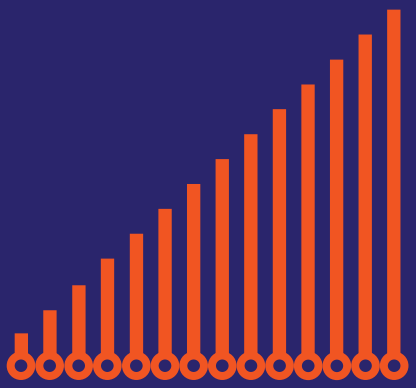
CENTRE OF PLANNING AND ECONOMIC RESEARCH

Issue 40, October 2019

GREEK ECONOMIC OUTLOOK



- **Macroeconomic analysis and projections**
- **Public finance**
- **Human resources and social policies**
- **Development policies and sectors**
- **Special topics**

GREEK

Economic Outlook

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Editor:
Nikolaos Rodousakis

Editorial Board:
Fotini Economou
Konstantinos Loizos
Vlassis Missos

Editing:
Helen Soultanakis

Publications Department
Information:
Eva Toulitsi
Τηλ.: 210 3676347

Printed by:
[βιβλιοτεχνια]
Pappas Fotis and Co

11, Amerikis str., 106 72 Athens, Greece
Tel.: +30-210-3676.300, 210-3676.350
Fax: +30-210-3630.122, 210-3611.136
Website: www.kepe.gr

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Editorial

The eyes of all economists and investors are on the United Kingdom and on the swirling developments that trigger the so-called Brexit, while the time is "counting down" until the October 31 deadline. Thus, the Greek interest focuses on the direct and indirect effects of this unprecedented political and economic event on the Greek economy. If, in other words, the growth rate of world GDP for 2019 slows down more than the projections, will Brexit affect Greece's GDP growth rate as well? Is the Greek economy vulnerable to the effects of Brexit on trade in goods and services, in particular in the sectors of the agri-food industry, fuel, pharmaceuticals and cosmetics, metal products, machinery and equipment, and tourism –and if so, to what extent? As is shown in this issue of the Journal, (a) the sectors mentioned above belong to the industries in which Greece has significant export activity to the United Kingdom and for which the effects of Brexit may be more pronounced, and (b) the increase in international tourist arrivals is strongly associated with the increasing flow of travelers from the United Kingdom.

At the same time, we must not forget the special features of the Greek economy, such as the large stock of "Red Loans", the fragile banking system, the high goals of achieving primary surpluses and, of course, the issues of productivity and competitiveness. In short, this is the axis of the present issue, in the pages of which the reader can find, in addition to the above-mentioned subjects, a comprehensive record of the current developments in the Greek economy.

In detail, the 40th issue of KEPE's *Greek Economic Outlook* is presented in two parts. Part One examines recent developments and prospects for the main components of demand, the Consumer Price Index in Greece and the Eurozone, the factor model forecasts for the short-term prospects of GDP as well as the developments and prospects for global economic activity.

In addition, it examines the evolution and structure of public debt. The key variables of the Greek labour market are analysed, as well as the main indicators of income inequality in Greece. As far as sectoral policies are concerned, the articles present analyses of the developments in the Greek tourism sector and of the industrial sector based on industrial production and turnover indices.

The second part of the magazine hosts three articles. The first article on Brexit discusses "Brexit and its effects on trade in goods: the case of Greece". The second article, "On the measurement and the multidimensional analysis of productivity in Greece", analyses theoretical and empirical issues related to productivity. Finally, the third article on the banking system deals with the "Investigation of the implications of Basel III on the profitability of the Greek banking sector".

NIKOLAOS RODOUSAKIS
Editor

1. Macroeconomic analysis and projections

KEPE, *Greek Economic Outlook,* issue 40, 2019, pp. 4-12

1.1. Main demand components: Developments and prospects

1.1.1. Introduction – Domestic and external demand

Yannis Panagopoulos

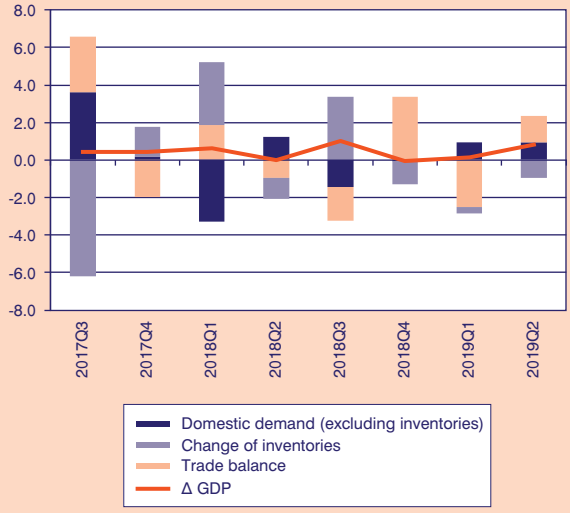
Based on the existing data, we next analyse the trend of the Greek economy. The first thing that we verify here, based on Table 1.1.1, is the improvement, compared to the corresponding period of 2018, in the rate of GDP growth during the second quarter of 2019. More specifically, the recoded growth was 1.9% (+0.4%), compared to 1.5% in the corresponding quarter of 2018. On the other hand, the GDP growth of the first semester of 2019 was smaller, compared to the analogous quarter of 2018. More analytically, the GDP growth of the first semester of 2018 was 2.1%, +0.6% higher than the growth of the first semester of 2019 (1.5%).

Regarding the contributing factors for this improved GDP growth rate, in the second quarter of 2019, these should be mainly sought in the positive contribution of public consumption (5.3%) as well in the increased contribution of exports compared to imports (5.4% versus 3.7%, accordingly). On the contrary, we have a negative contribution, compared to 2018, in private consumption (-0.7%) but, mainly, in fixed capital formation[1] (-5.8%).

Based on the existing components of the recorded *domestic demand*, for the second quarter of 2019, *public consumption* is the most stable positive contribution for the GDP growth (0.88). Additionally, a positive role is recorded concerning the contribution of the fixed capital formation, according to its component (0.285). On the other hand, *private consumption* appears with a negative contribution for the GDP growth (-0.27%). It is worth mentioning here that during the first quarter of 2019 the corresponding contribution of *public and private consumption* components to GDP growth were just reversed (0.04 & -0.27, respectively). It could, of course, be assumed that for the results of the second quarter of 2019, the election announcement was important and led to a recorded 13th pension replenishment as well as to the restraint, due to uncertainty, of private consumption.

A different trend, from the *domestic demand*, appears in the external (demand) sector during the second quarter of 2019. It incorporates the trade balance of goods and services (see Figure 1.1.1). More analytically, it seems that international demand, despite the recent positive but slowed rate of the European and world economies, has positively influenced the Greek economy. This was reflected in the contribution of this factor to GDP growth (1.42). Exports were the important part –mainly tourism and navigation– with a strong contribution to GDP growth (1.13). On the contrary,

FIGURE 1.1.1
Domestic and net external demand (components)



Source: National Accounts, ELSTAT, data processing by the author.

1. Net investments in Table 1.1.1.

TABLE 1.1.1 Basic macroeconomic figures

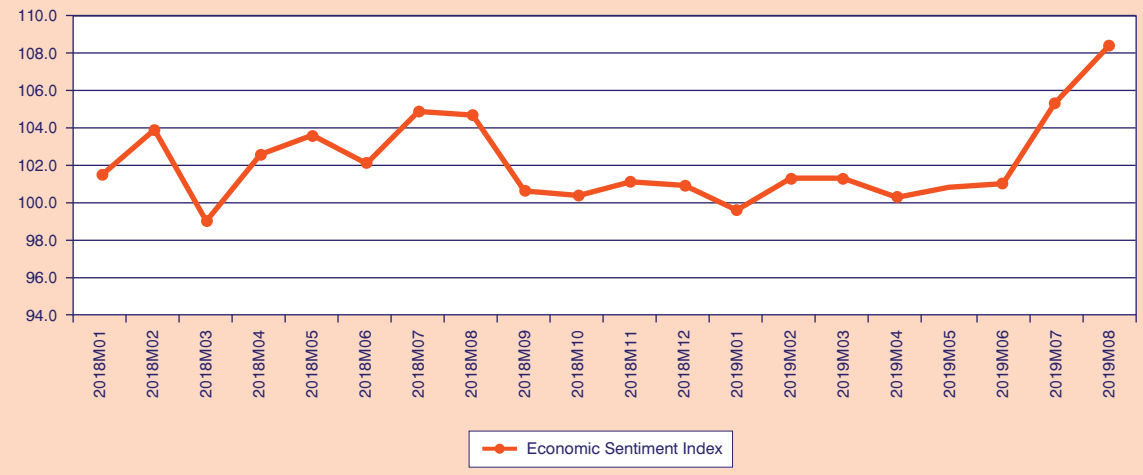
(%, seasonally adjusted data, volumes)

	2017Q1	2017Q2	2017Q3	2017Q4	2018Q1	2018Q2	2018Q3	2018Q4	2019Q1	2019Q2	1st Semester 2018	2nd Semester 2019
Private consumption	1.1	1.3	1.3	-0.1	0.5	1.4	1.1	1.0	0.5	-0.7	1.0	-0.1
Public consumption	-2.9	-1.1	0.4	1.7	-0.3	-3.9	-4.5	-1.4	-1.4	5.3	-2.1	1.9
Fixed capital formation	7.8	-8.8	26.1	12.6	-8.9	19.0	-22.9	-26.5	8.3	-5.8	4.3	0.7
Domestic demand*	0.6	1.8	0.4	2.6	3.0	1.3	1.0	3.4	-0.5	1.7	2.1	0.6
Exports of goods and services	6.0	9.0	7.0	5.5	8.7	9.1	6.9	10.2	4.3	5.4	8.9	4.8
Exports of goods	3.5	8.2	2.9	8.1	11.1	6.8	7.6	8.1	-0.4	4.0	8.9	1.8
Exports of services	9.5	11.3	10.7	2.5	5.4	11.9	7.1	12.7	9.1	6.9	8.6	8.0
Imports of goods and services	16.1	5.8	4.8	3.2	-7.5	2.8	15.6	2.2	9.8	3.7	-2.5	6.7
Imports of goods	17.9	4.3	4.1	2.2	-11.3	0.0	15.5	0.3	10.1	3.9	-5.8	6.9
Imports of services	9.8	13.6	5.2	7.8	11.8	16.0	16.7	13.1	6.3	2.8	13.9	4.5
GDP	0.0	1.7	1.9	2.1	2.7	1.5	2.0	1.5	1.1	1.9	2.1	1.5

Source: Quarterly data of the National Accounts and EC Forecasting, Spring 2019.

*Excluding inventories.

FIGURE 1.1.2
Economic Sentiment Index



Source: Eurostat.

the country's imports recorded a negative contribution to GDP growth (-0.30). We have the contribution of the *domestic demand* (excluding inventories) at an almost zero level (-0.05), while a significant negative contribution was recorded for the change in inventories (-0.97).

Regarding the trend of the Economic Sentiment Index (ESI), as a "proxy" of future demand, it is known that, like some other leading indices, it offers valuable information from both business and household perspectives concerning the economy. It is also an important indicator for the economy and can be used for the predictions relating to the future of GDP growth. As demonstrated by Figure 1.1.2, the ESI, from July 2019 until now (September 2019) has been moving with an upward trend, which has already exceeded 108 points. This can be interpreted as a "positive vote" on behalf of companies and households for the recent change of government.

Next, a more detailed discussion follows regarding the contribution of the trade balance of goods and services with respect to GDP growth, for the second quarter of 2019.

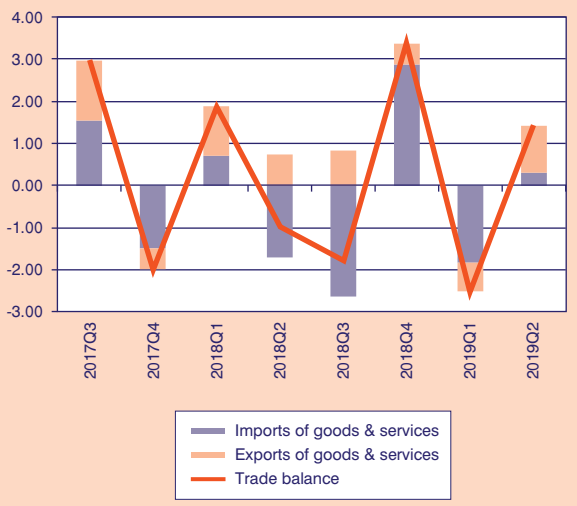
Trade balance (goods and services)

As already mentioned above, the contribution of the external sector (exports minus imports) regarding the growth of GDP, for the second quarter of 2019, ends up with a positive sign and reflects mainly the importance of international demand as well as the international economic climate.

More specifically, we will refer separately to the rate of change of goods and services for both imports and exports. Starting from the exports, we should underline that they have increased, at the second quarter of 2019, with a growth rate of 5.4%. More analytically, services –which are the relatively smaller portion of the total exports, in billions of euros– demonstrated an annual increase of 6.9%, while goods –which are most of the exports– experienced an annual growth of 4.0% during the same period. Concerning now the imports of goods and services, unlike the composition of the exports, they are more balanced as a distribution, and additionally, they have increased overall with a rate of 3.7%. The imported services increased with a rate of 2.8% (much lower rate than the corresponding quarter of 2018, which was 16.0%). On the other hand, the rate of increase of the imported goods, during the same time period, was considerably higher than that of services, at 3.9% (much higher than the corresponding rate of 2018, which was zero).

Concerning now the contribution of the trade balance of goods and services to the GDP growth rate, we can emphasise the different behavior of this factor during the initial two quarters of 2019. More specifically, its negative contribution of the first quarter of 2019 (-2.52) was totally reversed during the second quarter (+1.42). For this reversal, concerning this factor's contribution, the catalytic role was the strong decrease of imports' growth during the second quarter of 2019 (from 9.8% to 3.7%) and the corresponding increase in exports' growth during the same period (from 4.3% to 5.4%). This much higher exports contribution, relative to that of imports –in the first two quarters of 2019– is

FIGURE 1.1.3
Components of external demand



Source: National Accounts, ELSTAT, data processing by the author.

illustrated in Figure 1.1.3 where the change in the size and trends of imports and exports appear in the corresponding histograms.

This positive recorded trend, during the second quarter of 2019, of the balance of goods and services in the domestic demand, either as a contribution (1.42 units) or as a difference between the rates of change of imports and exports, provides, for the time being, an important positive weight concerning the contribution of net external demand to the GDP growth.

1.1.2. Private consumption and investment

Konstantinos Loizos

1.1.2.1. Private consumption

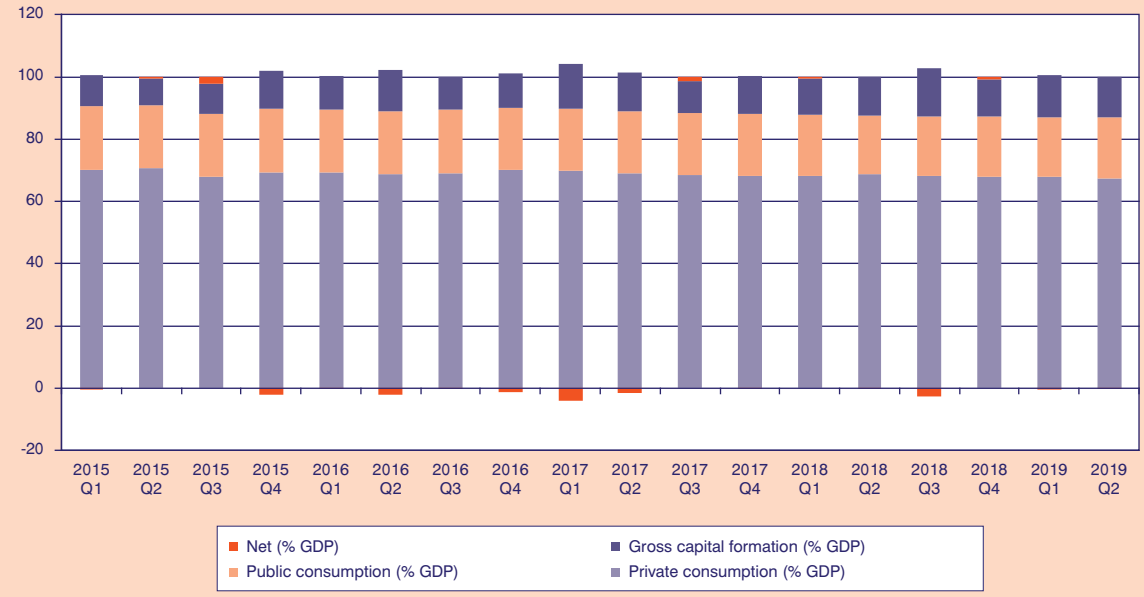
Based on quarterly, seasonally-adjusted *National Accounts* data,[2] private consumption, both in terms of current prices and in chain-linked volumes (reference year 2010), increased in the first quarter of 2019 but decreased during the second quarter of the year. Indeed, during the first quarter of 2019, private consumption rose to 31,533 million euros in current prices but contracted to 31,487 million euros in current prices during the second quarter of 2019. Despite this reduction, private consumption in the second quarter exceeded its average for 2018 (31,390 million euros in current prices). Such a reduction is confirmed in terms of chain-linked volumes from 32,462 million euros for the first quarter of 2019 to 32,332 million euros in the second quarter of 2019, which was lower than the average for 2018 (32,456 million euros). The above trend is corroborated from the examination of percentage changes both in terms of the corresponding quarter in the previous year and the previous quarter of this year on the grounds of seasonally adjusted chain-linked volumes. As a matter of fact, positive percentage changes of the first quarter of 2019 (0.5% with respect to the first quarter of 2018 and 0.1% as far as the last quarter of 2018 is concerned) were followed by negative percentage changes during the second quarter of 2019 (-0.7% with respect to the first quarter of 2018 and -0.4% with respect to the fourth quarter of 2018).

It is interesting to notice the trend of private consumption as percentage of total Gross Domestic Product in current prices. As depicted in Figure 1.1.4, private consumption as a percentage of GDP fluctuated between 70.7% and 70.1%, with an average value of 69.4% of GDP, during the whole period, which extends from the first quarter of 2015 through the last quarter of 2016. However, after the first quarter of 2017, when private consumption constituted the 69.9% of GDP, it manifests a downward trend, which was interrupted briefly by a small recovery in the second quarter of 2018, resulting in a decline thereafter in the first quarter of 2019 at 67.8% and in the second quarter at 67.3%. This negative trend appears to be partially offset by the rising share of public consumption, which constitutes the second largest component of GDP (measured by the expenditure approach). Public consumption rose from 19.3% in the last quarter of 2018 and the first quarter of 2019 to 19.7% in the second quarter of 2019. On the other hand, the shares of gross investment and net exports fluctuated during these last three quarters. Consequently, the above findings cannot substantiate, for the moment, the rising importance of some other component of GDP in the long term and at the expense of private consumption.

A more detailed picture is gained by the evolution of retail trade as described in the monthly data provided by ELSTAT (see Figure 1.1.5). In the first semester of 2019 we observe positive percentage changes, with respect to the same month in the previous year, only in March and June of 2019 for the overall volume index and the food items index and in February 2019 for the

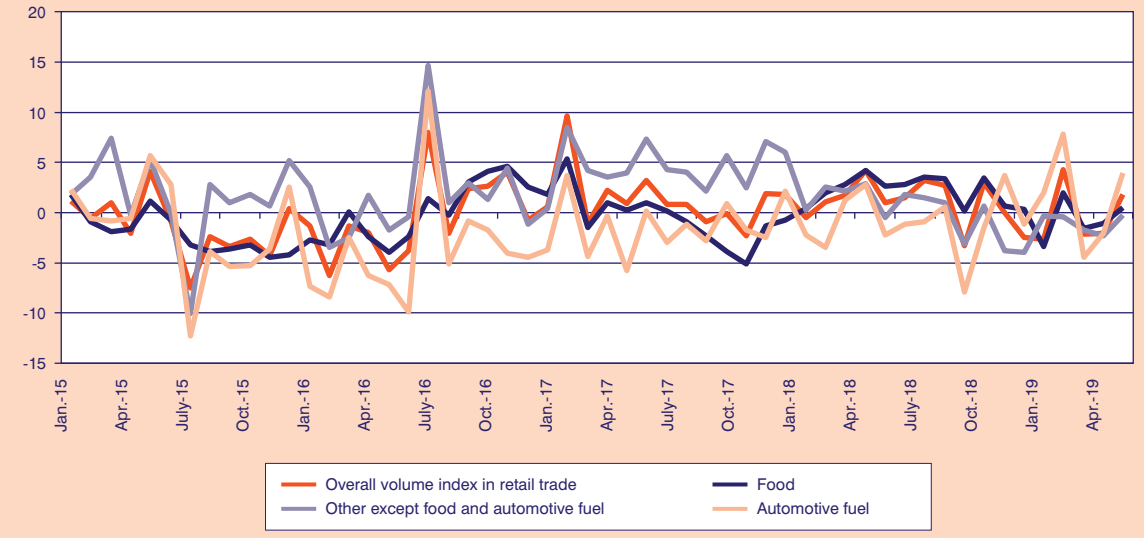
2. *Quarterly National Accounts,* Press release, ELSTAT, September 4, 2019.

FIGURE 1.1.4
The evolution of private consumption as a percentage of GDP (expenditure approach)
(seasonally adjusted data in current prices)



Source: ELSTAT, data processing by the author.

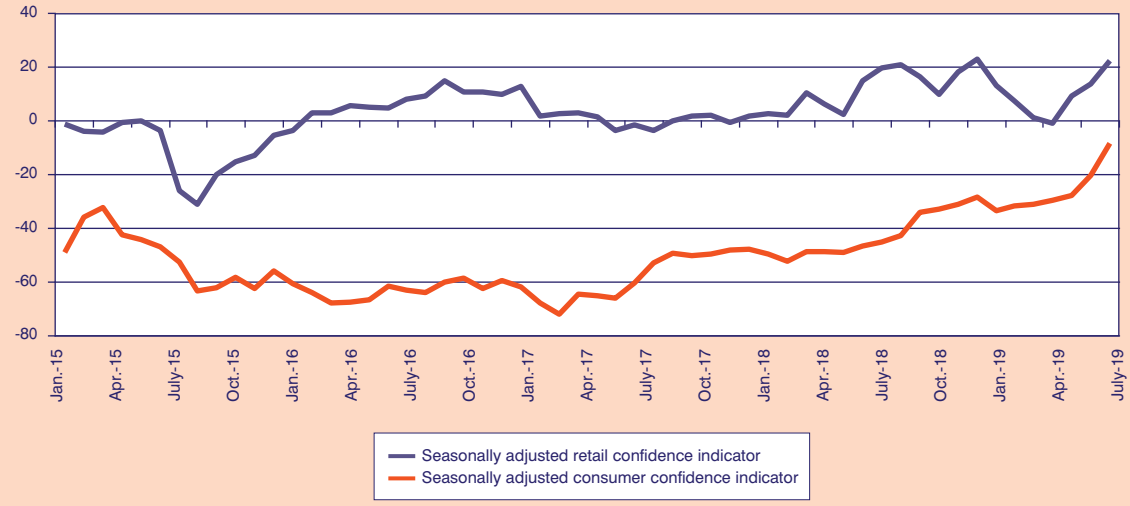
FIGURE 1.1.5
Percentage changes in the seasonally adjusted overall volume index and the main sector indices in retail trade



Source: ELSTAT, data processing by the author.

automotive fuel index. On the contrary, for the other items (except food and automotive fuel) percentage changes were negative for the whole semester. More specifically, the overall volume index, in terms of percentage changes, evolved in the first semester of 2019 with an average value of -0.55%. The same negative trend we observe for the food items index with an average value of -0.56% and for the other items index with an average value of -1.50%. Only the automotive fuel index increased on average by 1.01%. Consequently,

FIGURE 1.1.6
Confidence indicators in retail trade



Source: EUROSTAT, data processing by the author.

it seems that the developments in retail trade during the first semester of 2019 with respect to the corresponding semester of 2018 exhibit a falling trend on average in all sector indices except in automotive fuel.

In order to come up with a more comprehensive point of view, it is useful to complement the above analysis with some comments on the evolution of confidence indicators that highlight the prevailing mood both for entrepreneurs in retail trade and for consumers (see Figure 1.1.6).

Entrepreneurs' expectations in retail trade fluctuated widely, though in the positive region of the diagram, from April 2018, which was followed by a downward trend just after January 2019 and up to May 2019. However, this trend was reversed in June of the same year and thereafter. In addition, consumers' expectations maintained their improving trend, especially from March 2019, exhibiting dramatically increasing rates in July and August 2019, though in the negative region. The above, along with the evolution of retail trade indicators, indicate the notable trend of improving expectations in retail trade, despite a rather shaky consumer demand.

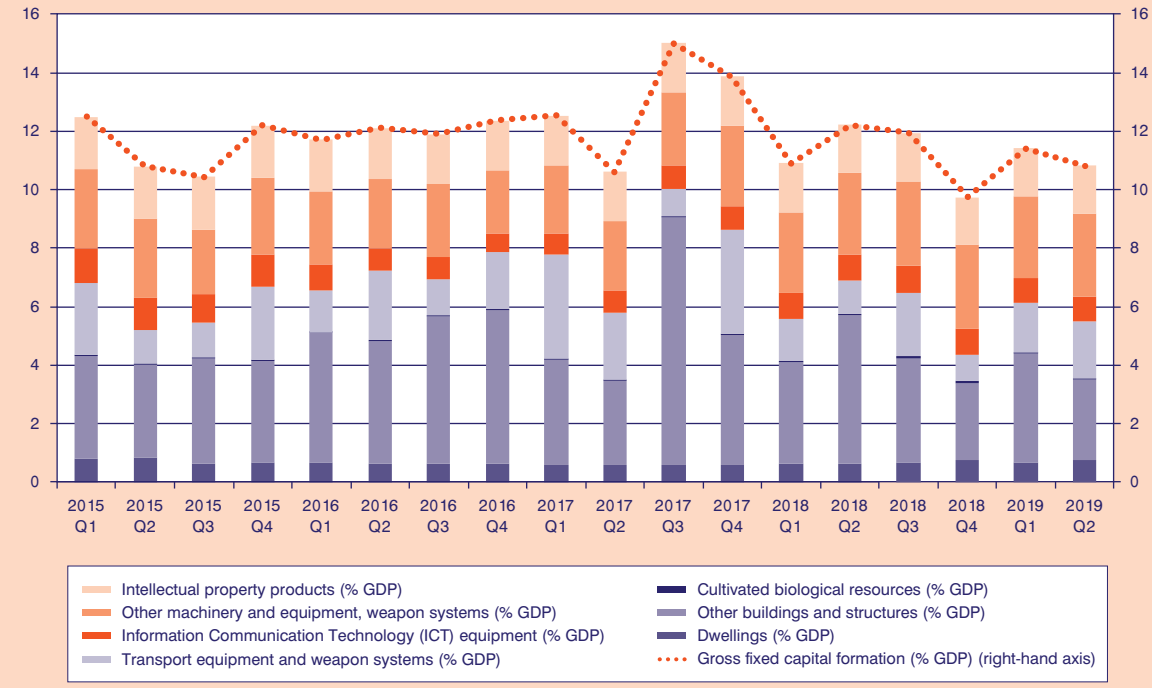
1.1.2.2. Investment

According to the quarterly, seasonally-adjusted *National Accounts,* gross fixed capital formation in current prices rose in the first quarter of 2019 with respect to the last quarter of 2018 but declined in the second quarter of 2019. More specifically, during the first quarter of 2019, gross fixed capital formation amounted to 5,300 million euros in current prices, whilst it fell to 5,068 million euros in current prices in the second quarter of 2019, lower than its average value during 2018, which reached the level of 5,153 million euros. The evolution of gross fixed capital formation looks rather improved in terms of seasonally adjusted chain-linked volumes. In the first quarter of 2019, gross investment amounted to 5,519 million euros and in the second quarter it rose to 5,651 million euros, exceeding in both cases its average value for 2018, which was 5,342 million euros.

The above trend is apparent by the inspection of percentage changes with respect to the previous quarter as these are calculated by the seasonally adjusted data on chain-linked volumes. Positive percentage changes are observed in the first and second quarter of 2019 (8.5% and 2.4%, correspondingly). However, the percentage changes with respect to the same quarter in the previous year are positive during the first quarter of 2019 (8.3%) but negative in the second quarter of this year (-5.8%). To establish the volatile character of this indicator, one must take into account the significantly negative quarterly values for 2018 with respect to the previous year, and especially those for the third quarter of 2018 (-22.9%) and the fourth quarter of this year (-26.5%), which followed the -8.9% recorded in the first quarter of 2018.

In order to assess the developments in investment during the last three quarters, we present in Figure 1.1.7 the gross fixed capital formation as a percentage of GDP along with its composition during the last four years.

FIGURE 1.1.7
Gross fixed capital formation as a percentage of GDP (overall and by asset)
(seasonally adjusted data in current prices)



Source: ELSTAT, data processing by the author.

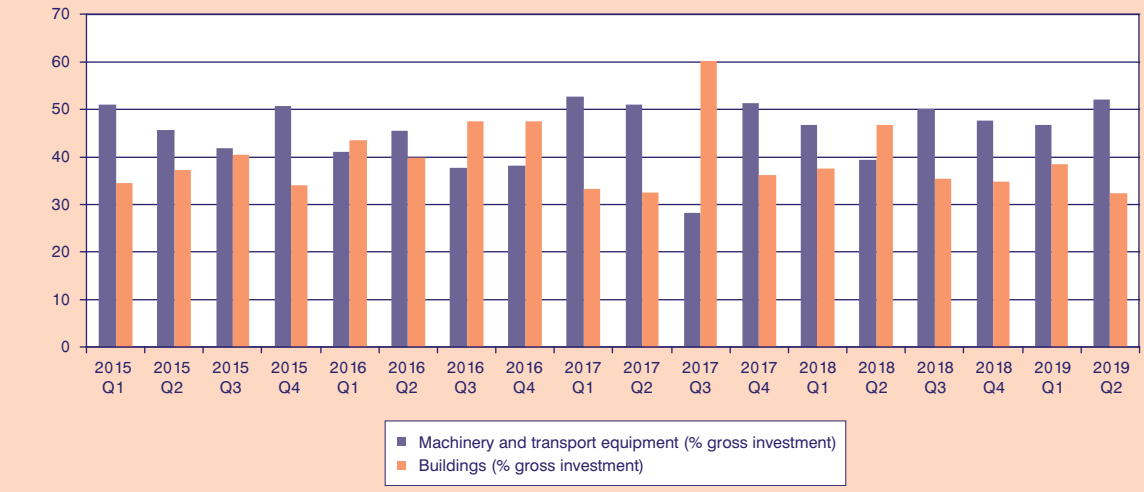
During the whole period, which extends from the first quarter of 2018 to the second quarter of 2019, gross investment did not exceed 11.2% of GDP on average, reaching its highest value during the second quarter of 2018 (12.2%) and its lowest in the fourth quarter of the same year (9.7%). The relevant figures for the first two quarters of 2019 were 11.4% and 10.8%, correspondingly. Also, during the entire period starting in 2015, gross investment as a percentage of GDP fluctuated around its mean value (11.8%). This observation does not allude to any upward or downward trend, but rather to the stagnation of gross investment.

The evolution of the individual components of gross investment is also interesting. The two most important categories of investment goods are the "buildings" ("dwellings" and "other buildings and structures") and "machinery and transport equipment" (which is comprised of the subcategories: "transport equipment and weapon systems", "Information Communication Technology (ICT) equipment", and "other machinery and equipment and weapon systems"). Inspecting Figure 1.1.8, it is obvious that these two categories alternate as far as their share in gross investment is concerned. The rising share of buildings and the falling share of machinery and transport equipment from mid-2018 to the first quarter of 2019 seems to reverse itself during the second quarter of 2019.

Within the "buildings" category, we observe a trade-off between "dwellings" and "other buildings and structures" since, in the first quarter of 2019, "dwellings" fell in percentage terms (-9.3%) whilst in the second quarter of 2019 this subcategory rose (9.9%) with respect to the previous period. On the contrary, "other buildings and structures", which rose significantly in percentage terms during the first quarter of 2019 (40.6%) with respect to the previous quarter, contracted in the second quarter by -25.7%. In any case, as depicted in Figure 1.1.9, taking into account the "buildings" category as a whole, there was a rising trend in the first quarter of 2019 with respect to the previous quarter (29.7%); in the second quarter this tendency reversed (-20.2%). The same holds as far as the first and second quarters of 2019 are concerned in relation to the corresponding quarters of 2018, where changes of the magnitude of 7.2% and -38.5%, respectively, were recorded.

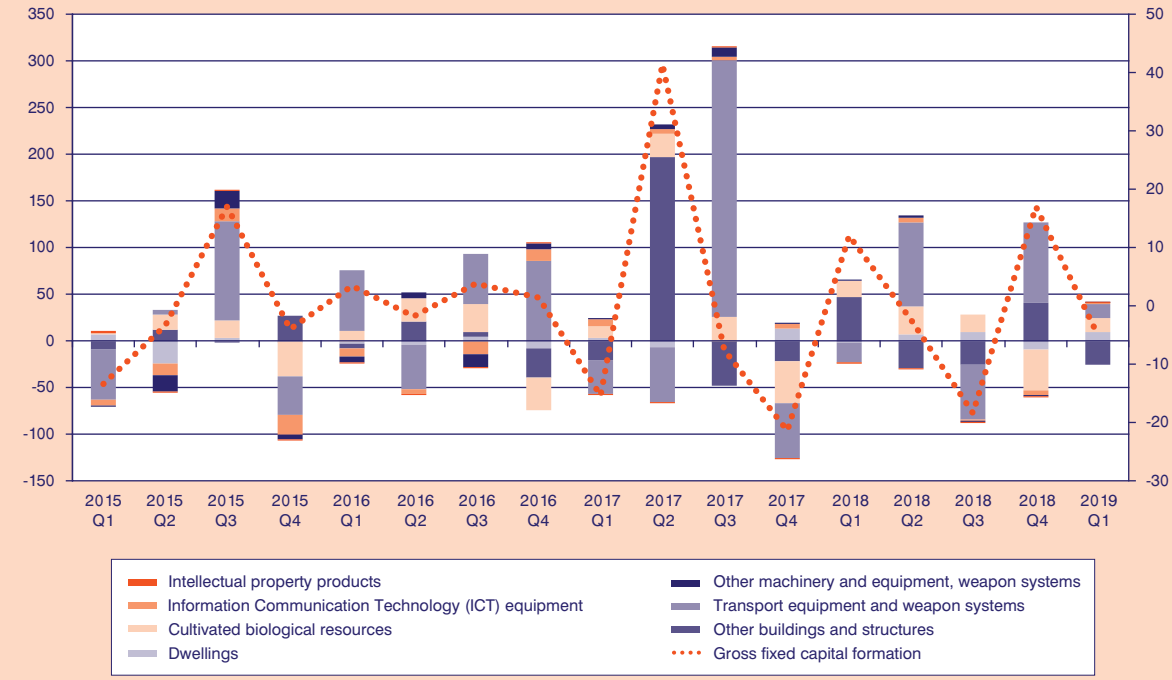
Within the "machinery and transportation equipment" category, "transportation equipment and weapon systems" present the widest fluctuations. In particular, there was a significant increase in the first quarter of 2019 with respect to the previous quarter (86.5%). This

FIGURE 1.1.8
Machinery, transport equipment and buildings as a percentage of gross fixed capital formation



Source: ELSTAT, data processing by the author.

FIGURE 1.1.9
Components of gross investment as a percentage of GDP (percentage changes)

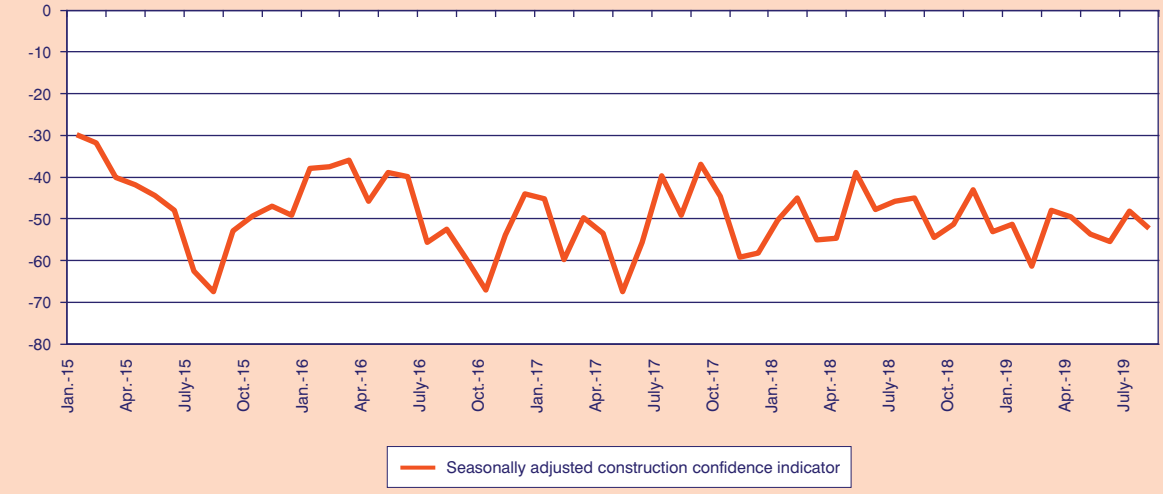


Source: ELSTAT, data processing by the author.

rising tendency was maintained in the second quarter of 2019, though with a milder positive change of 15.7%.

The other two subcategories ("Information Communication Technology [ICT] equipment" and "other machinery and equipment and weapon systems") exhibit a falling tendency in the first quarter of 2019 and a rising one in the second quarter, but at much more muted rates of change (-4.5% and -1.8% in the first quarter

FIGURE 1.1.10
The construction confidence indicator



Source: EUROSTAT, data processing by the author.

which reverse to 0.05% and 1.09% in the second quarter of 2019, correspondingly). In total, machinery and transportation equipment grew in percentage terms in both of the first two quarters of 2019 with respect to the preceding quarter (14.9% in the first quarter and 5.5% in the second quarter of 2019). Moreover, there was also a rising trend with respect to the corresponding quarters of 2018 (4.8% and 17.2% for the first and second quarters of 2019).

In addition to the above, we can gain insight into the evolution of entrepreneurial expectations in the construction sector by inspecting Figure 1.1.10. The most recent data provided by EUROSTAT incorporate the first eight months of 2019 and indicate a relative stagnation of the construction confidence indicator, which, notably, remains in negative territory. This confidence indicator seems to recover only in January, March and July of 2019 whilst it plunges in February, between April and June and in August 2019. A sentiment of uncertainty within an unstable economic environment in the construction sector seems to be confirmed.

1.1.2.3. Conclusions

The above analysis implies that private consumption expenditure did not maintain its recovery during the first quarter of 2019 in the context of improving but precarious conditions in the state of expectations in retail trade as depicted by the relevant confidence indicators. On the other hand, gross investment fluctuated, both as a whole and in terms of its construction component, but it showed a slightly improved picture in its machinery and transportation equipment component. In addition, the share of consumption as a basic component of GDP (measured in terms of the expenditure approach), seems to have diminished without a clear substitution by investment. Indeed, the gross investment share of GDP fluctuated during the last twelve months, whilst in the last quarters, public consumption appears to have been growing as a share in total expenditure. The above, in combination with the mixed messages one obtains by the evolution of consumer and retail confidence indicators (constant improvement in retail trade but a feeling of hesitation in construction) indicate the need for initiatives that will improve expectations, both in the market for consumption goods and in the market for capital goods, thus boosting consumption and investment expenditure. Among other things that would help are the return to smooth lending conditions in the credit market as banks manage to face effectively their non-performing loans, a more effective public sector, and the ability to tap into the significant domestic human capital in supporting the real economy with an emphasis in innovation and high-value added production.

KEPE, *Greek Economic Outlook,* issue 40, 2019, pp. 13-15

1.2. The evolution of the Consumer Price Index (CPI) in Greece and in the Eurozone

Emilia Marsellou

Greece

The Greek headline Consumer Price Index (CPI) during the three most recent months of 2019 (May, June and July) remained relatively stable, recording a slight annual increase by 0.2% in May, a reduction by 0.3% in June and no change (0.0%) in July. During this period, the core[1] of the CPI presented higher rates of change, especially in July, and recorded an annual increase by 1.0% (Table 1.2.1 and Figure 1.2.2).

In general, the evolution of the Greek headline CPI and the Greek harmonised CPI (HCPI) does not present any significant difference. However, during the three most recent months of 2019, the Greek HCPI recorded higher rates of increase, although these rates were low (below 1.0%). The core HCPI presented a slightly higher rate of increase than the HCPI.

In addition, it is worth mentioning that according to the most recent available data published by the Hellenic Statistical Authority (ELSTAT), the Greek CPI remained unchanged in July 2019 (0.0% y-o-y), mainly on account of the subsequent price decreases in the sub-categories of goods and services:

- -1.4% in *Food and non-alcoholic beverages* (mainly due to price decreases in bread and cereals; dried, salted or smoked meat; yoghurt; cheese; oils and fats; fresh fruit; dried fruit and nuts; preserved or processed vegetables; sugar-chocolates-sweets-ice cream; other food; coffee-cocoa-tea; fruit juices.

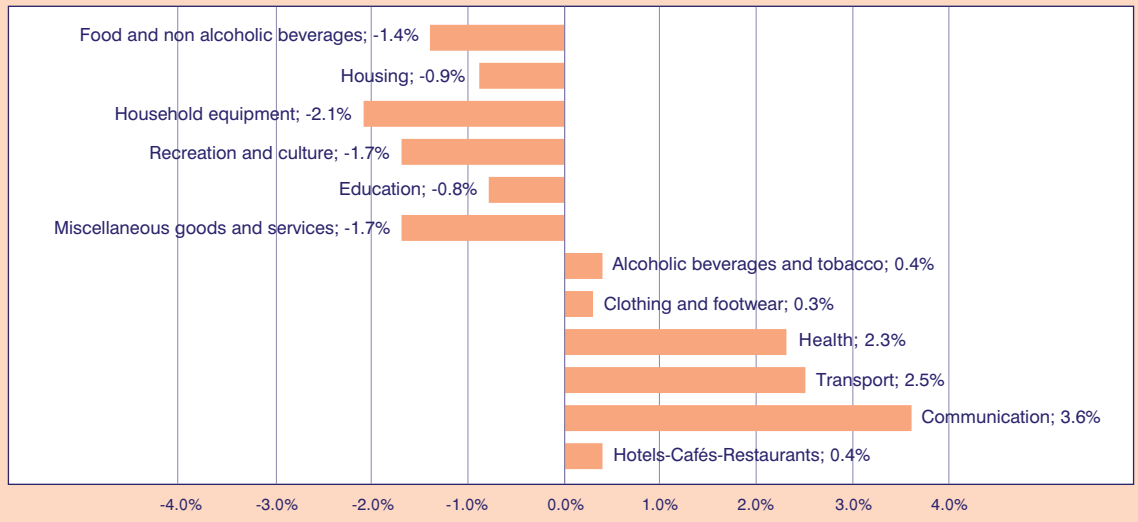
TABLE 1.2.1 Inflation in Greece and in the Eurozone

	Headline inflation (Greece)	Core inflation (Greece)	Harmonised inflation (Greece)	Core Harmonised inflation (Greece)	Harmonised inflation (EA19)	Core Harmonised inflation (EA19)
2018:M9	1.1%	0.1%	1.1%	0.4%	2.1%	1.1%
2018:M10	1.8%	0.3%	1.8%	0.7%	2.3%	1.3%
2018:M11	1.0%	0.1%	1.1%	0.5%	1.9%	1.1%
2018:M12	0.6%	0.6%	0.6%	0.6%	1.5%	1.1%
2019:M1	0.4%	0.3%	0.5%	0.4%	1.4%	1.2%
2019:M2	0.6%	0.2%	0.8%	0.5%	1.5%	1.2%
2019:M3	0.9%	0.4%	1.0%	0.7%	1.4%	1.0%
2019:M4	1.0%	0.5%	1.1%	0.7%	1.7%	1.4%
2019:M5	0.2%	0.2%	0.6%	0.5%	1.2%	1.0%
2019:M6	-0.3%	0.3%	0.2%	0.3%	1.3%	1.3%
2019:M7	0.0%	1.0%	0.4%	0.6%	1.0%	1.1%

Source: ELSTAT, EUROSTAT.

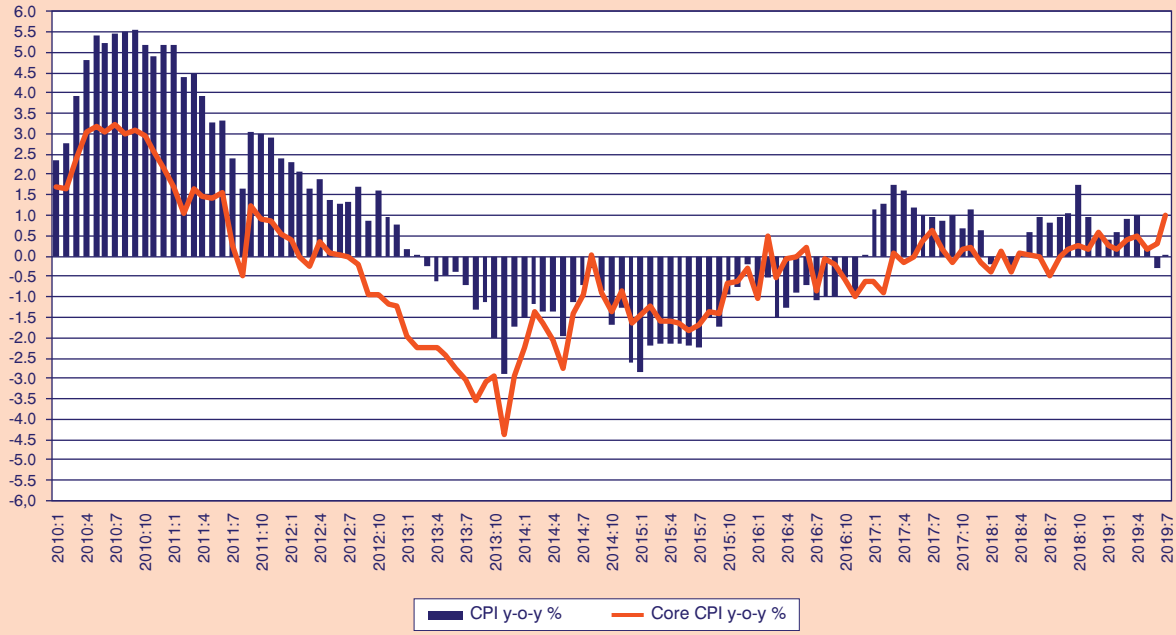
1. Core Inflation Index is calculated from the Overall Consumer Price Index excluding the divisions: 1. Food and non-alcoholic beverages, 2. Alcoholic beverages and tobacco and energy prices.

FIGURE 1.2.1
Annual changes in sub-categories of goods and services CPI (July 2019)



Source: ELSTAT.

FIGURE 1.2.2
CPI, % change relative to the respective month of the previous years (2009=100)

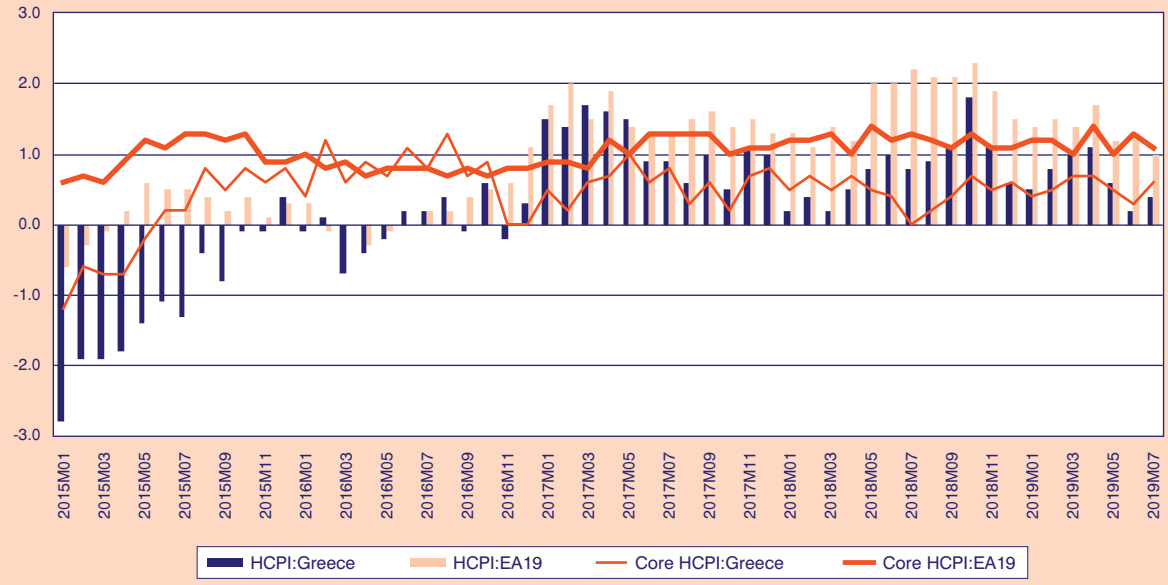


Source: ELSTAT.

Part of this decrease was offset mainly by the increase in the prices of pork, poultry, fresh fish, fresh vegetables and potatoes.)

- -0.9% in *Housing* (mainly due to price decreases in electricity and natural gas. Part of this decrease was offset mainly by the increase in the price of heating oil).
- -2.1% in *Household equipment* (mainly due to price decreases in household textiles, household appliances and repairs, non-durable household articles).

FIGURE 1.2.3
HCPI in Greece and the Eurozone, annual change (2015=100)



Source: Eurostat.

- -1.7% in *Recreation and culture* (mainly due to price decreases in audiovisual and information processing equipment).
- -0.8% in *Education* (mainly due to the decrease in the prices of fees of secondary education).
- -1.7% in *Miscellaneous goods and services* (mainly due to the decrease in the prices of other appliances and articles for personal care).

Part of the aforementioned price decreases were offset mainly by the increase in the prices of the following sub-categories of goods and services:

- +0.4% in *Alcoholic beverages and tobacco* (mainly due to the increase in the prices of tobacco. Part of this increase was offset mainly by the decrease in the prices of alcoholic beverages [not served]).
- +0.3% in *Clothing and footwear* (due to price increases of these products).
- +2.3% in *Health* (mainly due to increases in the prices of pharmaceutical products).
- +2.5% in *Transport* (mainly due to price increases in transport airplane tickets. This increase was partly offset mainly by the decrease in the prices of fuels and lubricants).
- +3.6% in *Communication* (mainly due to price increases in telephone services).
- +0.4% in *Hotels–Cafés–Restaurants* (mainly due to price increases in restaurants-confectioneries-cafés-buffets as well as accommodation services).

The Eurozone

The harmonised CPI of the euro area (HCPI-EA19) and the core HCPI-EA19 presented higher rates of increase compared to the corresponding Greek indexes during the crisis as well as since the start of the recovery of the Greek economy. The HCPI-EA19 annually increased by 1.0% in July 2019, down from 1.3% in June and 1.2% in May 2019. Hence, the HCPI-EA19 rate of increase remains lower than the target of the European Central Bank (ECB).[2] It is worth mentioning that during the period from July 2018 to October 2018, the HCPI-EA19 increased annually by a rate higher than the ECB 2.0% target.

According to the data released by Eurostat for July 2019, the higher contribution to the annual increase of the HCPI-EA19 is attributed to *Services* (+0.53 percentage points), *Food, alcohol and tobacco* (+0.37 pp), *Non-energy industrial goods* (+0.08 pp) and *Energy* (+0.05 pp).

2. In line with the European Central Bank's price stability target, inflation (annual CPI change) should be around 2.0% in the medium term.

1.3. Factor model forecasts for the short-term prospects in GDP

Factor Model Economic Forecasting Unit
Ersi Athanassiou, Theodore Tsekeris, Ekaterini Tsouma

The current section presents the updated short-term forecasts of KEPE concerning the evolution of the rate of change of real GDP in Greece for 2019.[1] The forecasts are produced by implementing a dynamic structural factor model, a detailed description of which can be found in Issue 15 (June 2011, pp. 19-20[2]) of KEPE's scientific journal entitled *Greek Economic Outlook*. The underlying time series database used to estimate the model and produce the forecasts includes 126 variables, covering the main aspects of economic activity in the country on a quarterly basis, spanning the time period from January 2000 up to June 2019. Specifically, the database incorporates both real economy variables (such as the main components of GDP from the expenditure side, general and individual indices concerning industrial production, retail sales, travel receipts and the labor market) and nominal variables (such as the general and individual consumer price indices, monetary variables, bond yields, interest rates, exchange rates and housing price indices). In addition, the data sample includes a considerable number of variables reflecting expectations and assessments of economic agents (such as economic sentiment and business expectations indicators). It is noted that the seasonal adjustment of all time series is carried out by use of the Demetra+ software, which is freely available from Eurostat.[3]

Based on the factor model econometric estimates presented in Table 1.3.1, and having incorporated published (provisional) GDP data for the first and second quarter of 2019,[4] the mean annual rate of change of real GDP for 2019 is predicted at 1.7% and the mean rate of change for the second half of 2019 at 1.9%. These forecasts reflect, on the one hand, a moderation of the GDP mean annual rate of change, relative to the preceding year (1.9%). On the other hand, they constitute a marginal downward revision of the preceding factor model forecast for 2019 (1.8%), while they further suggest an enhancement of growth during the second half of the year, as compared to the forecast of the preceding period of reference (1.6%). This trend is also mirrored in the corresponding mean rates of change for the third and fourth quarters of 2019 (as compared to the same periods of 2018), which are estimated at 1.7% and 2.1%, respectively, exceeding in both cases the respective rates of change of the preceding forecast (1.2% and 2%). It should be noted that any potential effects arising from the interim implementation of specific policy measures are not explicitly estimated, but are implicitly taken into account by updating the included economic variables to the most recent period of reference, which in the case of the above presented forecasts is the second quarter of 2019.

The presented estimates signal the continuation of the growth process in the country. Still, the weakening of

TABLE 1.3.1 Real GDP rate of change
(%, y-o-y)

	2019	
Quarters	**2019Q3**	**2019Q4**
Quarterly rate of change	1.68 [1.62 , 1.75]	2.08 [1.96 , 2.21]
Mean rate of change, 2nd half of 2019	1.88 [1.79 , 1.98]	
Mean annual rate of change	1.69* [1.64 , 1.74]	

Note: Values in brackets indicate the lower and upper boundaries of the 95% confidence interval of the forecasts.
*The mean annual rate of change incorporates the officially available (provisional) data for the first two quarters of 2019, on a seasonally adjusted basis.

1. The date of the forecast is September 13, 2019.
2. <https://www.kepe.gr/images/oikonomikes_ekselikseis/issue_15enb.pdf>.
3. The TRAMO/SEATS filter was used for the seasonal adjustment.
4. According to the most recent publication by ELSTAT for the *Quarterly National Accounts,* dated September 4, 2019.

the 2019 annual rate of change of real GDP, relative to the growth rate recorded in 2018, demonstrates an overall lack of additional growth dynamics. This assessment is compatible with the provided evidence, reflecting the major aspects of the most recent short-term developments in the Greek economy, and is, also, in accordance with the course indicated by the incorporated economic data for the first half of 2019. More specifically, the GDP growth rate remained subdued in the first quarter of the year, as compared to the respective rate of the first quarter of 2018 (2.7%), according to the downward revision undertaken by ELSTAT to 1.1% (from 1.3%). At the same time, the growth momentum seems to have strengthened in the second quarter of 2019, as indicated by the higher rate of 1.9% and taking, also, into account the corresponding growth rate of 2018 (1.5%). In addition, and according to the preceding factor model forecast, the intermediate slowdown projected in the third quarter of 2019 is followed by a significant acceleration towards the end of the year. As a result, all the provided indications suggest that the Greek economy follows a steady recovery path supported by crucial developments, such as the completion of the economic adjustment programmes and the rebalancing of major fiscal aggregates. In parallel, the observation of restrained growth dynamics relates to the developments in domestic demand, which are mainly driven by sluggishness in completing major projects and investments and by the overall financial burdens heavily weighing on households and enterprises. In addition, it could be further linked to a reluctance and wait-and-see stance, potentially reinforced by the pre-election period and prolonged, to a certain degree, as economic agents await possible changes in government policy.

The above general assessment of the economic conditions in the country is in line with the observed course of the major GDP components and a number of other economic variables, as indicated by the non-seasonally adjusted economic data for the second quarter of 2019 compared to the same quarter of 2018. In particular, and with respect to the recent developments in major GDP components, a rising course characterized consumption expenditure mainly on the basis of the increase in General Government expenditure, since growth in private consumption remained weak, and exports of goods and services. Furthermore, positive trends were recorded in industry, according to (a) the general industrial production index and certain indices of the individual categories, with the exception of those for *energy* and *durable consumption goods*, which decreased, and (b) the general turnover index in industry and a number of the sub-indices for the overall as well as for the internal and external markets, with the exception of the sub-indices for *energy* and *durable consumption goods*, which recorded a fall. Increases were also registered in: (a) travel and transport receipts, (b) passenger cars, according to passenger car licenses issued and the turnover index for motor trade (wholesale, retail trade and repair of motor vehicles etc.), (c) building activity, in terms of volume, on the basis of permits issued and (d) the General Index of the Athens Stock Exchange. In addition, positive developments characterized spreads (the difference between Greek and German 10-year bonds), which declined compared to the respective quarter of 2018, while favourable conditions were signaled by the path of certain indicators reflecting expectations, such as: (a) business expectations in manufacturing, (b) export expectations and (c) assessments on anticipated orders in industry and exports. Moreover, improvements were recorded in a number of cost/price competitiveness indicators.

Alongside the presented positive developments, encouraging signs were offered by the further continuation of the gradual reduction in unemployment (on an aggregate level, as well as for the long-term and the newly unemployed) and the preservation of the increasing trend in employment (on an aggregate level, and in the secondary and tertiary sectors, except for the primary sector), despite the overall adverse conditions still characterizing the domestic labour market.

On the negative side,[5] a decrease was recorded during the second quarter of 2019 in the major macroeconomic component of investment, driven basically by the unfavourable developments in the category of *other buildings and structures*. At the same time, downward trends characterized a number of indicators, such as: (a) the general volume index in retail trade and most of the indices of the corresponding individual categories, (b) the index for new orders in recent months in industry, (c) the turnover index in wholesale trade and (d) the general production index in construction, on the basis of the decrease in both sub-indices, but in particular in the *production of building construction* index (while the *production of civil engineering* index fell as well). Finally, both the economic sentiment indicator for Greece and the European Union (EU) deteriorated.

The forecasted course of the real GDP in the country, as well as the overall domestic economic environment, may evolve according to a more or less favourable –than indicated by the above presented pro-

5. Here again, the ascertainments refer to the course of the variables on a non-seasonally adjusted basis.

jections– scenario during 2019, depending on certain critical and decisive circumstances which concern a wide range of factors. These are associated with the course of the major GDP components: the recovery in private consumption and investment, in conjunction with the preservation of favourable developments with regard to exports, with the aim to safeguard the viability of the growth process and reinforce the production capacity in crucial sectors of the Greek economy, in order to create new and sustainable jobs. They also relate to the awaited economic policy decisions by the new government and any potential effects resulting from the implementation of policy measures in the short term. In addition, the broader geopolitical risks are anticipated to play a decisive role within 2019, alongside the economic conjuncture at the European and global level, given the major prevailing risks which mainly concern the projected slowdown in growth dynamics in the second half of 2019 and the expected downturn in trade worldwide, driven to a significant degree by the trade war between the USA and China, but also by the conditions resulting from withdrawal of the United Kingdom from the EU with or without an agreement.

KEPE, *Greek Economic Outlook,* issue 40, 2019, pp. 19-21

1.4. International environment: Recent developments and prospects of global economic activity

Aristotelis Koutroulis

Due to persistent weaknesses and unfavorable developments in advanced and emerging economies, global GDP growth rates for 2019 are projected to be lower than initially expected. The rate of expansion of international trade is projected to decline as well.

1.4.1. Trends and developments in the global economy

Economic activity

Compared with last spring's projections, global real GDP growth has been revised downwards. On the basis of the recently released OECD projections (OECD, 2019), the global economy in 2019 is expected to register its lowest growth rate (2.9%) since the outbreak of the Global Financial Crisis (see Table 1.4.1). With specific regard to the growth rates of the world's 20 largest economies (G20), these have been revised downwards as well.

Among the factors contributing to the gloomy picture of the global economic environment, the following are

TABLE 1.4.1 Real Gross Domestic Product[1,2]
(annual percentage changes)

	2018*			2019**			2020**		
	IMF	OECD	WB	IMF	OECD	WB	IMF	OECD	WB
World economy	3.6	3.6	3.7	3.2	2.9	3.3	3.5	3.0	3.5
Advanced economies	2.2	:	2.1	1.9	:	1.7	1.7	:	1.5
USA	2.9	2.9	2.9	2.6	2.4	2.5	1.9	2.0	1.7
Euro Area	1.8	1.8	1.8	1.3	1.1	1.2	1.6	1.0	1.4
Japan	0.8	0.8	0.8	0.9	1.0	0.8	0.4	0.6	0.7
United Kingdom	1.4	1.4	:	1.3	1.0	:	1.4	0.9	:
Developing economies	4.5	:	4.3	4.1	:	4.0	4.7	:	4.6
Brazil	1.1	1.1	1.1	0.8	0.8	1.5	2.4	1.7	2.5
Russia	2.3	2.3	2.3	1.2	0.9	1.2	1.9	1.6	1.8
India	7.1	7.0	7.2	7.0	5.9	7.5	7.2	6.3	7.5
China	6.6	6.6	6.6	6.2	6.1	6.2	6.0	5.7	6.1

Sources: IMF, *World Economic Outlook*, *Update*, July 2019; OECD, *OECD Interim Economic Outlook*, September 2019; World Bank, *Global Economic Prospects, June 2019*.

* Estimations, ** Projections.

Notes: 1. The observed differences between the available macroeconomic projections partly reflect the differences between the macro-econometric models and the data used by each international organisation.
2. The sub-group of emerging economies is included in the group of developing economies.

particularly influential: the continuing trade tensions between the USA and China, the limited expansion of international trade, the anemic activity of major manufacturing sectors and the escalation of geopolitical tensions in the Persian Gulf region. In the meantime, global economic activity remains vulnerable to a number of downside risks. These include a possible exit of the United Kingdom from the European Union without a deal, the increasing burden borne by debtors due to deflationary pressures, and a sharp readjustment in international investors' portfolios. In general, the short-term outlook of the world economy is highly uncertain at present. As a result, real investment remains below desired levels across many regions of the world thereby endangering future growth prospects.

Against this background, international organisations emphasise the need for more active economic policy on the part of advanced economies. Specifically, it is claimed that accommodative monetary policy should be accompanied by expansionary fiscal measures in the form of increased public investment in infrastructure. Given that interest rates remain at exceptionally low levels, countries with fiscal space should take the opportunity and invest in infrastructure projects. In the short run, as the argument goes, a policy mix of this kind can boost economic activity via increased demand. In the long run, a higher quality of infrastructure can be expected to improve total factor productivity and enhance potential output growth. Moreover, a more expansionary fiscal stance on the part of rich countries can benefit fiscally constrained ones via positive spillover effects.

1.4.2. Economic developments across the globe

Advanced economies

The USA: GDP growth in the US is expected to range between 2.4% and 2.6% in 2019. However, as the positive effects of supportive fiscal measures fade away, economic expansion rates are expected to fall marginally in 2020 (see Table 1.4.1). For the time being, the propitious labour market conditions (e.g., unemployment rates stand at historically low levels), the low inflation and the high rates of credit expansion to consumers seem to favour household spending. At the same time, however, the increased tariffs on certain imports of intermediate goods have led to increased production costs and threaten the cost competitiveness of domestic firms.

The Eurozone: For the Eurozone, growth is projected to be slightly above 1% in 2019, improving marginally in 2020 (see Table 1.4.1). Supported by a mildly expansionary policy, the key driver of the economy is domestic demand. On the other hand, external demand remains weak due to the overall slowdown in international trade. While consumer sentiment and business sentiment of the service sector are elevated, negative expectations in manufacturing, especially in the automobile industry, weigh on the general economic climate.

Japan: In Japan, growth in 2019 is expected to be 1%, moderating to 0.5% in 2020. One of the main factors contributing to GDP growth is investment activity driven by labour shortages and other capacity constraints. Expansionary fiscal policy has played a positive role as well. However, the recent consumption tax hikes along with the planned fiscal consolidation in 2020 are expected to weigh on economic activity.

The United Kingdom: The short-term outlook for the UK economy is highly uncertain as it is hard to predict the terms of the country's exit from the European Union. Given the challenging external environment and the prolonged weak sentiment that prevails domestically, growth is projected to moderate slightly and stand close to 1% in 2019 and 2020.

Developing economies

GDP growth in emerging and developing economies is projected to register a marginal decrease during the course of the current and the next year (see Table 1.4.1). In China, the re-escalation of trade tensions with the US has contributed to slowing investment activity. Nevertheless, the adoption of a more expansionary fiscal stance, along with the implementation of planned structural reforms, is expected to provide a boost to the economy. In India, lower rates of credit expansion have weakened private expenditures for consumption and investment. In Russia, oil production cuts coupled with strict monetary policy and rising consumption are the main factors contributing to growth moderation. As for Brazil, soft investment activity reflects the slow pace of structural reform implementation.

1.4.3. World trade and commodity prices

On the back of intensified trade disputes among major economies, international trade expansion rates (goods and services) are projected to register a historical low and settle at 2.5% in 2019 (see Table 1.4.2). This development undermines the prospects of the global economy through negative impacts on foreign direct investment and global value chains. Not surprisingly, the situation is more challenging for commodity exporters and countries with a significant presence in

TABLE 1.4.2 World trade volume
(annual percent changes, goods and services)

	2018*	2019**	2020**
Global economy	3.7	2.5	3.7
Advanced economies	3.1	2.2	3.1
Developing economies	4.7	2.9	4.8

Source: IMF, *World Economic Outlook, Update,* July 2019.

* Estimations, ** Projections.

global value chains. Provided that world leaders adopt a more cooperative approach to trade policy making, global trade expansion rates are expected to increase in 2020.

Regarding commodity prices, the international prices of agricultural products and basic metals (except nickel) have been on a downward trend until recently. Oil prices registered a sharp rise last August due to attacks on oil facilities in Saudi Arabia (World Bank, 2019b). However, provided that an escalation of tensions in the Persian Gulf is avoided, oil prices are expected to settle at normal levels determined by pure economic factors (i.e., levels that are consistent with global demand and supply).

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2. Public finance

KEPE, *Greek Economic Outlook,* issue 40, 2019, pp. 22-27

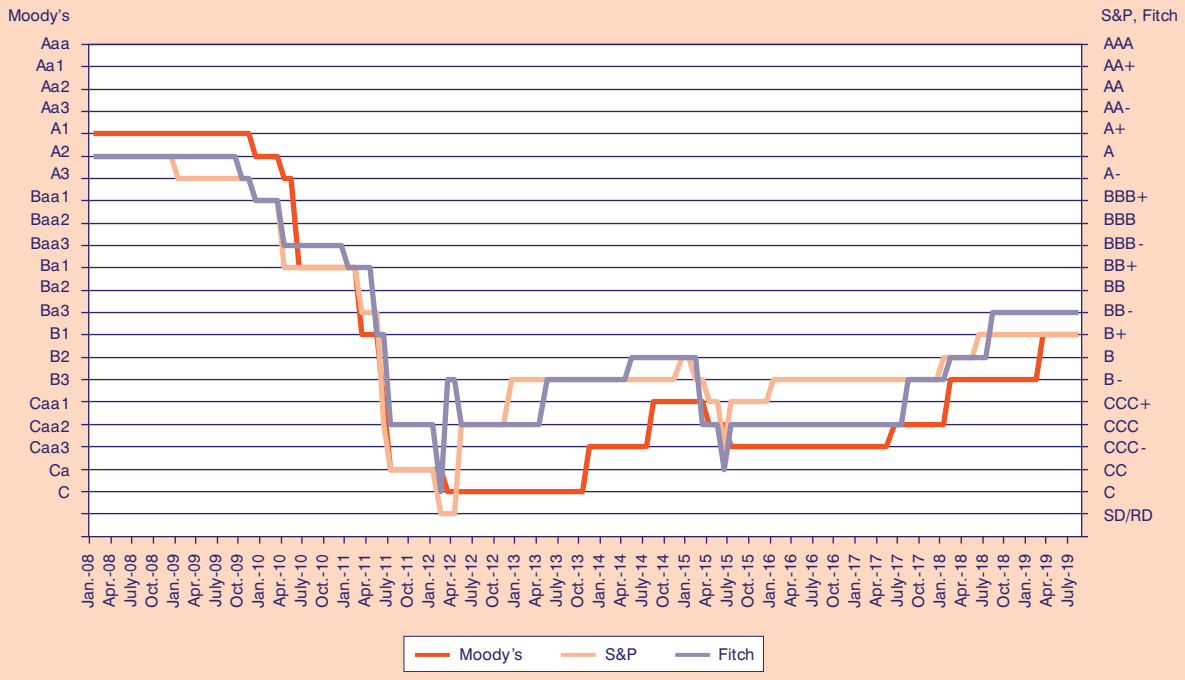
2.1. The evolution and structure of public debt

Fotini Economou

The level of public debt remains, among other things, a key factor in order to improve Greece's credit rating and return to investment grade.[1] According to the Public Debt Management Agency (PDMA) and the latest credit ratings, Greece received a B+ rating from Standard & Poor's with a positive outlook (July 2018), a BB- from Fitch with a stable outlook (August 2018), a B1 from Moody's with a stable outlook (March 2019), a B+ from Rating Investment with a positive outlook (April 2019) and a BB (LOW) from DBRS with a stable outlook (May 2019). Figure 2.1.1 illustrates the evolution of Greece's credit rating from the three major international rating agencies, Moody's, Standard & Poor's (S&P) and Fitch, from January 2008 to August 2019.

According to the European Commission's May 2019 estimates, General Government Debt is expected to drop to 174.9% and 168.9% of GDP for 2019 and 2020,

FIGURE 2.1.1
Credit rating of Greece (Jan. 2008–Aug. 2019)

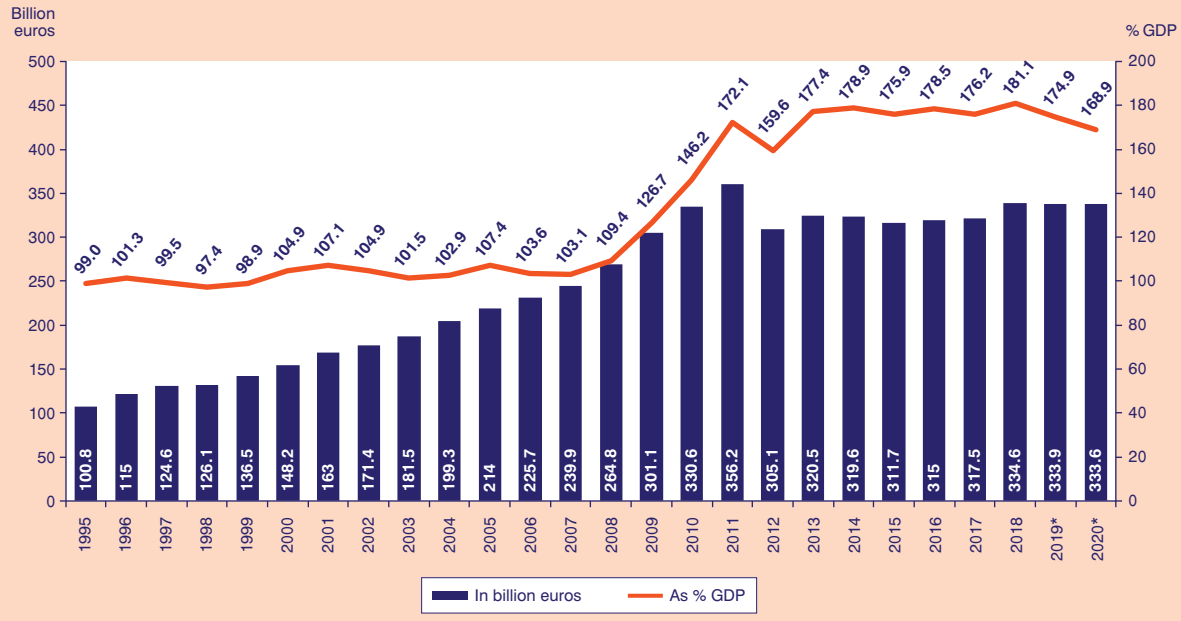


Source: PDMA and tradingeconomics.com.

Note: Credit rating on the last day of each month.

1. A country's bond is considered to be investment grade if it receives ratings BBB- or higher from the international rating agencies S&P and Fitch or Baa3 or higher from Moody's.

FIGURE 2.1.2
General Government Debt (1995–2020)



Source: European Commission, AMECO (last update 7/5/2019).

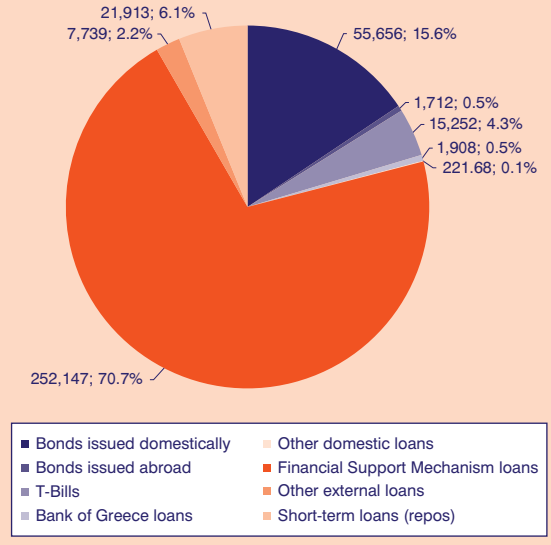
Note: *Estimate.

respectively, after reaching its peak in 2018 at 181.1% of GDP (Figure 2.1.2).

In addition, according to the quarterly data of the PDMA Public Debt Bulletin, the level of Central Government Debt[2] decreased by 1.1 billion euros in the second quarter of 2019, from 357.7 billion euros in March 2019 to 356.5 billion euros in June 2019 (Table 2.1.1). This change corresponds to a drop of 2.4 billion euros, from 358.9 billion euros at the end of 2018. Also note two key parameters of government debt, according to PDMA data: (a) the weighted average maturity of the Central Government Debt was 20.9 years in June 2019, including the extension of EFSF loans agreed on at the Eurogroup of 22/6/2018, from 18.2 years in 2018 and (b) the annual effective weighted average Central Government Debt (cash basis) was 1.62% in June 2019, from 1.61% in 2018.

Regarding the structure of the Central Government Debt, there were no significant changes in the second quarter of 2019. Bonds stood at 57.4 billion euros in June 2019, showing a decrease of 2.5 billion euros, from 59.8 billion euros in the previous quar-

FIGURE 2.1.3
Central Government Debt (June 2019), (million euros and % debt)



Source: PDMA Public Debt Bulletin (June 2019).

2. Central Government Debt differs from General Government Debt by the amount of intra-sectoral debt holdings and other ESA adjustments (see PDMA Public Debt Bulletin, June 2019).

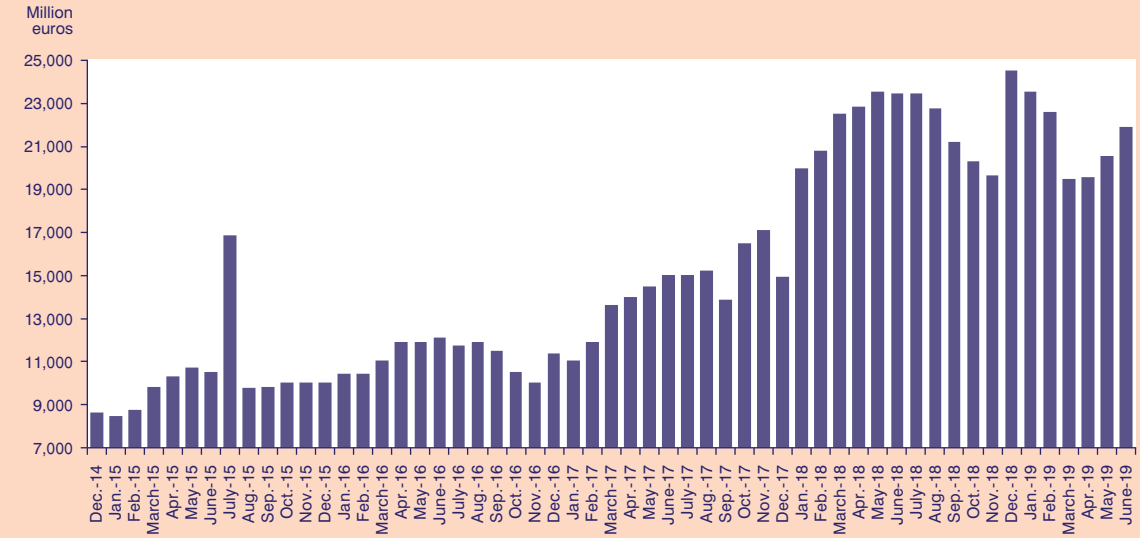
TABLE 2.1.1 Structure of Central Government Debt

	2011		2013		2017		2018		March 2019		June 2019	
	Million euros	% debt	Million euros	% debt	Million euros	% debt	Million euros	% debt	Million euros	% debt	Million euros	% debt
A. Bonds	**259,774**	**70.6**	**76,296**	**23.7**	**50,457**	**15.4**	**51,551**	**14.4**	**59,828**	**16.7**	**57,367**	**16.1**
Bonds issued domestically	240,940	65.5	73,415	22.8	48,681	14.8	49,779	13.9	58,109	16.2	55,656	15.6
Bonds issued abroad*	18,833	5.1	2,880	0.9	1,776	0.5	1,771	0.5	1,719	0.5	1,712	0.5
B. T-Bills	**15,058**	**4.1**	**14,970**	**4.7**	**14,943**	**4.5**	**15,280**	**4.3**	**15,269**	**4.3**	**15,252**	**4.3**
Γ. Loans	**93,145**	**25.3**	**230,210**	**71.6**	**248,373**	**75.6**	**267,598**	**74.6**	**263,121**	**73.6**	**262,017**	**73.5**
Bank of Greece	5,683	1.5	4,734	1.5	2,849	0.9	2,377	0.7	2,377	0.7	1,908	0.5
Other domestic loans	836	0.2	115	0	247	0.1	229	0.1	224	0.1	221.68	0.1
Financial Support Mechanism loans	73,210	19.9	213,152	66.3	232,959	70.9	253,105	70.5	252,667	70.6	252,147	70.7
Other external loans**	13,414	3.6	12,208	3.8	12,318	3.7	11,887	3.3	7,853	2.2	7,739	2.2
Δ. Short-term loans* **	**0**	**0.0**	**0**	**0.0**	**14,931**	**4.5**	**24,521**	**6.8**	**19,475**	**5.4**	**21,913**	**6.1**
Total (A+B+C+D)	**367,978**	**100.0**	**321,477**	**100.0**	**328,704**	**100.0**	**358,950**	**100.0**	**357,693**	**100.0**	**356,549**	**100.0**

Source: PDMA Public Debt Bulletins (December 2011, December 2013, December 2017, December 2018, June 2019) and Issue No 39 of the *Greek Economic Outlook*.

Notes: * Including securitisation issued abroad.
**Including special purpose and bilateral loans.
*** Including repos.

FIGURE 2.1.4
Central Government Short-Term Loans (repos)



Source: Ministry of Finance, General Government Bulletin (various months).

Note: The July 2015 performance is widely diverted as it includes the short-term "bridge" loan of €7.16 billion from the European Financial Stability Facility that Greece received during the period between the second and third adjustment programs.

ter. This amount accounts for 16.1% of the Central Government Debt compared to 16.7% at the end of March 2019. There was also no significant change in the Central Government financing through short-term securities (Greek Government Treasury Bills) which were 15.2 billion euros (4.3% of the Central Government Debt). The share of debt in loans slightly fell to 262 billion euros from 263.1 billion euros in the previous quarter, accounting for 73.5% of debt in June 2019, from 73.6% at the end of the previous quarter (Figure 2.1.3 above). Finally, the source of financing that increased in the second quarter of 2019 was that of short-term borrowing through repos agreements with General Government entities. Specifically, in June 2019 intra-governmental borrowing through repos increased by 2.4 billion euros, from 19.5 billion euros in the previous quarter to 21.9 billion euros (Figure 2.1.4). Thus, in June 2019, this source of funding accounted for 6.1% of Central Government Debt, compared to 5.4% in March 2019.

Regarding the structural characteristics of the Central Government Debt, in June 2019 the share of debt at a fixed rate stood at 93.2% of the debt, against 90.9% of the debt in March 2019 (Table 2.1.2 below). In addition, the non-negotiable debt rose slightly to 79.6% of the debt, from 79% in March 2019, with no significant change in the debt expressed in euros, which was 98.1%, from 98% in the previous quarter (Table 2.1.2).

Regarding the debt management strategy and the "safety net" (in terms of liquidity) established in 2018, the Greek government's cash reserves stood at 20.8 billion euros in June 2019, from 22.5 billion euros in the previous quarter, and the reserves in the special public debt account stood at 0.1 billion euros in June 2019, from 1.8 billion euros in March 2019 (see Public Debt Bulletin, June 2019).

Finally, the recent successful issuance of Greek Government Treasury Bills (T-bills) with reduced borrowing costs should be noted: (a) 26-week T-bills on August 28, 2019 with a borrowing cost of 0.15% (the same with the corresponding previous auction of July 31, 2019), against 0.23% in a prior auction of July 3, 2019, (b) 13-week T-bill on August 7, 2019 with reduced borrowing costs at 0.095%, from 0.23% in the corresponding previous auction of July 10, 2019. In the same spirit, the message of the successful issuance of a 7-year government bond on 16 July 2019 at a borrowing cost of 1.9%, significantly lower than the 3.5% of the 7-year bond issued in February 2018, was also positive.

The announcement of the complete lifting of capital controls from September 1, 2019 was followed by a

TABLE 2.1.2 Composition of Central Government Debt

	December 2011	December 2013	December 2017	December 2018	March 2019	June 2019
A. Rate						
Fixed rate[1]	62.0%	28.5%	48.1%	89.2%	90.9%	93.2%
Floating rate[1, 2]	38.0%	71.5%	51.9%	10.8%	9.1%	6.8%
B. Trade						
Tradable	74.7%	28.4%	19.9%	18.6%	21.0%	20.4%
Non-tradable	25.3%	71.6%	80.1%	81.4%	79.0%	79.6%
Γ. Currency						
Euro	97.5%	95.9%	97.4%	97.9%	98.0%	98.1%
Non-Euro area currencies	2.5%	4.1%	2.6%	2.1%	2.0%	1.9%

Source: PDMA Public Debt Bulletins (December 2011, December 2013, December 2017, December 2018, June 2019) and Issue No 39 of the *Greek Economic Outlook.*

Notes:
1. Fixed/floating ratio is calculated taking into account: i) interest rate swap transactions, ii) the use of funding instruments by the ESM regarding the loans that have been granted to the Hellenic Republic and iii) the incorporation of the risk metrics of the EFSF's liability portfolio into the Greek debt portfolio.
2. Index-linked bonds are classified as floating rate bonds.

significant decrease in the Greek 10-year government bond yields to historically low levels and a decrease in spreads against comparable German bond yields. As shown in Table 2.1.3 below, the average yield of the 10-year bond reached 1.98% in August 2019, from 4.28% in December 2018, and yields at the end of August reached below 1.6%. It is worth noting that, according to Bank of Greece data (Table 2.1.3), there is a significant decline in the average monthly bond yields of all categories (accompanied by price increases) compared to the end of 2018, with the largest change observed in the yields of the 15-year (decreased by 2.36%), 20-year (decreased by 2.35%) and 10-year bonds (decreased by 2.3%).

These developments are quite positive since the decrease of borrowing costs and the country's upgrading to investment grade by international ratings agencies are key objectives to improve the sustainability of public debt and increase the country's bargaining power.

TABLE 2.1.3 Monthly average of government benchmark bond prices and yields for maturities of 3, 5, 7, 10, 15, 20 and 30 years (Dec. 2018-Aug. 2019)

Maturity (Years)	3		5		7		10		15		20		30	
	Price	Yield %	Price	Yield %	Price	Yield %	Price	Yield %	Price	Yield %	Price	Yield %	Price	Yield %
December 2018	-	-	100.84	3.28	96.75	3.98	96.08	4.28	91.3	4.76	87.48	5.07	87.35	5.15
January 2019	104.87	2.89	101.42	3.12	97.42	3.86	96.58	4.21	91.93	4.7	88.71	4.96	88.59	5.05
February 2019	106.53	2.38	101.45	3.13	99.56	3.46	99.3	3.84	94.92	4.4	91.82	4.68	91.78	4.8
March 2019	107.51	2.04	103.52	2.69	101.58	3.08	100.6	3.76	96.65	4.22	93.63	4.53	93.6	4.66
April 2019	108.4	1.72	105.45	2.28	103.8	2.66	103.8	3.42	100.56	3.85	97.91	4.17	97.83	4.35
May 2019	108.49	1.63	105.86	2.17	104.15	2.59	104.19	3.37	100.87	3.82	98.37	4.13	98.34	4.32
June 2019	109.73	1.18	109.03	1.48	108.39	1.8	110.25	2.67	109.72	3.02	109.26	3.3	109.99	3.55
July 2019	110.92	0.73	110.46	1.15	107.61	1.51	114.83	2.16	114.54	2.61	116.13	2.82	118.59	3.05
August 2019	110.60	0.73	110.37	1.13	101.31	1.67	116.39	1.98	117.07	2.40	117.65	2.72	121.37	2.89

Source: Bank of Greece.

Note: The bond prices given are the clean prices per €100 nominal, while the respective yields are expressed in percentages.

3. Human resources and social policies

KEPE, *Greek Economic Outlook,* issue 40, 2019, pp. 28-34

3.1. Recent developments in key labour market variables

Ioannis Cholezas

3.1.1. Introduction

This article uses two types of Labour Force Survey Data (LFS) provided by ELSTAT: the quarterly data, which, at the time of writing, were available up to the first quarter of 2019 and the monthly data, which were available up to May 2019. Moreover, it uses data from the informational system ERGANI for paid employment flows available up to June 2019. The general impression is that despite short-term variation, the number of the employed and the reduction in the unemployment rate continued, although at a slightly slower pace compared to the recent past. Therefore, labour market conditions continue to gradually improve. The number of flexible job contracts seems to stabilise, which may imply that the time is approaching for the use of these contracts to gradually stop expanding so that new jobs entail less uncertainty and better prospects for the employed. Some social groups, such as youth and women, are more often employed under flexible job contracts. Moreover, the upturn in employment seems often to involve new jobs of low and medium skills; this does not align with the desirable upgrade of the production structure of the Greek economy, which would increase its competitiveness and utilise the available high-skill human capital.

3.1.2. Employment

3.1.2.1. Quarterly LFS data

The number of the employed aged 15-64 reached approximately 3,733,500 individuals in the first quarter of 2019; 58.1% were men. Unsurprisingly, compared to the last quarter of 2018, there were 21,300 fewer employed individuals due to the seasonal fluctuation of the economic activity, while compared to the first quarter of 2018, the number increased by 83,700 individuals. As a result, the employment rate for the entire population stood at 55%. Typically, men are more often employed than women (64.4% vs. 45.7%). The gender employment differential reached 19 percentage points, which is considerably smaller compared to the years before 2008 and the crisis, when it stood at 25 percentage points. Another interesting fact is that the number of employed women increased compared to both the last and first quarter of 2018. On the contrary, the number of employed men declined on a quarterly basis, but it increased on an annual basis, although not as much as the number of employed women.

The employment rate for individuals aged 15-19 is very low (2.4%) mainly because most are still studying at that age and studies do not usually involve working at the same time. As individuals age, the employment rate increases; it reaches its maximum at the age group 30-44. The majority of men (close to 80%) were employed in the first quarter of 2019, while the same is true for six out of ten women. The number of employed youth aged 15-29 has increased on an annual and quarterly basis, although marginally in the second case, contrary to the number of employed individuals aged 30-64 who were hurt by seasonal variation similar to men. Moreover, while the gender employment differential narrowed over time, the one between youth and individuals 30-64 expanded to 33 percentage points in the first quarter of 2019.

The educational qualifications for new jobs

Another important aspect of the new jobs created is the type and level of education they require. In earlier issues of the *Economic Outlook* we pointed out that the rate of new jobs for tertiary education graduates was slowing down. Unfortunately at the time of writing, the data for the first quarter of 2019 are not directly comparable to those of previous quarters for tertiary education graduates, because, due to §2, article 46 in Law 4485/2017, the graduates of certain university departments which offer five-year studies are considered to hold a unified and undivided second-stage tertiary degree (i.e. a post-graduate degree) and, therefore, starting in 2019, are classified by ELSTAT as holders of a Master's degree or/and a PhD. The number of the

employed graduates from the remaining educational groups increased less than 2% annually. The only exception was the employed graduates with a primary education degree or less education, whose number actually decreased.

New jobs by industry

On an annual basis the increase in the number of the employed, by 90,200 individuals (or 2.4%), has not been equally distributed amongst industries. Hence, the number of the employed increased by approximately 44% in real estate management, reflecting the improvement in real estate market conditions over the past year that was probably fuelled mainly by foreign buyers. The information and communication industry, which is a small industry in terms of employment, has increased the number of the employed by 16.2% since the first quarter of 2018. Amongst big industries in terms of employment, the number of the employed in agriculture and trade (wholesale and retail) remained almost constant (0.1% and 0.7% respectively), while the number of the employed in the third biggest industry, i.e., manufacturing, increased by 3.2% or 11,300 individuals. The number of the employed in tourism and education, which is dominated by the public sector, recorded the biggest increase in absolute terms with some 20,000 new jobs each. The outcome of these changes was the decrease of the employment share of seven industries and the increase in the remaining industries. It is also interesting that compared to the first quarter of 2014, when the number of the employed started to recover, the share of those employed in tourism has increased by 1.3 percentage points (from 7.1% to 8.4%), while the share of those employed in agriculture has decreased by 1.5 percentage points (from 13.8% to 12.2%). Note that both industries are labour intensive, although the decrease in the number of the employed in agriculture may have been caused by the substitution of labour with capital.

New jobs by occupation

The annual increase of the number of the employed was not equally distributed amongst occupation either. In absolute terms, the biggest increase was recorded in the number of those employed as clerical support workers (36,100), followed by professionals (26,500), i.e., individuals who exercise scientific, artistic and related professions, and those employed as service and sales workers (18,300). The first and third groups of the employed consist of low and medium skilled individuals. On the contrary, skilled agricultural, forestry and fishery is the only group in which the number of the employed decreased by 9,100 since the first quarter of 2018. In relevant terms, the number of managers in the private and public sector exhibited the second biggest increase (4.9%) following clerical support workers (9.3%). Given the hiring constraints in the public sector, it seems plausible that the increase in the number of managers was fueled by the private sector. The outcome of the above discussed changes was the increase in the share of those employed as clerical support workers by 0.7% over the past year, hence low or medium-skilled workers.

New jobs by administrative region

Over the past year the number of the employed increased considerably in the North Aegean (6.7%), Epirus (4.9%), Attica (4.6%) and Crete (4.5%). On the contrary, it decreased considerably in the South Aegean (3.3%). In the remaining regions of the country, the number of the employed exhibited small annual increases. Overall, the number of the employed decreased in just three regions. In some regions, short-term variations, as represented by quarterly changes, were more important than others. It suffices to mention that the decline in the number of the employed between the last quarter of 2018 and the first quarter of 2019 was 11.4% in the South Aegean islands, 6.8% in the Ionian Islands and 4.7% in Crete. On the contrary, the number of the employed in Attica continued to increase even in the short-term, although marginally (1% or 13,700 new jobs).

New jobs by ethnic origin

The population over 15 years of age declined between the first quarter of 2018 and the first quarter of 2019 by 36,700 individuals. Although the number of foreigners decreased by approximately 7% over the past year, the number of natives dropped only marginally (0.7%). On the other hand, the number of the employed from both groups increased. Despite the fact that, in absolute terms, most new jobs were occupied by natives (81.3%), in relevant terms, the increase in the number of the employed was bigger for foreigners (9.3% vs. 2.1% for natives). It is also interesting that although the overall increase in the number of employed women was twice as big as that of employed men (3.5% vs. 1.7%), there were considerable differences based on ethnic origin. Therefore, the number of employed native men increased by 1.1%, while the number of employed male foreigners increased by 11.9%. The differences between native and foreign employed females were smaller, but

they also favour foreign women (5.4% vs. 3.4%). That seems in accordance with the previous observation that new jobs involve low or medium-skilled workers; hence, they are more likely to employ foreigners than natives. Moreover, it could also imply that it is those industries and occupations that "prefer" to hire foreigners over natives that expanded. Last but not least, it could imply that the degree of substitution between the two groups has increased.

Underemployment

There were 235,200 underemployed individuals in the first quarter of 2019. That represents an increase of 5.6% on an annual basis and a 2.9% increase on a quarterly basis. The number of the underemployed aged 25-29 decreased over the past year by 18%, followed by the underemployed aged 45-64 (a 10.9% drop). On the contrary, a big annual increase was recorded for the underemployed aged 15-19 (38.4%). The seasonal variation of the economic activity seems to have "favoured" only underemployed individuals aged 20-24; their number increased by 11.6% (2,300 individuals). Underemployment continued to be more common amongst women and youth under the age of 30. Only the share of the last group dropped, by approximately one percentage point, compared to the first quarter of 2018. Based on those changes, the share of the underemployed stood at 6.2% in the first quarter of 2019, down by 0.5 percentage points compared to the respective quarter in 2018. Fully in accordance with our previous remark, the share of underemployed women was twice as big as the share of the underemployed men in the first quarter of 2019 (8.2% vs. 4.7%). Moreover, the share of underemployed youth was more than two times bigger than the share of underemployed workers over 30 (12.9% vs. 5.2%).

3.1.2.2. Monthly LFS data

In order to explore recent developments in employment flows, one needs to resort to monthly LFS data, which have less information available. Based on these data, the number of the employed aged 15-74[1] increased in the first five months of 2019. There were 3,923,000 employed persons in May 2019 (seasonally adjusted data). This means that approximately 6,200 new jobs were created in May alone. Moreover, during the first five months of 2019, there were 93,800 more employed individuals compared to the respective period in 2018. That number is similar to the one in 2016, while in the remaining years since 2015, when the first five-month increase in the number of the employed was recorded, the number of new jobs was smaller. Due to the increase in the number of the employed, the employment rate for people aged 15-74 increased to 48.8%[2] in the first five months of 2019; this corresponds to a 1.4 percentage point increase compared to the first five months of 2018. However, despite the increase in the number of the employed over the past few years, their number still fell short compared to the maximum recorded in 2008 (54.3%). Nevertheless, the evolution of the number of the employed did not cease to be positive; there is also room for further growth.

3.1.3. Paid employment flows

At the time this article was written, the most recent available data by the information system ERGANI included July 2019. Based on the monthly reports, we have constructed Table 3.1.1, which presents net paid employment flows for the first seven months of 2019. The negative sign means that the number of paid employees (henceforth employees) decreased, since the sum of layoffs and quits in a given month exceeded the number of hires. Typically, in the first seven months of the year the balance is positive. This was true even when paid employment was rapidly decreasing during period 2007-2012. Although the number of paid employees increased in the first seven months of 2019 also, the increase slowed down, since it fell short by approximately 7.7 thousand new jobs compared to 2018. However, new paid employment jobs reached 282,000. Exploring the monthly evolution of paid employment, one can conclude that in those months when paid employment flows are usually negative, they were larger in 2019. On the contrary, in those months when net paid employment flows are usually positive, they were smaller in 2019. February and April are the only exceptions.

The components of paid employment flows for period January-July in years 2013-2019 are presented in Graph 3.1.1, i.e., ever since paid employment flows have been recorded. It is interesting that all flows increased starting in 2013. This means that

1. Note the difference in the age group, which is now 15-74 (monthly data) instead of 15-64 (quarterly data).

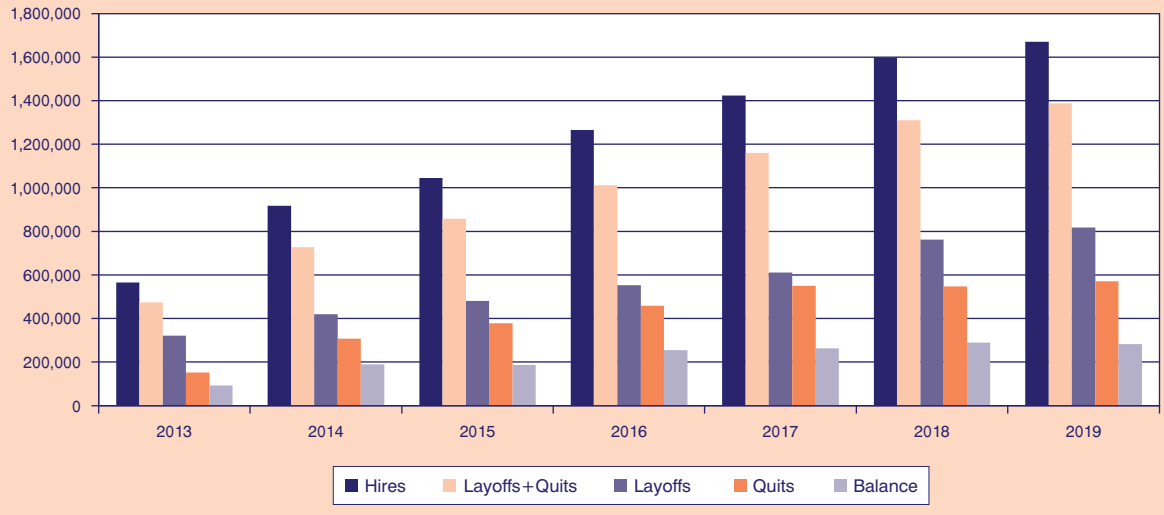
2. The employment rate is different than the employment rate of the age group 15-64 mentioned before, because individuals aged 65-74 are less likely to be employed. Moreover, even after the reform of the retirement age, most people retire before they turn 67.

TABLE 3.1.1 Net monthly paid employment flows, 2001-2019

	January	February	March	April	May	June	July	7-month	12-month
2001	-12,531	3,026	7,545	29,686	43,236	7,697	1,293	79,952	49,537
2002	-11,582	12,490	10,874	28,452	42,726	7,526	8,682	99,168	71,665
2003	-11,442	7,800	-3,050	27,332	47,106	16,017	-616	83,147	32,172
2004	-11,771	9,789	12,580	30,034	55,468	3,554	13,193	112,847	24,119
2005	-17,240	1,655	4,267	23,678	52,990	4,919	9,228	79,497	7,785
2006	-19,475	5,585	8,888	28,510	54,623	12,344	9,059	99,534	7,796
2007	-18,561	5,728	11,772	26,232	63,155	3,558	-1,354	90,530	-6,020
2008	-10,717	5,285	7,443	38,192	62,108	9,365	5,094	116,770	-10,103
2009	-26,564	-4,561	-5,731	23,159	54,073	-1,910	-2,757	35,709	-86,171
2010	-16,273	-1,308	1,247	23,299	49,608	4,432	1,059	62,064	-96,150
2011	-28,995	-10,652	-7,419	17,543	52,946	6,524	743	30,690	-125,944
2012	-26,538	-13,024	-7,564	14,435	41,820	10,180	14,131	33,440	-72,014
2013	-17,507	-281	8,950	29,298	55,733	14,341	1,077	91,611	133,488
2014	6,397	19,912	14,567	60,600	59,470	15,351	13,275	189,572	99,122
2015	-9,273	15,124	22,313	80,223	86,146	8,590	-16,658	186,465	99,700
2016	-9,954	14,437	29,351	90,631	76,591	33,608	19,281	253,945	136,260
2017	-29,817	24,938	38,517	92,132	89,534	40,599	7,242	263,145	143,545
2018	-16,542	16,628	55,494	100,246	108,725	33,620	-8,610	289,561	141,003
2019	-22,333	27,840	43,373	110,895	105,284	31,407	-14,691	281,775	-

Source: Ministry of Labour and Social Affairs, Information System ERGANI.

GRAPH 3.1.1
Components of paid employment flows in January-July, 2013-2019



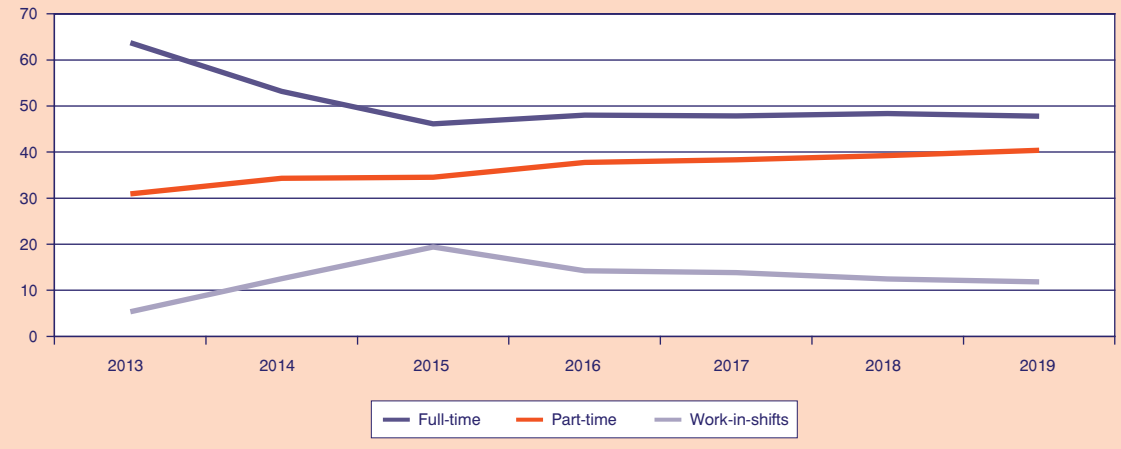
Source: Ministry of Labour and Social Affairs, Information System ERGANI.

the mobility in the labour market increased in parallel with employment recovery. This observation is reinforced also by the fact that the number of quits increased; there were 3.8 times more in 2019 than in 2013. Moreover, the layoffs to quits ratio stood at 2.1 in the first seven months in 2013 but dropped to 1.4 in the first seven months in 2019. This means that the number of quits increased disproportionately over the past years; partially because labour market conditions improved (a quit often equals moving to a new job or retiring). In the same context, one should not downplay the role of voluntary quit programmes, especially in the banking sector. Last, but not least, the widening of the differential between hires and layoffs, which has led to the increase in new jobs since 2013, reflects the marginally faster increase of hires compared to layoffs.

The type of new jobs and the associated job contracts are similar to those in the previous years. Hence, approximately 48% of new hires involved full-time job contracts, nearly four out of ten involved part-time job contracts and some 12% of hires involved work-in-shifts job contracts. Graph 3.1.2 presents the evolution of new hires in period 2013-2019. Two remarks need to be pointed out. First, the share of full-time jobs to the total number of new jobs dropped from 64% in 2013 to approximately 46% in 2015 and has been fluctuating around 48% ever since. Second, this reduction was accompanied by an increase in the number of flexible job contracts, especially work-in-shifts job contracts, which were facilitated by consecutive legislative initiatives during the crisis and, particularly, during period 2010-2012. The biggest share of work-in-shifts job contracts was recorded in 2015 (almost 20%), but it has been decreasing ever since; it stood close to 10% in 2019. On the contrary, there was a slightly increasing trend of hires involving part-time job contracts.

Combining the composition of new hires with the conversion of full-time job contracts to part-time or work-in-shifts job contracts seems to verify the claim that the labour market is turning to more employee-friendly types of flexible job contracts, partly because economic conditions have been improving. In the first seven months of 2019, approximately 25,740 full-time job contracts were converted to flexible job contracts. This number is bigger compared to the one for the respective period in 2018, but it is smaller than those in previous years. Nearly seven out of ten full-time job contracts were converted to part-time job contracts, which is more than in the past years. It suffices to mention that back in 2014 the respective rate was 50%. On the other hand, this means that the number of full-time job contracts converted to work-in-shifts job contracts has decreased. More specifically, the worst-case scenario for the worker (with the exception of a layoff) is to have his/her full-time job contract converted to a work-in-shift job contract without his/her consent. Thankfully, the number of such conversions declined in the first seven months of 2019 by 17.5%, compared to 2018, which means that their share dropped even lower than 9%; this is even lower than the respective share in 2014, which is a good thing.

GRAPH 3.1.2
The composition of new hires by type of job contract (%), 2013-2019



Source: Ministry of Labour and Social Affairs, Information System ERGANI.

Note: The composition of new hires in 2013 involves period March-July.

3.1.4. Unemployment

Despite the temporary increase in the unemployment rate by half a percentage point in the first quarter of 2019, and in accordance with the annual increase in the number of the employed already discussed, the unemployment rate stood at 19.4%, two percentage points lower than the respective period in 2018. This corresponds to a decrease in the number of the unemployed by 95,700 persons or 9.6%. Note also that the women's unemployment rate decreased faster, although, in absolute terms, the number of unemployed men dropped faster. A plausible explanation is that the male labour force decreased by 22,200 persons over the past year, while the female labour force increased by 9,900 persons at the same time. Hence, the participation of females in the labour market, which started to increase during the crisis, still continues to expand. Overall, the unemployment rate for women stood at 24.2%, while the unemployment rate for men stood at 15.5%. This means that the unemployment gender differential remained practically constant.

The other group that suffers from a higher than average unemployment rate is youth aged 15-29. The youth unemployment rate before the crisis erupted in 2008 was three times that of individuals aged 30-64. The age unemployment differential narrowed during the crisis; partly because the youth unemployment rate was already high (it started at 15% in 2008). In the first quarter of 2019 the youth unemployment rate stood at 32.4% vs. 17% for persons aged 30-64; it was two times bigger. Moreover, over the past year (the first quarter of 2018 to the first quarter of 2019), the youth unemployment rate decreased by 3.2 percentage points, while the unemployment rate for persons aged 30-64 decreased by just 1.7 percentage points. The fact that the job prospects for youth during the crisis deteriorated less compared to those for older individuals is also reflected upon the shrinking share of unemployed youth in the total number of the unemployed aged 15-64. Hence, in the first quarter of 2019, unemployed youth constituted one-quarter of the overall unemployed aged 15-64, while in the first quarter of 2008, their share stood close to 45% and in the first quarter of 2014, it stood at one third. There is no doubt that the number of unemployed youth has increased at a slower pace over the past years, partly due to the numerous active labour market programmes, which involved subsidised jobs and/or training, targeting specifically the youth.

Administrative regions

In the first quarter of 2019, the highest unemployment rate for persons over 15 was recorded in West Macedonia (27.1%) followed by the South Aegean (26.9%). On the other side of the spectrum lay the region of Peloponnese with a 13.5% unemployment rate. Between the first quarter of 2018 and the first quarter of 2019, the unemployment rate decreased considerably in Epirus (6.2 percentage points) and the Ionian Islands (5.7 percentage points), while it increased in the South Aegean (2.8 percentage points). In Attica, the unemployment rate dropped by 2.9 percentage points; it stood at 18.4% in the first quarter of 2019, approximately one percentage point below the country average. The standardised deviation increased compared to the first quarter of 2018, showing increasing heterogeneity across regions. The comparative changes that took place contributed in such a way so that the share of the unemployed in Attica to the total number of the unemployed across the country dropped slightly on an annual basis, while the share of the unemployed in the South Aegean islands increased marginally.

Ethnic origin

In addition to the decrease of the population already discussed, between the first quarter of 2018 and the first quarter of 2019, the size of the labour force also decreased (15+). The decrease involved primarily natives, since the participants in the labour force decreased by 30,900 persons over the past year. Moreover, the decrease involved mainly native males, since the labour force of native women remained almost constant. On the other hand, the number of unemployed native men and women decreased in a similar manner, while the number of unemployed foreign women increased faster compared to that of unemployed foreign men.

The result of those movements was the reduction of the unemployment rate for both native men (2 percentage points) and women (2.5 percentage points). On the contrary, the unemployment rate evolved differently for foreigners. In particular, the unemployment rate for foreign men decreased on an annual basis by one percentage point to 32.3% (despite the increase in the number of the unemployed due to the faster increase in the number of the labour force participants). On the other hand, the unemployment rate for foreign women increased on an annual basis by 2.4 percentage points to 41.1% (the number of unemployed foreign women increased faster than the number of the participants in the labour force). Hence, the unemployment differential between natives and foreigners widened over the past year, especially the differential between native and foreign women.

The widening unemployment rate differential between natives and foreigners (despite the fact that the number of employed foreigners increased faster and, thus, they continue to enjoy a higher employment rate than natives) is an issue that should interest policy makers a lot in the Greek context. To support this claim, it suffices to mention that foreigners do not have a family in the country or other assets, like the natives have, that could constitute a safety net against the consequences of unemployment. Moreover, it should always be remembered that the successful integration of foreigners into the Greek economy and society depends on their successful integration to the labour market.

KEPE, *Greek Economic Outlook,* issue 40, 2019, pp. 35-38

3.2. Basic income inequality indices in Greece

Vlassis Missos

3.2.1. Introduction

The study of income inequality in European countries is largely based on the magnitude of household income which, by applying a standard procedure, it is converted into an individual one. More precisely, the individual disposable (after taxes and other contributions have been deducted) income is extracted by an "equivalence scale" generated through a formula, the outcome of which is used for the allocation of the total household income among its members. These scales or weights are based on the number of adults and underage –or economically dependent– members comprising each household. Thus, the term "equivalised disposable income" is a statistical measure, interpreted as "income", under the assumption that the total household earnings are allocated among its members, irrespective of whether they contribute towards its acquisition (economically inactive or unemployed) or not. Over the last few years, the mainstream approach has followed the OECD "modified equivalence scale", adopted also by Eurostat.[1]

In addition, one of the most recognised and widely-accepted databases to be employed for measuring basic inequality indices of personal income distribution, refers to the annual Survey of Income and Living Conditions concerning the countries of the European Union (EUSILC), independently conducted by each national statistical authority, under the supervision of Eurostat. The data collection process follows a common set of rules and methodologies that are applied by all EU countries, thus offering the opportunity of compiling comparable indices for the study of inequality among the relevant economies. Due to the time-consuming process required for collecting, reviewing and completing the data-entry phases, the published survey is marked by a considerable time-lag. For example, during the time this article was written, the most recent data available for Greece were derived from the 2018 SILC survey (i.e., publicly available in 2018) referring to the income earned in 2017. In what follows below, the 2018 SILC inequality indices for Greece are compared with those of 2010 (2009 income), while the presented outcomes are related to the overall population as well as to particular sub-groups, according to the criterion of the employment status.

3.2.2. Inequality indices

The measurement of income inequality is examined with reference to various simplistic or more intricate indices such as *Gini*, *Mean Logarithmic Deviation* (*L*), *Theil* (*T*), *Squared Coefficient of Variation* (C^2) and the *Atkinson* inequality index –calculated for several values of the inequality– aversion parameter, ε. The above indices have been used in most recent articles concerning the study of income inequality in Europe and industrialised countries. The enjoyed high degree of acceptance among researchers is based on a series of satisfied properties. The most important ones are: a) "anonymity", which states that all permutations of personal labels are regarded as distributionally equivalent,[2] b) the "population principle" stating that an income distribution is to be regarded as equivalent to a distribution formed by replications of it, c) "scale invariance" and d) the "principle of transfers", which states that the new distribution generated by two opposite deformations is more unequal than the original one.

The commonly used inequality indicators mentioned above focus on different aspects of inequality and may provide for a well-balanced analysis of income distribution.[3] Due to their analytical structure and formation, each of these indices portrays a different level of sensitivity on income transfers made in each part of the

1. Hagenaars, A., K. de Vos & M.A. Zaidi (1994), *Poverty Statistics in the Late 1980s: Research Based on Micro-data*, Office for Official Publications of the European Communities. Luxembourg.

2. This property requires that the ordering principle uses only the information about the income variable and not about, for example, some other characteristic which may be discernible in a sample.

3. See Alfonso H., LaFleur M. & Alacrón D. (2015), "Inequality Measurement", Development Issues No. 2, Development Strategy and Policy Analysis Unit, UN/DESA.

distribution. Thus, the level of change is expressed through a particular social welfare function.[4] Also, inequality indices do not all respond in the same way to income transfers between groups on opposite ends as they do in other parts of the income distribution. For example, income transfers that take place in the middle parts of the distribution are better expressed through the *Gini* index rather than the *Theil*. Alternatively, when they occur at the highest rankings of income, their effect is displayed more through changes on C^2, whereas the lowest parts are articulated in *L*. Lastly, the *Atkinson* index sensitivity is based on the value of the parameter ε –decided by the researcher. The higher the value of ε, the more sensitive the index is to changes at the lowest end of income distribution. In a similar way, a higher value stands for a greater social willingness to accept lower incomes in exchange for a more equal distribution.

Furthermore, total inequality can also be interpreted and explained through the differences that exist *between* and *within* distinct non-overlapping population groups (divided by their employment status (their age or their level of educational). This can be done by using a broad family of measures, such as *L, T* and C^2, that form the "Generalised Entropy" class of measures and which are known for their feature of decomposability, i.e., breaking total inequality down into its components (population sub-groups) to explain the aggregate.

3.2.3. Basic outcomes

Table 3.2.1 presents the results of the inequality indices mentioned above, as they were taken from the 2010 and 2018 SILC surveys (the incomes of 2009 and 2017, respectively). The most common measure, the poverty rate, indicates the part of the population living on less than the 60% of the median equivalised disposable income. According to the data, between 2009 and 2017, the poverty rate has decreased from 20.13% to 18.54%. This decline was driven by the gradual decrease of the annual median income itself. Alternatively, in the case where the poverty threshold is kept stable, calculations differ substantially. Maintaining the poverty threshold of 2009 (in fix prices) intertemporal-

TABLE 3.2.1 Total population income inequality indices, 2009 and 2017, Greece

	2009	2017
Poverty rate (60% of the median income)	20.13%	18.54%
Poverty rate anchored at a point in time (2009)	20.13%	47.58%
Extreme rate of poverty (30% of the median income)[5]	1.34%	4.52%
p90/p10	4.150	4.277
p90/p50	1.944	1.915
L	0.182	0.191
Theil	0.187	0.200
C2/2	0.252	0.383
Gini	0.323	0.319
$A_{\varepsilon=0.5}$	0.088	0.090
$A_{\varepsilon=2}$	0.329	0.402
Income share of the lower 20% of the population	7.21%	7.16%

Source: Micro-data processing, Surveys in Income and Living Conditions, ELSTAT.

4. Each assumption and definition affects the manner in which inequality is measured. See Papatheodorou Ch. (2004), "Conceptual and methodological issues on the measurement of economic inequality: alternative interpretations and its consequences", in Petmezidou M. & Papatheodorou Ch. (eds.), *Poverty and Social Exclusion*, Athens, Exandas (in Greek).

5. EC (2017), "The ESM stability support programme: Greece first & second reviews", July 2017 background report, Institutional Paper 064, European Commission, p. 80.

ly constant,[6] we come to conclude that in 2017, the population percentage living on less than *that* fixed "poverty line" increased to 47.58%. Lastly, the rate of *extreme* poverty, defined as the part of the population living on less than 30% of the equivalised individual median income, also increased from 1.34% in 2009 to 4.52% in 2017. This abrupt change is very important in understanding the inequality level in Greece.

During the same period, the relation between the income of the upper 10% of the population over that of the lower 10% (p90/p10) has increased. Accordingly, the distance between the two opposite ends has itself expanded. In contrast, the distance between the income of the highest and that of the fifth decile has fallen. As a consequence, the relation between these sub-groups has contributed to the increase of the overall inequality, whereas the latter has worked in a different direction. This can also be shown by the income share of the lowest 20% of the population, whose relative share marginally dropped (from 7.21% to 7.16%). Between 2009 and 2017, the lower parts of the income distribution in Greece have suffered greater losses in comparison with the higher income rankings.

This fact alone is reflected on the *L*'s level of change. Its increase indicates the relatively high percentage changes that took place in the lower parts of the income distribution. Moreover, the respective increase of the *T* index signifies that the overall dispersion of the observed incomes around the mean has gone upwards, whereas the critical change in the level of C^2 underlines the higher level of inequality that exists in the upper end of the income distribution. In addition, *Gini*'s marginal drop is indicative of the mitigation between the income differences observed around the mid-parts of the distribution whereas the higher values of the Atkinson indices (calculated for ε=0.5 and 2) for 2017 indicate that the transfers in both the lower and the upper parts of the income distribution were significant. However, the aggregate income inequality in Greece was mainly affected by the greater relative fall of the lower income rankings.

Moreover, Table 3.2.2 refers to the level of inequality by subdividing the overall population according to their status in employment. As it is observed, apart from $A_{\varepsilon=2}$, all other indices designate that full-time employees' income inequality has been lowered, whereas part-time employees' inequality has gone upwards. The critical rise in C^2 means that the level of dispersion in the higher income brackets is greater and, at the same time, within the self-employed and unem-

TABLE 3.2.2 Income inequality indices within population sub-groups by employment status, 2009 and 2017, Greece

	Full-time employees		Part-time employees		Self-employed (part and full-time)		Unemployed		Pension beneficiaries	
	2009	**2017**	**2009**	**2017**	**2009**	**2017**	**2009**	**2017**	**2009**	**2017**
L	**0.137**	0.130	**0.284**	0.314	**0.160**	0.172	**0.165**	0.215	**0.146**	0.107
T	**0.146**	0.132	**0.287**	0.411	**0.152**	0.180	**0.162**	0.180	**0.153**	0.110
C^2	**0.193**	0.184	**0.410**	1.129	**0.169**	0.305	**0.214**	0.197	**0.197**	0.143
Gini	**0.281**	0.269	**0.398**	0.419	**0.306**	0.306	**0.301**	0.328	**0.295**	0.254
$A_{\varepsilon=0.5}$	**0.068**	0.062	**0.132**	0.160	**0.075**	0.082	**0.078**	0.092	**0.071**	0.052
$A_{\varepsilon=2}$	**0.250**	0.278	**0.467**	0.453	**0.298**	0.340	**0.316**	0.496	**0.266**	0.200

Source: Micro-data processing, Surveys in Income and Living Conditions, ELSTAT.

6. Indices anchored at a point in time are often estimated as alternative ways of measuring the level of income inequality. Such an index in which the 2007 (EUSILC 2008) poverty threshold is kept constant throughout the years, is published by Eurostat while in the past, the 2005 one (EUSILC 2006) was used instead. In the present article, a modified version of the Eurostat's index is utilised, choosing to keep real (CPI deflated) value of the 2009 (SILC 2010) poverty threshold for Greece as fixed in time. This modification follows the fact that 2009 can conventionally be taken as the beginning of a recessionary period for the Greek economy.

TABLE 3.2.3 Percentage of total inequality attributed to different population sub-groups, based on the employment status of individuals, 2009 and 2017, Greece

Inequality indices	2009	2017
L	7.5	10.8
T	7.3	9.8
C^2	5.4	5.0

Source: Micro-data processing, Surveys in Income and Living Conditions, ELSTAT.

ployed sub-groups, income inequality has risen. More precisely, among the unemployed, the C^2 index has surged from 0.316 to 0.496 between 2009 and 2017, i.e., inequality within the upper income brackets of the unemployed individuals has become quite high. Pensioners, in addition, constitute the only population group whose income observations have concentrated around a compellingly diminished new mean.

Furthermore, Table 3.2.3 shows the percentage of the total level of inequality explained by the employment status criterion. Between 2009 and 2017, dividing the population by employment status has presented a variety of different trends. More specifically, in 2017, it explained the 10.8% of the overall inequality measured by the L index and the 9.8% measured by the T. On the contrary, the role of C^2 was marginally reduced. All findings indicate the increasing role of the changes that took place in the lower parts of the distribution.

3.2.4. Conclusions

Between 2009 and 2017, total income inequality, as measured by the commonly used indicators referred to above, has presented a variety of different trends. However, the mean, around which income observations of the lower parts of the distribution have themselves concentrated, has decreased more than the respective mean generated by the middle or the higher parts. Within the higher income brackets, the average distances between income observations have declined less than in the lower ones (see the percentage change of $A_{\varepsilon=2}$ in Table 3.2.1). Moreover, changes in inequality are even more important when the criterion of employment status is taken into account. In contrast with the full-timers, both the categories of the unemployed and part-time employees have contributed towards the rise of income inequality. Lastly, the period between 2009 and 2017 has been marked by the growing importance of the status in employment in explaining the overall income inequality.

4. Development policies and sectors

KEPE, *Greek Economic Outlook,* issue 40, 2019, pp. 39-48

4.1. Developments in the Greek tourism sector

Nikolaos Vagionis
George Soklis

The tourism sector is of significant importance for the Greek economy due to its increasing share in GDP and total employment. Last year, 2018, was a good year for Greek tourism, both in terms of turnover and inbound tourism.[1] This article presents the latest developments in the sector, based on the most recent data for the Turnover Index in Accommodation and Food Service Activities, Inbound Tourism (at both country and regional levels), and Domestic Tourism. Finally, the conclusions are drawn.

4.1.1. The Turnover Index in the Greek Tourism Sector

Table 4.1.1 and Figure 4.1.1 present the Turnover Index in the Accommodation and Food Service Activities for the period 2010-2019.[2] The year-by-year and quarter-by-quarter analysis of the index[3] indicates that in the first quarter of 2019, the turnover index decreased by 19.2% compared to the corresponding quarter of the previous year, recording its lowest value for the pe-

TABLE 4.1.1 Turnover Index in the Accommodation and Food Service Activities
Annual and quarterly averages, Base 2015=100

	Annual	Q1	Q2	Q3	Q4
2010	**111.1**	84.0	112.3	163.2	84.8
2011	**99.4**	69.2	112.7	151.5	64.0
2012	**78.8**	49.1	82.3	132.3	51.3
2013	**82.0**	44.8	84.5	133.4	65.4
2014	**92.8**	55.1	92.3	149.4	74.2
2015	**100.0**	59.7	105.1	165.2	70.0
2016	**100.8**	53.2	105.0	177.3	67.7
2017	**109.1**	50.3	110.6	203.0	72.5
2018	**118.9**	55.2	122.7	223.2	74.6
2019	**-**	44.6	138.5[a]	-	-

Source: Hellenic Statistical Authority.

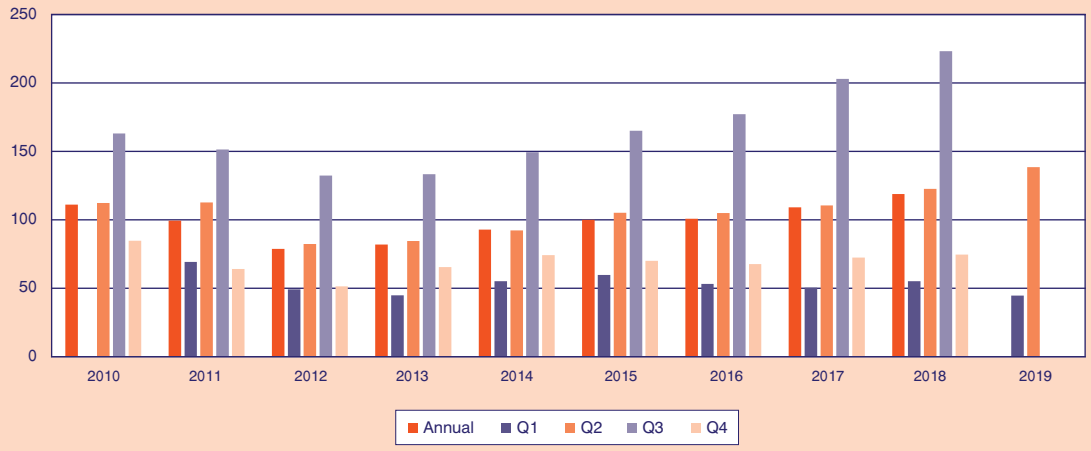
Note: a. Provisional data.

1. See *Greek Economic Outlook*, V. 39, "4.1 Analysis of trends and fundamentals of tourism in Greece".

2. Hellenic Statistical Authority, *Turnover Index in the Accommodation and Food Service Activities, Second Quarter 2019*. Piraeus, September 2019.

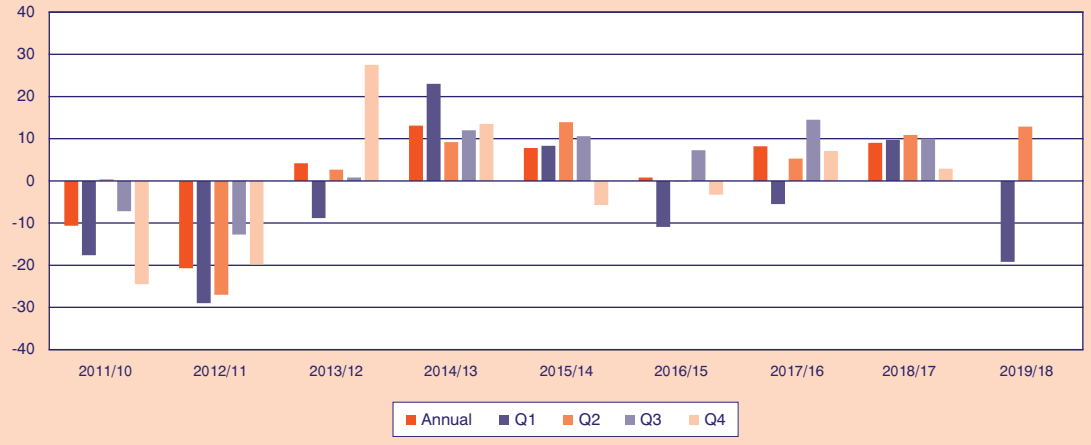
3. The Index, according to NACE rev. 2, has been described in detail in: *Greek Economic Outlook,* V. 20, "4.1. Recent developments in the tourism sector in Greece" and is presented in all subsequent analyses.

FIGURE 4.1.1
Turnover Index in the Accommodation and Food Service Activities, 2010-2019
Annual and quarterly averages, Base 2015=100



Source: Hellenic Statistical Authority.

FIGURE 4.1.2
Turnover Index in the Accommodation and Food Service Activities, 2010-2019
% change of the annual and quarterly indices



Source: Hellenic Statistical Authority.

riod under examination (see also Figure 4.1.2, which presents the respective percentage changes). On the contrary, in the second quarter of the year, the index increased by 12.9% compared to the corresponding quarter of 2018, recording the highest value for the period under examination and continuing its upward trend from 2016 onwards.

Although we cannot yet derive definitive conclusions for the evolution of the index on an annual basis, we may note that the increase recorded in the 2nd quarter of the year tends to offset the decline in the 1st quarter due to the increased relative importance of the 2nd and 3rd quarters for Greek tourism. Thus, the average six-month turnover index for 2019 is at 91.6 points, while that for 2018 was at 89.0 points.

4.1.2. Inbound tourism

We now turn to the analysis of the country's inbound tourism, based on the findings of the Bank of Greece's (BoG's) *Frontier Survey*.

International travel receipts

Table 4.1.2 and Figure 4.1.3 show the country's international travel receipts for the period 2010-2019, both annually and quarterly.[4] Except for the years 2012 and 2016, travel receipts increased over the period under examination, with receipts exceeding €16 billion in 2018. In the first quarter of 2019, travel receipts increased by 34.8%, compared to the corresponding quarter of the previous year, reaching €747 million.

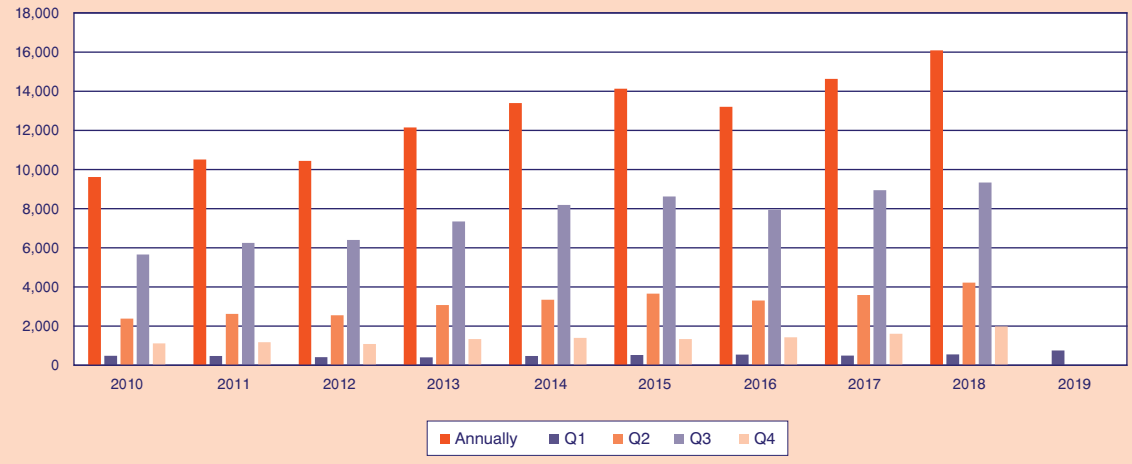
The largest contribution to this increase was from residents of the United States (20.3%) and the United Kingdom (15.3%).[5] Furthermore, according to the

TABLE 4.1.2 International travel receipts, 2010-2019
Annually and quarterly (in million euros)

	Annually	Q1	Q2	Q3	Q4
2010	**9,611**	477	2,375	5,651	1,108
2011	**10,505**	467	2,621	6,246	1,171
2012	**10,442**	413	2,546	6,402	1,083
2013	**12,152**	402	3,074	7,343	1,333
2014	**13,393**	471	3,339	8,190	1,392
2015	**14,126**	516	3,655	8,617	1,338
2016	**13,207**	539	3,302	7,940	1,426
2017	**14,630**	489	3,588	8,944	1,609
2018	**16,086**	554	4,223	9,336	1,973
2019	**-**	747	-	-	-

Source: Frontier Survey, Bank of Greece.

FIGURE 4.1.3
International travel receipts, 2010-2019
Annually and quarterly (in million euros)



4. From 2012 onwards, the data include amounts for *Cruises* except *Frontier Survey*.

5. For a detailed analysis of the Greek inbound tourism per country of origin, see *Greek Economic Outlook*, V. 39, "4.1 Analysis of trends and fundamentals of tourism in Greece".

BoG's provisional data, in the first seven months of 2019, travel receipts amounted to approximately €9.1 billion, recording an increase of 13.6% compared to the same period of the last year.

International travel arrivals

Table 4.1.3 and Figure 4.1.4 show the international travel arrivals in the country for the period 2010-2019, both annually and quarterly.[6] We notice that international arrivals increased throughout the entire period under investigation, exceeding 33 million in 2018. In the first quarter of 2019, arrivals increased by 7.0% compared to the corresponding quarter of the previous year, reaching approximately 2 million.

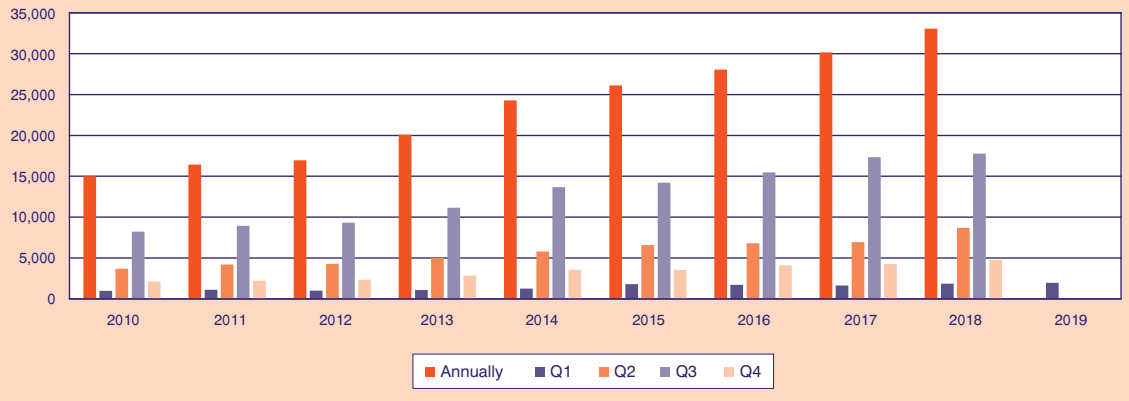
The largest contribution to this increase was from residents of the United Kingdom (32.8%) and the United States (26.0%). Furthermore, according to the BoG's provisional data, travel arrivals in the first seven months of 2019 amounted to about 15.1 million, recording an increase of 0.6% compared to the same period of the previous year.

TABLE 4.1.3 International travel arrivals, 2010-2019
Annually and quarterly (in thousands of travellers)

	Annually	Q1	Q2	Q3	Q4
2010	**15,007.5**	980.4	3,674.8	8,238.1	2,114.2
2011	**16,427.2**	1,108.4	4,195.8	8,925.7	2,197.4
2012	**16,946.5**	998.1	4,288.7	9,315.0	2,344.8
2013	**20,111.4**	1,091.1	5,009.9	11,165.7	2,844.7
2014	**24,272.4**	1,259.6	5,781.6	13,676.4	3,554.8
2015	**26,114.2**	1,792.8	6,574.9	14,227.9	3,518.5
2016	**28,070.8**	1,709.9	6,798.5	15,475.6	4,086.8
2017	**30,161.0**	1,637.4	6,937.0	17,339.2	4,247.4
2018	**33,072.2**	1,840.0	8,695.8	17,786.3	4,750.1
2019	**-**	1,969.0	-	-	-

Source: Frontier Survey, Bank of Greece.

FIGURE 4.1.4
International travel arrivals, 2010-2019
Annually and quarterly (in thousands of travellers)



6. From 2012 onwards, the data include arrivals for *Cruises* except *Frontier Survey*.

Non-residents' expenditure per journey

Table 4.1.4 and Figure 4.1.5 show the expenditure per journey of non-residents for the period 2010-2019, both annually and quarterly. We notice that the expenditure per journey decreased in the period 2010-2016 and increased the last two years. In the first quarter of 2019, the expenditure per journey increased by 26.0% compared to the corresponding quarter of the previous year, reaching €379.1 per journey.

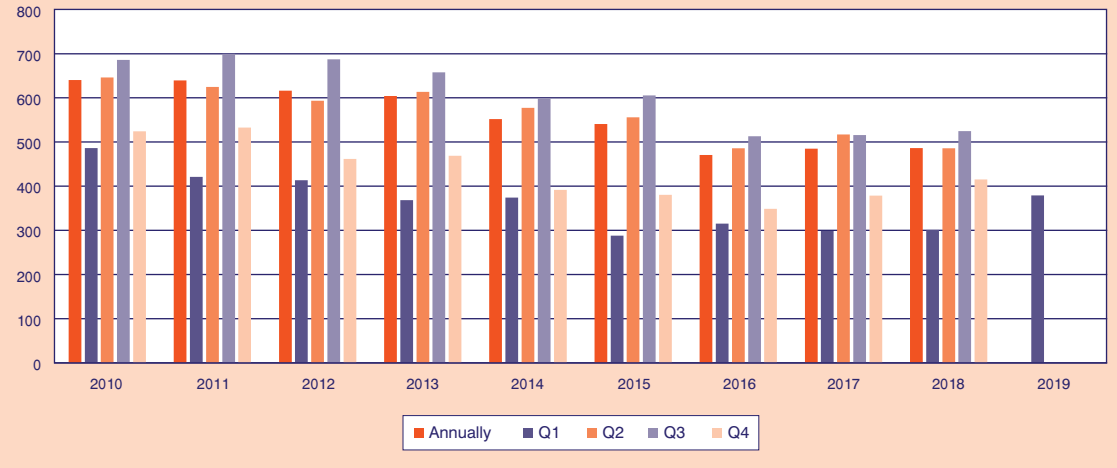
Furthermore, according to the BoG's provisional data, in the first seven months of 2019, expenditure per journey amounted to €591.1, recording an increase of 13.1% compared to the same period of the previous year. Thus, it seems that the increasing tendency recorded in the last two years has continued this year as well.

TABLE 4.1.4 Non-residents' expenditure per journey, 2010-2019
Annually and quarterly (in euros)

	Annually	Q1	Q2	Q3	Q4
2010	**640.4**	486.1	646.3	686.0	524.3
2011	**639.5**	421.1	624.7	699.8	532.9
2012	**616.2**	413.4	593.6	687.2	461.7
2013	**604.2**	368.3	613.6	657.7	468.7
2014	**551.8**	374.2	577.6	598.9	391.5
2015	**540.9**	287.8	555.9	605.6	380.3
2016	**470.5**	315.3	485.7	513.1	348.8
2017	**485.1**	298.9	517.2	515.8	378.8
2018	**486.4**	301.0	485.6	524.9	415.4
2019	-	379.1	-	-	-

Source: Frontier Survey, Bank of Greece.

FIGURE 4.1.5
Non-residents' expenditure per journey, 2010-2019
Annually and quarterly (in euros)



Regional distribution of international travel receipts

Table 4.1.5 reports the breakdown of international travel receipts for the year 2018 as well as the 1st quarter of 2019 into the thirteen regions of the country.[7] As shown in Figure 4.1.6, more than 88% of international receipts are concentrated in five regions of the country, i.e., the Southern Aegean (28.2%), Crete (20.0%), Attica (14.6%), Central Macedonia (14.5%) and the Ionian Islands (10.8%), with the remaining regions recording shares below 3%.

In the first quarter of 2019, 53.5% of travel receipts were recorded in the region of Attica, followed by the regions of Central Macedonia (17.3%) and the South Aegean (5.6%), with the rest of the regions recording shares below 5% (see Figure 4.1.7).

Furthermore, these data indicate that the largest increases in travel receipts compared to the same quarter of the previous year were recorded in the regions of Crete (+196%) and the South Aegean (+144%); the largest decreases were recorded in the regions of Eastern Macedonia and Thrace (-21%) and Epirus (-19%), while the region of Attica had the highest contribution to the increase in travel receipts (64.6%).

Regional distribution of international travel visits

Table 4.1.6 reports the breakdown of international travel visits for the year 2018 as well as the 1st quarter of 2019 into the thirteen regions of the country.[8] As shown in Figure 4.1.8, almost 82% of the visits are concentrated in five regions of the country, i.e., Central Macedonia (22.5%), the Southern Aegean (19.0%), Attica (16.3%), Crete (15.0%) and the Ionian Islands (9.1%), with the remaining regions recording shares less than 6%.

TABLE 4.1.5 Regional distribution of international travel receipts, 2018-2019
(in million euros)

		2018				2019
Region	**Annually**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**
ATTICA	2,278.9	271.5	604.5	849.2	553.6	392.9
NORTHERN AEGEAN	164.2	7.7	31.1	111.5	13.8	7.3
SOUTHERN AEGEAN	4,414.1	16.7	1,159.4	2,817.4	420.6	40.8
CRETE	3,133.9	9.5	995.4	1,800.1	329.0	28.0
EASTERN MACEDONIA AND THRACE	321.6	42.1	69.3	169.5	40.7	33.2
CENTRAL MACEDONIA	2,275.4	98.9	452.8	1,465.5	258.2	126.8
WESTERN MACEDONIA	60.6	6.6	12.1	32.8	9.0	7.3
EPIRUS	221.9	20.9	53.2	121.5	26.4	16.9
THESSALY	270.5	12.0	57.7	175.7	25.1	11.2
IONIAN ISLANDS	1,691.1	7.2	457.0	1,137.7	89.2	10.2
WESTERN GREECE	211.8	24.3	40.0	112.9	34.6	22.0
CENTRAL GREECE	193.8	12.9	38.1	111.9	30.8	18.0
PELOPONNESE	415.5	16.9	107.7	237.4	53.4	20.3
TOTAL	**15,653.2**	**547.3**	**4,078.3**	**9,143.2**	**1,884.4**	**734.9**

Source: Frontier Survey, Bank of Greece.

7. It is noted that the regional statistics do not include data for *Cruises* except *Frontier Survey*. Therefore, there are some differences with respect to the data presented in the preceding sections for the whole country.

8. It is noted that *Visits* are not identical with *Arrivals*, since travellers may visit more than one region during their trip.

FIGURE 4.1.6
Regional distribution of international travel receipts, 2018

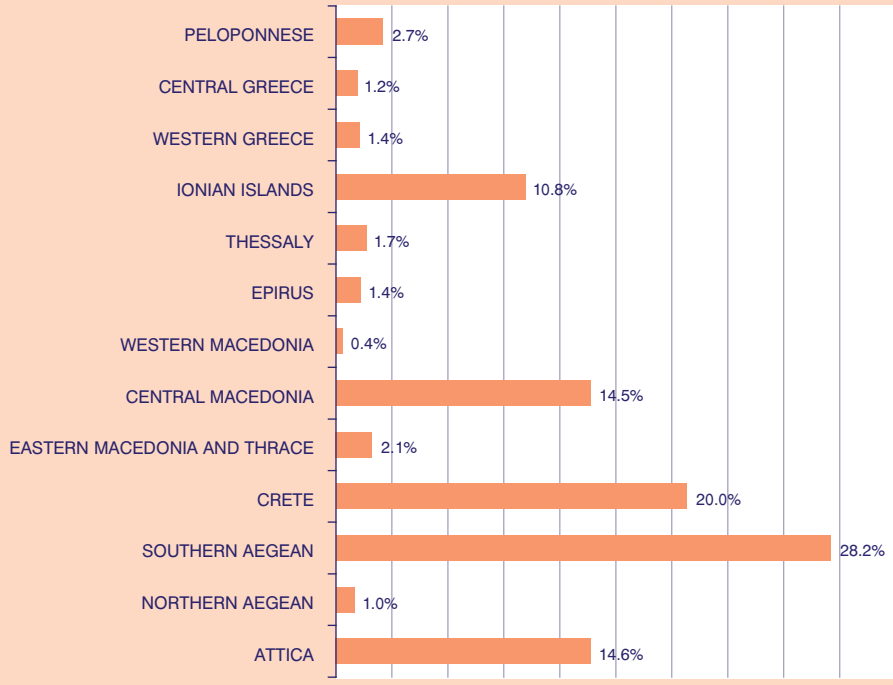


FIGURE 4.1.7
Regional distribution of international travel receipts, Q1-2019

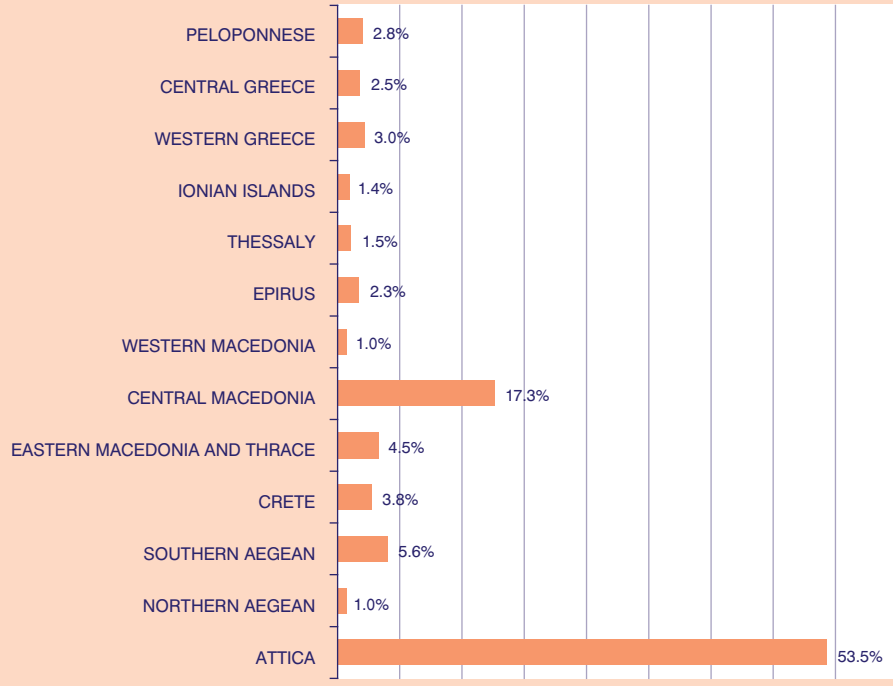


TABLE 4.1.6 Regional distribution of international travel visits, 2018-2019
(in thousands of visits)

		2018				2019
Region	**Annually**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**
ATTICA	5,680.8	751.4	1,611.9	2,075.9	1,241.6	846.2
NORTHERN AEGEAN	388.9	12.6	59.6	293.4	23.2	7.7
SOUTHERN AEGEAN	6,629.4	47.0	1,742.9	4,026.1	813.5	80.3
CRETE	5,228.4	20.9	1,534.4	2,981.4	691.8	51.2
EASTERN MACEDONIA AND THRACE	1,929.9	247.6	366.3	990.0	326.0	296.6
CENTRAL MACEDONIA	7,830.2	559.7	1,789.9	4,474.3	1,006.3	536.0
WESTERN MACEDONIA	348.9	40.5	72.7	196.8	38.9	32.9
EPIRUS	823.2	106.3	212.6	389.6	114.7	71.8
THESSALY	675.0	46.9	169.8	382.7	75.5	47.0
IONIAN ISLANDS	3,162.3	19.9	700.3	2,232.7	209.3	26.1
WESTERN GREECE	699.2	76.3	156.3	331.7	134.9	61.3
CENTRAL GREECE	548.9	63.0	139.7	241.6	104.6	65.1
PELOPONNESE	886.0	61.1	217.7	457.2	150.0	56.9
TOTAL	**34,831.1**	**2,053.3**	**8,774.2**	**19,073.3**	**4,930.3**	**2,179.1**

Source: Frontier Survey, Bank of Greece.

FIGURE 4.1.8
Regional distribution of international travel visits, 2018

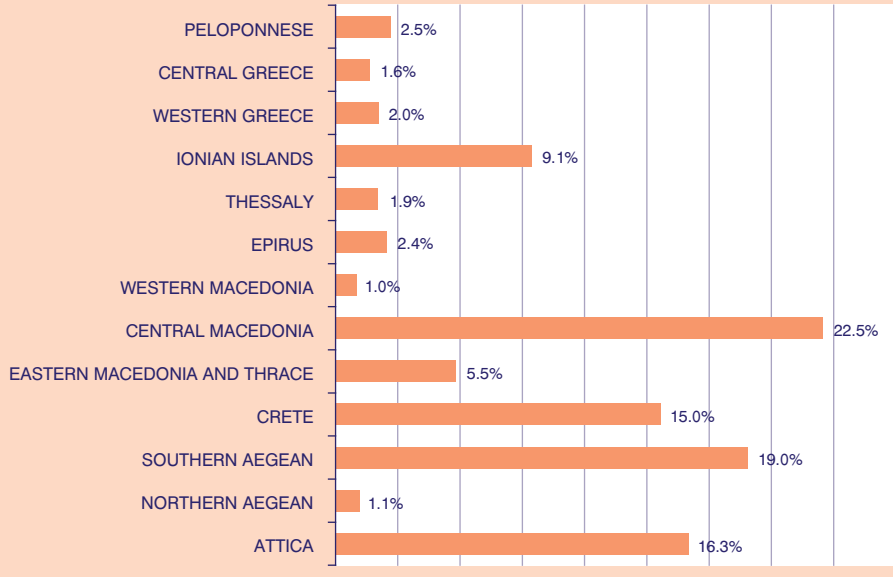
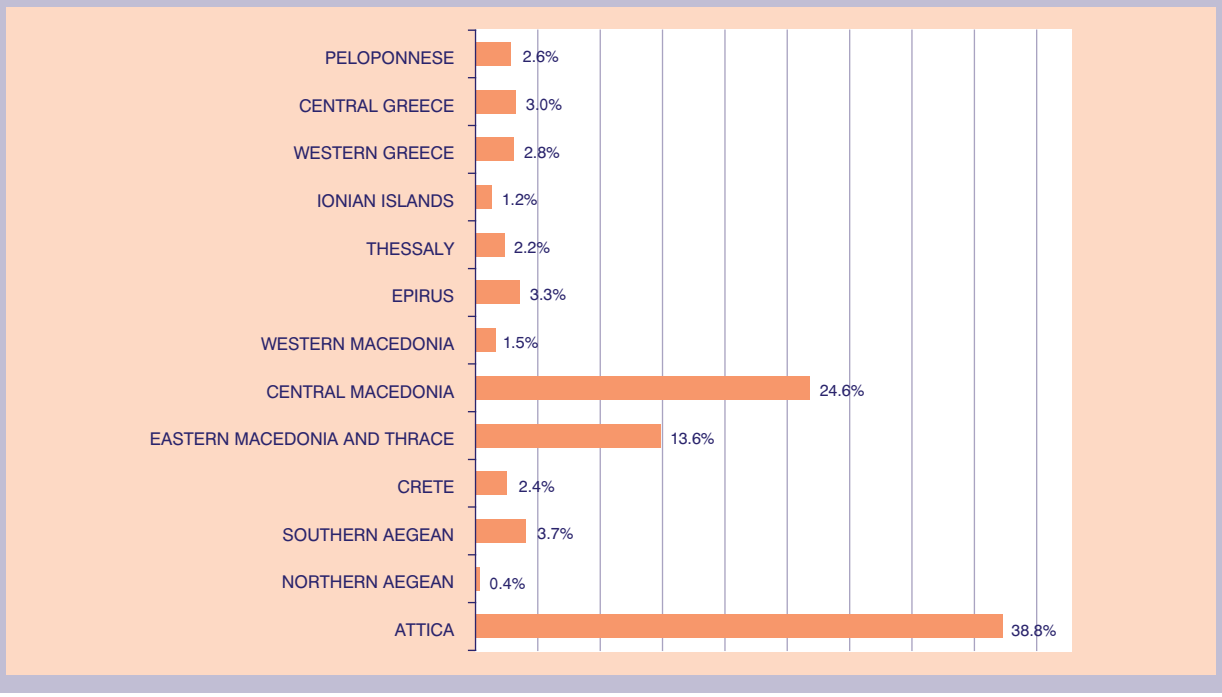


FIGURE 4.1.9
Regional distribution of international travel visits, Q1-2019



In the first quarter of 2019, 38.8% of international visits were recorded in the region of Attica, followed by the regions of Central Macedonia (24.6%) and Eastern Macedonia and Thrace (13.6%), with the rest of the regions recording shares below 5% (see Figure 4.1.9).

Furthermore, these data indicate that the largest increases in travel visits, compared to the same quarter of the previous year, were recorded in the regions of Crete (+145%) and the South Aegean (+71%); the largest decreases were recorded in the regions of the Northern Aegean (-39%) and Epirus (-32%), while the region of Attica had the highest contribution to the increase in travel visits (75.4%).

4.1.3. Domestic tourism

Table 4.1.7 reports data related to the country's domestic tourism for the period 2014-2018, retrieved from the *Vacation Survey* of the Hellenic Statistical Authority. The first column of the table reports the travel expenses of domestic travellers for personal trips within the country, while the second column reports the number of the corresponding trips for each year.[9]

According to these figures, domestic travel expenses increased for the third consecutive year, reaching €1.7 billion in 2018, while the number of the corresponding trips increased for the second consecutive year, exceeding 5.5 million trips in 2018. Figure 4.1.10 shows the annual percentage change in domestic travel expenses and trips.

Thus, we observe that domestic travel expenses increased by 8.7% in 2017 and by 22.6% in 2018, while

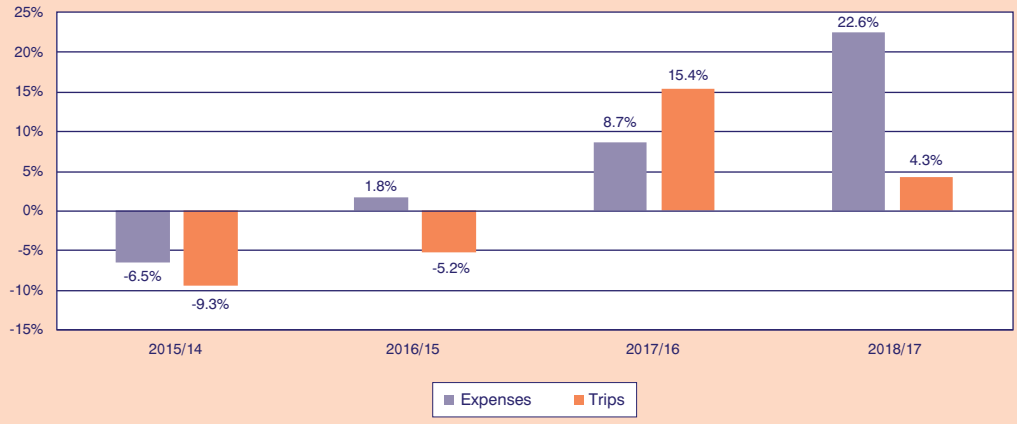
TABLE 4.1.7 Domestic tourism

	Travel expenses (in euros)	Trips
2014	1,352,466,146	5,340,163
2015	1,264,125,934	4,841,525
2016	1,286,735,621	4,590,484
2017	1,398,365,311	5,296,499
2018	1,714,551,588	5,523,673

Source: Vacation Survey, Hellenic Statistical Authority.

9. It is noted that these data do not include business trips or the corresponding expenses and, therefore, domestic tourism is somewhat underestimated.

FIGURE 4.1.10
Domestic tourism, 2014-2018
% change



the corresponding trips increased by 15.4% in 2017 and by 4.3% in 2018.

4.1.4. Conclusions

In this article, we examined the recent developments in the Greek tourism sector. The available data so far indicate that, in terms of both turnover and inbound tourism indicators, trends for the tourism sector in 2019 are positive. The increase in international travel receipts is relatively larger, due to an increase in tourism flows from the United States and the United Kingdom, while the corresponding expenditure per journey has also increased. The analysis of the regional distribution of international travel receipts and visits indicates that the region of Attica had the highest contribution to the increase in receipts and arrivals in the first quarter of 2019, while significant increases in inbound tourism were also reported in the regions of Crete and the Southern Aegean. Finally, positive trends have also been recorded for domestic tourism.

KEPE, *Greek Economic Outlook,* issue 40, 2019, pp. 49-53

4.2. Analysis of the industrial sector based on industrial production and turnover indices

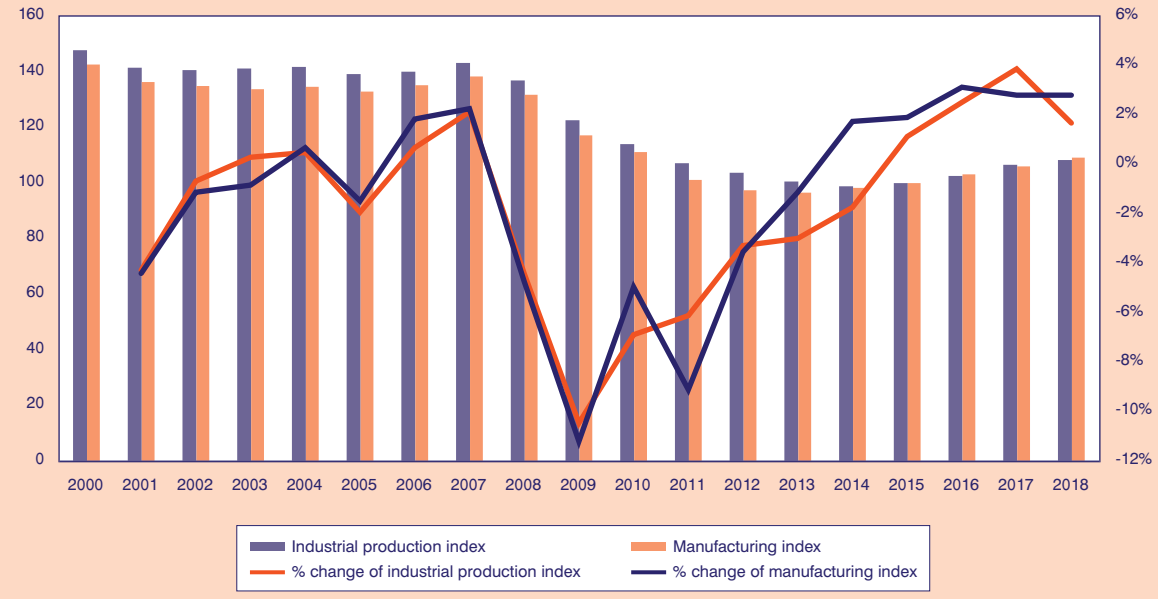
Konstantinos Passas

Industrial production is an extremely important variable since it largely depicts economic activity and is directly linked to the economic performance of a country. In this section we present changes at the sectoral level as described by high frequency indices.[1] The analysis focuses on industrial production and industry turnover indices, and aims to present the latest developments and identify perspective indications as far as the evolution of the industrial sectors are concerned.

4.2.1. Industrial production indices

Figure 4.2.1 illustrates the industrial production index[2] and the manufacturing index,[3] as well as the percentage changes of both indices for the period 2000-2018. The negative effects of the economic crisis on industrial production became apparent in 2008, when both indices started to decrease. Focusing on the industrial production index, we observe that its decline peaked in 2009, at a rate of 10.4%, followed by a period of recovery, returning to growth after 2015. In particular, in 2015 the index increased by 1.2%, by 2.5% in 2016 and by 3.9% in 2017, while in 2018 we observe a significant deceleration as the index grew by 1.7%. Turning to the manufacturing index, we observe that its decline also peaked in 2009, at a rate of 11.2%, returning to growth by 2014. In particular, increased by 1.8% in 2014, by 1.9% in 2015, by 3.1% in 2016, by 2.8% in 2017, and by the same amount in 2018. In conclusion, the industrial production index declined

FIGURE 4.2.1
The general industrial production index and the manufacturing index and their percentage changes



1. The source of the data for the indices is ELSTAT. We note that indices have been rebased, with the base year being 2015.

2. The industrial production index includes the sectors of mining, manufacturing, electricity and water production. Base year is 2015 and the data are seasonally adjusted.

3. The manufacturing index is a sub-index of the general industrial production index.

for seven consecutive years (2008-2014) and the manufacturing index for six years (2008-2013).

Between 2007 (the year before the economic crisis) and 2018, the industrial production index decreased by 24.3%, whereas the manufacturing index fell by 21.1%. We note that by 2014 the index of industrial production decreased by 30.9%, while by 2013 the manufacturing index fell by 30.2%. Thus, we observe that significant reductions during the initial period of the crisis continue to affect industrial production in Greece. It should also be noted that the average annual change of the industrial production index in the period before the economic crisis (2001-2007) was -0.5%, while the average annual change for the same period for the manufacturing index was -0.4%. The respective changes for the period 2008-2018 were -2.4% and -2.0%. This indicates that the country's industrial production was not thriving even before the economic crisis.

Figure 4.2.2 illustrates the percentage changes of the monthly industrial production index and the manufac-

FIGURE 4.2.2
Percentage changes in the industrial production index and the manufacturing index, compared to the corresponding month of the previous year

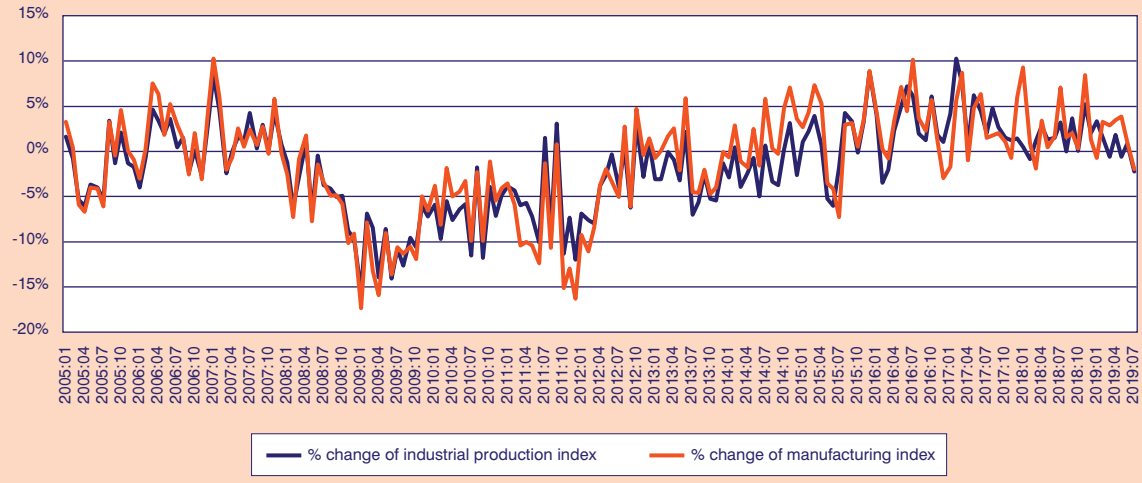
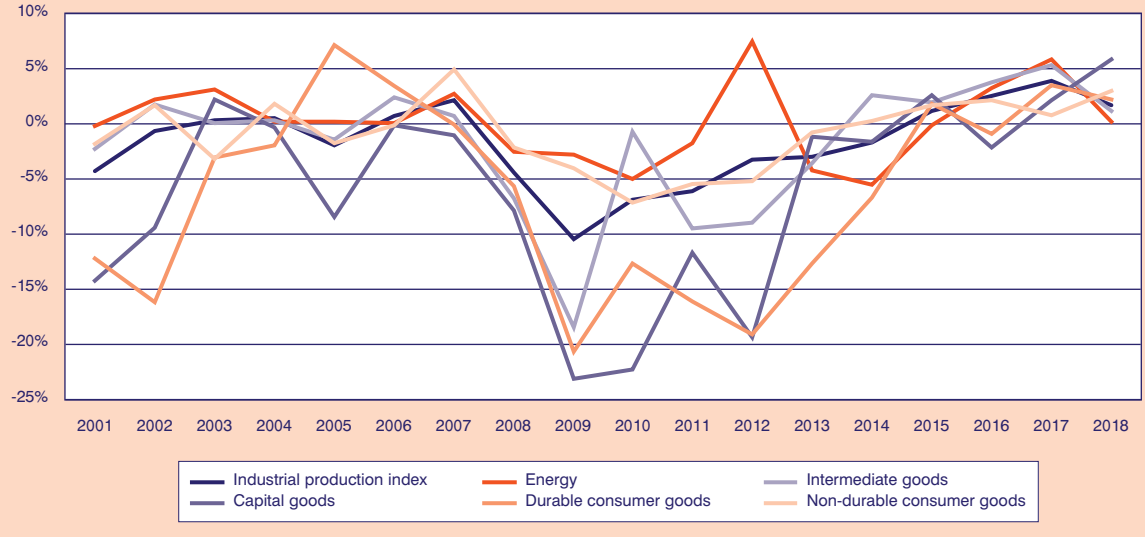


FIGURE 4.2.3
Percentage changes of the industrial production indices compared to the previous year



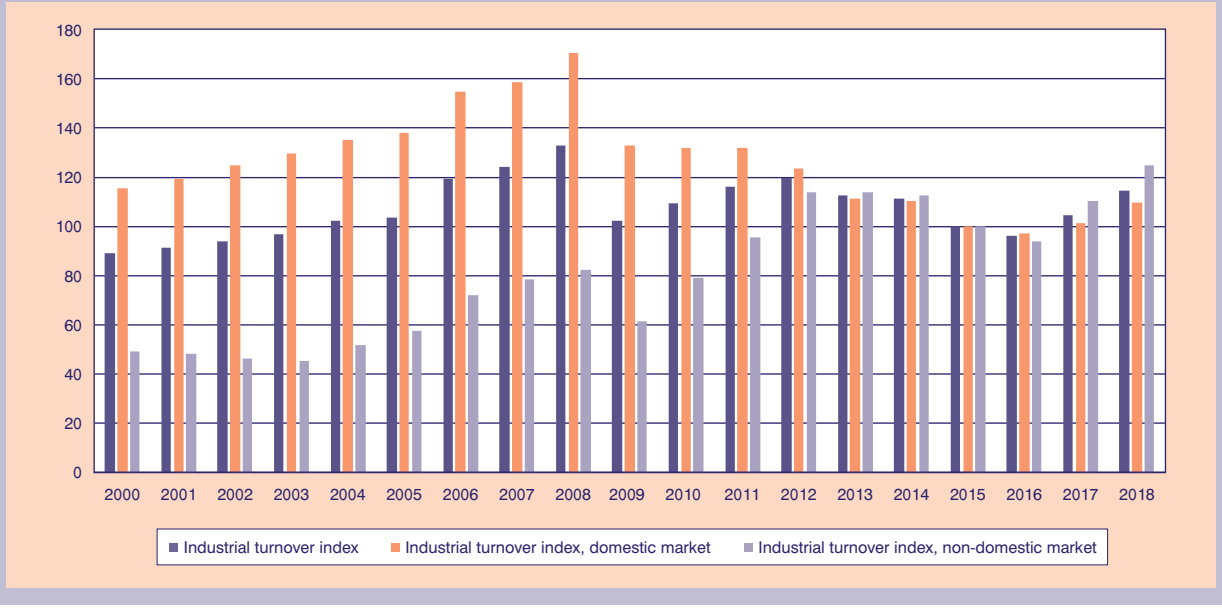
turing index compared to corresponding months of the previous year. Both indices follow a similar course. In 2018 the industrial production index grew every month, except in February where it marginally decreased by 0.8% relative to the same month of the previous year. Likewise, the manufacturing index also increased in every month except March where it decreased by 1.9% relative to the same month of the previous year. During the first seven months of 2019, the industrial production index decelerated as it grew at an average rate of 0.6%, compared to 1.4% in the previous year. Similar deceleration is observed for the manufacturing index as it grew at an average rate of 1.7%, compared to 3.0% in the previous year. We also note that the industrial production index appears to be negative in March, May and July of 2019, while the manufacturing index was negative during January and July.

Important information is also provided by the sub-indices of industrial production for energy, intermediate goods, capital goods, durable consumer and non-durable consumer goods. Figure 4.2.3 above presents the percentage changes of these indices compared to the previous year. From 2008 to 2012 all five sub-indices declined with the exception of the energy index that in 2012 grew by 7.5 and subsequently returned to negative territory. The manufacturing index, as well as intermediate goods and non-durable consumer goods turned positive by 2014, the index of energy by 2016, and the indices of capital goods and durable consumer goods by 2017. By 2018 all indices returned to growth.

4.2.2. Industrial turnover indices

Important information can also be drawn from the industrial turnover index[4] that depicts industrial activity in value terms, as well as by the domestic market industrial turnover and the non-domestic market industrial turnover sub-indices. Figure 4.2.4 illustrates the industrial turnover indices (general, domestic market and non-domestic market), while Figure 4.2.5 presents the percentage changes of the three indices. From 2001 until 2008 the general turnover index and the domestic market index increased, while the non-domestic market index decreased from 2001 until 2003 and increased from 2004 until 2008. The first two indices recorded their largest increase in 2006 (the non-domestic market index recorded its second largest increase). In 2009 the three indices decreased dramatically, by more than 22%, compared to 2008. The domestic market index continued to decrease until 2016, reflecting the decline of domestic demand. The general turnover index and the non-domestic market index followed a similar course: both increased during the period 2010-2012 and decreased from 2013 until 2016. For the first time since 2008, all three in-

FIGURE 4.2.4
Turnover indices



4. The general index of industrial turnover incorporates the following sectors: mining and quarrying, and manufacturing.

FIGURE 4.2.5
Percentage changes of industry turnover indices, compared to the previous year

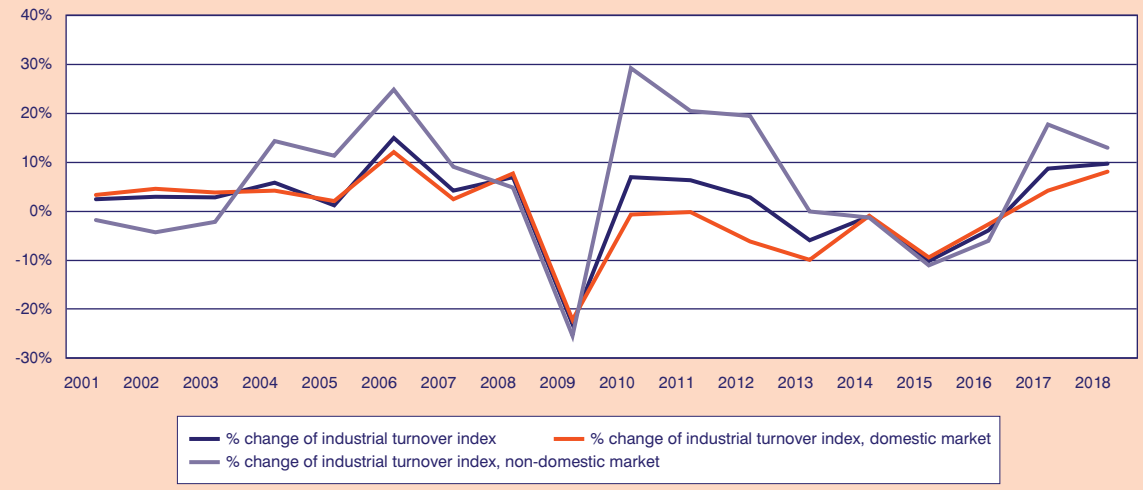
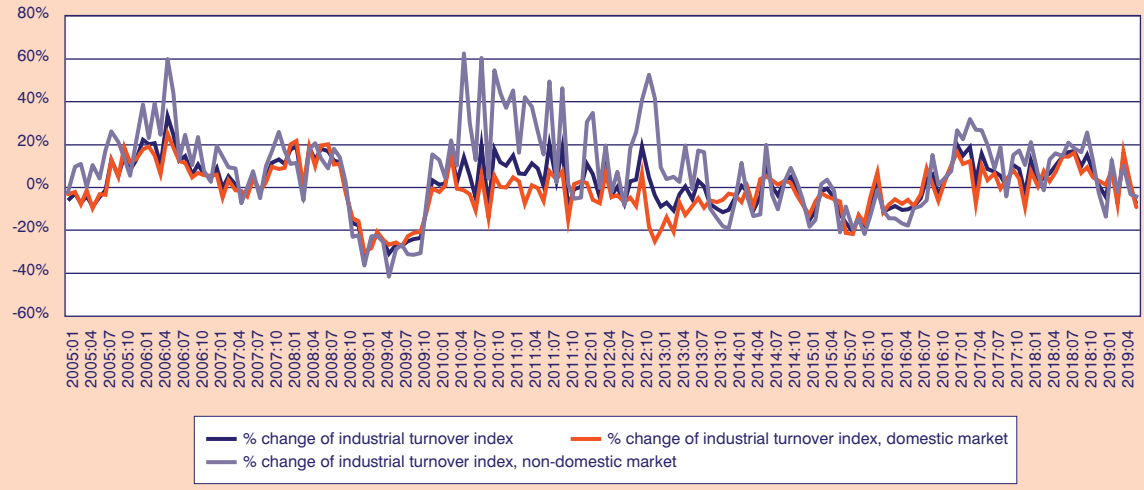


FIGURE 4.2.6
Percentage changes of monthly industry turnover indices compared to the corresponding month of the previous year



dices increased in 2017: the general index increased by 8.74%, the domestic market index by 4.21% and the non-domestic market index by 17.68%. In 2018 the domestic market index increased at an accelerated pace of 8.09%, while the non-domestic market index decelerated to 13.03%. Likewise, the general index in 2018 increased by 9.76%. It should be noted that in the period before the economic crisis (2001-2007), the average annual change of the general turnover index was 4.9%. Likewise, the domestic market index was 4.7% and the non-domestic market index was 7.3%. The corresponding figures for the period 2008-2018 were -0.2%, -2.9% and 5.5%.

In order to follow the evolution of the three indices in greater detail, Figure 4.2.6 illustrates the percentage changes of the monthly turnover indices compared to the corresponding months of the previous year for the period from January 2005 to June 2019. In 2018, the monthly changes for the general turnover index and the domestic market index were continuously positive, while the non-domestic market index was also positive in all months except during March and December. During the first six months of 2019, all three indices had mix results. The general index increased during February and April, with an average monthly change of 1%, mainly because of an exceptionally positive result

during April where it increased at a rate of 14.18%. The domestic market index increased in all months with the exception of March and June, at an average monthly change of 1.78%. Finally, the non-domestic market index decreased in all months except for Febuary and April, at an average monthly change of -0.04%.

4.2.3. Conclusions

The industrial production index during 2018 decelerated significantly as its growth was reduced from 3.9% in 2017 to 1.7%. This deceleration cannot be attributed to changes in the manufacturing index, since it had the same growth rate in 2018 as in 2017, namely 2.8%, but appears to be the result of negative changes in the sectors of energy and intermediate goods. First indications from the first seven months of 2019 appear to be negative, as the index further decelerated to 0.6%. Regarding the industrial turnover indices (general, domestic market and non-domestic market), we note that positive results during 2018 appear to continue, albeit at a decelerated pace, during 2019.

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Brexit and its effects on trade in goods: The case of Greece

Ersi Athanassiou*

Abstract

This article seeks to map Greece's current trade links with the UK, and to explore the main channels through which Brexit could affect trade in goods between these two countries. The analysis presented in the paper has been conducted both at the aggregate and the sectoral levels and at the product-by-product level, and includes estimates of the tariff costs that Greece could face in the case that EU-UK trade relations after Brexit fall under the most adverse scenario. The analysis highlights the potential tariff and non-tariff costs of Brexit for EU countries, with a focus on issues of specific interest to Greece. Furthermore, it also identifies sectors and products for which the importance of the UK as a destination for Greek exports, combined with high tariff rates under the WTO's most favoured nation regime, would render the tariff costs of a no-deal Brexit considerable for Greece.

Keywords: *Brexit, trade in goods, tariffs, non-tariff barriers*

JEL classification: *F13*

1. Introduction

The historic links of the United Kingdom (UK) with the rest of the European Union (EU), in conjunction with geographical proximity considerations and the effect of the fundamental freedoms underlying the EU Single Market, have contributed to the development of close trade relations in goods between the UK and the EU. According to recent Eurostat data, in 2018 the UK imported €301.4 billion worth of goods from EU Member States, representing 52.8% of the country's total imports of goods. During the same period of time, the value of exports of UK goods to the EU amounted to €194.1 billion, representing 47.1% of the total UK exports of goods. Out of the total EU trade flows, the UK shares are, no doubt, considerably smaller than the corresponding EU shares in UK trade flows. In particular, UK exports to the remaining 27 EU Member States (EU-27) account for approximately 3.7% of their total demand for imported goods, which, in 2018 amounted to €5.13 trillion. At the same time, the UK accounts for approximately 5.3% of the total EU-27 exports of goods (which stood at €5.06 trillion). According to Cappariello et al. (2018), more than one-third of the UK-EU trade flows relate to intermediate goods and services moving within international production chains, reflecting the close interconnections of the EU and the UK's industrial manufacturing networks.

The extent of international trade in goods between the EU and the UK renders the potential effects of Brexit on this sector a central issue for the UK, which presents a particularly high degree of dependence on trade with EU countries. At the same time, however, these effects are also an important issue for the EU, for which the UK is a significant trading partner. EU Member States differ in the extent of their trade relations with the UK but, also, in the types of products that dominate their trade with the UK. In addition, the trade barriers that may arise post-Brexit may vary widely across different products. Therefore, depending on the scenario that will ultimately materialise with respect to the UK-EU trade relations post-Brexit, the effects of Brexit may vary significantly across EU Member States but, also, across individual trade sectors and products.

In light of the above, it is clear that the interests of the EU Member States in case of an eventual Brexit are not fully aligned. What is also clear is that each EU Mem-

* Senior Research Fellow, Centre of Planning and Economic Research (KEPE). e-mail: eathan@kepe.gr

– Opinions or value judgments expressed in this article are the author's own and do not necessarily reflect those of the Centre of Planning and Economic Research.

ber State has an interest to map its trade relations with the UK and identify issues, sectors and products that may be affected more heavily depending on the final outcome of the UK-EU negotiations. In this vein, the present article aims to map Greece's existing trade relations with the UK in the field of goods and to explore the likely effects of Brexit on trade in goods between these two countries, with an emphasis on the possible tariff implications of the most adverse Brexit scenario. To summarise the main issues arising for international trade in goods in view of an eventual Brexit, the first part of this article presents certain indicative scenarios for the EU-UK trade relationship post-Brexit, accompanied by a brief overview of the main channels through which Brexit may affect trade in goods between the UK and the EU. The second part of this article provides an overview of the current trade links between Greece and the UK, analysing the most recent sectoral and product-level data available. The final part of this article seeks to provide an approximation of the tariff costs that Brexit may entail for Greece, by calculating the average tariff rates likely to apply on the bilateral trade in goods between Greece and the UK in the event of the most adverse Brexit scenario.

Before turning to the substance of our analysis, one remark is apposite. Given the level of uncertainty and complexity surrounding Brexit and its potential effects on trade, and the space constraints to which the author of this article is subject, the analysis set out below does not purport to be exhaustive, with several issues and questions lying outside its remit. Its inevitable limitations notwithstanding, this article seeks to provide an instructive case study, highlighting issues and risks which are also of a more general interest for the assessment of the trade effects of an eventual Brexit on other EU Member States.

2. Indicative scenarios for the EU-UK trade relationship after Brexit

The direction of the Brexit negotiations, the attendant delays and the British Parliament's failure to ratify the draft agreement reached between the EU and the UK by the time of the expiry of the original deadline for the UK's exit from the EU (29 March 2019), have encouraged pessimism in respect of the parameters of an eventual Brexit. Subsequently, following the decision to extend the UK's exit process until 31 October 2019 and to cater for the UK's participation in the 2019 European elections, all scenarios appeared to be open. Recent times have seen an escalation in the uncertainty surrounding Brexit, and an increase in the perception that a no-deal Brexit is the likeliest scenario, raising serious concerns about the future of trade between the EU and the UK. Despite the uncertainty, indicative scenarios for Brexit, as discussed in the relevant literature, include the following alternatives.[1]

Mild Brexit scenario

EU Member States participate in both the Single Market and the Customs Union. One end of the spectrum of Brexit scenarios is occupied by milder approaches to UK-EU trade post-Brexit. These include full or partial UK access to the Single Market, subject to possible adjustments to some of its rules. In this context, the two main scenarios most often cited in the relevant literature –although, in practice, these have found next to no resonance in the actual UK-EU negotiations– are as follows:

- *Norwegian scenario:* UK to remain within the European Economic Area (EEA)

In addition to the EU Member States, the EEA includes Norway, Iceland, and Liechtenstein. The UK's participation in the EEA would entail zero tariffs on most products, with the possible exception of certain sensitive goods, especially in specific segments of the agri-food sector. However, the UK's participation in the EEA would not guarantee exemption from non-tariff barriers (see Section 3, below), as new rules and procedures (e.g., with respect to customs controls and product regulations/standards) could be introduced in light of an eventual EU-UK agreement. In order to participate in the EEA, the UK would have to comply with Single Market rules without, however, being involved in the relevant decision-making process. At the same time, the UK would be obliged to contribute to the EU budget and to comply with the EU's four fundamental freedoms, namely the free movement of persons, goods, services and capital.

- *Swiss scenario:* Conclusion of a special agreement, similar to the one between the EU and Switzerland, which is a member of the European Free Trade Association (EFTA)

Such an arrangement would be based on a series of agreements, under the terms of which the UK would continue to apply part of EU legislation, to contribute

1. Many of the relevant studies and analyses on Brexit include a description of alternative scenarios. See, e.g., Cambridge Econometrics (2018), Copenhagen Economics (2018), Maravegias et al. (2017), European Movement International (2017).

to the EU budget, and to comply with some of the Single Market rules, including the free movement of persons, but without the right to participate in the relevant decision-making process.

No-Deal Brexit scenario

The other end of the spectrum of Brexit scenarios is occupied by a range of unfavorable outcomes, of which the most extreme is that of the UK's exit from the EU without a deal (no-deal Brexit). In such a scenario, the trade relationship between the EU and the UK is expected to assume the following form:

- *WTO scenario:* Transition to the World Trade Organization (WTO) tariff regime

In this scenario, tariffs will be levied on bilateral trade between the EU and the UK for most products, with the transition to the WTO regime being based on the Most Favored Nation (MFN) clause, according to which WTO members cannot discriminate between their trading partners. Therefore, unless any of the conditions falling under the exceptions to this rule apply (e.g., in the event of the existence of a customs union, a free trade agreement or another bilateral preferential agreement), WTO members are to charge each product they import with a predetermined tariff rate, irrespective of its country of origin. Should this scenario prevail, customs controls will be imposed on EU-UK trade, while significant deviations are likely to arise in terms of product regulations, standards and other relevant rules, thus giving rise to sizeable additional costs in terms of non-tariff barriers.

Intermediate Brexit scenarios

In-between the possibility of a mild and a no-deal Brexit lie a number of intermediate scenarios (semi-hard Brexit, hard Brexit), variants and elements of which were also considered in the context of the EU-UK negotiations.

- *Customs Union scenario:* Conclusion of a Customs Union Agreement between the UK and the EU

The EU has entered into Customs Union Agreements with a number of third countries (Turkey, Andorra, San Marino). The conclusion of a similar agreement with the UK would ensure free trade and zero tariffs on UK trade with the EU Member States for most products, with the exception of certain goods. In addition, the conclusion of such an agreement would imply that the UK will impose the same tariffs as the EU on trade in products with third countries, and will enjoy the benefits of any EU trade agreements with those countries, without, however, being able to conclude its own independent trade agreements.

- *Free Trade Agreement scenario:* Conclusion of a Free Trade Agreement between the UK and the EU

The EU has Free Trade Agreements in place with several countries, the most recent of which is the EU-Canada Trade Agreement, which entered into force in September 2017. Free Trade Agreements are usually concluded after lengthy negotiations and vary considerably both in their terms and in the range of issues they cover. The latest "new generation" agreements (such as those with Canada, South Korea, Peru and Ecuador) cover, apart from tariff cuts on goods, other activities relevant to services and public procurement (European Commission, 2018). A Free Trade Agreement between the EU and the UK would entail zero tariffs on UK trade with EU Member States for most products, with the exception of some agri-food items. In this scenario, the UK would be able to conclude its own trade agreements with countries outside the EU.

It is noted that, in all of the above intermediate scenarios, the UK would be exempt from the obligation to contribute to the EU budget or to comply with the four EU freedoms. However, all of these scenarios would entail the introduction of customs controls, whilst, compared to mild Brexit scenarios, they would also involve a higher risk of deviation between the EU and the UK in terms of rules, standards or other relevant arrangements.

3. Brexit channels of influence on EU-UK goods trade

For the majority of EU Member States, the most important channels through which Brexit may affect their trade relations with the UK are through the introduction, post-Brexit, of a tariff regime and of a number of non-tariff barriers, such as observing rules of origin and applying rules and standards to products and their marketing. Particularly in the case of the Republic of Ireland, there is also the fundamental issue of a 'backstop' to guarantee the avoidance of a "hard border" with Northern Ireland (an integral part of the UK). In addition, other specific issues, such as the status of Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) products, may also be relevant for some EU Member States, including Greece. Finally, trade in goods between the UK and the EU-27, as well as various other aspects of EU-UK economic relations, are expected to be affected by the overall impact of Brexit on the UK economy and the pound sterling, and by the status of EU citizens work-

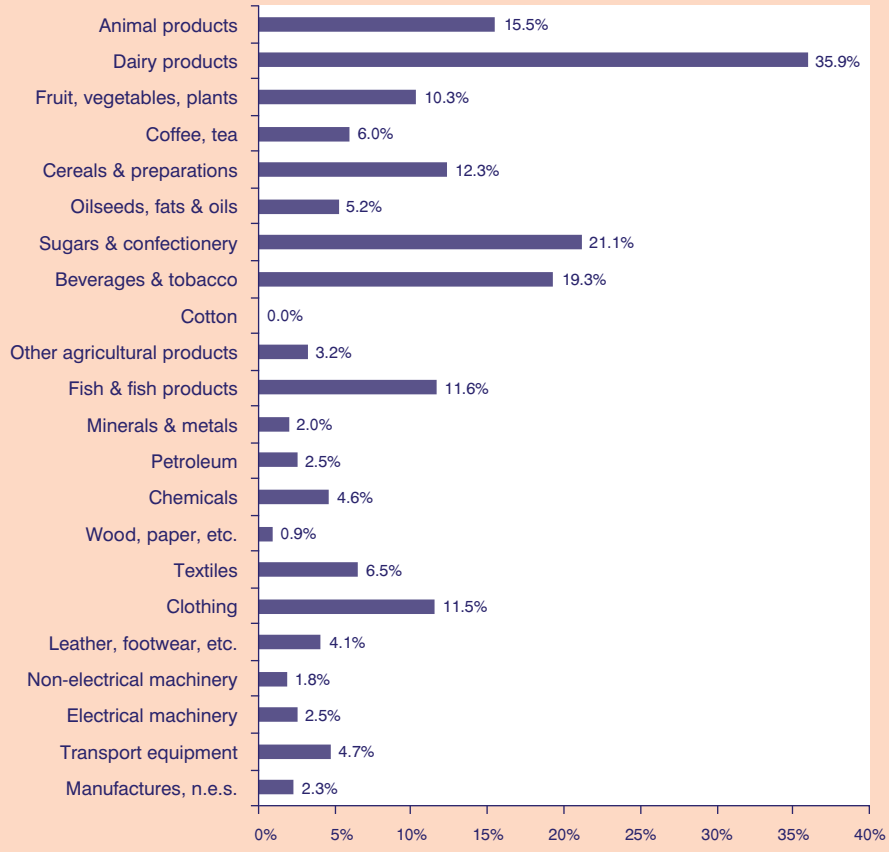
ing or studying in the UK and providing a source of demand for products from their countries of origin.

Customs duties

One of the four fundamental freedoms underlying the EU Single Market is that of the free movement of goods, the application of which entails the prohibition of any tariffs on trade in goods between EU Member States. The EU-UK customs regime in the post-Brexit era will be a determining factor for the actual impact of Brexit on EU-UK trade in goods. Should any of the milder or intermediate Brexit scenarios prevail, trade between the UK and the EU will continue to be subject to zero tariffs on all or most products. However, as mentioned above, in the event of a worst-case Brexit scenario, tariffs will be imposed on bilateral trade between the EU and the UK for the majority of products, following a transition to the WTO regime and the application of the MFN clause. Thus, UK product imports into the EU will be subject to EU-imposed MFN duties on imports from third countries with which there is no preferential agreement in place, whereas the UK will be free to impose its own MFN tariffs on imports from third countries (including the EU Member States), based on WTO rules. It should be noted that a temporary transition to the WTO regime may occur even if the EU and the UK decide to, for instance, proceed to the conclusion of a Free Trade Agreement, since, until such an agreement has been concluded, none of the two parties will be able to apply a more favorable trade tariff to the other.

Figure 1 presents the EU's average tariff rates under the MFN regime on key product categories imported from third countries with which no preferential trade agreement has been concluded. These duties appear to be significant in several categories, with the highest rates applying in the agri-food sectors, and with quite substantial rates applying in certain other sectors such as the automotive and the clothing sectors.

FIGURE 1
EU-applied average tariff rates by product group under MFN, 2018



Source: WTO, ITC, UNCTAD (2018), World tariff profiles 2018.

It bears noting that, in addition to the direct costs it would generate, depending on the level of tariffs per product, the eventual imposition of duties on the trade of goods between the EU and the UK would also entail significant additional financial burdens and difficulties due to heavy and time-consuming bureaucratic procedures, including those necessary for customs clearance. Indicatively, important issues that may arise in such a scenario would include the details relevant to the status of the Irish-UK border, the adequacy of customs infrastructure, especially at the key entry and exit points of products to and from the UK (Dover, Calais), the economic impact on sectors in which the UK and the EU cooperate closely in the context of international production chains (e.g., the automotive industry), etc.

Rules of origin

As members of a full Customs Union, EU Member States not only apply zero tariffs on internal trade in goods but, also, a uniform system of tariff rates, customs controls and restrictions on imports from third countries that are not members of the Customs Union. This implies that imports from third countries are subject to the same customs duties and controls regardless of their point of entry into the EU, and can then move freely within the EU without being subject to additional procedures. One central position of the most ardent supporters of Brexit is that the UK should leave the Customs Union in order to have the freedom to form an independent trade policy vis-à-vis non-EU Member States. This means that even if no trade duties are imposed between the EU and the UK, businesses and customs authorities of the two parties will henceforth be charged with the application of rules of origin. These rules will be in place to ensure that the UK is not used by third countries to access the EU market subject to lower tariffs compared to those imposed by the EU. In common to the imposition of tariffs, the application of rules of origin will also entail an increase in the time required for, and in the bureaucratic costs of, EU-UK customs controls. Furthermore, it will raise a host of other related problems, for example with respect to the adequacy of the customs infrastructure in the UK and the EU and the operation of international production chains in certain sectors, such as the automotive industry.

Regulations and standards

Within the Single Market, EU Member States are allowed some degree of flexibility in enforcing regulations and standards on certain products and their marketing (e.g., health, phytosanitary and veterinary standards, rules on the design or packaging of specific products, etc.) with a view to achieving public policy objectives such as consumer protection, environmental protection, etc. The imposition of such rules and standards is apt to impede trade in goods, which is why EU Member States have, as far as possible, harmonised their respective institutional framework, mostly through the implementation of Directives adopted for this purpose. The UK's exit from the EU will free both parties from their existing harmonisation obligations and, therefore, the degree of harmonisation that will apply in the post-Brexit era will be another important issue. In the case of milder Brexit scenarios, mutual changes in the relevant rules and standards are likely to be relatively limited, although they may ultimately have a significant impact on trade in specific sensitive products (e.g., agri-food or chemicals). In the event of the worst-case Brexit scenarios, adjustments in rules, and the resulting non-tariff barriers, are likely to be wider and more intense.

Status of products with protected geographical indication

The European Commission has taken a clear position in its negotiations with the UK in favour of the full copyright protection in the UK of EU Member State products and processes in the event of an eventual Brexit, including the protection of geographical indication products (PDO or PGI products) (EC, 2017). However, the extent to which the UK will go along with this position will depend on the overall outcome of the negotiations related to EU-UK trade in goods. As illustrated in Tables 1 and 2, several EU Member States such as France, Italy, Spain and Greece have a large number of geographical indication products, and significant exports to the UK for some of these products (e.g., parmesan, feta cheese, champagne, and various other wines). In contrast, for other EU Member States, such as Sweden, Estonia and Latvia, the issue of the protection of PDOs and PGIs in the UK market is of low or even zero interest. From a UK perspective, this issue is of relevance for a significant number of products, some of which account for a high share of UK exports to the EU (e.g., Scottish whiskey, Cheddar cheese, Scottish smoked salmon).

As experience has shown, the protection of PDO and PGI products under the EU-third country free trade agreements regime can be selective. Therefore, in the event of a similar scenario for EU-UK trade relations following an eventual Brexit, it may be possible to negotiate which PDO and PGI products will continue to

TABLE 1 Number of registered/approved products with protected geographical indication by product category and by EU Member State, June 2019

	Agricultural products and foods		Wines		Spirit drinks	Total
	PDO indication	PGI indication	PDO indication	PGI indication	Geographical indication	
Austria	10	6	26	3	9	**54**
Belgium	4	11	8	2	10	**35**
Bulgaria	1	2	52	2	12	**69**
France	103	142	380	75	54	**754**
Germany	12	79	14	26	34	**165**
Denmark	0	8	1	4	0	**13**
Greece	76	31	33	116	15	**271**
Estonia	0	0	0	0	1	**1**
United Kingdom	27	41	3	2	5	**78**
Ireland	3	4	0	0	3	**10**
Spain	103	91	102	45	19	**360**
Italy	169	131	474	129	38	**941**
Netherlands	6	5	2	12	5	**30**
Croatia	10	9	16	0	6	**41**
Cyprus	2	4	7	4	2	**19**
Latvia	1	2	0	0	0	**3**
Lithuania	1	5	0	0	8	**14**
Luxemburg	2	2	1	0	0	**5**
Malta	0	0	3	1	0	**4**
Hungary	6	8	56	8	16	**94**
Poland	8	23	0	0	4	**35**
Portugal	64	74	46	10	19	**213**
Romania	1	4	38	13	9	**65**
Slovakia	2	10	18	3	1	**34**
Slovenia	9	13	14	3	7	**46**
Sweden	3	3	0	0	3	**9**
Czech Republic	6	23	12	2	1	**44**
Finland	5	2	0	0	2	**9**

Source: EU databases: Door, E-Bacchus, E-Spirit Drinks, 2019.

TABLE 2 Value of exports from EU Member States to the UK for selected products with protected geographical indication and significant export volume, 2018 (€ million)

Country of origin	Product	Value of exports to the UK
France	Champagne	420.4
	Bordeaux wines	205.5
	Cognac	89.3
	Burgundy wines	80.2
	Rhine valley wines	65.6
Greece	Feta cheese	56.1
Ireland	Irish cheddar	266.0
Spain	Rioja wines	101.2
	Cured meat products	79.2
Italy	Prosecco wines	345.6
	Parmesan and grana padano cheese	84.5
	Mozzarella cheese	59.5

Source: ITC, eight-digit classification data, in categories consisting largely of PDO/PGI products, 2019.

enjoy protection. On the other hand, in the event of a more extreme Brexit scenario, PDO and PGI products are likely to no longer enjoy protection in the UK market, which will significantly affect the goods sectors of those EU Member States that have considerable exports of such products to the UK (e.g., dairy products and beverages).

Pound sterling exchange rate

The impact of Brexit on the exchange rate of the pound sterling (GBP) is a factor that could have a significant impact on future UK trade with the EU. Since the Brexit referendum, in June 2016, the pound sterling has registered significant losses against the euro, with the exchange rate standing at €1.1224 / GBP on September 13, 2019, down from €1.2898 / GBP on June 1, 2016. The evolution of the euro-pound sterling exchange rate in the near future is expected to be significantly impacted by the outcome of the Brexit negotiations, while, over time, the exchange rate may be significantly different from that of the first post-Brexit period, depending on the course of the UK and EU economies. In general terms, the worst-case Brexit scenarios are linked to the risk of an immediate devaluation of the pound sterling against the euro, while the more positive scenarios could even see a boost in the value of the pound sterling against the euro. A significant depreciation of the pound sterling would have a detrimental effect on the UK market's purchasing power, thereby affecting negatively exports of goods from the EU to the UK. On the other hand, such a development would favor UK exports, making UK products more accessible to continental Europeans. Although the focus of this article is on trade in goods, it bears noting that, for a country such as Greece, some of the major potential effects of the euro-pound sterling exchange rate developments may relate to several other parameters of economic relations with the UK, such as inbound tourism from the UK, the cost of studying in the UK, remittances from Greek citizens working in the UK, etc.

Other issues

It follows from the above that the outcome of the negotiations on the form of the future EU-UK trade relations could have a significant impact on the economies of the two parties, thereby also affecting bilateral trade in goods. At the same time however, decisions on other key issues concerning the future EU-UK relations, such as the free movement of services, capital and citizens,

can significantly affect the UK and EU economies and, by necessary implication, also trade in goods, and the movement of capital and citizens. For example, restricting freedoms in the financial sector could significantly affect the UK economy, creating opportunities for a growth of the financial sector in some of the other EU Member States and causing a shift in demand for imports from the UK to those countries. At the same time, restrictions in free movement for citizens, as well as other possible measures, such as an increase in UK higher education fees for EU citizens[2], could have a negative impact on those EU citizens who work or study in the UK and absorb a significant portion of the UK's imports of food and beverages from their countries of origin.

4. Trade in goods between Greece and the UK

As shown in Figure 2, the UK is one of Greece's most important trading partners. In 2018, the value of exports of Greek goods to the UK amounted to €1.2 billion, while the value of imports of UK goods in Greece amounted to €1.4 billion, making the UK Greece's 8th most important export destination and the 13th most important country of origin of Greece's imports.

The overall course of Greece's trade in goods with the UK has, so far, followed the general trends in Greece's foreign trade. As shown in Figure 3, Greek imports of goods from the UK declined sharply in the 2009-2012 period, followed by a period of relative stability (2013-2017) and, more recently, by a period of significant

FIGURE 2
Greece's top twenty trading partners in 2018 (ranking by value of trade flows in € million)

Source: UN Comtrade, 2019.

2. A possible devaluation of the pound sterling against the euro could offset, to some extent, an increase in tuition fees, reducing the equivalent cost of studying and living in euro. However, in case Brexit finally leads to a significant increase in the cost of studying in the UK, the demand for studies in the UK may decline, thus cutting down the corresponding outflow of funds towards the UK.

FIGURE 3
Evolution of Greece's total trade in goods with the UK: 2001-2018 (value in € million)

Source: UN Comtrade, 2019.

FIGURE 4
UK shares in Greece's trade flows in goods: 2008-2018 (%)

Source: UN Comtrade, 2019.

recovery (starting in 2018). At the same time, exports of Greek goods to the UK fluctuated over the 2009-2012 period, recording an upward trend from 2013 onwards. These developments have led to a reduction in Greece's external goods deficit with the UK, from €1.1 billion in 2008 to €163 million in 2018.

In terms of its shares in Greece's total trade in goods, the UK does not rank particularly high, which could, at first sight, convey the impression that the immediate effects of Brexit on Greece's foreign trade will only be moderate. As shown in Figure 4, Greece's exports of goods to the UK as a percentage of Greece's total exports of goods ranged between 3.6% and 4.2% over the last five years, while Greece's imports from the UK as a percentage of Greece's total imports of goods amounted to between 2.3% and 2.8%.

For a more comprehensive assessment of the importance of the UK as a trading partner for Greece, the above overview of the UK's ranking in Greece's exports and imports of goods should, no doubt, be seen through the prism of a corresponding industry-level analysis. This analysis may point to sectors and products where trade relations with the UK are closer, creating scope for more serious consequences for Greece in the event of Brexit.

At the sectoral level, Table 3 presents a breakdown of the trade of goods between Greece and the UK for 2018, by main category (section) of products of the

TABLE 3 Sectoral breakdown of exports of Greek goods to the UK and imports of UK goods to Greece by main category (section) of goods, 2018

CN Code	Sector of goods	Value of Greek exports to the UK (million €)	Share in Greece's exports to the UK (%)	Value of imports to Greece from the UK (million €)	Share in Greece's imports from the UK (%)	Balance (million €)
01-05	Live animals, animal products	121.2	*10.0*	25.8	*1.9*	95.4
06-15	Vegetable products, fats	75.8	*6.3*	13.1	*1.0*	62.7
16-24	Foodstuffs, beverages, spirits, vinegar, tobacco and manufactured tobacco substitutes	183.6	*15.2*	106.2	*7.8*	77.4
25-27	Mineral products	234.2	*19.4*	177.0	*12.9*	57.3
28-38	Products of the chemical and allied industries	212.0	*17.6*	279.9	*20.4*	-67.9
39-40	Plastics, rubbers and articles thereof	40.4	*3.3*	87.0	*6.4*	-46.6
41-43	Raw hides, skins, leather, furs and articles thereof	2.9	*0.2*	8.4	*0.6*	-5.5
44-49	Wood, wood products, paper and paperboard	8.5	*0.7*	47.9	*3.5*	-39.4
50-63	Textiles and textile articles	45.8	*3.8*	73.2	*5.3*	-27.4
64-67	Footwear, headgear, etc.	2.6	*0.2*	16.5	*1.2*	-13.9
68-71	Articles of stone, plaster, cement, etc., glass, glassware,	14.8	*1.2*	14.1	*1.0*	0.7
72-83	Base metals and articles of base metal	137.2	*11.4*	105.2	*7.7*	32.0
84-85	Machinery, electrical equipment	100.0	*8.3*	168.0	*12.3*	-68.0
86-89	Transport equipment	3.9	*0.3*	136.4	*10.0*	-132.4
90-97	Miscellaneous instruments/apparatus	23.0	*1.9*	109.7	*8.0*	-86.7
	TOTAL	**1,206.2**	***100.0***	**1,369.1**	***100.0***	**-162.9**

Source: UN Comtrade, 2019.

Note: The category names of goods appearing in the table are abbreviated (for the precise nomenclature see the Official Journal of the EU, L273, 31 October 2018).

Combined Nomenclature (CN) –based on the Harmonised System or HS product classification. As the data in this table shows, the UK is an important trading partner for Greece in specific product categories. Specifically, significant shares of the total exports of Greece to the UK concern the categories of *mineral products* (19.4%), *chemicals and allied industry products* (17.6%), *foodstuffs, beverages, spirits, tobacco and tobacco substitutes* (15.2%), *base metals and metal products* (11.4%), *live animals and animal products* (10.0%), and *machinery and equipment* (8.3%), with the value of Greece's exports to the UK for these six categories reaching, in total, € 988 million. At the same time, a considerable share of Greece's imports from the UK corresponds to *chemicals and allied industry products* (20.4%), *mineral products* (12.9%), *machinery and equipment* (12.3%) and *transport equipment* (10%).

At a more granular level, Table 4 lists the exports of Greek goods to the UK for 2018, arranged by their corresponding two-digit code, for the 20 (out of a total of 97) two-digit CN sectors with the highest export value. For 2018, these sectors accounted for nearly 90% of the total value of Greek exports to the UK, while their corresponding share of the total a decade earlier had also been similar (85.5%). As shown in the table, Greece's exports to the UK are highly concentrated in specific sectors, with almost 40% of their 2018 value corresponding to three two-digit codes, namely *mineral fuels, mineral oils and products of their distillation/bituminous substances; pharmaceutical products; and dairy products, eggs, honey, edible products of animal origin n.e.s*. The table also shows that for many of the 20 sectors under consideration, the UK absorbs a high share of Greece's total exports for those sectors, with the most typical for 2018 being *dairy products, eggs, honey, edible products of animal origin n.e.s.* (15.9%), *cereal preparations, flours, starches, milk, pastries* (12.2%), *pharmaceuticals* (11.1%), *copper and copper articles* (10.8%) and *vegetable, fruit and fruit preparations* (9.3%). Based on this record, the UK was, in 2018, in the top five of Greece's export destinations for 15 out of the 20 sectors appearing in the table. What this finding suggests is that, for all these sectors, the impact of Brexit on Greece's export activity could be significant, depending on the outcome of the EU-UK negotiations.

Turning to imports, Table 5 presents an analysis of Greece's imports from the UK in the 20 two-digit CN sectors with the highest import value for 2018. As shown in the table, these imports also demonstrate a high degree of concentration, with *mineral fuels, mineral oils and products of their distillation/bituminous substances; pharmaceutical products;* and *vehicles, and parts and accessories thereof* accounting for 33.3% of the total value of imports from the UK in 2018. With respect to the UK's share of the total of Greece's imports in the 20 sectors under consideration, this ranges from 1.1% (*mineral fuels, mineral oils and products of their distillation/bituminous substances*) to 32.7% (*printed books, other products of the printing industry*). If one is to focus on the sectors with the highest import value, the UK's shares do not appear to indicate any particular dependence of Greece on UK imports at the sectoral level.

At an even more granular level, Table 6 presents Greece's exports to the UK, at the eight-digit CN code level, for the 20 products with the highest export values to the UK for 2018. These products totaled 55% of the value of Greece's exports to the UK for 2018. From the 20 codes appearing in the table, three codes correspond to *fuel and petroleum products* (*jet fuel, mineral oils*), four codes to *pharmaceuticals,* eight codes to *agri-food products* (*feta cheese, olives, pastry blends and doughs, grapes, currants, canned peaches, yogurt,* etc.) while the remaining codes refer to *cosmetics, copper tubes, electric conductors,* and *portland cement*. The data appearing in the Table shows that for most of the 20 products under consideration, the UK's share of Greek exports exceeds 10% while, in some cases, the share in question exceeds 20%. Thus, for 17 of the 20 products appearing in the Table, the UK was in the top three of Greece's export destinations for 2018.

The above analysis leads to the conclusion that there are several sectors/products where Greece's trade relations with the UK are quite close. However, the potential significance of Brexit for the future trade in goods in these sectors and products can only be assessed taking into account the value of their exports to the UK in absolute terms, as well as the extent of any trade barriers that may arise in these sectors as a result of Brexit. In general, the potential barriers appear to be more severe in the case of agri-food products, which account for a significant share of Greece's exports to the UK. The analysis of the potential tariff costs of a worst-case Brexit scenario in the following section of this article suggests that exports of products belonging to the agri-food sector will be subject to high duties under the MFN regime. In addition, even in the event of a less extreme Brexit scenario, these products will be particularly vulnerable to the imposition of non-tariff barriers or the possible loss of protection of their geographical indication on the UK market. To take the example of feta cheese, Greece's significant export activity to the UK appears to be at risk, with the potential

TABLE 4 Exports of Greek goods to the UK in the 20-digit CN sectors with the highest export value in 2018 and the UK's ranking among Greece's export destinations in these sectors

CN Code	Sector	Value of Greek exports to the UK (million €)		% in the total exports of Greece in the sector		% in the total exports of Greece in the UK		Ranking of the UK among Greece's export destinations in the sector
		2008	2018	2008	2018	2008	2018	2018
27	Mineral fuels, mineral oils and products of their distillation, bituminous substances	122.4	212.0	2.7	1.8	12.8	17.6	15th
30	Pharmaceutical products	124.0	162.6	14.2	11.1	13.0	13.5	3rd
4	Dairy products, eggs, honey, edible products of animal origin n.e.s.	40.2	105.9	14.5	15.9	4.2	8.8	3rd
20	Preparations of vegetables, fruit, nuts or other parts of plants	80.5	98.8	11.1	9.3	8.4	8.2	3rd
85	Electrical machinery and equipment and parts thereof	116.8	73.9	12.1	7.3	12.2	6.1	3rd
74	Copper and articles thereof	35.8	72.7	6.3	10.8	3.8	6.0	3rd
8	Edible fruit and nuts	55.6	50.6	8.3	5.6	5.8	4.2	6th
76	Aluminium and articles thereof	44.2	45.0	4.4	2.6	4.6	3.7	9th
39	Plastics and articles thereof	30.7	39.2	3.5	3.3	3.2	3.3	9th
19	Preparations of cereals, flour, starch or milk, pastry products	2.6	33.1	1.7	12.2	0.3	2.7	3rd
21	Miscellaneous edible preparations	2.3	33.1	2.0	11.4	0.2	2.7	3rd
33	Essential oils, perfumery, cosmetic or toilet preparations	14.8	28.0	6.1	10.8	1.5	2.3	2nd
84	Machinery, mechanical appliances, boilers, parts thereof	42.7	26.1	4.3	1.6	4.5	2.2	11th
61	Articles of apparel and clothing accessories, knitted or crocheted	38.9	24.9	6.2	6.3	4.1	2.1	5th
25	Salt, sulphur, earth and stone, plastering materials, cement	18.6	21.7	5.2	3.5	1.9	1.8	4th
3	Fish, crustaceans, molluscs	23.8	13.8	5.2	2.0	2.5	1.1	10th
38	Miscellaneous chemical products	3.2	12.7	2.0	4.1	0.3	1.1	8th
71	Jewelry, coins	0.7	11.9	1.4	12.2	0.1	1.0	3rd
15	Animal or vegetable fats and oils	9.4	9.1	2.5	1.3	1.0	0.8	11th
56	Wadding, felt and nonwovens; special yarns; cordage, ropes	9.1	8.7	9.1	6.6	1.0	0.7	3rd
	Total of the 20 sectors	**816.2**	**1,083.4**	**-**	**-**	**85.5**	**89.8**	**-**

Source: UN Comtrade, 2019.

Note: The category names of goods appearing in the Table are abbreviated (for the precise nomenclature see the Official Journal of the EU, L273, 31 October 2018).

TABLE 5 Imports of goods to Greece from the UK in the 20-digit CN sectors with the highest import value in 2018

CN Code	Sector	Value of imports of Greece from the UK (million €)		% in the total imports of Greece in the sector		% in the total imports of Greece from the UK	
		2008	2018	2008	2018	2008	2018
27	Mineral fuels, mineral oils and products of their distillation, bituminous substances	11.2	174.5	0.1	1.1	0.5	13.4
30	Pharmaceutical products	326.0	137.8	9.2	4.9	16.0	10.6
87	Vehicles, rolling stock, and parts and accessories thereof	286.9	119.7	5.7	5.3	14.1	9.2
84	Machinery, mechanical appliances, boilers, parts thereof	208.4	76.9	3.8	2.0	10.2	5.9
85	Electrical machinery and equipment and parts thereof	140.6	73.7	3.5	2.6	6.9	5.7
90	Optical, photographic, cinematographic, measuring, medical, etc. instruments and apparatus	88.4	47.0	6.0	5.0	4.3	3.6
39	Plastics and articles thereof	45.0	44.0	2.5	2.4	2.2	3.4
95	Toys, games and sports requisites	24.4	41.0	5.8	10.3	1.2	3.2
22	Beverages, spirits, vinegar	172.2	39.1	38.3	11.8	8.4	3.0
40	Rubber and articles thereof	12.6	39.1	3.1	10.5	0.6	3.0
72	Iron and steel	86.0	34.2	3.7	2.6	4.2	2.6
49	Printed books, other products of the printing industry	54.0	33.9	26.2	32.7	2.6	2.6
38	Miscellaneous chemical products	49.2	33.1	7.9	5.1	2.4	2.6
62	Articles of apparel and clothing accessories, not knitted or crocheted	54.8	32.8	4.9	4.2	2.7	2.5
61	Articles of apparel and clothing accessories, knitted or crocheted	41.8	28.6	3.8	3.5	2.1	2.2
33	Essential oils, perfumery, cosmetic or toilet preparations	46.1	28.0	7.0	4.8	2.3	2.2
34	Soaps, lubricating preparations, candles	26.6	23.8	7.7	8.8	1.3	1.8
32	Tanning or dyeing extracts, dyes, pigments and other colouring, paints, varnishes, putty, inks	28.6	22.3	8.3	6.9	1.4	1.7
19	Preparations of cereals, flour, starch or milk, pastry products	23.7	19.8	7.4	6.2	1.2	1.5
74	Copper and articles thereof	8.4	19.7	1.0	3.0	0.4	1.5
	Total of the 20 sectors	**1,735.1**	**1,069.1**	**-**	**-**	**85.1**	**82.3**

Source: UN Comtrade, 2019.

Note: The category names of goods appearing in the Table are abbreviated (for the precise nomenclature see the Official Journal of the EU, L273, 31 October 2018).

TABLE 6 Greek exports to the UK in the 20 highest export-value products for 2018, at the eight-digit CN code level

CN Code	Product	Value of Greek exports to the UK (million €)	% in the total exports of Greece in the product	% in the total exports of Greece in the UK	Ranking of the UK among Greece's export destinations in the product
27101921	Jet fuel	128.1	8.0	10.6	2nd
30049000	Medicaments	101.5	9.0	8.4	3rd
74111010	Tubes and pipes of refined copper, straight	62.3	26.4	5.2	1st
27101947	Gas oils of petroleum or bituminous minerals, with a sulphur content of > 0,002% but <= 0,1% ...	59.8	5.2	5.0	4th
04069032	Feta	56.1	15.0	4.6	2nd
85444999	Electric conductors for a voltage <=1.000 v	27.6	30.1	2.3	1st
20057000	Olives	25.3	5.8	2.1	5th
19012000	Mixes and doughs of flour, groats, meal, starch or malt extract	23.4	27.5	1.9	2nd
33049900	Beauty or make-up preparations and preparations for the care of the skin (other than medicaments)	18.9	14.5	1.6	1st
30042000	Medicaments containing antibiotics	18.6	14.7	1.5	2nd
27101968	Fuel oils obtained from bituminous materials, with a sulphur content of > 1% by weight	18.3	1.1	1.5	13th
08061010	Fresh table grapes	17.6	19.8	1.5	2nd
30045000	Medicaments containing vitamins	15.6	35.6	1.3	1st
21069098	Food preparations, n.e.s.	15.1	12.0	1.3	3rd
08062010	Currants	14.6	41.2	1.2	1st
25232900	Portland cement (excl. white, whether or not artificially coloured)	14.3	8.6	1.2	3rd
20087071	Peaches prepared or preserved, containing no spirit but with added sugar	13.7	14.0	1.1	3rd
04031011	Yogurt (excl. flavoured or with added fruit, nuts or cocoa) with a fat content <= 3%	13.6	27.9	1.1	2nd
85446090	Electric conductors for a voltage > 1.000 v	11.9	20.3	1.0	2nd
30044900	Medicaments containing alkaloids or derivatives thereof	8.7	22.5	0.7	2nd

Source: UN Comtrade, 2019.

export tariff cost alone, in the event of an unfavorable Brexit scenario, being significant (see Table 8, below). For a more detailed account of the possible Brexit tariff costs for Greek products, the reader is referred to Section 5 of this article.

5. Estimation of tariff costs on goods traded between Greece and the UK in the event of a transition to the WTO regime

As stated above, should the UK exit the EU without the two parties having concluded a Free Trade Agreement, the trade relationship between the EU and the UK will be governed by the WTO tariff regime, based on the MFN clause. What this new arrangement would mean in practical terms is that bilateral trade between the UK and the EU will be subject to tariff costs for EU and UK exporters alike.

Given that the level of tariffs varies widely across different sectors and products, the resulting tariff burden for each EU Member State would depend on the composition of its bilateral trade with the UK. This section seeks to provide estimates of the tariff costs to be incurred in the bilateral trade of goods between the UK and Greece in the event of a transition to the WTO regime. This estimate is based on the methodology developed by Cappariello (2017). According to this methodology, in the case of Greece, this cost will correspond to the average tariff rate to be imposed on exports of goods to the UK and imports of goods from the UK, based on the EU's current MFN tariff rates and taking into account the current composition of product-level trade flows between Greece and the UK. This methodology allows for an estimation, *ceteris paribus,* of the tariff burden both on an aggregate and on a sector-by-sector basis, helping to identify activities for which the worst-case Brexit scenario would entail the highest tariff costs. For the purposes of applying this methodology, it is assumed that the MFN tariffs to be adopted by the UK will be the same as that of the EU, a scenario which appears quite plausible.

The data used in this article on the level of the EU's MFN duties per product were sourced from the WTO-Integrated Data Base (IDB) for 2018. This database provides information on the *ad valorem tariff rates* applicable –that is, tariff rates expressed as a percentage of the value of the imported product– per six-digit CN product code. For some products, mainly in the case of the agri-food sector, tariffs are not calculated on the basis of value, but on the basis of quantity or weight and, therefore, no *ad valorem duties* appear on the WTO-IDB basis. For these particular cases, the analysis relies on the estimated equivalent duties (*ad valorem equivalent tariffs*) available from the International Trade Center Market Access Map (ITC MAP) database. Where tariff-rate quotas are provided for a product, the analysis incorporates inside-quota tariff rates[3] and, therefore, particularly for the agri-food sector, which includes several sectors with quotas, the tariff costs estimated on the basis of this methodology can be considered to be the lower limit of what may materialise.

Based on the above detailed breakdown of tariff rates per product under the MFN regime for 2018, the average tariff rate to be charged on bilateral trade between Greece and the UK in the event of a transition to the WTO regime is estimated by using as weights the values of Greek exports to the UK and UK exports to Greece for 2018, at the level of six-digit CN product codes. Data on these trade flows are available from the United Nations International Trade Database (UN ComTrade). Table 7 presents the results of the estimates for the average bilateral tariff rates, on aggregate and by product category. More specifically, the first column of the table features estimates of the average tariff rates for goods that the UK imports from Greece (i.e., for Greek exports to the UK), while the second column features the corresponding rates for goods that Greece imports from the UK. As it has been assumed that the UK MFN tariffs will match the corresponding EU tariffs, the divergences in the estimates listed in these two columns reflect the significant differences in the composition of products imported from one country to another.

According to the estimates, the average UK tariff rate on Greek products following a transition to the MFN regime is estimated at 7.0%, while the corresponding average rate on UK products imported by Greece is estimated at a considerably lower level, amounting to 3.7%. The tariff estimate of 7% for Greek exports exceeds 5%, which can be considered as a threshold above which tariffs will significantly affect trade flows (WTO, ITC, UNCTAD, 2015). Compared to earlier estimates presented in the literature, this estimate is well above the EU overall estimate (5.2% according to Cappariello [2017] and 5.8% according to Protts [2016]) and slightly lower than the earlier estimate for Greece by Cappariello (2017), which stood at 8.3%.

3. A tariff-rate quota is a tariff regime which allows a specified quantity of a given product (sometimes from a specific country) to be imported at a lower or even zero tariff rate, which is referred to as the inside-quota tariff rate.

TABLE 7 Estimates of UK-Greece bilateral tariff rates by CN main product categories in the event of a transition to the WTO regime (%)

CN Code	Sector of goods	Estimated bilateral tariffs		Imports	
		Simple average of MFN tariffs, 2018		Sector share (%)	
		On Greek goods	On UK goods	UK from Greece	Greece from UK
01-05	Live animals, animal products	13.6	11.5	12.0	1.9
06-15	Vegetable products, fats	11.2	7.4	7.5	0.9
16-24	Foodstuffs, beverages, spirits, vinegar, tobacco and manufactured tobacco subsitutes	15.2	8.1	16.3	7.9
25-27	Mineral products	2.4	0.6	5.0	13.5
28-38	Products of the chemical and allied industries	0.4	1.8	19.0	20.7
39-40	Plastics, rubbers and articles thereof	6.4	5.2	3.2	6.4
41-43	Raw hides, skins, leather, furs and articles thereof	3.5	3.9	0.7	0.6
44-49	Wood, wood products, paper and paperboard	1.6	0.0	0.9	3.4
50-63	Textiles and textile articles	10.7	11.3	6.6	5.3
64-67	Footwear, headgear, etc.	10.7	10.1	0.5	1.1
68-71	Articles of stone, plaster, cement, etc., glass, glassware,	2.6	3.1	0.9	1.0
72-83	Base metals and articles of base metal	4.0	1.4	14.5	7.9
84-85	Machinery, electrical equipment	2.3	1.4	10.4	11.6
86-89	Transport equipment	3.4	8.5	0.3	10.1
90-97	Miscellaneous instruments/apparatus	0.4	0.8	2.2	7.7
	TOTAL	**7.0**	**3.7**	**100.0**	**100.0**

Source: Estimates using data from the WTO-IDB database and the International Trade Centre Market Access Map (for tariffs) and UN Comtrade (for trade flows).

At the sectoral level, the estimates in Table 7 of the tariff burden on Greek products exported to the UK point to average tariff rates above 10% in four main categories of goods, which account for more than 40% of the total exports of Greek products to the UK. More specifically, the average rates on exports of Greek products to the UK are estimated at 13.6% for *live animals and animal products*; at 11.2% for *vegetable products/fats;* at 15.2% for *foodstuffs, beverages, spirits, vinegar, tobacco and manufactured tobacco substitutes;* and at 10.7% for *textiles and textile articles*. At the same time, a low tariff burden on Greek exports to the UK is estimated to apply to the important categories of *mineral products* (2.4%) and *chemicals and allied industry products* (0.4%), which include *fuel* and *pharmaceuticals,* respectively. As for the tariff rates in product categories where Greece has significant imports from the UK, the estimates presented in Table 7 suggest low average tariff rates, except for the category of *transport equipment* (8.5%), which includes *cars* and *accessories* thereof.

It is stressed that as the MFN tariff rate varies widely not only across sectors, but also across products in the

TABLE 8 EU tariff schedule under the MFN regime for the 20 highest export value products of Greece to the UK, 2018

CN Code	Product	MFN tariff	Inside-quota MFN tariff
27101921	Jet fuel	0.00%	-
30049000	Medicaments	0.00%	-
74111010	Tubes and pipes of refined copper, straight	4.80%	-
27101947	Gas oils of petroleum or bituminous minerals, with a sulphur content of > 0.002% but <= 0.1% ...	0.00%	-
04069032	Feta	151EUR/100kg	75.5EUR/100kg
85444999	Electric conductors for a voltage <=1.000 v	3.70%	-
20057000	Olives	12.80%	-
19012000	Mixes and doughs of flour, groats, meal, starch or malt extract	7.6% + agricultural component	-
33049900	Beauty or make-up preparations and preparations for the care of the skin (other than medicaments)	0.00%	-
30042000	Medicaments containing antibiotics	0.00%	-
27101968	Fuel oils obtained from bituminous materials, with a sulphur content of > 1% by weight	0.00%	-
08061010	Fresh table grapes	11.50%	-
30045000	Medicaments containing vitamins	0.00%	-
21069098	Food preparations, n.e.s.	9% + agricultural component	18.00%
08062010	Currants	2.40%	-
25232900	Portland cement (excl. white, whether or not artificially coloured)	1.70%	-
20087071	Peaches prepared or preserved, containing no spirit but with added sugar	19.20%	-
04031011	Yogurt (excl. flavoured or with added fruit, nuts or cocoa) with a fat content <= 3%	20.5EUR/100kg	-
85446090	Electric conductors for a voltage > 1.000 v	3.70%	-
30044900	Medicaments containing alkaloids or derivatives thereof	0.00%	-

Source: International Trade Center Market Access Map, 2019.

TABLE 9 Estimates of tariff costs on imports of Greek products from the United Kingdom by main category (section) of CN goods in the event of a transition to the WTO regime

Κατηγορία		Imports of Greek products to the UK		
		Estimated value of tariffs (million €)	Value of imports to the UK (million €)	Average estimated tariff rate (%)
01-05	Live animals, animal products	16.5	121.7	13.6
06-15	Vegetable products, fats	8.6	76.2	11.2
16-24	Foodstuffs, beverages, spirits, vinegar, tobacco and manufactured tobacco subsitutes	25.1	164.9	15.2
25-27	Mineral products	1.2	50.7	2.4
28-38	Products of the chemical and allied industries	0.9	192.6	0.4
39-40	Plastics, rubbers and articles thereof	2.1	32.5	6.4
41-43	Raw hides, skins, leather, furs and articles thereof	0.3	7.4	3.5
44-49	Wood, wood products, paper and paperboard	0.1	9.0	1.6
50-63	Textiles and textile articles	7.1	66.5	10.7
64-67	Footwear, headgear, etc.	0.5	4.6	10.7
68-71	Articles of stone, plaster, cement, etc., glass, glassware,	0.2	9.0	2.6
72-83	Base metals and articles of base metal	5.9	146.2	4.0
84-85	Machinery, electrical equipment	2.4	105.4	2.3
86-89	Transport equipment	0.1	3.1	3.4
90-97	Miscellaneous instruments/apparatus	0.1	22.3	0.4
	TOTAL	**71.0**	**1,012.0**	**7.0**

Source: Estimates using data from the WTO-IDB database and the International Trade Center Market Access Map (for tariffs) and UN Comtrade (for trade flows).

same sector, the tariff for individual products falling into the above categories can demonstrate large upward or downward deviations from the above averages. Indicative of the range of tariff rates under the EU MFN tariff schedule is the information presented in Table 8 above with respect to the tariffs on the 20 products of Table 6. As it seems, the EU MFN tariff schedule provides for high tariffs on imports of agri-foods from third countries (*feta-style cheese, olives, grapes, peaches, bakery items, food preparations*), as well as zero duties on *fuels* and *lubricants - cosmetics*.

On the basis of the above estimates of the tariff rates on Greek-UK bilateral trade in the event of a transition to the WTO regime, it is apposite to present a corresponding estimate of the amount of the relevant tariff cost in value terms. Table 9 shows the relevant estimate in millions of euro per basic category of goods for exports of Greek products to the UK, while Table 10 presents the corresponding estimate for imports of UK products into Greece.

As noted above, the estimates of the potential tariff costs of Brexit are based on the assumption that the

TABLE 10 Estimates of tariff costs on imports of UK products to Greece by main category (section) of CN goods in the event of a transition to the WTO regime

CN Code	Sector of goods	Imports of UK products to Greece		
		Estimated value of tariffs (million €)	Value of imports to Greece (million €)	Average estimated tariff rate (%)
01-05	Live animals, animal products	2.8	24.5	11.5
06-15	Vegetable products, fats	0.8	11.3	7.4
16-24	Foodstuffs, beverages, spirits, vinegar, tobacco and manufactured tobacco substitutes	8.3	102.4	8.1
25-27	Mineral products	1.1	175.6	0.6
28-38	Products of the chemical and allied industries	4.8	269.4	1.8
39-40	Plastics, rubbers and articles thereof	4.3	83.1	5.2
41-43	Raw hides, skins, leather, furs and articles thereof	0.3	7.2	3.9
44-49	Wood, wood products, paper and paperboard	0.0	44.3	0.0
50-63	Textiles and textile articles	7.8	68.5	11.3
64-67	Footwear, headgear, etc.	1.5	14.9	10.1
68-71	Articles of stone, plaster, cement, etc., glass, glassware,	0.4	12.9	3.1
72-83	Base metals and articles of base metal	1.5	102.6	1.4
84-85	Machinery, electrical equipment	2.1	150.8	1.4
86-89	Transport equipment	11.2	131.5	8.5
90-97	Miscellaneous instruments/apparatus	0.8	99.9	0.8
	TOTAL	**47.6**	**1,299.0**	**3.7**

Source: Estimates using data from the WTO-IDB database and the International Trade Center Market Access Map (for tariffs) and UN Comtrade (for trade flows).

UK will adopt, at least initially, the EU MFN tariff schedule. If the UK were to choose to deviate significantly from this practice, then the related costs would vary accordingly.

6. Concluding remarks

In terms of its share of Greece's total goods trade, the UK does not rank particularly high and, therefore, compared to other European economies, Greece appears to be less vulnerable to the impact of Brexit on goods trade. However, Greece maintains significant UK export activity in specific sectors of goods for which the effects of Brexit could be more pronounced. These sectors are mainly in the agri-food industry and in the fields of fuel, pharmaceuticals and cosmetics, metal products and machinery and equipment. For most of these sectors, Brexit may result in the introduction of non-tariff barriers, which are likely to be more burdensome in the case of the most adverse Brexit scenarios. At the same time, for some of these sectors, a worst-case Brexit scenario would entail a high probability of imposition of appreciable tariff rates on UK imports of Greek products. Furthermore, in the case of protected geographical indication products, the potential impact of Brexit on Greek exports will also depend on whether or not these products will continue to enjoy protection in the UK following Brexit.

The above analysis, specifically covering the case of Greece, coupled with this paper's presentation of the broader picture of the channels of impact of Brexit on the EU-UK trade relationship, highlights the challenges and difficulties that the UK's exit from the EU will signal for trade between the EU and the UK. In order to reduce, as much as possible, the costs associated with the issues touched on in this article's, both parties to the negotiation and each EU Member State individually will need to demonstrate a spirit of cooperation and a certain degree of readiness to explore mutually beneficial compromises.

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On the measurement and the multidimensional analysis of productivity in Greece

Pródromos Prodromídis*

Abstract

The article explains the differences among the output-to-input measures of productivity, the marginal measures of productivity, and multifactor productivity; draws attention to a number of relevant issues; and looks into the presence of increasing, decreasing or constant returns to scale in Greece —closely woven with the marginal and multifactor productivities. Estimating the sizes and patterns of the various measures of productivity is crucial for the formulation of well-targeted policy proposals on the economic development of individual regions, sectors, and the country at large.

Keywords: *input productivity, multifactor productivity, returns to scale, sectoral and spatial heterogeneity, Cobb-Douglas production function*

JEL classification*: C33, E23, E24, O47, R11*

1. Introduction

As mentioned in the editorial of the previous issue of the *Greek Economic Outlook*, KEPE was recently selected by the State to perform the functions of the country's National Productivity Board (NPB). At the recommendation of the EU Council, NPBs are currently being established across the euro area to carry out high-quality economic and statistical analyses in each member state, advise on economic productivity and competitiveness, and generally promote sustainable economic growth and convergence (European Commission, 2019).

KEPE, not only as a research center that brings together under one roof scientists specializing in many different areas in economics as well as in related fields, so as to conduct complex analyses, but also as successor to the Greek Productivity Center's (1954-1998) research mission, in the opinion of this writer, is in a position to execute the aforesaid task.

KEPE's interest in measuring productivity and studying the impact of productivity on GDP and per capita income in Greece is conspicuous both in its earliest works (Pepelasis and Yotopoulos, 1962; Coutsoumaris, 1963) and a good number of planning series publications, and other analyses carried out in the years that followed. See, for example, KEPE (1965, 1976, 1980, 1986, 2002, 2003, 2005), Sykianakis (1967), Shaw (1969), Economou (1975), Athanassiou et al. (1995), Savva-Balfoussia et al. (2009), Kanellopoulos et al. (2011a, 2011b). In addition, following developments in the international literature, Koutsogiannis-Kokkova (1964) econometrically estimated key elements of productivity in Greece; and over the years Yotopoulos (1967), Nikolaou (1978), Prodromídis et al. (2010) re-estimated these elements. Georganta (1993a, 1993b), Georganta et al. (1994), Chletsos et al. (1997), Kaditi and Nitsi (2009) estimated, via various ways, the effects of certain developments and factors on productivity; Balfoussias (1995), Savva-Balfoussia (2004) and Papaioannou (2013) estimated productivity trends; Stavrinos and Droucopoulos (1996) estimated the effects of productivity changes on sectoral employment; and Terrovitis (2005) estimated the impact of a sector on the country's productivity.

As KEPE's output and discussions on the matter are likely to increase on account of its new role, in the following pages we try to: (a) Inform the reader about the various productivity measures that exist. Some of these measures are calculated via basic arithmetic (Section 2) while other measures are estimated through more sophisticated, econometric techniques (Section 3). (b) Give a sense of the main features of Greece's production function through which the second set of measures is obtained —the estimations are carried out within the so-called Cobb-Douglas framework with the aim of keeping things simple (Section 4). (c) Reach some conclusions and offer ideas (Section 5).

* Senior Research Fellow, Centre of Planning and Economic Research (KEPE). e-mail: pjprodr@kepe.gr

– Opinions or value judgments expressed in this article are the author's own and do not necessarily reflect those of the Centre of Planning and Economic Research.

2. Output-to-input productivity

In theory, the level of production —whether supplied by an enterprise or an area, by a sector or by the whole society— depends on the quantity and quality of inputs, on the way inputs are combined, and on the factors shaping demand. The inputs consist of labor (specialized and/or unskilled), manmade capital (machines, buildings, etc.), land (the Earth's surface in the broad sense: area size and configuration, water, flora-fauna-minerals, etc.), as well as energy and other materials used in the process (all obtained from land, labor and capital). For the sake of convenience, let us symbolize production (output) with the letter Q, labor with letter L, land with Γ, energy with E, materials (intermediate goods and services) with M, the stock of buildings with K_1, machines with K_2, and the sum of the latter two (overall capital) with K.

Moving on to define and measure productivity, one has to keep in mind that there exists not only one type of productivity, but many: The Q/L ratio provides the *productivity of labor*, Q/K conveys the productivity of capital, Q/Γ provides the productivity of land, Q/E stands for the productivity of energy, and, as a rule, any ratio of output to a single input, over a specific length of time, yields the productivity measure of the said output.

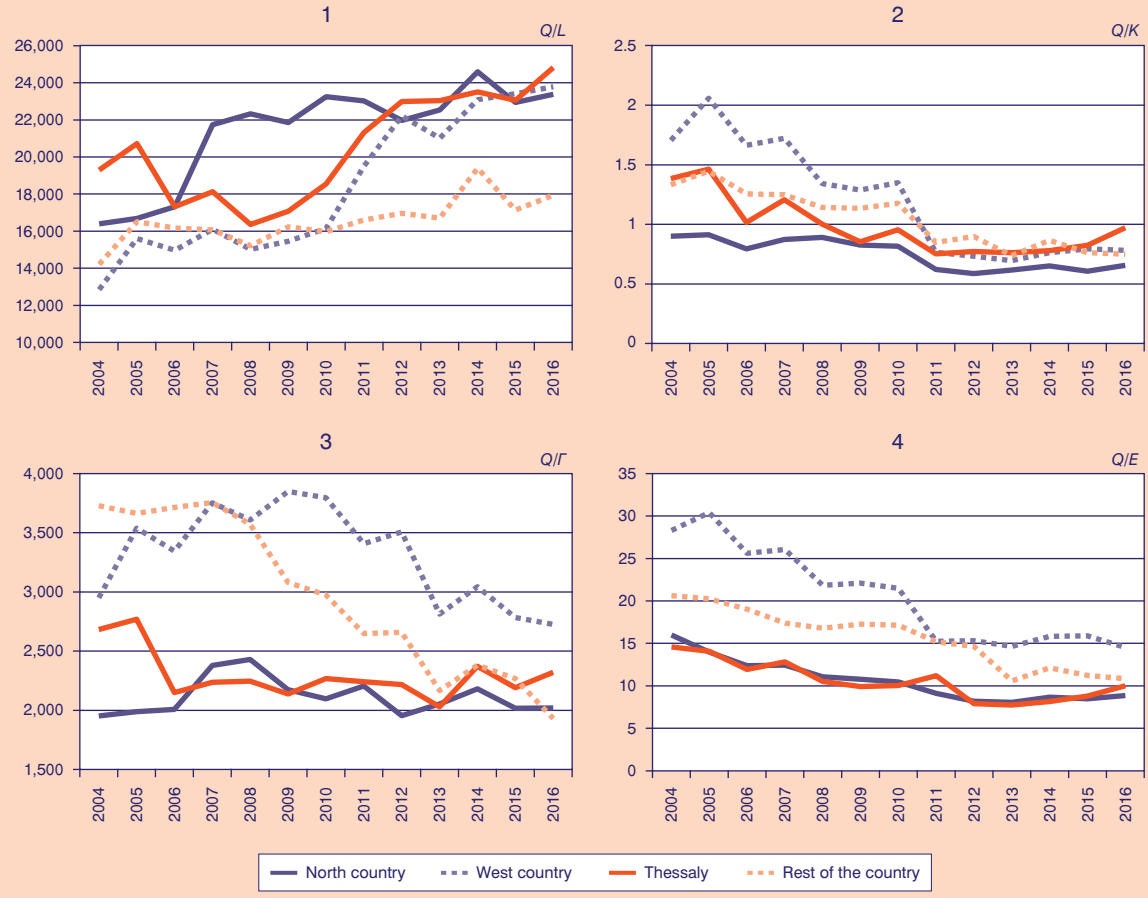
Understandably, the numerical result may change over time, and may vary from sector to sector, country to country and —possibly— within a country, from one region to another. This is easy to illustrate with some examples based on the annual agricultural statistics of the European Union's member states (EU-28). The statistics are collected from samples and provided by the European Commission's Farm Accountancy Data Network. Indeed, Figures 1-4 suggest that during 2004-2016, in Greece: the productivity of labor increased while the productivity of capital, of land and of energy decreased. The productivity of labor and the productivity of land in the north part of the country evolved quite differently compared to the west part of the country, and so on.

Developments in any of the above ratios may affect other crucial economic variables (for instance, employment, profitability, etc.) and may be diffused across space. The latter may be illustrated with an example based on the annual structural business statistics of the EU-28 provided by Eurostat. Indeed, Figure 5 suggests that during 2008-2016, changes in labor productivity in Denmark's administrative and support service activities by-and-large anticipated labor productivity changes (in the same direction) in the administrative and support services of neighboring Sweden.

As with any measurement, a productivity figure becomes meaningful when compared to other such figures. Of the productivity measures mentioned above, labor productivity is both easy to assess and access. Indeed, it is widely used in analyses and comparisons as it offers a dynamic measure of economic growth, competitiveness, and living standards. Hence, productivity figures from a country or sector may be easily compared to other such figures in the same or different country or sector. As a case in point, based on the aforesaid structural business statistics, Table 1 provides the average labor productivity levels observed across the secondary and tertiary sectors in the EU-28 member states during 2014-2016. It reveals that:

- The highest levels of Q/L were observed in mining and quarrying in Denmark and the Netherlands (averaging €901.5 and 679.6 thousand per employee, respectively), and in electricity-natural gas-steam-air conditioning in Spain, Portugal and the Republic of Ireland (averaging €503.7, 429.8, 403.4 thousand per employee, respectively).
- Electricity, etc. exhibited either modest or high levels of Q/L (averaging, €75-199.9 or over 200 thousand per worker, respectively): the highest or second highest level in each and every EU member state. By contrast, accommodation and food services exhibited either low or very low levels (averaging €25-74.9 or 0-24.9 thousand per worker, respectively): the lowest or second lowest level in each and every EU member state.
- Denmark, the Netherlands, and the Republic of Ireland exhibited high levels of Q/L in three out of the twelve activities monitored by Eurostat. Sweden, Luxembourg, and the United Kingdom of Great Britain and Northern Ireland exhibited high levels of Q/L in two activities. Belgium, Spain, Italy, Portugal, and Finland exhibited a high level of Q/L in one activity (namely, electricity, etc.) The former seven member states and Austria exhibited high or modest levels of Q/L in six or more out of the twelve activities. France, Germany, Italy, Cyprus, and Finland exhibited modest levels of Q/L in three or more activities. Greece, Estonia, Croatia, Malta, Hungary, Poland, Slovakia, Slovenia, and the Czech Republic exhibited modest levels in one activity (namely, electricity, etc.), while Croatia, Lithuania, and Romania exhibited very low levels in eight out of twelve activities, Latvia in nine, and Bulgaria in eleven activities.

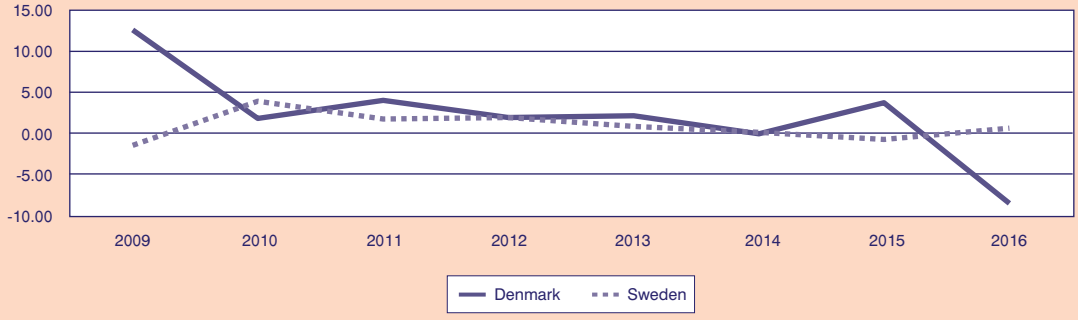
FIGURES 1-4
Productivity in agriculture across Greece, 2004-2016 (average holding, annual data)



Source: European Commission (ec.europa.eu/agriculture/fadn_el). Own calculations.

Notes: The north country consists of West, Central and East Macedonia, Western Thrace and the islands of Thasos and Samothraki. The west country consists of Epiros, the Ionian islands, Achaea, Ilis and the rest of the Peloponnese south and west of the isthmus of Corinth, except Troezin. Thessaly includes the (northern) Sporades islands.
Labor is expressed in full-time person equivalents.

FIGURE 5
Labor productivity changes in the administrative and support service activities sector, 2009-2016 (in thousand €, annual data)



Source: Eurostat (ec.europa.eu/eurostat/data/databases), structural business statistics. Own calculations.

TABLE 1 Labor productivity across enterprises in the EU-28 by member state and sector (gross value added per person employed in thousand €, three-year average: 2014-2016)

Sectors:	1	2	3	4	5	6	7	8	9	10	11	12
DK	A	A	A	B	B	B	B	B	C	C	C	C
LU	A	A	B	B	B	B	B	B	B	C	C	C
UK	A	B	A	B	B	B	C	B	C	B	C	C
IE	A	C	B	A	A	C	B	C	C	C	B	C
BE	A	B	B	B	B	B	B	B	C	C	C	C
NL	A	A	A	B	B	B	C	C	C	C	C	D
SE	A	A	B	B	B	B	C	C	C	C	C	C
FI	A	B	C	B	B	B	C	C	C	C	C	C
AT	B	B	B	B	B	B	C	C	C	C	C	C
FR	B	B	B	B	C	C	C	C	C	C	C	C
DE	B	B	B	B	C	B	C	C	C	C	C	D
IT	A	C	B	B	C	C	C	C	C	C	C	D
CY	B	C	C	B	C	B	C	C	C	C	D	C
ES	A	C	C	C	C	C	C	C	C	C	D	D
SI	B	C	C	C	C	C	C	C	C	D	D	D
PT	A	C	C	C	C	C	C	D	D	D	D	D
GR	B	C	C	C	C	C	C	D	D	D	D	D
EE	B	C	C	C	C	C	C	D	D	D	D	D
MT	*	B	*	C	C	*	C	C	C	C	C	D
SK	B	C	C	C	C	D	C	D	D	D	D	D
CZ	B	C	C	C	C	C	D	D	D	D	D	D
HU	B	C	C	C	C	D	D	D	D	D	D	D
PL	B	C	C	C	D	C	D	D	D	D	D	D
HR	B	C	C	C	D	D	D	D	D	D	D	D
LT	C	C	C	C	D	D	D	D	D	D	D	D
RO	C	C	C	C	D	D	D	D	D	D	D	D
LV	C	D	C	C	D	D	D	D	D	D	D	D
BG	C	D	D	D	D	D	D	D	D	D	D	D

Source: See Figure 5.

Note: Sectors: (1) electricity, natural gas, steam, air-conditioning; (2) real estate; (3) mining, quarrying; (4) information, communication; (5) manufacturing; (6) water supply, sewerage, waste management, remediation activities; (7) transportation, storage; (8) professional, scientific, technical activities; (9) wholesale, retail trade, repair of motor vehicles; (10) construction; (11) administrative and support services; (12) accommodation, food services.

Productivity levels: A: ≥ 200. B: 75 - 199.9. C: 25 - 74.9. D: 0 - 24.9.

* No data.

- Greece exhibited: (a) Modest levels of Q/L in electricity, etc. (averaging €120.3 thousand per employee). (b) Low levels of Q/L in mining and quarrying (€66.4 thousand), water supply, etc. (€43.9 thousand), information and communication (€42.5 thousand), real estate (€36.8 thousand), manufacturing (€33.3 thousand), transportation and storage (€29.9 thousand). (c) Very low levels of Q/L in construction (€16.3 thousand), administrative and support services (€15.9 thousand), wholesale and retail trade, as well as the repair of motor vehicles (€15.0 thousand), professional, scientific, and technical activities (€13.3 thousand), accommodation and food services (€7.8 thousand). The numbers suggest that by-and-large there is room for improvement, so perhaps the transfer of successful ideas and practices from countries that achieve much higher levels of labor productivity ought to be considered.

3. Marginal and multifactor productivity

Moving on to the other measures of productivity mentioned in the introduction and to the techniques used to estimate these measures, we turn to the relatively simple, yet widely used, functional form proposed by Cobb and Douglas (1928) to describe production:[1]

$$Q = AK^{\alpha} L^{\beta}. \quad (1)$$

In this context, the dependent variable (regressand), Q, is determined by two independent variables (regressors), namely, K and L; and the unknown terms, A, and the exponents, are estimated econometrically, simultaneously, on the basis of the known values of the dependent and independent variables. Furthermore, if data for additional relevant inputs, say, Γ and E, exist, and the degrees of freedom permit, then the consideration of a more advanced expression, a variant of (1), may be preferable on econometric grounds:[2]

$$Q = A K^{\alpha} L^{\beta} \Gamma^{c} E^{\varepsilon}. \quad (2)$$

Of these:

- A, often referred to as *multifactor productivity*, captures: (i) The more or less innovative technological and/or entrepreneurial way in which the inputs are combined. (ii) The impact of any other omitted regressor or regressors (i.e., independent variables not included in the function).[3] See also Box 1.

BOX 1

An alternative approach of calculating multifactor productivity

A good number of economists proxy the growth of A by constructing indices for successive years and subtracting growth rates of L and K from the growth rate of Q, generally assuming that $\alpha+\beta=1$. For more on this approach see Schreyer (2001) and Saari (2011); and for a good number of past and recent estimates regarding Greece recovered in this very way, see Leounakis and Sakellaris (2014).

According to Diwan (1968), the assumption that $\alpha+\beta=1$ is simplistic and throws away a lot of information. To the best of this author's knowledge, the assumption's accuracy has not been confirmed for Greece.

1. The way in which the inputs enter (or are thought to enter) the production function, as well as the availability and accuracy of the data, are crucial for the quality of the estimates obtained (Syverson, 2011) and, consequently, for the quality of the conclusions reached.

2. There may exist other specifications that are more suitable than the Cobb-Douglas function in a good number of circumstances (e.g., Duffy and Papageorgiou, 2000). However, if the purpose is to demonstrate definitions and how the estimation of a function's parameters is carried out via econometrics, then it is probably preferable to stay with the simplest functional form rather than the more complex. (This is not to say that analyses based on the Cobb-Douglas functional form cannot be intricate or challenging, e.g., by Olley and Pakes, 1996; Levinsohn and Petrin, 2003; Ackerberg et al., 2015.)

3. Though frequently referred to as *total factor productivity* —the word *total* suggests all inputs have been measured and included— the term is estimated as a residual of the factors that are included in the expression. Therefore, it does not necessarily include or serve as the sum of the productivities mentioned in Section 2. It should also be noted that depending on the circumstances, the number of inputs that are not measured or included in the empirical analyses may vary.

- The exponents (parameters) of L and K are used to calculate the *marginal productivities* of the respective inputs, for instance, the marginal productivity of labor, $\beta Q/L$, and the marginal productivity of capital, $\alpha Q/K$. In addition, if the sum of the exponents equals one, then the production function exhibits constant *returns to scale*. This means that doubling the use of the inputs will double output. Conversely, if the sum of the exponents exceeds (is below) one, then the production function exhibits increasing (decreasing) returns to scale. This means that doubling the use of the inputs will more than double (less than double) output. (See Barro, 1990; Brown, 1987; Charnes et al. 1976; Chiang, 1984: 414-16; Comin, 2008; Erken et. al., 2016.)

To get a sense of the numerical values of the exponents in the Cobb-Douglas context, we turn to two empirical analyses of relatively recent European data carried out by Marrocu et al. (2011)[4] and Mazurek (2018). Marrocu et al. considered data from thirteen secondary and tertiary sector economic activities across 276 EU-27 regions during 1996-2007 (i.e., before the international financial crisis reached western Europe), and found that:

- The estimates of α ranged between 1 and 20% in five activities, ranged between 21 and 40% in one activity, took values of 41% or higher in seven activities, and took the value of 34% overall. The estimates of β ranged between 20 and 50% in seven activities, ranged between 51 and 70% in one activity, took values of 71% or higher in five activities, and took the value of 59% overall.[5] In short, the values recovered at the sectoral level generally varied from the value recovered at the aggregate level. Let us call this *Conclusion 1*.
- The sum of the two exponents, i.e., $\alpha + \beta$, took values between 70 and 90% in four activities, between 91 and 110% in eight activities, a value in excess of 111% in one activity, and the value of 92% overall.

Mazurek considered data from thirty national economies and found that during 2006-2015, the estimates of α ranged between 99 and 1.01%, the estimates of β ranged between -0.15 and -0.98%. Let us call this *Finding 1*.[6] As in the previous case, the sum of the two exponents was below 100%. Let us call this *Finding 2*.

Next, working along the lines of expression (2) and using the regional and time-series agricultural input and output data considered in Section 2, we illustrate how the estimates of A and of the input exponents may or may not vary within Greece. Table 2 supplies the version that best fits the data.[7] It suggests that:

- Despite initially allowing A to vary across regions, the regional estimates turn out to be so similar during the years under consideration that they are combined: $\ln(0.023) = 1.02$. On the other hand, the effects associated with labor, energy, and buildings (i.e., the exponents β, ε, α, respectively) often vary from one region to the next. (See the recovered coefficients of rows 2-9 in Table 2.) As a result, in Thessaly the production function takes the following form:

$$Q = 1.02 \times L^{0.53} \times E^{0.19} \times K_1^{-0.15} \qquad (3)$$

and in the other regions it is expressed in a similar manner.

- If we turn to the recovered p-values we have to conclude that there exists considerable heterogeneity across the country. That is, the positive value of β in Thessaly, in the west country and in the other parts of the country (vis-à-vis the north part of the country), the positive value of ε in the north part and in the other parts of the country (vis-à-vis Thessaly and the west part of the country), and the negative value of α regarding buildings in the west part of the country (vis-à-vis the other three regions) are all different from the respective values elsewhere.[8]
- The inclusion of energy alongside the other explanatory variables allows for a better fit. It is not

4. The particular authors are mentioned in the previous issue of the journal by Tsekeris (2019), specifically because of their findings. These findings are outlined here as well.

5. The p-values associated with these are below 1%, so the estimates are significantly different than zero.

6. In all cases the p-values associated with α are less than 1% and the p-values associated with β are over 10%. To the extent the analysis is carried out in the population rather than a sample, dwelling on p-values is probably immaterial.

7. More complex variants of the Cobb-Douglas production function specification considered here exhibit higher levels of fitness.

8. Obtaining a negative α is not surprising. Lucas (1970), Romer (1987) and others have obtained similar results. Diwan (1968), Shadbegian and Gray (2005), and others, provide some explanations. Obtaining a negative (though not statistically significant) β in the north recalls Finding 1. In a slightly more elaborate version of the Cobb-Douglas regression, the particular estimate turns out positive —a statistically significant result.

TABLE 2 OLS regression with robust standard errors on agricultural holding production (expressed in €) in Greece, annual data 2004-2016 (log-log, first differences)

	Explanatory variables	Coefficients	p-values
1	*A*	0.023	0.030
	L (in full-time person equivalent)		
2	• in the north country	-0.059	0.751
3	• in the west country and Thessaly	0.533	0.029
4	• in the rest of the country	1.394	0.001
5	*E* (in €) in the north country	0.502	0.000
6	• in the west country and Thessaly	0.190	0.141
7	• in the rest of the country	0.593	0.021
8	K_1 (in €) in the west country	-0.453	0.030
9	• in Thessaly, the north and rest of the country	-0.150	0.262
Observations		48	
Model fitness *(R^2)*		49%	

Source and geographic terminology: See Figures 1-4.

Notes: All regressors are linearly independent of one another: *E* from *L*, K_1 from *L* and *E*. Those featuring similar coefficients are grouped together so as to preserve degrees of freedom. The Levin-Lin-Chu, Harris-Tzavalis, Breitung, Im-Pesaran-Shin and Hardi tests are considered. All variables are stationary.

unreasonable: Energy is probably preferable to, say, machines, bearing in mind that machines require energy in order to operate and are useless without energy.

- Building capital has an independent effect. However, to the extent the p-value associated with a negative result in the west part of country is about 3% (row 8 in Table 2), one may deduce that a marginal reduction in this form of capital in the west part of Greece (perhaps not fully utilized or serving other purposes), by freeing up resources, may have a positive effect on production. Let us call the particular result *Finding 3*.
- Insofar as the input coefficients in three of the country's four regions add up to less than one, it follows that agricultural production probably takes place under decreasing returns to scale. That is, during 2004-2016, the production process became less efficient when production expanded.[9] As already observed in other analyses (see *Finding 2*), the sum of the exponents may not equal one and, indeed, is often less than one.

4. Some recent evidence from Greece

A broader and relatively recent picture regarding the size of *A* and the function's exponents is supplied by a number of empirical analyses that rely on regional and sectoral input and output data from 2000 to 2012, carried out by Papaioannou et al. (2017: 109, 111-112, 123). The authors simultaneously estimate the average *A*, α, and β, and find that:

- *A* exhibits considerable variation from one econometric analysis to the next, but the time trends exhibit little variation (cases with p-value <5%).

9. By contrast, in the fourth region, the input coefficients add up to more than one. This suggests that agricultural production probably takes place under increasing returns to scale.

- α is estimated once at 24%, four times at 43-47%, and eight times at 55-63% (cases with p-value <5%).
- β is estimated thirteen times at 17-56% and two times at 68-81% (cases with p-value <5%).
- $\alpha + \beta$ is estimated eight times at 64-90%, four times at 94-96%, once at 1.05% (cases where both exponents are associated with p-values <5%).

The general sense is that α is probably equal to or somewhat higher than 55%, β is probably equal to or lower than 56%, and the sum of the two is probably less than 100%. Let us call this *Finding 4*.

In a separate empirical analysis regarding production at the regional level in Greece, using sectoral supply and aggregate demand figures from 2001 to 2011, carried out by Prodromidis and Papathanasiou (2018), the authors simultaneously estimate A, α, and β, and find that:

- A varies across space and changes over time,
- The exponents regarding L and K (in fact, a variant of K that is linearly independent of L)[10] vary across space and across sectors.[11] In most cases α is estimated to about -15% (this recalls *Finding 3*), and β to about 81%.[12]

In particular:

Of these, Q is the GDP, Q and K are in millions of euro, L is in thousands of residents, the Latin numbers by L and K convey the inputs used in six broad sectors of economic activity (see footnote 11); $T = 0.17t_{2003\text{-}06} + 0.30t_{2007\text{-}11}$, with $t_{2003\text{-}06}$ denoting years 2003-2006 and $t_{2007\text{-}11}$ denoting years 2007-2011.

Against the econometric method of simultaneously estimating the unknown A, α, and β from the known values (i.e., the data) of the dependent and independent variables, a number of analysts take a *shortcut* by setting $\alpha+\beta=1$. For instance, Voutsinas and Tsamadias (2014) do so while using input and output data from 2000 to 2007. In the same spirit, Tsekeris (2019) postulates that α is 33% and β is 66% at both the aggregate and the regional levels despite the sectoral heterogeneity and idiosyncrasies observed at the regional level in Greece, and despite *Conclusion 1* and *Finding 4*. It is on this basis that he calculates/proposes values for A across Greece.

5. Conclusions

The article distinguishes between the output-to-input productivity measures that are calculated via basic arithmetic, and the marginal and multifactor productivity measures estimated via more sophisticated, econometric techniques. It also shows that: (a) The former

Attica, Troezin, isles:	$Q = e^{-4.43+T} \times L_{I+\ldots+V}^{0.81} \times L_{VI}^{0.34} \times K_{I+III+\ldots+VI}^{-0.15} \times K_{II}^{0.12}$ etc.	(4)
South Aegean islands:	$Q = e^{-0.91+T} \times L_{I+\ldots+V}^{0.81} \times L_{VI}^{0.34} \times K_{I+III+\ldots+VI}^{-0.15} \times K_{II}^{0.12}$ etc.	(5)
Central Greece:	$Q = e^{-0.91+T} \times L_{I+\ldots+VI}^{0.81} \times K_{I+III+\ldots+VI}^{-0.15} \times K_{II}^{0.12}$ etc.	(6)
Epiros:	$Q = e^{-1.71+T} \times L_{I+III+\ldots+VI}^{0.81} \times L_{II}^{0.05} \times K_{I+III+\ldots+VI}^{-0.15} \times K_{II}^{0.12}$ etc.	(7)
Ionian islands:	$Q = e^{-4.43+T} \times L_{I}^{0.36} \times L_{II+\ldots+VI}^{0.81} \times K_{I+III+\ldots+VI}^{-0.15} \times K_{II}^{0.12}$ etc.	(8)
North Aegean islands:	$Q = e^{-4.43+T} \times L_{I+\ldots+VI}^{0.81} \times K_{I+III+\ldots+VI}^{-0.15} \times K_{II}^{0.12}$ etc.	(9)
E.Macedonia-W.Thrace:	$Q = e^{-4.43+T} \times L_{I+\ldots+IV}^{0.81} \times L_{V+VI}^{0.32} \times K_{I+III+\ldots+VI}^{-0.15} \times K_{II}^{0.12}$ etc.	(10)
Central Macedonia:	$Q = e^{-1.07+T} \times L_{I+\ldots+VI}^{0.81} \times K_{I}^{0.03} \times K_{II}^{0.12} \times K_{III+\ldots+VI}^{-0.15}$ etc.	(11)
Rest of Greece:	$Q = e^{-1.07+T} \times L_{I+\ldots+VI}^{0.81} \times K_{I+III+\ldots+VI}^{-0.15} \times K_{II}^{0.12}$ etc.	(12)

10. See also the notes of Table 2.

11. The six sectors are (I) the primary sector, (II) construction, (III) the other secondary sector activities, (IV) the wholesale-retail trade-repair of motor vehicles, transportation-storage, accommodation-catering and information-communication sector, (V) the business-support sector (includes administrative, professional-scientific-technical activities, real estate, financial intermediation), (VI) the other tertiary sector.

12. The analysis is carried out in the population. The p-values reported by the software (intended for analyses regarding samples) are by-and-large less than 1%. In the case of α = -0.15, the p-value reported is slightly higher: 0.012.

may vary across space and sectors and may converge or diverge or be affected by output-to-input productivity measures observed elsewhere. (b) Labor and capital inputs may have different effects on production across space and across sectors. (c) Other inputs may be associated with significant, yet heterogeneous, effects as well. (d) Multifactor productivity may be the same or similar across space or may vary from one place to another. Obviously, the more accurate the estimates of multifactor productivity and of the various input coefficients, the better the chances to formulate well-targeted policy proposals for economic development. Conversely, reliance on untested parameters may be a cause of concern. In addition, the article suggests that if productivity in one of Greece's sectors seems to fall behind compared to other places in the EU, perhaps the transfer of good practices, from the best performer to Greece, ought to be considered.

As the country comes out of a long recession, with the same land (terrain) as before, the manmade capital worn out, the workforce trickling out of the country, the use of EU funds and the attraction of investments (including technology transfers) lagging behind —requiring wider changes and consistency over time in order to improve— perhaps the obvious resource to turn to is entrepreneurship. The good reception that some regional business-development plans and pro-entrepreneurship initiatives enjoy (Prodromidis and Papaspirou, 2018) suggests that things may be moving in that particular direction. The signs will improve when the plans are carried out and bear fruit.

The five-to-seven year hiatus between (a) the statistics considered by Papaioannou et al. (2017) and by Prodromidis and Papathanasiou (2018) and (b) the years of publication, highlights a delay in data availability. This inhibits timely analyses and policy reaction, and ought to be addressed. In all likelihood the establishment of a National Productivity Board in Greece will prompt a new round of discussions, research and suggestions regarding policy planning, as well as useful interactions with research or other institutes overseas.

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Investigation of the implications of Basel III on the profitability of the Greek banking sector

Stephanos Papadamou*
Dimitrios Sogiakas**
Vasilios Sogiakas***
Kanellos Toudas****

Abstract

This article examines the implications of the adoption of the liquidity provisions of Basel III on the profitability of the Greek banking system.

For the purposes of the analysis, the Net Stable Funding Ratio (NSFR) is constructed according to Basel III provisions. NSFR aims to protect the banking sector during distressed periods by creating liquidity for the banks.

The empirical analysis of the article suggests that there are positive implications in the adoption of higher values of NSFR on the profitability of the Greek banking system.

Keywords: *Basel III, NSFR*

JEL classification: *G21; C23; C32; C33*

1. Introduction

Capital requirement is undoubtedly necessary for managing risk in the banking sector. This article examines the implications of the adoption of banks' liquidity provisional proposals of Basel III (BIS 2012, BIS 2013, BIS 2014), such as the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), on the profitability of the Greek banking sector.

The implementation of Basel III was initiated optionally in 2012, while in 2015 and 2018 (LCR and NSFR, respectively) this became mandatory with a minimum requirement set at 100%. The challenges for avoiding a financial crisis for both individual and central banks are unlimited and there is space to further develop and promote a stable banking environment through the new regulative framework.

There is an ongoing discussion about the efficiency or not of setting high liquidity requirements and of publicly releasing this information for each bank. On the one hand, bankers argue that tighter regulation could diminish the efficient functioning of banks, while, on the other hand, regulative authorities adopt liquidity practices (NSFR and LCR) that aim to promote stability in the banking sector and the financial sector.

In this article our aim is to examine the implications of complying with a tighter regulatory framework on the performance of the Greek banking sector. Specifically, we examine the potential implications of adopting higher capital requirements (Tier 1) and higher liquidity provisions (NSFR) on bank performance. Although the first part (Tier 1) has been extensively considered in the literature, providing evidence of a negative association with profitability, the second part (NSFR) lies in the sphere of the efficient banking regulation and functioning of the banking sector. Our analysis covers the period of the recent financial crisis, 2007-2008. Furthermore, our analysis accounts for the risk-adjusted profitability of banks underlying the importance of the efficient functioning of banks. We also examine our research hypotheses in the sub-periods before and after the financial crisis of 2007-2008. In this framework, we examine whether the efficient functioning of banks is strengthened with the adoption of tighter regulation. Finally, we apply a quantile regression to account for potential non-linearities in the relationship between capital (Tier 1) and liquidity (NSFR) requirements with bank performance. Due to sample size issues, we adjust the quantile regression in order to account for two ranges as is dictated by the NSFR median.

Although the development of the liquidity provisions LCR and NSFR and their mandatory implementation is

* University of Thessaly, Department of Economics. e-mail: stpapada@uth.gr

** University of Thessaly, Department of Economics. e-mail: dsogiakas@uth.gr

*** American College of Greece, Business School and Economics. e-mail: vsogiakas@acg.edu (corresponding author)

**** National and Kapodistrian University of Athens, Department of Economics. e-mail: kstoudas@econ.uoa.gr

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very recent (2015 and 2018, respectively), this article focuses on a dynamic relationship between liquidity provisions and bank performance. The retrospective analysis of the harmonization period (period of 2000-2014) of the regulatory framework sheds much light on its efficiency.

Using data from Greek banks during 2000-2014 and by adopting a dynamic panel analysis, we found strong evidence in favor of the role that NSFR could play in enhancing bank profitability, especially during distressed periods.

The rest of the article is organized as follows. Section 2 discusses briefly the extant literature, while Section 3 explains the data and the applied research methodology. Section 4 discusses our empirical findings, and finally, Section 5 concludes the article.

2. Literature review

The findings of many articles that investigate the effectiveness of supervision and regulation practices do not coincide necessarily and are model and data specific.

According to Demirguc-Kunt, Detragiache and Merrouche (2013), better capitalized banks perform better during distressed periods. This implies that a stronger capital position is an elementary asset during a systemic crisis, and that the introduction of a minimum leverage ratio to supplement minimum risk-adjusted capital requirements is of crucial importance, as proper risk exposure measuring is very difficult, especially for large and complex financial organizations. Consequently, the greater emphasis on higher quality capital in the form of Tier 1 capital or tangible equity is justified. Otker-Robe and Pazarbasioglu (2010) investigate the Basel III reforms on capital requirements and claim that this requirement represents a substantial improvement in the quantity and quality of the capital of banks in the post-crisis period compared with the pre-crisis situation. They also suggest that the Basel II capital standards have a significant impact on investment-banking-type activities, which is a key parameter when investigating the trade-off between the reduction of systemic risk and the dampening of financial intermediation.

However, Delis and Staikouras (2011) investigate the role of banking supervision in controlling bank risk. They incorporate the banking regulation into their analysis in terms of capital adequacy and disclosure requirements. Bank risk is measured with three alternative specifications: the z-score, the ratio of NPL to total loans and the ratio of risky assets to total assets and its change from the previous period or the simple volatility of ROA. Banking supervision is measured in terms of enforcement outputs. They conclude that increased transparency and the associated enhanced market discipline have stabilizing effects for banks while capital requirements could not mitigate risk sufficiently. Similarly, Valascas and Hagendorff (2013) cast doubts on the role of the minimum capital requirements on the efficient functioning of banks since the relevant risk weights for calculating the capital requirement should be revised. Feess and Hege (2012) argue that the incentives for tightening the capital standards lie in the necessity to encourage banks to raise more equity and not to reduce loan supply. Most importantly, they propose a theoretical model that accounts for the heterogeneity between banks.

With respect to the liquidity provisions of Basel III, the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), Dietrich, Hess and Wanzenried (2014) calculated retrospectively the NSFR for a sample of 921 European banks during 1996-2010 and argued that NSFR was lower than the current minimum requirement, especially in the pre-crisis period. Furthermore, it is found that lower NSFR is not associated necessarily with higher profitability, but only risk. Yan, Hall and Turner (2012) conclude that there is a comparative advantage on the functioning of banks by adopting higher NSFR ratios rather than higher capital requirements. This pronounces the role of Basel III liquidity provisions in protecting the banking sector during distressed periods by creating liquidity for the banks. Wei, Gong and Wu (2017) develop a theoretical framework for investigating the impact of NSFR on bank profitability and the utilization of short-term debt, which is a component of the NSFR. They conclude that NSFR contributes to bank profitability and reduces the number of bank failures/bankruptcies.

3. Data and research methodology

For the purposes of our article, we investigate retrospectively the regulative framework of Greek banks. The current Basel III liquidity provisions refer to the liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR). Both NSFR and LCR are designed to ensure financial institutions have the necessary assets on hand to ride out short-term liquidity disruptions, either in the long term or in the short term, respectively.

As our research objective refers to the impact of banking regulation in the long-term perspective, the

NSFR among the two ratios is chosen as a more adequate measure for our purpose. The time period under consideration is from 2000 to 2014 and covers both the harmonization period towards the adoption of Basel's liquidity requirements and the recent financial crisis.

Specifically, we focus on the Tier 1 capital requirement and on the Net Stable Funding Ratio. While the former variable is publicly available for most banks, the latter variable needs to be constructed using many variables from balance and off-balance-sheet data. Higher values of the ratio aim to protect bank liquidity, especially during distressed financial periods. The mathematical formula for calculating NSFR is as follows:

$$NSFR_{i,t} = \frac{available\ stable\ funding_{i,t}}{required\ stable\ funding_{i,t}}$$

$$NSFR_{i,t} = \frac{\sum_{j}^{n_x} w_j \cdot x_{i,j,t}}{\sum_{j}^{n_{x'}} w_j' \cdot x_{i,j,t}'} \quad (1)$$

Where:

$NSFR_{i,t}$ is the NSFR for year t for bank i,

$x_{i,j,t}$ is the available stable funding for bank i during year t

$x'_{i,j,t}$ is the required stable funding for bank i during year t

w_j is the weight of variable x_j.

For the purposes of our analysis, we collect annual data from Bankscope and SNL banker for the Greek banking sector during 2000-2014. These data refer to the variables presented in Table 1.

Table 2 refers to the correlation dynamics between the examined variables. From Table 2, it is observed that there exists a negative association between performance and capital requirements. This relationship is pronounced in the period after the 2007-2008 crisis. NSFR tends to have a positive relationship with performance, and especially with the risk-adjusted performance. Due to some relatively high coefficients of correlation, we adopt several parametrizations, in order to avoid potential multicollinearity issues, by considering separately the explanatory variables in our models (model (a) and (b)) and then all models simultaneously (model (c)).

Initially, we examine whether bank profitability depends on the adoption of the regulative framework applying the dynamic panel analysis of Arellano-Bond (1991). The deterministic factors include the Tier 1 and the NSFR as shown below:

Model 1:

$$\Delta\left(ROA_{i,t}\right) = b_0 + b_1\Delta\left(ROA_{i,t-1}\right) + \\ + b_2\Delta\left(Tier1_{i,t-1}\right) + b_3\Delta\left(NSFR_{i,t-1}\right) + e_{i,t} \quad (2)$$

where, *ROA* represents the return on assets of bank *i* at year *t*, Tier 1 represents the capital requirement for bank *i* at year *t*, NSFR is the Net Stable Funding Ratio of bank *i* at year *t* and *e* corresponds to the residuals of the model.

In order to avoid any potential endogeneity issue, we adopt the "Helmert" approach (Arellano and Bover [1995]), where the orthogonality between the transformed variables remains unchanged. According to Blundell and Bond (1998), the GMM estimator is more desired than that of Arellano and Bond (1991).

Furthermore, we consider the risk-adjusted return on assets of banks in order to investigate the effect of banking regulation on their profitability per unit of risk. Risk is accounted for through the standard deviation of the last three years of ROA and the analysis is conducted through the following model:

Model 2:

$$\Delta\left(RAROA_{i,t}\right) = b_0 + b_1\Delta\left(RAROA_{i,t-1}\right) + \\ + b_2\Delta\left(Tier1_{i,t-1}\right) + b_3\Delta\left(NSFR_{i,t-1}\right) + e_{i,t} \quad (3)$$

where $RAROA_{i,t}$ is the risk-adjusted *ROA* of bank *i* at *t*: $RAROA_{i,t} = \frac{ROA_{i,t}}{\sigma_{ROA,i,t-3:t}}$, Tier 1 represents the capital requirement for bank *i* at year *t*, NSFR is the Net Stable Funding Ratio of bank *i* at year *t* and *e* corresponds to the residuals of the model.

Finally, we estimate our models applying a quantile-type regression for detecting potential non-linearities in the investigation of the relationship between banking regulations (Tier 1 and NSFR) and bank performance with respect to the NSFR range of banks, as shown below in models 3 and 4. Due to the relatively small sample, we account only for two ranges as dictated by the median of NSFR:

Model 3:

$$\Delta\left(ROA_{i,t}^{Q_{NSFR}}\right) = b_0^Q + b_1^Q \cdot \Delta\left(ROA_{i,t-1}^{Q_{NSFR}}\right) + \\ + b_2^Q \cdot \Delta\left(Tier1_{i,t-1}^{Q_{NSFR}}\right) + b_3^Q \cdot \Delta\left(NSFR_{i,t-1}^{Q_{NSFR}}\right) + e_{i,t} \quad (4)$$

TABLE 1 List of the required variables and their weights for the calculation of the Net Stable Funding Ratio (NSFR), BIS (2010)

Summary of Net Stable Funding Ratio

Available stable funding		Required stable funding	
Item	**Factor (%)**	**Item**	**Factor (%)**
Tier 1 & 2 capital instruments	100	Cash	0
Other preferred shares and capital instruments having an effective maturity of 1 year or greater		Short-term unsecured actively-traded instruments (<1 yr)	
Other liabilities with an effective maturity of 1 year or greater		Securities with exactly offsetting reverse repo	
		Securities with maturity <1 yr	
Stable deposits of retail and small business customers (non-maturity or residual maturity < 1 yr)	90	Interbank claims with maturity < 1 yr	
Less stable deposits of retial and small business customers (non-maturity or residual maturity < 1 yr)	80	Government debt with a 0% risk weight under Basel II	5
		Debt issued or guaranteed by sovereigns, central banks, BIS, IMF, EC, non-central government, multilateral development banks with a 0% risk weight under Basel II standardized approach	
Wholesale funding provided by non-financial corporate customers, sovereign central banks, multilateral development banks and public sector entities (non-maturity or residual maturity < 1 yr)	50	Unencumbered non-financial senior unsecured corporate bonds and covered bonds rated at least AA-, and debt that is issued by sovereigns, central banks, and public sector entities with a risk-weighting of 20%; maturity ≥ 1yr	20

All other liabilities and equity not included above (including interbank lending)	0	Unencumbered listed equity securities or non-financial senior unsecured corporate bonds (or covered bonds) rated from A+ to A-, maturity ≥ 1 yr Gold Loans to non-financial corporate clients, sovereigns, central banks, and public sector entities with a maturity < 1 yr	50
		Unencumbered residential mortgages of any maturity that would qualify for the 35% or lower risk weight under Basel II standardized approach Other unencumbered loans (excluding loansto financial institutions) with a remaining maturity of 1 year or greater that would qualify or the 35 or lower risk weight under Basel II standardized approach	65
		Other loans to retail clients and small businesses having a maturity < 1 yr	85
		All other assets	100
		Undrawn amount of committed credit and liquidity facilities Other contigent funding obligations - factor at discretion of national supervisors	5

Source: BIS (2010).

TABLE 2 Correlation matrix of the main variables of the analysis for the whole period 2000-2014 and for the two sub-periods with respect to the financial crisis, i.e., 2000-2007 and 2008-2014

Correlation matrix of the main variables

This table presents the correlation matrix of the main variables of the analysis, that is: the Return on Assets **(ROA)**, the Risk-Adjusted Return on Assets **(RAROA)**, the **Tier 1** and the Net Stable Funding Ratio **(NSFR)** for the whole period 2000-2014 and for the two sub-periods with respect to the financial crisis, i.e., 2000-2007 and 2008-2014.

	Panel A 2000-2014				Panel A 2000-2007				Panel A 2008-2014			
	ROA	RAROA	Tier 1	NSFR	ROA	RAROA	Tier 1	NSFR	ROA	RAROA	Tier 1	NSFR
ROA	1.000				1.000				1.000			
RAROA	0.478	1.000			0.512	1.000			0.427	1.000		
Tier1	-0.014	-0.012	1.000		-0.008	-0.011	1.000		-0.024	-0.014	1.000	
NSFR	0.145	0.119	-0.312	1.000	0.099	0.101	-0.258	1.000	0.167	0.186	-0.389	1.000

Model 4:

$$\Delta\left(\frac{ROA^{Q_{NSFR}}}{\sigma_{ROA\,i,t}}\right)=b_0^Q+b_1^Q\cdot\Delta\left(\frac{ROA^{Q_{NSFR}}}{\sigma_{ROA\,i,t-1}}\right)+ \\ +b_2^Q\cdot\Delta\left(Tier1_{i,t-1}^{Q_{NSFR}}\right)+b_3^Q\cdot\Delta\left(NSFR_{i,t-1}^{Q_{NSFR}}\right)+e_{i,t} \quad (5)$$

Similarly, $ROA_{i,t}^{Q_{NSFR}}$ and $\frac{ROA^{Q_{NSFR}}}{\sigma_{ROA\ i,t}}$ represent the return on assets and the risk adjusted return on assets of bank *i* at year *t* for high and low NSFR banks, respectively, Tier 1 represents the capital requirement for bank *i* at year *t*, *NSFR* is the net stable funding ratio of bank *i* at year *t* and $e_{i,t}$ corresponds to the residuals of the model.

Our models are estimated for the whole time period (2000-2014) and for the sub-periods in order to detect potential structural changes with respect to the recent financial crisis that has serious implications for the Greek economy and the Greek banking sector. Thus, the analysis is conducted additionally for the subperiods 2000-2007 and 2008-2014 that account for the 2007-2008 crisis in a balanced framework.

4. Empirical findings

The results of the investigation of the effect of the implementation of the regulative framework (Tier 1 and NSFR) on bank performance are illustrated in Table 3. As already mentioned, due to the correlation dynamics between the explanatory variables, the analysis is based on model 1, by considering the explanatory variables separately (models 1(a) and 1(b)) and, consequently, jointly (model 1(c)). Furthermore, the results are presented in three panels according to which the first one (Panel A) refers to the whole time period (2000-2014) while the second (Panel B) and third (Panel C) focus on the sub-periods before and after the financial crisis of 2007-2008. According to the high values of the Wald test of model 1 (Panel A, B and C), the estimations of model 1 are consistent. The autocorrelation coefficient is relatively high, which justifies the adoption of the dynamic econometric approach in our methodology. With respect to the variable Tier 1, it is shown that it has a negative effect on bank profitability. This is reflected in Panel A (models 1(a) and 1(c)). By consideration of the sub-periods before and after the crisis as shown in Panel B and C respectively, it is found that its negative impact on profitability is strengthened in the post-crisis period. In contrast, NSFR tends to affect bank profitability positively. This evidence is pronounced in the post-crisis period. Overall, the negative association of capital requirements (Tier 1) and the positive association of the Basel III liquidity provisions (NSFR) with bank profitability are robust under alternative model parametrizations (models 1(a), 1(b) and 1(c)) and through the examination of potential structural changes with respect to the financial crisis of 2007-2008.

TABLE 3 The effect of banking regulation on bank performance

Model 1: The effect of Tier 1 and NSFR on bank performance

This table presents the estimation results of the model with the effects of Tier 1 and NSFR on bank performance using the GMM dynamic panel model. The t-statistic of the coefficient is presented below the coefficients while the significance of the coefficients is denoted by either one * (10%), two ** (5%) or three *** (1%).

	Panel A. 2000-2014			Panel B. 2000-2007			Panel C. 2008-2014		
	a	b	c	a	b	c	a	b	c
b0	0.214***	0.427**	0.014	0.190*	0.254*	0.334*	0.189**	0.159*	0.114
	6.125	3.025	0.147	2.365	2.368	2.458	2.975	2.017	0.842
b1	0.486***	0.158***	0.383***	0.235***	0.349***	0.276***	0.485***	0.176*	0.258***
	5.037	5.015	6.378	4.359	4.125	4.696	5.368	2.560	3.375
b2	-0.146*		-0.139*	-0.111*		-0.183**	-0.748*		-0.458***
	-2.547		-2.489	-2.160		-2.985	-2.599		-3.358
b3		0.158*	0.170*		0.193*	0.248***		0.985***	1.158***
		2.036	2.015		2.497	3.356		3.954	5.068
Wald Chi2	1469.39***	1578.36***	1763.93***	1279.04***	1374.97***	1492.07***	1179.74***	1269.00***	1340.85***
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Model 1(a): ROA = f(Tier 1)

Model 1(b): ROA = f(NSFR)

Model 1(c): ROA = f(Tier 1, NSFR)

$$\Delta\left(ROA_{i,t}\right) = b_0 + b_1\Delta\left(ROA_{i,t-1}\right) + b_2\Delta\left(tier1_{i,t-1}\right) + b_3\Delta\left(NSFR_{i,t-1}\right) + e_{i,t}$$

The results of the estimation of model 2, which accounts for the risk-adjusted return on assets, are illustrated in Table 4. The empirical evidence from model 2 is qualitatively similar to that of model 1. Higher values of Tier 1 diminish bank profitability per unit of risk in contrast to the effect of higher liquidity provisions according to Basel III. Thus, banks with higher available stable funding than required stable funding (i.e., higher NSFR) tend to have higher and risk-adjusted profitability compared to those with low NSFR, retrospectively. These findings are valid for the whole examination period and for both sub-periods before and after the financial crisis of 2007-2008, while they are pronounced in the post-crisis period. It is worth mentioning that although the empirical evidence of model 2 is qualitatively similar than that of model 1, there is a slight dampening effect of the magnitude of the adoption of regulative reforms on bank profitability when this is adjusted for risk.

Finally, Table 5 presents the results of models 4 and 5 according to the quantile regression adjusted to account for two ranges of banks' NSFR ratio. With respect to capital requirements for both the whole period (2000-2014) and the two sub-periods, there exists a negative effect on bank profitability and risk-adjusted profitability. This finding is valid for low NSFR banks; for higher NSFR banks, the Tier 1 negative effect fades out. According to Table 5, NSFR affects positively bank performance for high NSFR banks in both the whole period 2000-2014 and the two sub-periods. However, this evidence is not valid when accounting for the profitability of low NSFR banks in the post-crisis period and when accounting for the risk adjusted profitability of low NSFR banks in the whole period and in the first sub-period.

TABLE 4 The effect of banking regulation on banks' risk-adjusted performance

Model 2: The effect of Tier 1 and NSFR on banks' risk-adjusted performance

This table presents the estimation results of the model with the effects of Tier 1 and NSFR on banks' risk-adjusted performance using the GMM dynamic panel model. The t-statistic of the coefficient is presented below the coefficients while the significance of the coefficients is denoted by either one * (10%), two ** (5%) or three *** (1%) respectively.

	Panel A. 2000-2014			Panel B. 2000-2007			Panel C. 2008-2014		
	a	b	c	a	b	c	a	b	c
b0	1.115***	0.985***	0.856***	1.125***	0.958**	0.647*	1.358***	1.258***	1.247***
	3.985	5.684	7.365	3.365	2.694	2.160	8.364	7.076	8.029
b1	0.368***	0.368***	0.486***	0.100**	0.975***	0.348***	0.783***	0.863***	0.694***
	8.369	8.354	7.384	2.978	4.348	5.364	7.370	4.697	7.650
b2	-0.147**		-0.124***	-0.431		-0.027	-0.198**		-0.236**
	-2.984		-3.369	-1.256		-0.480	-3.058		-3.284
b3		0.842***	0.876***		0.476*	0.289		0.985***	0.874***
		3.369	4.360		2.054	1.698		4.370	3.985
Wald Chi2	1756.32***	1926.49***	2065.80***	1478.37***	1619.32***	1849.55***	1978.36***	2158.36***	2356.39***
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Model 2(a): RAROA = f(Tier 1)

Model 2(b): RAROA = f(NSFR)

Model 3(c): RAROA = f(Tier 1, NSFR)

$$\Delta\left(\frac{ROA^{Q_{NSFR}}}{\sigma_{ROA\ i,t}}\right)=b_0^Q+b_1^Q\cdot\Delta\left(\frac{ROA^{Q_{NSFR}}}{\sigma_{ROA\ i,t-1}}\right)+b_2^Q\cdot\Delta\left(Tier1_{i,t-1}^{Q_{NSFR}}\right)+b_3^Q\cdot\Delta\left(NSFR_{i,t-1}^{Q_{NSFR}}\right)+e_{i,t}$$

TABLE 5 Comprehensive findings of the effect of banking regulation on bank performance segmented according to NSFR level (quantile regression)

		Tier 1			NSFR		
		whole	pre	post	whole	pre	post
ROA	All	-	-	-	+	+	+
	Q1	-	-	-	+	+	0
	Q2	0	0	0	+	+	+
RAROA	All	-	-	-	+	+	+
	Q1	-	-	-	0	0	+
	Q2	0	0	0	+	+	+

Model 3: $$\Delta\left(ROA_{i,t}^{Q_{NSFR}}\right)=b_0^Q+b_1^Q\cdot\Delta\left(ROA_{i,t-1}^{Q_{NSFR}}\right)+b_2^Q\cdot\Delta\left(Tier1_{i,t-1}^{Q_{NSFR}}\right)+b_3^Q\cdot\Delta\left(NSFR_{i,t-1}^{Q_{NSFR}}\right)+e_{i,t}$$

Model 4: $$\Delta\left(\frac{ROA^{Q_{NSFR}}}{\sigma_{ROA\ i,t}}\right)=b_0^Q+b_1^Q\cdot\Delta\left(\frac{ROA^{Q_{NSFR}}}{\sigma_{ROA\ i,t-1}}\right)+b_2^Q\cdot\Delta\left(Tier1_{i,t-1}^{Q_{NSFR}}\right)+b_3^Q\cdot\Delta\left(NSFR_{i,t-1}^{Q_{NSFR}}\right)+e_{i,t}$$

5. Conclusions

The aim of the article is to investigate the effect of the adoption of the Basel III regulative reforms that refer to the capital requirements and the liquidity provisions on Greek banks' performance. The capital requirements and the liquidity provisions are quantified through the Tier 1 and the net stable funding ratio (NSFR). For the purposes of our analysis, we applied a dynamic panel analysis retrospectively, accounting for the harmonization period 2000-2014 before the compulsory adoption of the regulative reforms and considering potential structural changes of our analysis with respect to the financial crisis of 2007-2008. The retrospective investigation of the potential effects of the regulative framework a decade or more before its implementation contributes to the deeper understanding of the harmonization process of banks to the new regulative framework and addresses potential challenges for its development towards a more efficient banking sector.

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