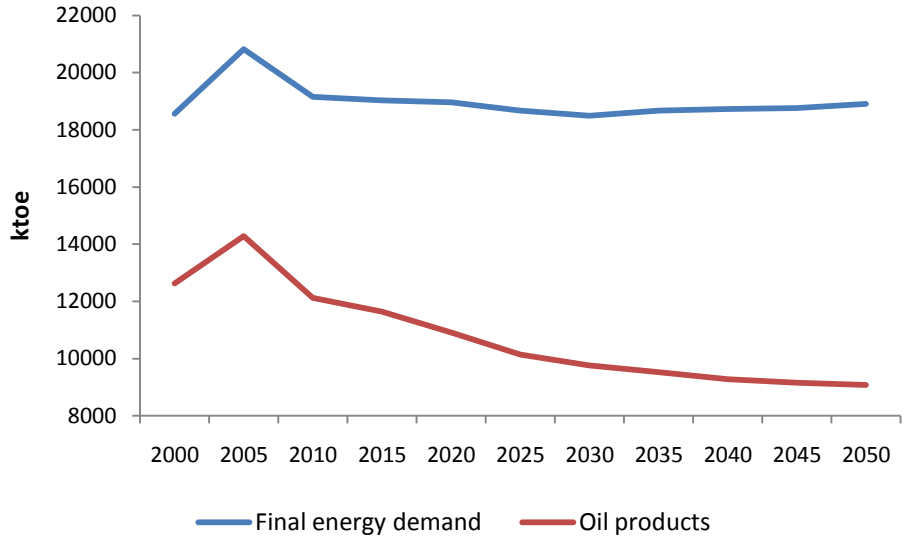


Source: Eurostat, Data processing IOBE.

In the longer term, the domestic environment is not expected to be favourable for the sector. According to the most recent baseline energy scenario of the European Commission,[3] in which the energy system is projected assuming the successful implementation of all existing relevant policies, demand for petroleum products in Greece will decrease faster than overall energy demand (Figure 2.11). In addition, as the existing policies do not achieve the long-term targets for reducing CO_2 emissions in the EU, the need for more ambitious policies (greater energy savings, renewable energy penetration / biofuels, electrification of transport, etc.), will result in an even more unfavourable outlook for the demand of petroleum products in Greece and the EU.

[3] See European Commission (2013), EU Energy Transport and GHG Emissions, Trends to 2050 reference scenario 2013.

Figure 2.11: Projected final energy demand and oil products' demand based on existing EU policies

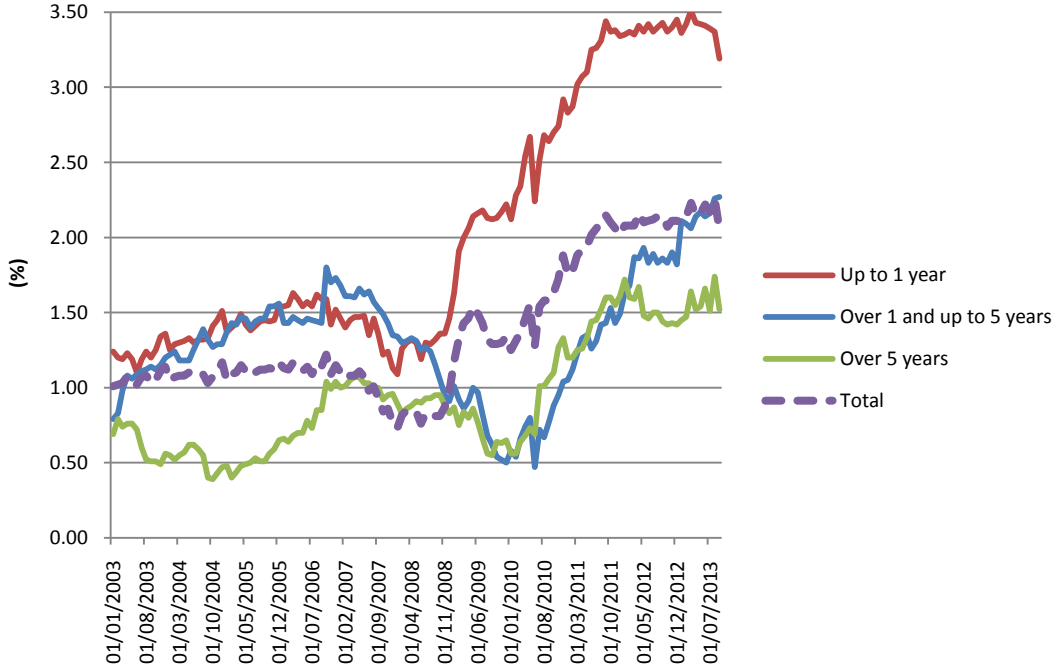


Πηγή: European Commission, 2013b.

2.6. Financing costs

The domestic refining activity is also significantly influenced by the financing conditions. The need for working capital and for funds to finance investment plans is immense. Consequently, even small changes in funding costs may affect the competitiveness of the Greek refineries in the globalised environment of energy markets in which they operate.

Figure 2.12: Interest rate differentials of business loans in Greece vs Eurozone



Source: European Central Bank.

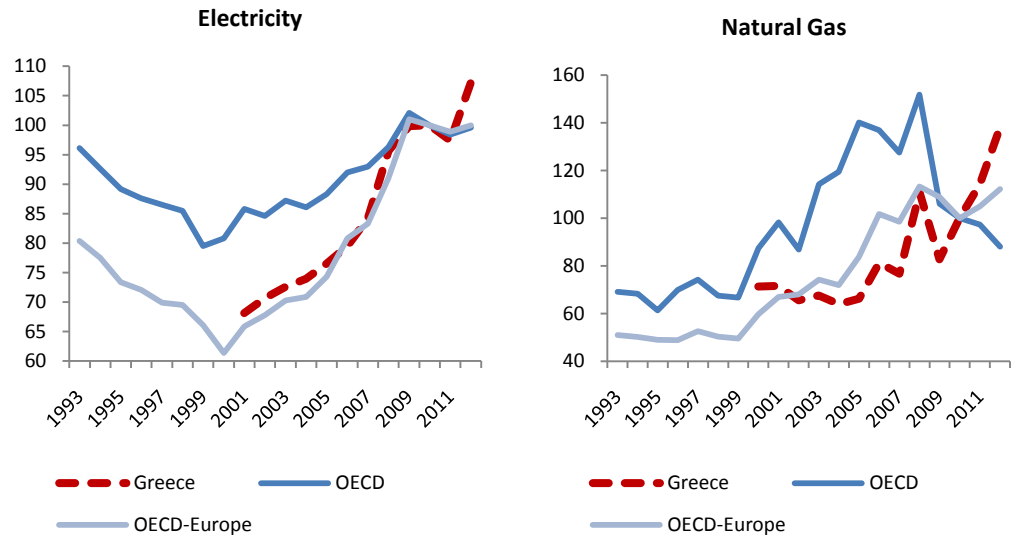
The financing conditions in Greece have deteriorated significantly during the economic crisis. The limited liquidity of banks has affected the borrowing rates, which since October 2009 have moved sharply upward, widening their distance from the base rate of funding from the European Central Bank. Compared with the average rate of corporate loans in the Eurozone, from 2011 onward the Greek companies have taken loans with interest rates higher by approximately 200 basis points (2%) (from about 100 bps before the crisis), while in the case of short-term borrowing the interest rate differential is even greater, having stabilized since the second half of 2011 at 340 basis points.

2.7. Energy cost

Energy cost constitutes a considerable part of the production cost of European refineries, covering on average about 60% of their operating costs in 2010, according to EUROPIA. Taking into account the geographical position of Greece, the differentiation of energy costs, particularly compared with third (non-EU) countries, has a significant impact on competitiveness and greatly affects the viability prospects of the sector.

The energy costs in industry have grown significantly in Greece in recent years (Figure 2.13). The increase in the price index of electricity was rapid, comparable with the respective change of the price index for OECD-Europe, but much higher compared to all OECD countries as a group. The gas prices in Greece increased by 37% during 2010-2012, when in OECD-Europe they increased by 12% on average, while for OECD countries as a whole they decreased by 12%.

Figure 2.13: Energy price indeces in Industry, 1993-2012 (2010=100)



Source: IEA. Price indeces for Greece are based on wholesale prices. The base year has been adjusted in order to allow a comparison with indicators for all OECD.

The increases in final electricity prices in Greece are mainly caused by increases of taxes and duties incurred by domestic and industrial consumers. Since 2010 an excise duty on electricity has been imposed (€ 2.5 per MWh for industries connected to high voltage

transmission network), while the increase in the deficit of the special account held by the electricity market operator (LAGIE) that finances the development of renewable energy in Greece makes it imperative to increase the Special Duty for Emissions Reduction (ETMEAR), which covers the deficit in the special account.

In addition, the need to recover the cost of providing public service obligations (PSO) to the consumers in non-interconnected islands and to low income households has increased.[4] Since January 2013, the electricity tariffs have incorporated the full cost of CO_2 emissions in electricity generation (indirect emission costs), which with the current prices of emission allowances has been set at approximately 4.3 € per MWh.

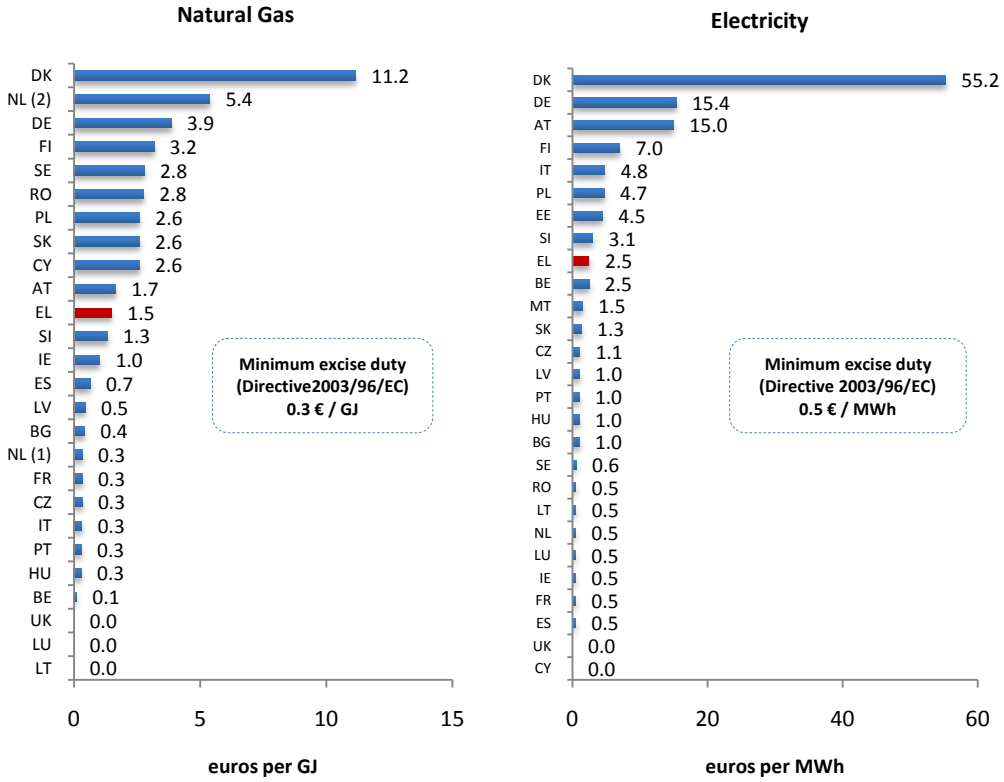
The gas prices for the Greek industry are mainly depending on import prices set by long-term contracts of DEPA (the main importer of natural gas in Greece) with gas suppliers. In turn, changes in the import prices of natural gas are influenced by the evolution of oil prices, with which they are linked in the long-term contracts (oil-indexed gas pricing). Thus, the rise in international oil prices in recent years has pushed up the gas prices for domestic industry, which are among the highest in Europe in the absence of a gas spot market in the region with sufficient liquidity, in which the prices would be formed by supply and demand of gas (gas-to-gas pricing). It should also be noted that in the case of gas an excise tax amounting to € 5.4 per MWh has been applied since 2011, which has put an additional burden on final gas prices and therefore on industrial production costs. Given the low penetration of natural gas in the refining sector, the issue arising from high final gas prices is the lack of incentives for the substitution of alternative fuels with natural gas to reduce both the processing cost and the CO_2 emissions of refineries.

The excise duties on electricity and natural gas in Greece are significantly higher compared with the minimum specified in the relevant EU Directive (2003/96/EC). Compared to other EU Member States, Greece is in the group of countries with relatively high rates of excise duty on natural gas and electricity. Compared to the EU Member States in the South and Eastern Europe, the rates in Greece are among the highest.

What is perhaps more important is that the refining sector in Greece is charged with higher prices than their competitors in third countries. According to a recent study on prices and energy costs in the EU during the period 2008-2012 (European Commission, 2014a), the European industry is burdened with almost the highest energy cost worldwide. In 2012 the cost of electricity for industry in the EU was 20% higher compared with China, over 65% of that of India and twice as much compared with the US and Russia. Gas prices during the same period were four times higher than in the US, Canada, India and Russia.

[4] The energy intensive industries connected at high voltage network had lower increases in these regulated charges compared to other consumer categories.

Figure 2.14: Excise duty rates for natural gas and electricity in Industry



Source: European Commission, Excise Duty Tables, January 2014.
(1) Large consumers, (2) Very small consumers.

Therefore, the refining industry in Europe and even more in Greece, which has a higher intensity of trade with third (non-EU) countries, as we will see in the next chapter, has a clear competitive disadvantage, at least as regards energy prices.

Recently, the importance of energy costs for industrial competitiveness was recognised by the Greek authorities. In February 2014 the Greek government announced a package of measures to reduce energy costs for industry (implementation of demand side management measures for installations connected at the high voltage network, reduction in industrial electricity tariffs, reduction of import prices for gas, offsetting of indirect emissions costs, etc.). These measures should lead to a reduction in total energy costs of about 20-30%.

For the refining sector it is estimated that the implementation of these measures will reduce the cost of electricity by about 15%. Additional measures that would have a positive impact on reducing electricity costs are the reduction of the excise duty, PSO charge and RES levy on the electricity tariffs for industry. Such an intervention would save the industry up to € 9.5 million per year. In addition, a further reduction of energy costs of about € 4.8 million per year could be achieved by compensating for the indirect costs of CO_2 emissions. However, this should be seen in the context of EU rules on state aid, where the Greek side must push for expanding the selection criteria of sectors eligible for compensation for indirect emission costs, given the high volume of trade of Greek refineries with countries outside EU.

Table 2.2: Indicative estimation of the benefit for the refining sector by reducing taxes and other charges on electricity tariffs

Electricity	Current situation	Reduction scenario	Abolition Scenario	Units
Consumption	1,126,000	1,126,000	1,126,000	MWh
Excise duty	2.50	0.50	0.50	€/MWh
Public Service Obligations	4.14	2.07	-	€/MWh
RES levy	2.23	1.12	-	€/MWh
CO_2 charge	4.30	4.30	4.30	€/MWh
Expenditure	78,820,000	68,139,890	64,553,580	€
Excise duty	2,815,000	563,000	563,000	€
Public Service Obligations	4,661,640	2,330,820	-	€
RES levy	2,510,980	1,255,490	-	€
CO_2 charge	4,841,800	4,841,800	4,841,800	€
	14,829,420	8,991,110	5,404,800	€
Benefit		5,838,310	9,424,620	€
Additional benefit from offsetting indirect CO_2emission cost		4,841,800	4,841,800	€
Total annual benefit for the refining sector		**10,680,110**	**14,266,420**	€

Source: IOBE.

Electricity consumption: Average of 2008-2011 from Eurostat. Indicative electricity price: 70€/MWh.

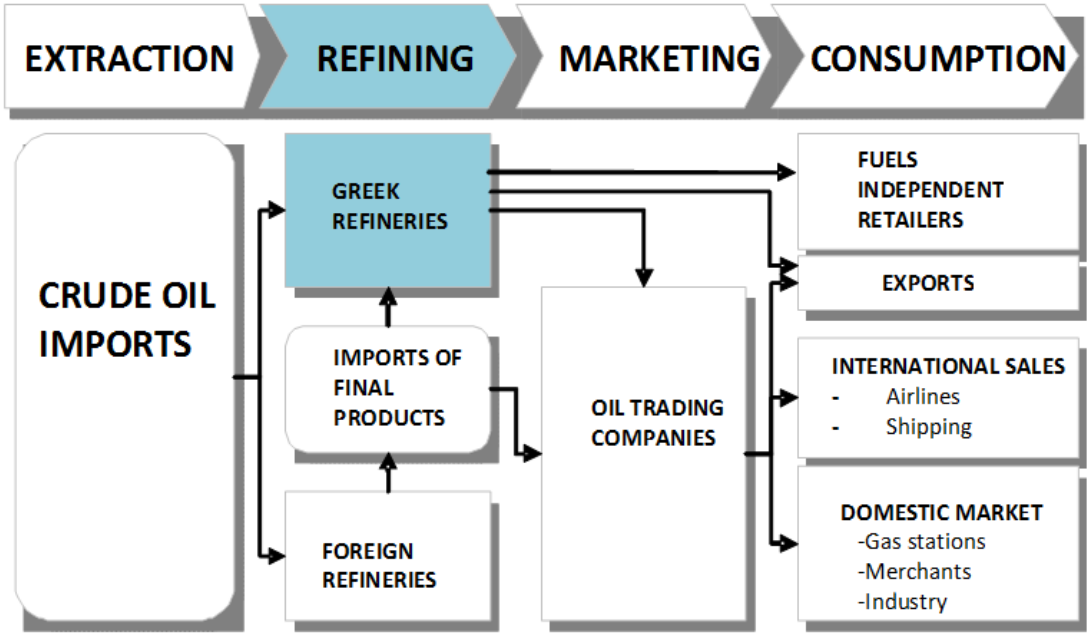
The fall in the import price of natural gas could act as an incentive for its use from refineries. However, the sector (and the economy as a whole) would have a further significant benefit by adjusting the gas excise duty to the minimum possible level (from 5.4 to 1.08 € / MWh). With potential consumption of about 5.5 TWh per year, the benefit for the refining sector is approaching € 24 million.

3. The contribution of the refining sector to the Greek economy

3.1. Introduction

The petroleum refining industry is a vital link in the supply chain of petroleum products (Figure 3.1). It imports and processes crude oil, producing intermediate and finished petroleum products. The products are then directed for final consumption (domestic demand and exports), mainly through the network and infrastructure of oil trading (marketing) companies.

Figure 3.1: Supply chain of oil from the Greek market perspective



Two groups of companies (Hellenic Petroleum SA and Motor Oil Hellas SA) operate four refineries with a total refining capacity of 526,000 barrels per day or 26.3 million tons per year (Table 3.1). With continuous investments in modernization and upgrading, the Greek refineries have achieved a high Nelson complexity factor. For comparison, the average capacity of European refineries is about 144,000 barrels per day, while the average Nelson complexity factor is 7.63 (IHS, 2013). In Greece, the average capacity is slightly smaller, 131,000 barrels per day, but the average complexity factor is well above the European average (9.57). It is worth noting that the most complex refineries have the capability of producing petroleum products with high market value and can process most types of crude oil and thus exploiting variations in price and availability. Moreover, they can adapt more easily to changing market conditions and local fuel specifications. These factors contribute to better profitability, but the greater complexity requires significant investments and implies an increased need for inputs and energy use.

Table 3.1: Capacity of Greek refineries, 2013

Refinery	Owner	Refining capacity		Nelson complexity factor	Type
		Million tones per year	Thousand barrels per day		
Aspropyrgos	Helpe SA	7.5	148	11.0	Cracking (FCC)
Eleysina	Helpe SA	5.0	100	8.1	Hydrocracking
Thessaloniki	Helpe SA	4.5	93	7.3	Hydroskimming
Korinthos	Motor Oil SA	9.3	185	10.4	Cracking (FCC)
Σύνολο		**26.3**	**526**	**9.6**	

Source: Annual reports of Helpe SA and Motor Oil SA.

Overall, the existing refining capacity in Greece is sufficient to meet domestic demand, except for some periods where due to the seasonality of demand some imports might be necessary (e.g. heating oil). Indicatively, the total demand for petroleum products in 2012 amounted to 12.7 million tons. As mentioned in the previous chapter, with the decline in domestic demand in recent years Greece has become a major net exporter of petroleum products. Furthermore, the presence of the industry minimises whatever problems may arise by short-term interruptions to the smooth supply of oil, enhancing the security of energy supply in the country.

3.2. Main structural statistics

In addition to the sufficient way with which the sector covers domestic demand and the security of supply that it ensures, the oil refining industry has significant presence in domestic manufacturing and the overall Greek economy (Table 3.2).

Table 3.2: Main structural statistics of the Greek refining sector, 2005-2011 (in million euros)

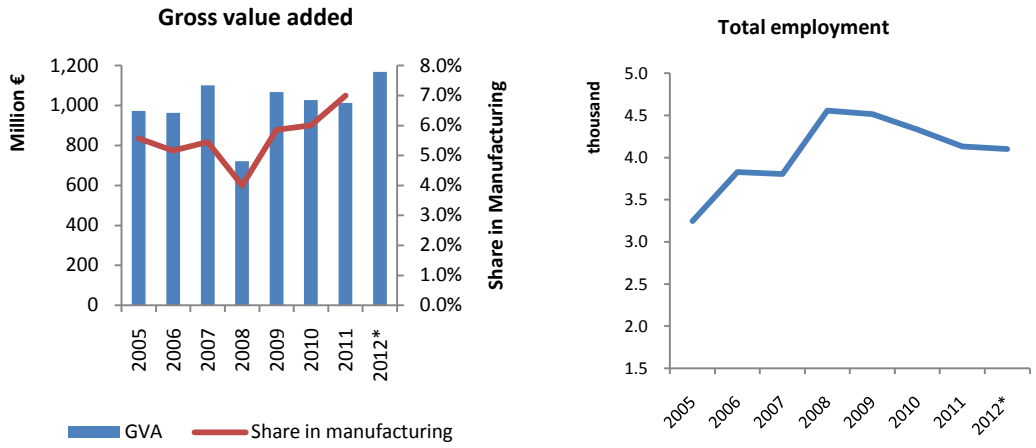
	2005	2006	2007	2008	2009	2010	2011
Employment (persons)	3,246	3,828	3,806	4,557	4,513	4,333	4,129
Labour cost	246	259	265	350	389	349	356
Remuneration of employees	*191*	*200*	*205*	*268*	*305*	*268*	*275*
Social security contributions	*56*	*59*	*60*	*81*	*84*	*81*	*80*
Gross production value	7,390	8,837	9,544	12,875	9,235	12,760	14,363
Total intermediate consumption	6,417	7,874	8,442	12,154	8,168	11,732	13,350
Gross value added (GVA)	973	963	1,102	721	1,068	1,028	1,013
Value of production sold	6,912	8,362	9,184	12,538	8,820	11,964	13,642
Investments	406	114	66	314	223	378	373
Turnover	NA	NA	NA	17,297	11,949	15,340	19,181
Investment intensity (Investments /GVA)	*42%*	*12%*	*6%*	*44%*	*21%*	*37%*	*37%*
Average labour cost (in thousand €)	*75.9*	*67.5*	*69.6*	*76.7*	*86.2*	*80.6*	*86.1*
GVA/Production value	*13%*	*11%*	*12%*	*6%*	*12%*	*8%*	*7%*
GVA share in manufacturing	*5.6%*	*5.2%*	*5.5%*	*4.0%*	*5.9%*	*6.0%*	*7.0%*
Employment share in manufacturing	*0.8%*	*1.0%*	*0.9%*	*1.1%*	*1.1%*	*1.1%*	*1.2%*
Investments share in manufacturing	*16.9%*	*3.6%*	*2.5%*	*8.9%*	*7.1%*	*13.4%*	*25.9%*

Source: ELSTAT. Data processing IOBE.
(NA: Not available data)

In recent years, the added value resulting from the productive activities of the sector has constantly stood at more than € 1 billion, contributing about 7% of the manufacturing value added and 0.5% of the Greek GDP in 2011 (Figure 3.2). The contribution of the industry has expanded during the financial crisis, because the refineries have managed to increase their production through exports, in contrast to overall manufacturing, which recorded a continuous decline in its production volume (Figure 3.3). Furthermore, approximately 4,100

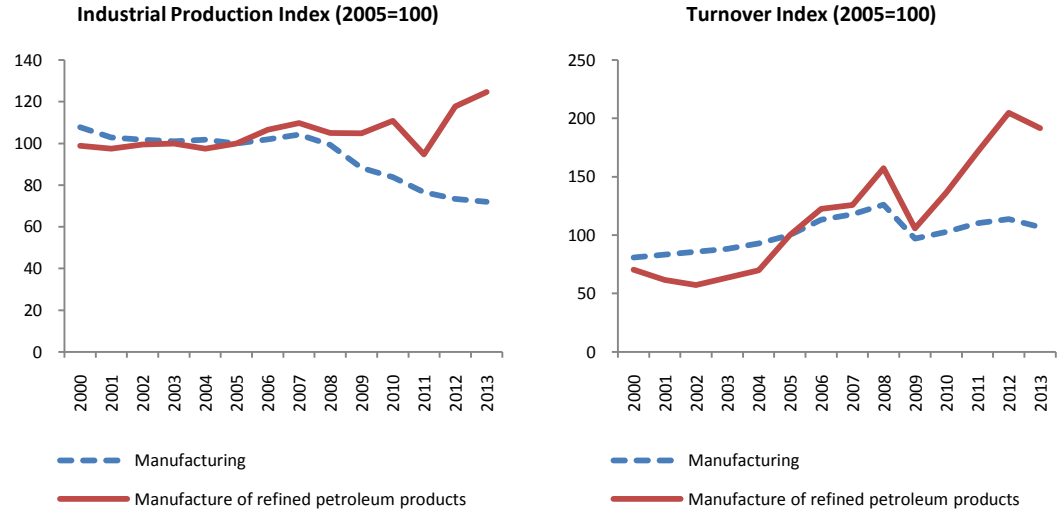
people are directly employed in the Greek oil refining industry, with small – but growing – share in manufacturing, as the refining industry is capital intensive. Since 2008 employment in the sector has slightly decreased, at a lower rate however compared with total manufacturing.

Figure 3.2: Gross value added and employment in petroleum refining sector, 2005-2012*



Source: ELSTAT. *IOBE estimation.

Figure 3.3: Industrial production and turnover index of the Greek refining sector, 2000-2013



Source: ELSTAT.

The investment activity of the sector is also remarkable, as its viability depends on its ability to adapt to changes in the external environment and to comply with the strict standards set by the European and national legislation, particularly in relation to the environmental performance of the industry and its products. According to official figures, from 2008 to 2011 the Greek refineries carried out investments worth €1.3 billion, a size that corresponds to 12% of the investments in domestic manufacturing during the same period.[5] This is

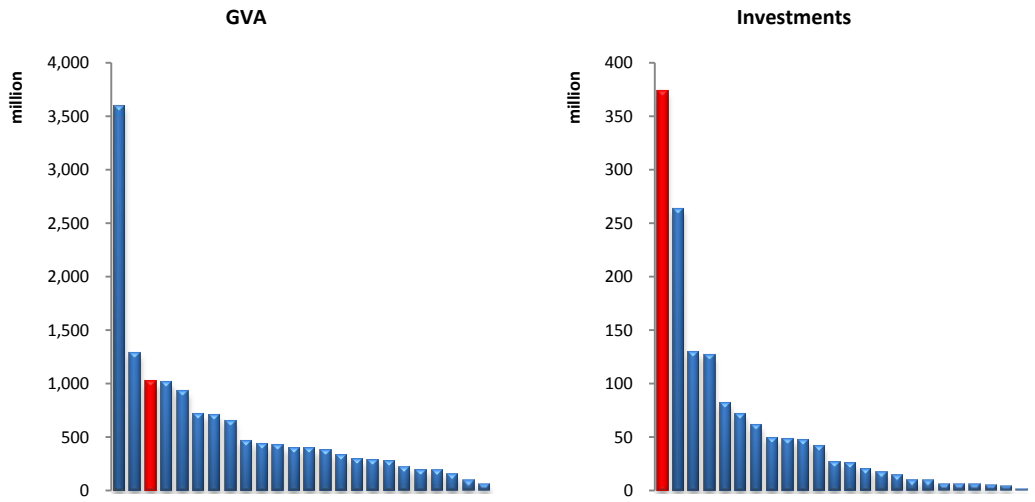
[5] According to data published in Greek oil companies annual reports, total investments in the period 2009-2012 exceeded € 2.7 billion.

particularly important at a time of a drastic reduction of investment and deferral of investment plans due to the unfavourable conditions in the Greek economy and notably the lack of funding.

For a long time period (2005-2011) the sector's investment intensity (investment expenditure over value added) exceeded 28% on average, when in manufacturing it was slightly above 15%. It should be noted that the index of investment intensity of the sector reached 37% in 2010 and 2011, while in the previous investment cycle it had exceeded this value. This means that a large part of the operating surplus of the sector is reinvested.[6] Thus in 2011 the investments made by the sector accounted for 26% of total investment in manufacturing.

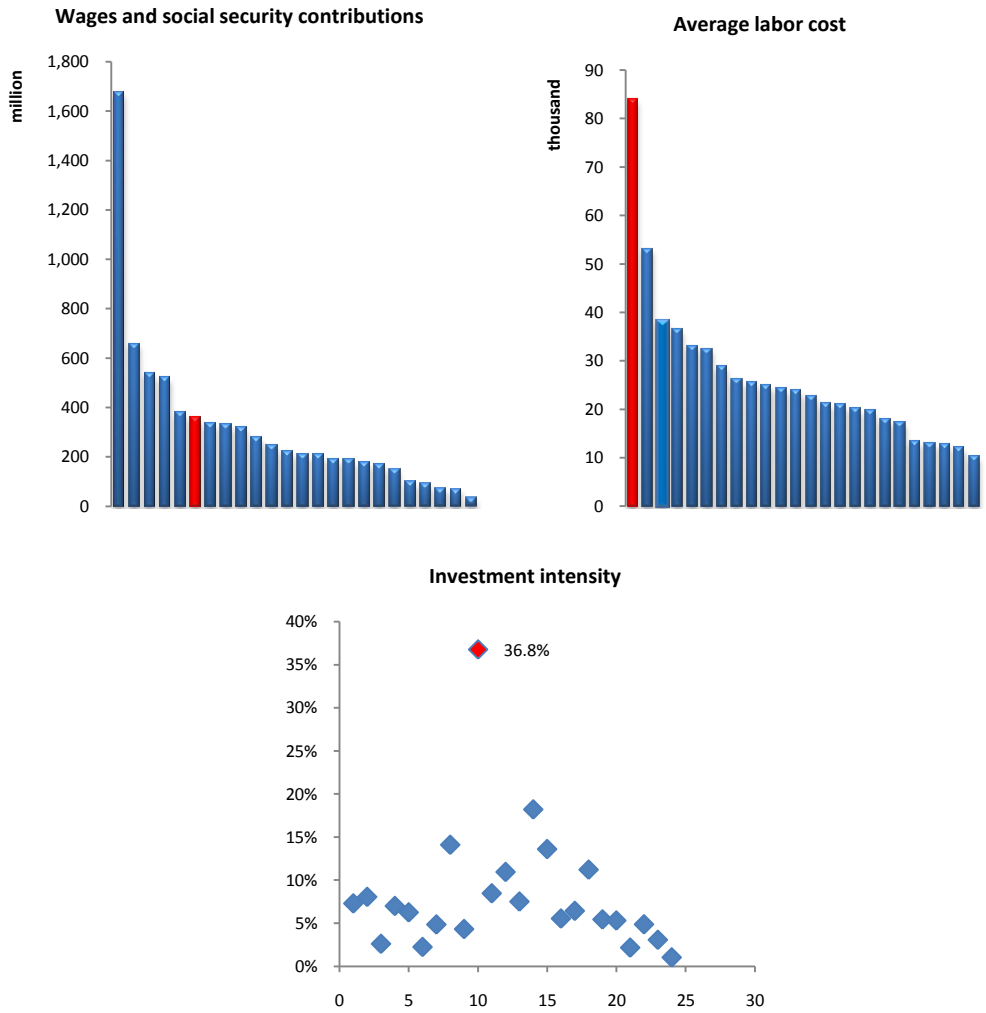
Figure 3.4 shows the ranking of the refining sector compared with other broadly defined sectors of the domestic manufacturing (at 2 digit level of NACE rev. 2) in 2011. In terms of value-added, the refining sector ranks third, while based on the investment activity it comes first. Regarding total labour remuneration and social security contributions the sector holds the sixth position, while it has the highest average remuneration level in manufacturing.[7] Moreover, the investment intensity in the refining industry is the highest in domestic manufacturing.

Figure 3.4: Refining sector's position in domestic manufacturing, 2011



[6] The operating surplus is equal to gross value added minus wages and social security contributions.

[7] At the EU level in 2011 and for those countries that data were available, the average labor cost is estimated at € 61,000 and € 87,000 if we exclude the countries of Eastern Europe. For comparison the respective figure for Greek refineries is € 86,000 (€ 22,000 for Greek manufacturing).



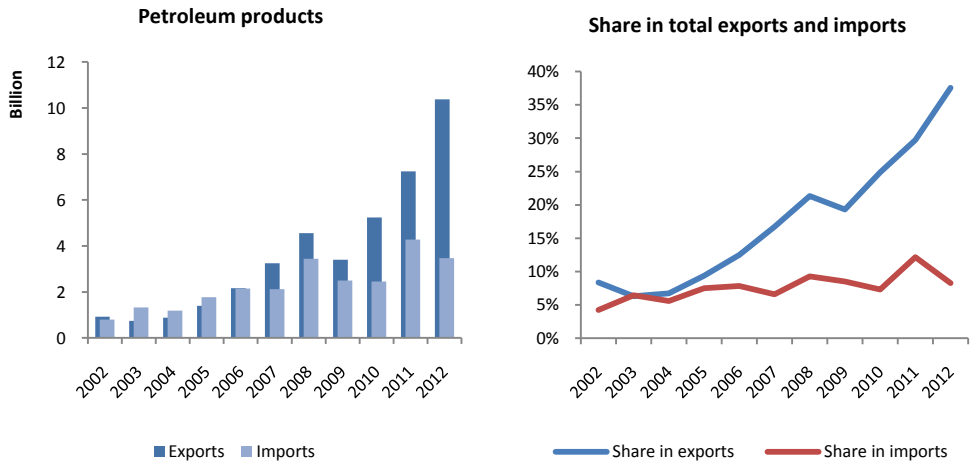
Source: ELSTAT. Data processing IOBE.

3.3. Exports and contribution to trade balance

A less obvious impact from the activity of the Greek refineries comes from their contribution to the reduction of the trade deficit. With the exports of petroleum products reaching €10.3 billion in 2012, most of which (86%) going to non-EU countries, the Greek refineries contributed 37.5% of the total exports of the country, from 8.4% a decade earlier. Meanwhile, imports remained relatively stable (Figure 3.5). As a result, according to Bank of Greece data, the import coverage ratio of crude oil and petroleum products with exports increased from 25% in 2005 to 42% in 2012.

The export performance of the sector has supported the growth of Greek exports in the recent crisis years, cutting down in this way out the country's current account deficit. It is notable that 96% of the 13.4% growth in Greek exports of goods in 2012 (i.e. 12.8 percentage points) was due to the increase in the exports of petroleum products.

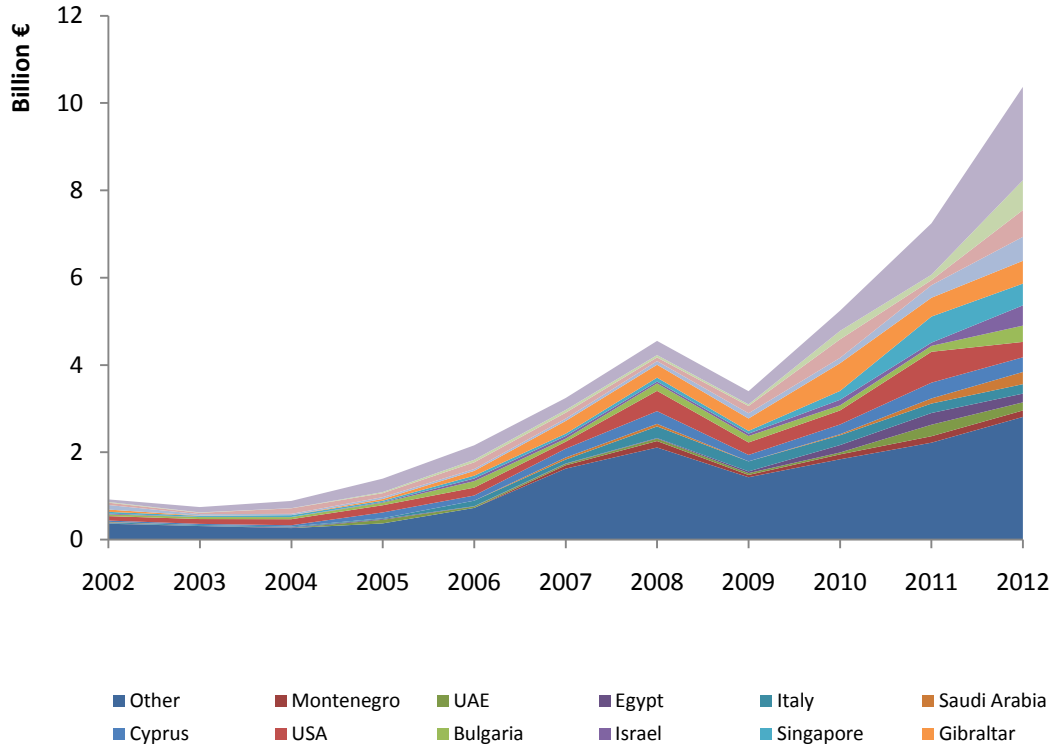
Figure 3.5: Exports and imports of petroleum products and their share in total trade of goods, 2002-2012 (in billion euros)



Source: Eurostat. Data processing IOBE.

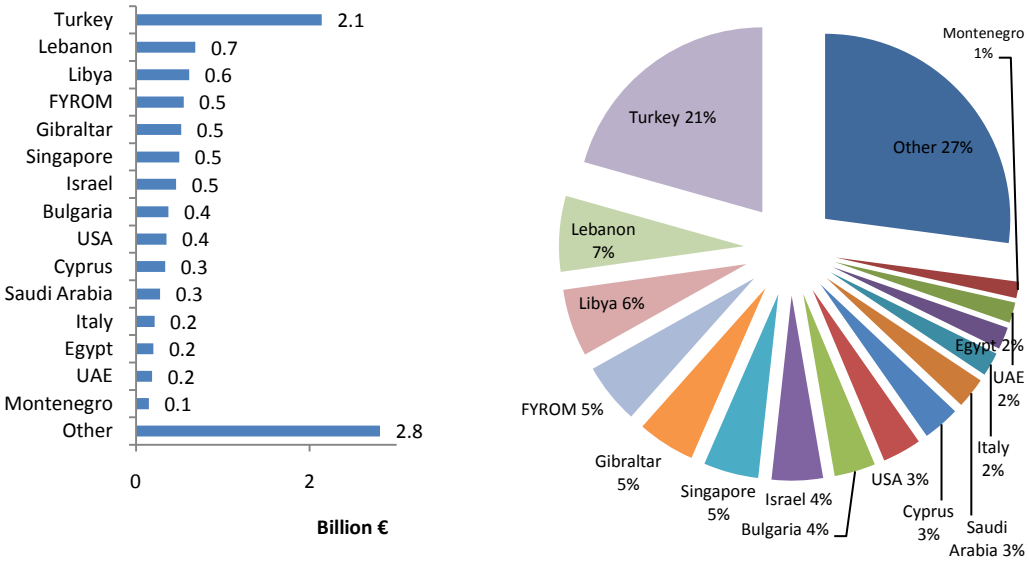
The geographical distribution of the petroleum products' exports highlights the significant challenges that the Greek refineries are facing (Figure 3.6 and Figure 3.7). The majority of exports are directed to neighbouring countries that are not EU members. The most important of these is the Turkish market, which accounts for about one third of the increase in exports in 2012. These markets, however, are contestable by refineries from other nearby regions, such as the Middle East and Russia, in which as we have already mentioned modern refining capacity is being built. This particularity, due to the geographical position of Greece, is critical for evaluating the impact of EU policies and will be analysed in the next chapter.

Figure 3.6: Evolution of the exports of Greek petroleum products



Πηγή: Eurostat.

Figure 3.7: Level and composition of exports of Greek petroleum products in 2012



Source: Eurostat. Data processing IOBE.

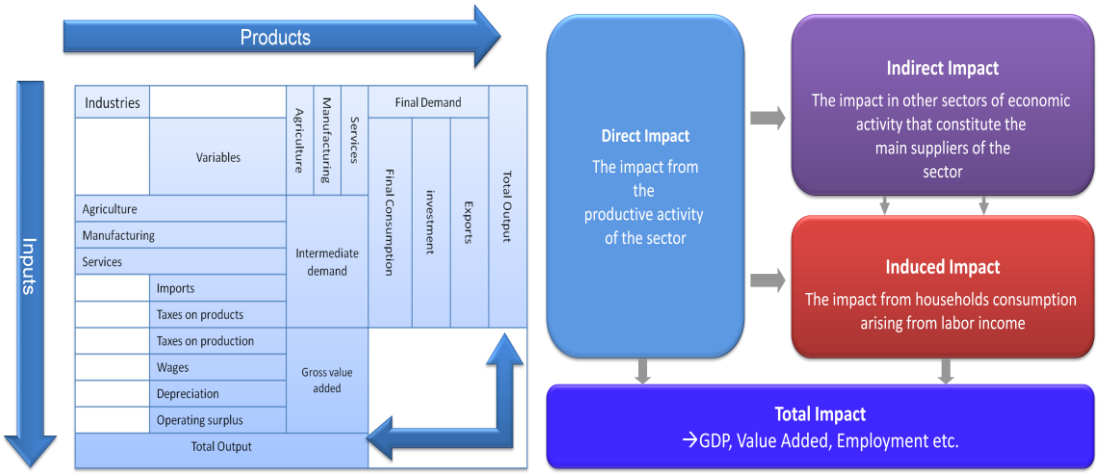
3.4. The total contribution of the refining sector to the Greek economy

The value added of a sector and the jobs that it creates do not highlight its total contribution to the economy, as these metrics do not take into account the interactions with other sectors of economic activity. This gap is covered by the input-output analysis, which captures the interdependencies of industries in an economy. It is used to estimate the total economic impact of an exogenous change, such as a new investment, in economic activity and to determine the overall contribution of a sector to the national economy. It was developed in the mid 20th century by the Russian-born economist Wassily Leontief, who was awarded the Nobel Prize in Economics in 1973 for the development of the input-output model and its application to practical issues.

Essentially, the total contribution of a sector is derived comparing the economy with a hypothetical scenario, where the intermediate and final demand of the industry's products and services is met entirely by imports. In this hypothetical scenario an economy loses not only the value added and jobs created directly by the industry when it satisfies the intermediate and final demand for its products, but also the value added and jobs in all other sectors to the extent that they are involved in the supply chain of the examined sector.

The model is based on input-output tables that describe the interactions of production and demand by industries and other sectors of the economy (Figure 3.8). Every industry uses as inputs in its production process products and services from other industries. On the output side, the production of each industry goes to intermediate consumption in other sectors of the domestic economy, to final consumption of households and the state, to investments and to exports.

Figure 3.8: Input-Output tables and types of impacts to the economy



The difference between the total value of production and the value of intermediate consumption of a sector is the Gross Value Added (GVA) of the sector, which corresponds to the resources available to the sector's companies for the payment of salaries, employer contributions, depreciation, direct taxes and dividends to their shareholders and for creating reserves.

By adding indirect taxes such as VAT, excise duties, etc., to the GVA of all sectors we come up with the Gross Domestic Product (GDP) of the country, which is also calculated as the sum of final consumption (from households and government), investment (private and public) and net exports (exports minus imports).

The analysis in this study is based on the input-output tables of the Greek economy from Eurostat's database for 2010, which include 64 sectors of the economy. An adjustment of the tables was made to reflect more accurately the interdependencies of the refining industry and their suppliers, and in figures such as production value, value added, wages and social security contributions, using data from the Annual Structural Business Statistics survey of the Hellenic Statistical Authority (EL.STAT.).

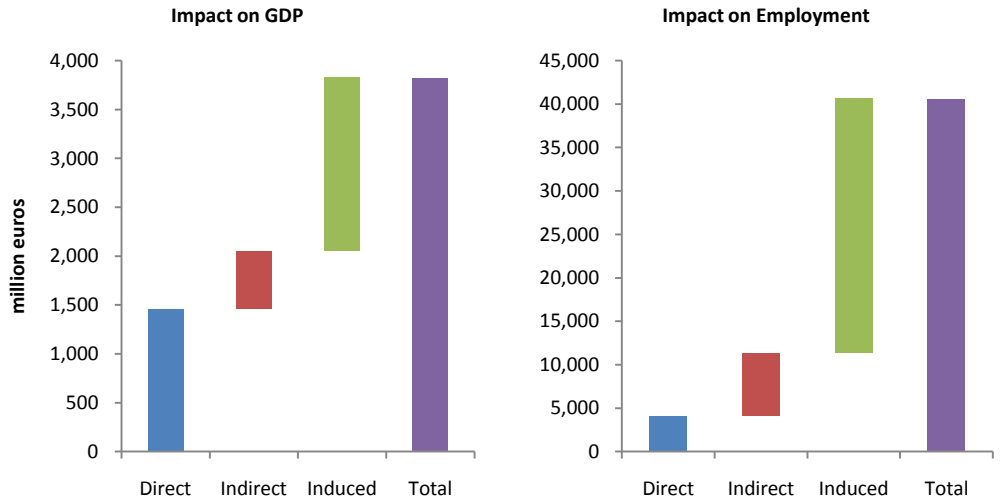
The reference year for our estimation is 2012. We have not taken into account both the contribution to the economy from investment projects of the industry and the contribution of the sectors with which the refineries have forward linkages, such as the petroleum trade sector. For the direct contribution of the latter, however, a specific reference is made in the next section.

In terms of the input-output model, the overall economic impact of the oil-refining sector has three components: direct, indirect and induced impact.

- The direct impact refers to economic effects resulting from the productive activities of the sector, without taking into account the linkages with other sectors of the economy.
- The indirect impact refers to economic effects resulting from the linkages among the sectors of the economy. The activity of one sector requires inputs of goods and services from its suppliers. Thus, the expenditure for buying these inputs provides income for the suppliers, which would not have arisen without the initial demand. In addition, the suppliers should obtain inputs from their own suppliers, spending for this purpose money, which constitutes income for their suppliers etc. The final indirect impact on the economy is the overall result coming through the entire chain of economic linkages.
- The induced impact refers to the effect caused by the change in consumption expenditure (private consumption) of workers in the sectors affected directly or indirectly by a change in final demand. Employees in these sectors spend their wages to purchase goods and services, thus creating income to sectors and companies that provide these goods and services. The increased demand for the products of the sectors involved in the supply chain of consumer goods raises economic activity and employment in these sectors.

Based on the above and according to our estimates, the total impact of the refining industry on the Greek economy is considerably stronger. If we also take into consideration the indirect and induced effects, alongside the direct impact of the sector, it is estimated that the refining activity contributed about €3.8 billion (2% of GDP) and more than 40,600 jobs to the domestic economy (Figure 3.9).

Figure 3.9: Direct, Indirect and Induced impact of refining sector on GDP and Employment, 2012 (in million euros)



Source: IOBE.

In particular, total Gross Value Added created by the refining industry in the economy approached €3.2 billion, 46% of which is attributable to the induced contribution of the sector due to the strengthening of private consumption (induced effect) (Table 3.3).

The indirect effect (without the effect of boosting private consumption) reaches 15%, reflecting the sector's relatively low intermediate consumption of products and services from the domestic economy, as the main part of intermediate consumption consists of the imported crude oil.[8] It follows that every unit of value added produced by the refining sector generates 2.7 units of value added in the overall economy.

Table 3.3: Economic impact of the refining sector in Greece, 2012 (in million euros)

	Direct	Indirect	Induced	Total
Gross production value	16,574	1,616	2,449	20,639
Gross value added	1,169	553	1,447	3,169
GDP	1,459	592	1,776	3,828
Labour income	273	182	373	829
Taxes on products	*290*	*39*	*329*	*659*
Taxes on production	*0*	*0*	*-25*	*-25*
Labour income taxes	*19*	*13*	*26*	*59*
Total taxes	310	52	331	693
Social security contributions	80	65	101	246
Taxes and social security contributions	390	117	432	939
Employment (number of jobs)	4,100	7,236	29,293	40,629

Source: IOBE.

[8] The standard form of input-output tables does not permit the estimation of the indirect impact resulting from maritime transport of crude oil in Greece, to the extent that this occurs through shipping offices located in Greece. This happens because crude oil imports are tabulated in CIF prices which include transportation costs. Therefore, the indirect and induced effects of the refining sector are likely underestimated.

Table 3.4: Economic impact of the refining sector by economic activity, 2012

	Value Added (million €)				GDP (million €)			
Sector	*Direct*	*Indirect*	*Induced*	*Total*	*Direct*	*Indirect*	*Induced*	*Total*
Agriculture	0	3	56	59	0	3	61	64
Mining	0	71	2	74	0	78	2	80
Manufacturing	0	28	127	155	0	32	138	170
Refining	1,169	51	6	1,226	1,459	64	8	1,531
Utilities	0	43	63	105	0	45	67	112
Construction	0	2	8	10	0	2	9	11
Wholesale and retail trade	0	19	189	208	0	20	197	218
Transport and storage services	0	10	41	51	0	11	46	57
Hotels and restaurants	0	6	163	169	0	6	173	179
Communication and Information technologies	0	16	83	99	0	17	87	104
Financial services	0	132	73	205	0	136	75	211
Services	0	170	522	692	0	176	530	706
Public administration	0	0	7	7	0	0	7	7
Health, Education and Social services	0	2	105	107	0	2	108	110
Total	**1,169**	**553**	**1,445**	**3,169**	**1,459**	**592**	**1,508**	**3,560**
	Employment (thousand persons)				**Labor income (million €)**			
Sector	*Direct*	*Indirect*	*Induced*	*Total*	*Direct*	*Indirect*	*Induced*	*Total*
Agriculture	0	0.2	4.6	4.8	0	0	9	10
Mining	0	0.3	0.0	0.3	0	39	1	40
Manufacturing	0	0.8	3.0	3.8	0	13	44	56
Refining	4.1	0.2	0.0	4.3	273	12	1	287
Utilities	0	0.2	0.5	0.7	0	10	19	29
Construction	0	0.0	0.3	0.4	0	1	3	3
Wholesale and retail trade	0	0.7	7.1	7.8	0	8	77	85
Transport and storage services	0	0.3	1.4	1.7	0	5	16	21
Hotels and restaurants	0	0.1	3.7	3.8	0	1	24	25
Communication and Information technologies	0	0.1	0.7	0.8	0	4	17	21
Financial services	0	1.4	0.8	2.2	0	58	31	89
Services	0	2.7	4.7	7.4	0	31	73	104
Public administration	0	0	0.2	0.2	0	0	4	4
Health, Education and Social services	0	0.0	2.3	2.3	0	1	52	53
Total	**4.1**	**7.2**	**29.3**	**40.6**	**273**	**182**	**373**	**829**
	Tax revenues (million €)				**Social security contributions (million €)**			
Sector	*Direct*	*Indirect*	*Induced*	*Total*	*Direct*	*Indirect*	*Induced*	*Total*
Agriculture	0	-1	-19	-20	0	0	1	1
Mining	0	9	0	9	0	13	0	14
Manufacturing	0	5	10	15	0	3	11	14
Refining	310	14	2	325	80	3	0	84
Utilities	0	4	5	9	0	3	4	7
Construction	0	0	1	1	0	0	1	1
Wholesale and retail trade	0	1	14	15	0	2	24	26
Transport and storage services	0	2	8	10	0	1	5	7
Hotels and restaurants	0	0	11	12	0	0	6	6
Communication and Information technologies	0	1	5	6	0	1	6	8
Financial services	0	9	5	13	0	27	14	41
Services	0	8	14	22	0	9	17	26
Public administration	0	0	0	0	0	0	2	2
Health, Education and Social services	0	0	6	6	0	0	10	11
Total	**310**	**52**	**63**	**425**	**80**	**65**	**101**	**246**

Source: IOBE.

The direct employment in the Greek refineries is estimated at 4,100 people in 2012. However, the overall jobs supported directly and indirectly by the production activity in the refining sector are estimated at 40,629. This implies that each job in the refining sector generates a total of 10 jobs in the wider economy. The indirect effect of sector's employment is significant (18% of total), but it is the induced effect that supports the majority of jobs in other sectors of the economy. This result is reasonable given the well-paid jobs in the sector and the greater labour intensity, both in the sectors in which refineries source their inputs, and the sectors in which the private consumption expenditure is directed.

The contribution of the sector to the income from labour and to the revenues from taxes and social security contributions is also of particular importance. The total estimated labour income generated in the economy by all types of effects associated with the activity of the Greek refineries reaches € 829 million, with social security contributions approaching € 250 million. Fiscal revenues from taxes - excluding the revenues from excise duties on petroleum products – are estimated at € 310 million and increase to € 659 million if indirect and induced effects are counted.

Services and the financial sector have the largest indirect impact on value added and employment. When we account for the induced effects, the most favoured sectors are those related to goods services purchased by households, such as activities related to real estate (purchase and rental of houses), hotels and restaurants, retail trade, etc. Table 3.4 presents the results of direct, indirect and induced effects aggregated in 14 sectors of economic activity.

3.5. The contribution of the sector of trade of petroleum products

The refining industry contribution to the economy was estimated compared with a hypothetical scenario in which the demand for petroleum products was entirely met by imports. A reasonable assumption was made, that the infrastructure of the sector of petroleum product trade, irrespective of the existence of oil refineries in Greece, would continue to exist in order to supply the domestic market. Therefore, the trading activity of petroleum products, despite the fact that it has its own contribution to the economy, was not included in the contribution of the refining sector.

However, we must not ignore the fact that the Greek refineries have expanded their activities to the trade of petroleum products in which they have a significant market share, which was extended after the acquisition of two multinational marketing companies, who recently left the Greek market. Thus, the already close interconnection of the refining sector with the trade activity became even stronger.

Many of the factors affecting the fuel trade sector shape also the domestic market environment of the Greek refineries. For example, the demand conditions and the tax treatment of fuels, the deteriorating profitability and liquidity in the wholesale and retail markets of petroleum products and other factors that worsen the competitiveness of the trade companies directly affect the overall financial position and results of the refineries at group level. For these reasons, we believe it is appropriate to briefly examine the direct contribution of the fuel trade sector to the Greek economy.

According to data from the Hellenic Petroleum Marketing Companies Association (see SEEPE, 2013), the Greek wholesale and retail market of petroleum products includes:

- 22 marketing companies with type-A licence that have storage and distribution facilities throughout Greece.

- 29 marketing companies with licences in categories B1 and B2 for marine and/or jet fuels, having facilities in ports to supply fuels to ships and supply stations in 25 airports. From them, 13 also have type-A license.
- 34 companies with type-C licence, namely for selling LPG, with investments in LPG bottling infrastructure. 4 of them have type-A licence as well.
- 26 companies with type-D licence, namely for marketing asphalt. From them, 7 have also type-A licence.
- One company with licence for transportation though pipeline, which is active in the transportation of jet fuels from Refineries to "Eleftherios Venizelos" Airport.
- Approximately 6,500 gas stations (of which about 500 are independent, that is not selling under the brand held by a fuel wholesale company).
- About 1,000 sellers of heating oil.
- In fuel distribution - a network of pipelines, about 1,500 trucks (for public use), 350 trucks of oil trade companies (for private use), together with 8,400 smaller trucks for heating oil distribution.

The above supply structure adequately meets the needs of different consumers throughout the country.

With total turnover approaching € 12.5 billion in 2012, it is estimated that the petroleum trade sector (companies - members of SEEPE) directly offered € 486 million of value added in the Greek economy and more than 23,000 jobs. Moreover, the social product of the sector, which include: a) revenues from taxes on the sale of petroleum products, income taxes and social security contributions, b) salaries of staff, c) interest on loans and d) net profits from business activity, exceeded € 4 billion.

Table 3.5: Key figures for the fuel trade sector

	2009	2010	2011	2012
Turnover (million euro)	10,729	12,893	13,532	12,473
Value added* (million euro)	840	657	593	486
Social product (million euro)	4,218	5,269	4,405	4,033
Payroll expenditure (million euro)	158	146	131	116
Investments (million euro)	94	62	63	45
Gas stations (SEEPE)	6,472	6,310	6,192	6,059
Employment in oil marketing companies (ΣΕΕΠΕ)	2,733	2,433	2,269	2,123
Employment of public use trucks (SEEPE)	1,468	1,527	1,525	1,539
Estimation of employment in gas stations	20,710	20,192	19,814	19,389
Total employment**	24,911	24,152	23,608	23,051

Source: IOBE (2013c). The table refers only to SEEPE members, which cover about 90% of the domestic market.

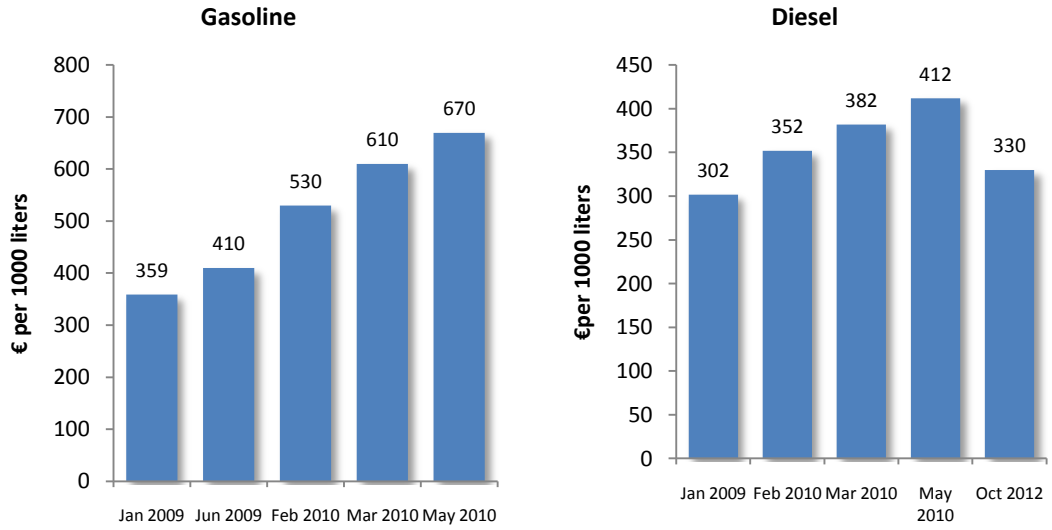
* Approximation based on the sum of gross profits and other operating revenues.

** IOBE's estimation (excluding independent gas stations) with the assumption that each gas station employs on average 3.2 persons (ELSTAT 2007 data). Total employment is estimated to be higher by 1,500 jobs if we include the independent gas stations.

The tax rates applied to fuels affect, as already mentioned, considerably the fuel trade sector. Focusing on road transportation fuels, we observe that since 2009 and under the fiscal consolidation effort of Greece, the rate of excise duty on gasoline has increased by 87%, while the excise duty on diesel oil, after its equation with heating oil in October 2012, has increased by 9% (Figure 3.10). As a result in 2012 the rate of excise duty applicable to gasoline in Greece is among the highest in EU (Figure 3.11).

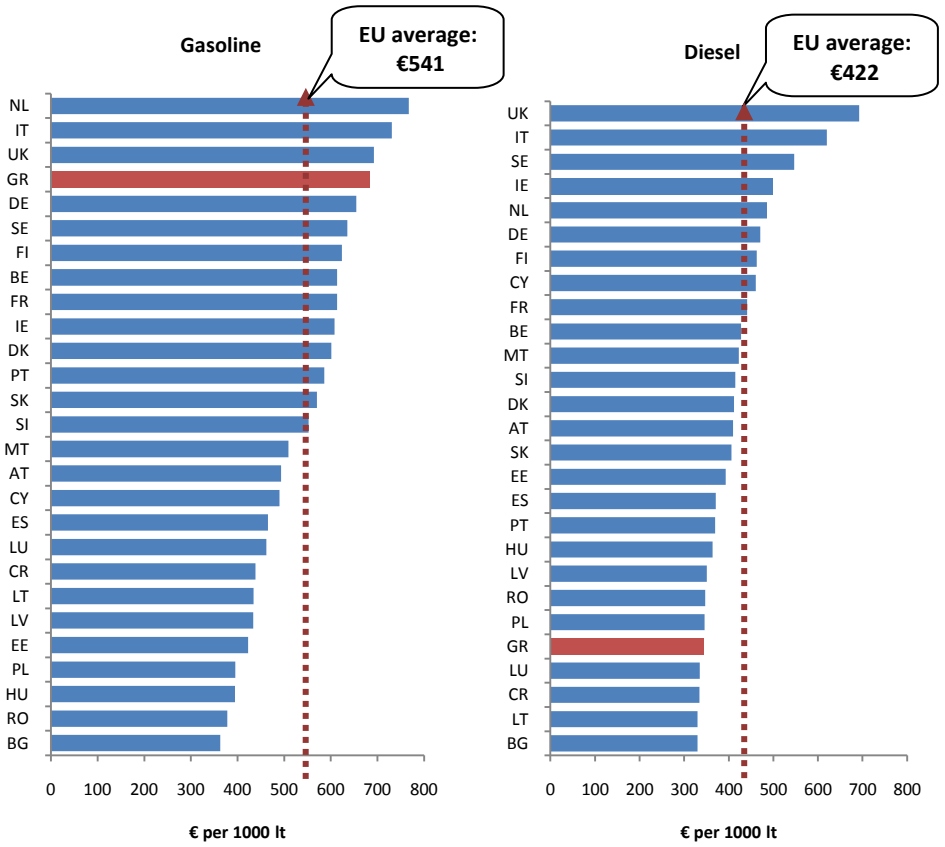
On the other hand, the reduction in the excise duty on diesel oil to the minimum permissible level (330 € per thousand litres) has brought Greece to the group of EU countries with the lowest rates in this product, in the aftermath of its significant increase in 2010. Moreover, it should be noted that the increase in the VAT rate from 19 to 23% in July 2010 has also affected retail prices and has reduced fuel demand even further.

Figure 3.10: Evolution of excise duties on gasoline and diesel oil



Source: European Commission.

Figure 3.11: Excise duty rates on gasoline and diesel oil in the EU



Source: European Commission.

Apart from the level of excise duties, which affect fuel demand through final prices, a related problem for the sector is the lack of provision of credit days to the trade companies for excise duties payments, unlike what happens in cigarette and spirits taxation (28 days delay for the payment of excise duties).

With the adverse liquidity conditions and high interest rates prevailing in recent years in Greece, the financial costs for the fuel trade companies are very high, contributing largely to the losses recorded at industry level (Table 3.6). The harmonisation of the excise duty credit days across products would improve the liquidity of the trade companies, limit their losses and create better conditions for the pricing of the products, with a positive effect on the final consumers, provided that the sector will return to profitability. Indicatively, we estimate that the avoidable interest for oil marketing companies, according to data for 2012, would have been about € 23 million and it would have largely reduced the losses eventually recorded by the fuel trade sector.

Table 3.6: Estimation of the impact on the financial results of fuel trade companies from the provision of 30 credit days for the excise duty payment

In thousand euro	2011	2012
EBIT	25,674	-7,688
Interest (net)	62,785	60,812
Earnings before taxes	-37,111	-68,500
Net profits	-46,374	-81,713
Excise Duties and Taxes	4,234,497	3,911,529
Excise Duties per month	352,875	325,961
Avoidable interest payments (at i=7%)	**24,701**	**22,817**
Interest with credit period of one month	38,084	37,995
Earnings before taxes with credit period of one month	-12,410	-45,683

Source: IOBE (2013c) and IOBE estimations.

In summary, the considerable contribution of the Greek refineries to the Greek economy and the additional contribution of the closely linked petroleum trade sector, underline the need to preserve their competitiveness, so that they can continue to contribute to the recovery efforts and to the sustainable development of the Greek economy.

4. EU policies and their impact on the competitiveness of the refining sector

4.1. Introduction

The obligations arising from the EU policies have a significant impact on the refineries' production costs. The refining industry is affected directly mainly by the following Directives:[9]

- Directive on Emission Trading Scheme (EU ETS)
- Industrial Emissions Directive (IED)
- Fuel Quality Directive (FQD)

The European Commission, acknowledging the economic contribution and the strategic importance of the refining industry for energy security in the EU, as well as the significant challenges that it faces and in which it is expected to continue to be exposed in the coming years, is conducting a fitness check of the regulatory framework governing the sector and in particular the impact of the framework on the competitiveness of EU refineries. The fitness check will be completed in September 2014, accompanied by proposals for policy measures and actions towards ensuring the competitiveness and the contribution of the sector to the European economy.

In the next sections we briefly examine the regulatory framework and the obligations for the refining industry arising from these Directives and we evaluate their impact on the competitiveness of the sector.

4.2. Emission trading scheme[10]

The Emissions Trading Scheme of the European Union (EU ETS) is a "market mechanism" for the pricing of carbon dioxide (CO_2) and other gas emissions contributing to global warming. The EU ETS includes emissions from large, energy-intensive, industrial facilities, power plants and civil aviation. The purpose of the system is to reduce greenhouse gas emissions from the activities included in it, with the minimum possible cost. The emissions from the refining sector are included in the EU ETS.

[9] Other directives related to the refining sector are the Directive on renewable energy and the Directive on energy efficiency. The sector will also be affected by policy decisions on Climate and Energy goals for 2030, as well as by the Clean Air package, which has the wider objective to reduce air pollution from industry, energy production, transportation and agriculture.
[10] The description in this section draws heavily on IOBE (2014).

The EU ETS began operation in 2005. Since 2013 it has entered its third phase of operation, with significant changes compared to the previous two periods (2005-2007 and 2008-2012). The system has an EU-wide emissions target, which is gradually reduced so that in 2020 the emissions should be 21% lower compared to the emission level in 2005. The rules for allocating free allowances have been harmonised with the change of the system from that of national allocations based on historical emissions (grandfathering), to that of joint allocation based on emission level benchmarking by industry. Auctions have been the main method for allocating emission allowances, while measures to limit the accumulation of surplus allowances, such as a significant reduction in the number of allowances granted to facilities that have reduced their production, were put in place. Finally, new sectors and gases have been included in the system.

The EU ETS imposes additional direct and indirect emissions costs to the refining industry that lead to an increased risk of "carbon leakage". Carbon leakage describes the relocation of production and therefore of greenhouse gas emissions outside the EU when the producers within the EU cannot pass on the cost increases resulting from the EU ETS into product prices without a significant loss of their market share. So, refineries with production activity in regions where greenhouse gas emissions are priced, as is the case of the Greek refineries, lose in terms of competitiveness against refiners operating in areas that do not apply emission trading schemes or carbon taxes. The loss of competitiveness leads to weaker economic activity, lower income and fewer jobs, not only in the sector but in the wider economy as well.

The existing EU legislative framework takes into account that the refining sector is exposed to the risk of carbon leakage, as it has high trade intensity with third (non-EU) countries and high direct and indirect emissions costs. Thus, refineries are not subject to the gradual transition to the full auctioning of allowances by 2027 and at least until 2014 they will receive for free a large part of the allowances that correspond to their emissions.[11]

However, even with the free allocation of allowances the compliance costs for the sector can be considerable. The allowances allocated under reference emission indicators (benchmarks) were defined by the average emission intensity of the 10% of refineries with the fewer emissions in the EU during the previous phases of the ETS. This implies that, on average, 19 of the 20 refineries receive fewer allowances than they would have received if they had the benchmark emissions.

Achieving the emission benchmarks is not possible for the refining industry in Greece due to geographic and economic particularities. The availability, for example, of cheaper natural gas in Northern Europe allows refineries to use in their production process natural gas and electricity instead of own produced fuels, reducing considerably their emissions.

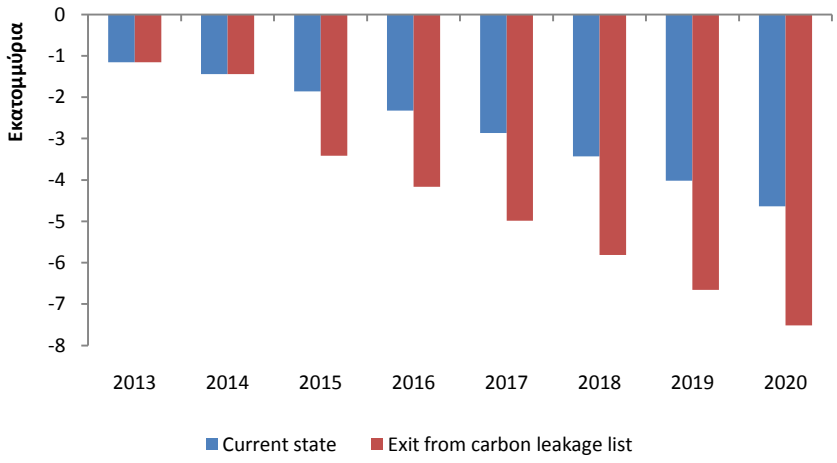
[11] The intention of the European Commission regarding the review of the sectors that will be protected from the risk of carbon leakage in the period 2015-2019 (carbon leakage list), as expressed in the communication on energy and climate policy for 2030, on January 22nd, 2014, is to keep untouched both the assessment criteria and the assumptions used in drawing up the first carbon leakage list in 2009.

The compliance costs for the refineries are further raised by the implementation of a cross-sectoral correction factor, through which emission allowances are reduced horizontally (across the sectors) compared with their initial allocation by 5.7% in 2013 to 17.6% 2020, in order to achieve the overall emission reduction target of the EU ETS. It is estimated that compared to their historical level of activity and despite their protection against the risk of carbon leakage, the Greek refineries will have a deficit of allowances of about 25% on average. This comes by 12 percentage points from the implementation of the cross-sectoral correction factor during 2013-2020 and by 13 percentage points as a mean deviation from the emission benchmarks.

Examining the outlook for emissions during the third phase of the EU ETS, the refining sector is estimated to experience a deficit of allowances, as the level of production is higher compared to the 2005-2008 period that was used to determine the free emission allowances (Figure 4.1). The deficit is expected to grow over time because of the reduction of free allowances, due to the implementation of the cross-sectoral correction factor, and because of the expected return of the economy to positive growth rates.

If the partial protection of the industry against the risk of carbon leakage is lifted after 2015, the deficit would increase even further. Depending on allowance prices, the direct emission costs for the refineries throughout 2013-2020 can range from € 108 million (in the case of allowance prices at 5 €/tCO_2 and existing protection against the risk of carbon leakage) to € 1,050 billion (allowance prices at 30 €/tCO_2 and lack of protection against carbon leakage risk).

Figure 4.1: Projection of the balance of CO_2 emission allowances for the refining sector, 2013-2020

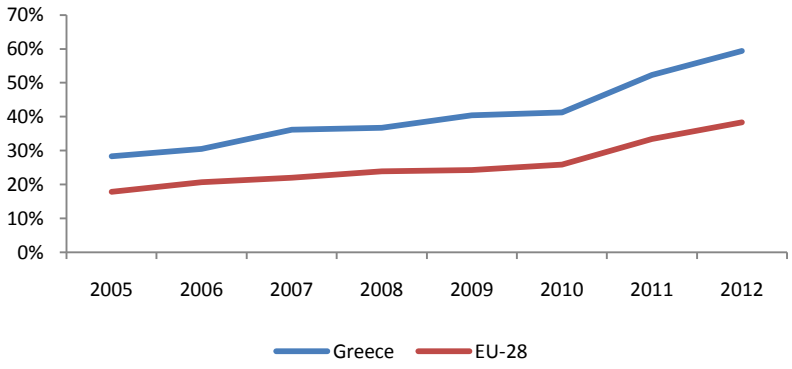


Source: IOBE.

The geographical position of Greece also affects the competitiveness of the sector due to the proximity to countries not participating in the EU ETS. Indicatively, based on the criterion of trade intensity with third countries, which is used in the formulation of the carbon leakage list, the petroleum refining sector in Greece shows significantly higher values compared with the EU-28, even during the period when the first carbon leakage list was compiled (Figure 4.2). This reflects the shift towards exports, which however was possible because of the low price of emission allowances.

Finally, another particularity that affects the degree of protection of the sector from the emission costs is related to the CO_2 emission factor used to determine the additional indirect emission costs as a percentage of the gross value added of the sector. In Greece, because of the existing power generation mix, the emission factor is higher than the one used by the European Commission to identify sectors that will receive increased percentage of free allowances. Therefore, in this case too, the cost for the Greek refineries is actually higher compared to the EU, putting the domestic production at a disadvantage.

Figure 4.2: Trade intensity index of the refining sector, 2005-2012



Source: Eurostat. IOBE estimates.
NB: The trade intensity index is calculated as the ratio of the sum of imports and exports to non EU countries over the sum of production value and imports from non-EU countries.

4.3. Industrial Emissions Directive

With the Directive 2010/75/EC on Industrial Emissions the EU updated and merged seven pieces of existing legislation, introducing stricter rules to reduce emissions from large industrial combustion plants across the EU, to provide environmental and health benefits. It entered into force on January 1st, 2011 and the Member States had to transpose it into national law by January 2013.

At the focus of the Directive, which directly affects the refining sector, is the strengthening of the implementation of Best Available Techniques (BAT), with the conclusions on BAT being the reference point in the environmental licensing process. The Directive revises the minimum emission limits that apply to large combustion plants across the EU, in order to align with BAT. These requirements should ensure that the operators of industrial installations apply BAT in a more uniform manner and that, therefore, a level playing field for the industry is achieved.

The Directive includes improved mechanisms for monitoring and enforcing compliance with the new legislation by the Member States. For example, the provisions on emission monitoring, reporting and environmental inspections have become more stringent. Also, it includes improvements in the public access to information. The more explicit requirements for the Member States shall facilitate the work of the European Commission to ensure the full implementation of the Directive.

The Directive regulates emission levels by requiring large combustion plants to get environmental permits that cover emissions to air, water and soil, in conjunction with waste management and energy efficiency plans. The licensing conditions and the emission limit values (ELVs) included in the permit conditions are determined by reference to the best available techniques (BAT). During the period 2001-2009, 29 European reference manuals on BAT (BREFs) were issued, each of which leading to conclusions on representative BAT's for each sector. In the current implementation process of the Directive on industrial emissions, reference manuals for the refining industry are under review by the European Integrated Pollution Prevention and Control Bureau (EIPPCB). Following the publication of the revised manual, which is expected in 2014, and the examination of emission limit values for the combustion of fuels with no commercial use (e.g. own-produced fuels), the environmental permits of refineries will be revised to include the new emission limit values.

The compulsory compliance with the Best Available Techniques (BAT) as part of the Industrial Emissions Directive brings about a high cost of emission reduction for the refineries. If no flexibility is provided for meeting the emission targets, the compliance cost will drastically increase, deteriorating significantly the competitiveness of the sector. In particular, the impact on the competitiveness of the refineries will be significant if the BAT provisions: a) do not recognise the differences in refinery configuration and in raw material usage, b) do not distinguish between existing and new facilities and c) do not provide flexibility in achieving the environmental standards. As a result, the refineries will be required to undertake investments that will reduce the externalities from their activities, but without investment return. In the current conditions, where the financing of investment programs is difficult, it will not be easy to finance such investments. Coupled with the need for upgrading in order to reduce the imbalance between supply and demand for petroleum products in the EU, such a development would undermine the competitive position of the European refineries against refineries outside the EU. It is estimated that the compliance costs will be ranging from € 70 to € 300 million per refinery in the absence of the necessary flexibility to achieve the emission objectives (Europia, 2013).

4.4. Fuel Quality Directive

The Fuel Quality Directive (Directive 98/70/EC as amended by Directive 2009/30/EC) imposes a reduction of the carbon footprint of fuels used in the transport sector. Article 7a of the Directive places an obligation on the Member States to require from fuel suppliers to progressively reduce their greenhouse gas emissions per unit of energy of fuels they supply by 10% until December 31, 2020 compared to a pan-European Low Carbon Fuel Standard. To achieve the target some flexibility is given: 2% can be achieved using technologies such as electric cars and carbon capture and storage (CCS) and an additional 2% through the Clean Development Mechanism of the Kyoto Protocol. For the remaining 6% reduction there are intermediate indicative targets: 2% in 2014 and 4% by 2017.

The potential impact on the competitiveness of refineries is associated with limiting the access of European refineries to particular types of crude oil, the processing of which leads to higher greenhouse gas emissions per unit of energy of fuels, but also either leads directly to higher value added products covering domestic demand or requires fewer processing steps of intermediate products to meet European fuel specifications.

Thus, it is possible that the refining margins for EU refineries would shrink, if the types of crude oil that are compatible with products with low carbon footprint have a higher price. Therefore, while the EU ultimately requires high quality products, the European refiners suffer (through the Directive) a competitive disadvantage against refineries outside the EU that do not face restrictions in the choice of their raw materials.

The Directive includes additional measures regarding the fuel specifications (such as sulphur content reduction), which will incur additional adjustment costs for the refineries. The changes in the acceptable fuel quality introduce additional processing requirements and/or changes in the choice of crude oil, which raises the required investment and the operating cost of the refineries, potentially leading to higher CO_2 emissions during the fuel production process and thus the need for more emission allowances.

5. Conclusion and policy implications

5.1. Conclusion

The contribution of the Greek refineries to the domestic economy, albeit particularly significant, is not widely recognised. In particular:

- With more than €1 billion gross value added in 2011, which corresponds to 0.5% of Greek GDP, the refinery sector ranks third among the manufacturing branches, with its share increasing significantly over the past few years.
- The human capital in the sector is highly skilled, maintaining better-paid jobs compared with other industrial branches. About 4,100 people are employed in the sector.
- The sector has a strong investment activity, with investment totalling €2.7 billion in 2009-2012, when GDP contracted by more than 20%.
- The closely linked with the refinery industry sectors of wholesale and retail trade of petroleum products (including third-party fuel transportation) contributed directly to the Greek economy €500 million value added and at least 23,000 jobs.

According to our estimates, the total impact of the refinery sector on the Greek economy is considerably stronger. If we also take into consideration the indirect and induced effects, alongside the direct impact of the sector, it is estimated that the refining activity contributed about €3.8 billion (2% of GDP) and more than 40,000 jobs to the domestic economy. The contribution of the sector to tax and social security revenues is also significant.

A less obvious impact from the activity of the Greek refineries comes from their contribution to the reduction of the trade deficit. With the exports of petroleum products reaching €10.3 billion in 2012, most of which (86%) going to non-EU countries, the Greek refineries contributed 37.5% of the total exports of the country, from 8.4% a decade earlier, while imports remained relatively stable. As a result, according to Bank of Greece data, the import coverage ratio of crude oil and petroleum products with exports increased from 25% in 2005 to 42% in 2012.

The significant contribution of the Greek refineries to the Greek economy underlines the need to preserve their competitiveness, so that the refining industry continues to contribute to the recovery efforts and the sustainable development of the Greek economy.

In this context, the choice for stronger export orientation should overcome several challenges and considerable commercial risks in order to prove its viability. The competitive pressures faced by the Greek refineries today are particularly strong and are expected to intensify further, driven by the excess capacity at global level and the development and modernisation of refining capacity in the Middle East and Asia Pacific.

In addition, the non-EU refineries are not burdened with the cost to comply with the product quality requirements and the environmental standards of production that are applied in the EU. This fact, coupled with the absence of similar standards in non-EU markets where the bulk of the domestic oil products is directed, sets the Greek refineries at a competitive

disadvantage with the possibility for this position to deteriorate in the near future. The cost of buying crude oil and electricity, which have greatly increased in recent years, and the backlog of pending secondary legislation to implement the relevant EU Directives, such as the Directive 2010/75/EU for industrial emissions, put an additional burden on the sector. The implementation of the Directive increases significantly the investment risk and entails additional costs of compliance with new environmental standards.

Meanwhile, the EU policy to tackle climate change imposes additional costs on the sector through the EU Emissions Trading System (EU ETS) from: a) the CO_2 emissions of the sector itself (direct emission costs) and b) an increase of the prices of electricity consumed by the sector, which incorporate the cost of CO_2 emissions in electricity generation (indirect emission cost). Furthermore, the protection of the sector from the risk of "carbon leakage" in the medium and long term is clouded with uncertainty. The carbon leakage can lead to reduced economic activity, lower income and fewer jobs, not only in the sector, but in the wider economy as well.

Currently, the sector is expecting the specification of policies that could have an impact on its competitiveness. In the short term, within 2014, the formulation of the new carbon leakage list (2015-2019) and the recognition that the sector continues to be exposed to the risk of carbon leakage, i.e. that it has high direct and indirect CO_2 emission costs and high intensity of trade with third countries, are of paramount importance. The existing EU legislative framework takes into account the risk of carbon leakage and protects the industries that are exposed to it, such as the refinery sector, with free emission allowances. Nevertheless, for a number of reasons (benchmarking, cross-sectoral factor) the European refineries are not receiving all of the required allowances and as a consequence the protection is only partial and in fact falling over time.

At the same time, due to geographic particularities, the carbon leakage risk for the Greek refineries is significantly higher compared with the refineries in other EU member-states. The trade intensity with third countries – one of the criteria for being on the carbon leakage list – reached 52% in Greece in 2012 (38% in EU27) from 24% in 2005 (18% in EU27). In addition, the availability of cheaper natural gas in Northern Europe allows the refineries to use in the production process natural gas and electricity instead of own produced fuels, reducing considerably their emissions and as a result increasing the distance of the Greek refineries from the emission benchmarks, without this being due to a technological lag. Hence, dropping from the carbon leakage list would have a significant impact on the Greek refineries. The likelihood of this, following the recent announcements by the European Commission, seems rather distant for the time being. However, this uncertainty is reduced only temporarily, as the new list is in force for five years, while it is not clear whether the sector will continue to receive beyond 2020 even the partial protection that it enjoys today. The carbon leakage list that will be in force after 2020 should be clarified by the EC well in advance, as it constitutes a crucial parameter in the investment planning of the refineries.

In addition, the EU Climate and Energy package for 2030 will largely affect the energy costs of the sector, the demand outlook for petroleum products and ultimately the investment decisions and viability prospects of the Greek refineries. Nevertheless, it seems, from the Communication of the European Commission in January 2014, that the issue of the competitiveness of the European industry has come to the forefront of the EU policies for Climate, Energy and the Environment.

Finally, the compulsory compliance with the Best Available Techniques (BAT) as part of the Industrial Emissions Directive brings about a high cost of emission reduction for the refineries. If no flexibility is provided for meeting the emission targets, the compliance cost will drastically increase, deteriorating significantly the competitiveness of the sector.

5.2. Policy implications

The competitiveness of the Greek refineries, which constitutes a necessary condition for their viability in order to preserve their significant contribution to the Greek economy, is not secured, as it is affected by a multitude of exogenous (for the companies in the sector) factors. The current EU legislation and the planned EU policies create an additional burden and uncertainty for the refining industry, while at national level a number of factors increase the production cost through the electricity tariffs. Therefore, the preservation of the viability prospects of the sector indicatively requires the following:

- A balanced approach in the implementation of policy measures in the fields of Energy and Environment, so that the impact on the industry competitiveness is taken into account alongside the impact on the environment. This constitutes a key requirement for the sustainable development and the preservation of thousands of jobs in the economy. In this regard, it is important to secure the protection of the refining sector against the risk of carbon leakage before and after 2020, particularly taking into account the geographical differences between Greece and the other EU countries, and their implication on the risk of carbon leakage for the refineries.
- Change of focus of the EU climate policy, from unilateral measures to the achievement of a global agreement on the reduction of greenhouse gases.
- Completion of the fitness check by the European Commission, regarding the regulatory framework of the refinery industry, particularly in relation to its impact on the competitiveness of the refineries, prior to making any further significant decisions for the implementation of current legislation or the passing of new measures. It is also very important to stress that the fitness checks should include planned revisions of the current European legislation as well.
- Interventions in relation to the national industrial policy that will reduce the energy costs, on top of the already announced measures, such as for example reduction of the excise duty of electricity and natural gas, of the surcharges in the electricity tariffs for public service obligations and of the special levy for the reduction of greenhouse gas emissions for industrial enterprises.
- Interventions in the tightly linked trade of petroleum products sector, such as allowing for a credit period for collecting the excise tax on liquid fuels and

implementation of the adopted measures for the elimination of the illicit fuel trade, in order to boost the liquidity in the sector and its competitiveness in the domestic market.

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