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AND ECONOMIC
RESEARCH (KEPE)

Annual Report 2019

The Productivity and Competitiveness
of the Greek Economy

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Foreword

The Centre of Planning and Economic Research (KEPE) assumed the function of the Greek National Productivity Board in April 2019.* Even though this is a new role for KEPE, the Centre has a long history of research in matters concerning the Greek economy and its productivity. Indeed, since its establishment in 1959, headed by Andreas G. Papandreou, who would later become the Prime Minister of Greece, KEPE has kept a close eye on the Greek economy, producing studies and reports that have helped economic policy makers in their decisions and contributed to the scientific study of the Greek economy. Today, with 30 researchers on staff, KEPE remains the largest research institute on economic matters in Greece. KEPE is mostly financed by the Greek Government, but retains its independence. Researchers are hired with open calls for specific positions and their recruitment and promotion is decided by independent committees. We have researchers specialising in different fields of research and sectors of the Greek economy. This expertise has been put to use in producing the first productivity and competitiveness report at hand.

Apart from producing the annual report on productivity, KEPE has already produced a number of studies and reports that deal directly with issues pertaining to productivity. As a National Productivity Board, KEPE is in the process of producing a number of more specialised studies that will help us understand the productivity and competitiveness problems that face the Greek economy. Indeed, the Global Economic Crisis has been particularly harsh on Greece, with a drop in its output that has been the largest for a developed country in living memory. This also means that

* Law 4605/2019, Art. 37, *Gov. Gaz. A'* 52/1.4.2019.

we have to adjust our scientific tools and methods in order to comprehend what has happened and what needs to be done. ‘Fair weather’ approaches clearly do not work here. Standard econometric techniques are less effective when we have drastic ruptures in the social and economic fabric, and simple methods of studying aggregate variables with a few constituent components are less useful in understanding an economy in crisis. We also have to reassess the role of the standard productivity indicators in assessing performance.

Thus, in the future, we will have to work more with disaggregated data and to produce more focused and qualitative studies that examine the role of separate causes of the problems of the Greek economy. We must, firstly, assess the effect of the macroeconomic policies of austerity imposed on Greece by the Memoranda of Understanding. Secondly, we must examine the impact of the structural reforms that have been implemented, how they relate to the performance of the economy and the reasons of their relative failure. Thirdly, we must examine the pivotal role of the financial system and, fourthly, the productive model of the Greek economy.

We hope that this first report, which takes a long view of examining the performance of our economy, will provide a useful overview of the current situation. It is a broad brushstroke which we must work to make more detailed and accurate in the future. We must search ‘under the hood’ in order to shed light on the problems of an economy that is, at the moment, underperforming and responsible for the inequality, poverty, unemployment and misery that trouble a people that has lived for a decade in the throes of depressing austerity.

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Executive Summary

This first Annual Report of the Greek National Productivity Board for the year 2019 provides a broad and retrospective view of all the important trends, characteristics and aspects of the productivity and competitiveness of the country at the macroeconomic, sectoral and regional levels. It reviews policies that have already been implemented and others in progress which aim at enhancing the productivity and competitiveness of the Greek economy. First, the analysis underlines the significant productivity and competitiveness gaps between the Greek and the other EU economies. It identifies factors of productivity growth, in terms of investment, innovation, skills, enterprise and competition.

By disentangling the main components of aggregate demand over time, we stress that the current recovery mainly rests on the macroeconomic stability achieved through the fiscal consolidation and positive developments in the balance of trade and private consumption. However, investment behaviour remains volatile and several adverse external and domestic factors can threaten macroeconomic stability in the long run. Based on a decomposition approach, it is found that, during the crisis, and compared with the preceding period, decreases in labour utilisation played the most significant role in the reduction of output per capita, followed by smaller –but also significant– reductions in labour productivity growth.

The analysis of the sectoral composition of the Greek economy provides evidence that its overall structure remained largely unchanged during the crisis. By using a shift-share analysis, we show that changes in productivity growth are mainly explained by changes in productivity within sectors, with reallocation effects having a positive contribution before the crisis and a negative

contribution during the crisis. Based on a growth accounting framework, the results indicate significant heterogeneity on the effects of Information and Communication Technologies (ICT) and non-ICT capital within sectors, and systematic underperformance of total factor productivity (TFP).

During the crisis period, the gap in productivity and TFP between the capital region of Attiki and the other regions of the country increased. Specifically, the TFP reduced in all the regions, although it has recovered somewhat since 2013. The larger reductions in both labour productivity and TFP are observed in the island regions (of Voreio Aigaio, Notio Aigaio and Ionia Nisia).^{*} In the same period, the region of Attiki increased its TFP gap with the best-performing EU region. In order to promote regional growth and convergence, the strategic objectives and policies of the sectoral growth plans should be aligned and integrated with the special planning frameworks for main economic activities, established land uses and special planning regulations for realising ‘fast-track’ infrastructure investments. In this way, more locally targeted actions will be taken to enhance productivity and diminish inequalities, avoiding possible conflicts between sectoral and regional policies.

Taking into account that the concept of competitiveness is multifaceted, different approaches are employed in order to illuminate its different aspects. Specifically, Greece exhibits a current account deficit that was significantly reduced during the economic crisis. The country’s price/cost competitiveness, as reflected in the real effective exchange rates, improved from 2010-11 until 2015-16, while the unit labour cost decreased from 2011 until 2016. Exports of both goods and services have been increasing since 2009, but the market share of Greece in the global markets is decreasing.

In terms of the international competitiveness indicators, Greece’s performance presents several problematic areas, such as the quality of institutions, macroeconomic stability, labour market efficiency and finance. Greece’s participation in Global Value Chains (GVCs) increased during 2010-2015, compared to the previous period (2005-2009) and exceeded

^{*} The names of regions follow Eurostat’s NUTS-2 (<<https://publications.europa.eu/code/en/en-5001000.htm>>). These names are translated into English as follows: Attica (Attiki), Central/Continental Greece (Sterea Ellada), Central Macedonia (Kentriki Makedonia), Crete (Kriti), Eastern Macedonia and Thrace (Anatoliki Makedonia-Thraki), Epirus (Ipeiros), Ionian Islands (Ionia Nisia), North Aegean (Voreio Aigaio), Peloponnese (Peloponnisos), South Aegean (Notio Aigaio), Thessaly (Thessalia), Western Greece (Dytiki Ellada), Western Macedonia (Dytiki Makedonia).

the Euro Area 19 (EA19) average. Given that one of the country's main characteristics is the significant difference between the capital region and the remaining regions, regional competitiveness is another important aspect that should be taken into account when competitiveness is measured and competitiveness-enhancing policies are designed. The most important competitiveness gaps between the Greek (mostly, the peripheral) and EU regions concern the areas of macroeconomic stability and labour market efficiency.

Therefore, it can be argued that the existence of negative (during the crisis period) or weak positive (in the mild recovery period that follows) productivity growth rates in the Greek economy, despite the treatment of fiscal deficits and the improvement of the current account balance and cost/price competitiveness, can be largely associated with: persistent structural problems of its production system (which is of low knowledge- and technology-intensity compared to the EA19 average) and its non-price/non-cost competitiveness, such as the stability of the macroeconomic environment, the quality of institutions, financing conditions, and the (in)efficient functioning of labour and product/service markets.

The need for implementing a comprehensive policy framework with both sectoral and regional dimensions is stressed. Such a framework would promote the export-oriented entrepreneurship of the Greek economy, through structural reforms, and emphasise the quality of jobs and human resources to boost the productivity of Greek businesses. An effective demand management policy should rely on international tradeable sectors of the economy: (a) tradeable services, (b) the primary sector and (c) a few industrial sectors that can significantly affect output/employment, given that the manufacturing industry is heavily dependent on imports. Such a framework could involve redistributing government expenditures and increasing the autonomous demand of key sectors, in conjunction with an industrial policy programme.

Finally, as far as horizontal policies are concerned, these should be targeted at increasing Research and Development (R&D) expenditures, supporting innovation and upgrading the role of e-government/digitisation in public administration. They should also improve the market conditions and create high-quality, accessible, resilient, reliable and sustainable infrastructures in network industries (transport, logistics, energy, information and telecommunications), as these can foster Greece's economic transformation and lead to significant productivity gains.

1. Introduction

Increasing productivity is crucial for boosting the potential growth of the Greek economy and for supporting all the necessary transformations aimed at orientating businesses to sustainable, higher value added and outward-looking activities. The strategic objective of the Greek authorities refers to the convergence of the productivity level of the Greek economy with the EU average, by achieving annual productivity growth rates above 2% in the long run. In order to achieve this objective, a series of reforms and interventions are being implemented in 10 policy areas, which are described in detail in the separate chapters of the National Growth Strategy, setting up a modern and comprehensive policy framework to enhance productivity.¹

Economic recovery now allows for the development of meaningful interventions, through appropriate policy actions and business initiatives,² which have a direct or indirect positive impact on productivity. These initiatives are in line with EU objectives (2019 Annual Growth Overview) and key guidelines and recommendations of the OECD (2019a). The current policy framework goes beyond the fragmented approaches of the past (e.g., increasing productivity exclusively through the deregulation of markets and professions), while, at the same time, it renders the quality of jobs and human resources as key factors in boosting the productivity of Greek businesses and sectors. Empirical findings highlight the limited effectiveness of ‘horizontal’ economic policy measures, which had been implemented in the post-2010 euro area (EA) economy, as key policies for productivity recovery. This fact highlights the need for more targeted interventions to strengthen those sectors

1. See Key Performance Indicators (KPIs) of the Greek authorities (Ministry of Economy and Development, 2019a).

2. See European Commission (2019a).

that can make a significant contribution to economic growth, employment and regional development.³

As it is well known, the available means of economic policy that national authorities may use to adjust their economies are:

- Fiscal policy
- Monetary policy
- Trade policy
- Income policy

Furthermore, as the great Jan Tinbergen has shown (Tinbergen, 1952), the number of targets that economic authorities set must be equal to the number of the available means of economic policy (see, e.g., Hansen, 1958; Prodromidis, 1973, ch. 2 and 3).

In the case of the Greek economy, as a member of the Eurozone, monetary and trade policies are restricted, while the fiscal policy is bound to the ‘Fiscal Compact’. Therefore, the only fully available tool of economic policy for a Eurozone economy is income policy.

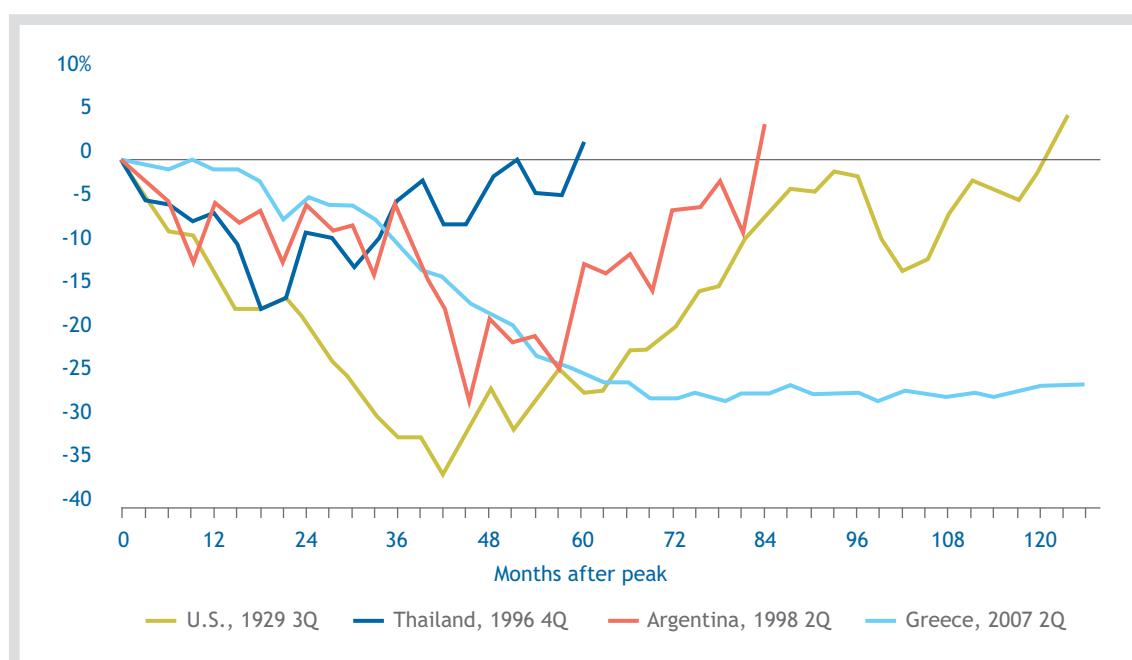
The 2008-2009 global economic crisis revealed the structural weaknesses of the Greek economy, which was characterised by serious fiscal and external imbalances and resulted in the inability to refinance debt. Given the restrictions in the availability of the means of economic policy, Greek governments attempted to correct the imbalances of the economy through the application of fiscal and internal devaluation policies, such as reductions in government expenditures, increases in taxes and cuts in unit labour costs. These policies brought about significant improvement for the state budget primary deficit, but, also, significant GDP and employment losses due to the effect of these measures on domestic demand.

The structural weaknesses of the private sector of the economy, the resulting burden on the public sector, the expansion of the debt of the public and private sectors, the external trade imbalances and transformations in the global fragmentation of production and labour led to a significant drop of the competitiveness of the Greek economy in the pre-crisis period and the underutilisation of domestic capital and the labour force. Specifically, the Greek economy tends to have reached a new equilibrium state with a high level of unemployment, low capacity utilisation, and an almost steady loss of GDP by about -25% over a 60-month period after the beginning of the crisis at the second quarter of 2007 (see Figure 1.1). This situation can be regarded as one of the deepest and most persistent economic crises of a single OECD country in the last century.

Due to the common currency and the free capital mobility that characterises the EA economies, there is a strong tendency for the formulation of a uniform interest rate amongst the participant countries. At the same time, the mobility of the labour force within the EA is relatively low, compared to other unified economic areas, such as the USA and Canada. These facts imply that the relative wages within the EA are largely determined

3. For instance, see Prodromidis and Papathanasiou (2018), who stressed the differences in the entrepreneurship and technology, and the labour and spending effects across regions, as well as in the capital and investment effects across sectors.

Figure 1.1
Change (%) from peak GDP during some of the deepest recessions



Source: Stamouli and Walker (2018).

by the relative capital and labour productivities, while the persistent divergence among them leads to a vicious cycle of fiscal and external imbalances in the economy that should be adjusted by adequate cuts in unit labour costs and increases in labour mobility. This seems to be the case for the post-2008 Greek economy.

Thus, improving the productivity of the Greek economy is a central priority in the new period that unfolds after the completion of the adjustment programmes, which aimed at addressing structural weaknesses in the domestic production system. These weaknesses are reflected in the backwardness of the Greek economy in the field of productivity. Labour productivity was lower (by about 35%) in 2017 than the average of the EU (Greece = 64.1 and EU-28 = 100).

Regarding the organisation of the remaining part of the report, Section 2 describes and analyses, with the use of different techniques (decomposition methods, shift-share analysis and growth accounting), the long-term developments of productivity in Greece, in aggregate terms, within and between sectors, and across the 13 regions of the country.

Section 3 discusses different concepts of competitiveness and presents germane measures of macroeconomic performance (including those of the current account balance and exports), indicators of non-cost/non-price competitiveness (based on international organisations) and the cost/price competitiveness (such as the real/nominal effective exchange rates and unit labour cost) of the Greek economy. It also analyses competitiveness in terms of the participation of the country in global value chains as well as in relation to indexes for the Greek and the EU regions.

Section 4 discusses the most recent studies on the productivity/competitiveness of the Greek economy, highlighting major driving forces and impending factors responsible for the significant productivity and competitiveness gaps between Greece and its international competitors. The productivity determinants are initially analysed at the macroeconomic level, including investment, innovation, skills, entrepreneurship and competition, and then at the level of sectors of economic activity and regions of the country. Additionally, public policies for boosting productivity that have recently been implemented, or are in progress, are reviewed in terms of sectoral policies, policies for small and medium-sized enterprises (SMEs), and horizontal policies. Section 5 concludes and outlines the main directions of a comprehensive policy framework for improving the competitiveness and productivity of the Greek economy on aggregate, in key sectors and across regions.

2. Productivity Developments in Greece

2.1. Macroeconomic environment and productivity growth

2.1.1. The Greek macroeconomic environment

After having lost more than a quarter of its economic activity during the great economic crisis (2008-2016), Greece is experiencing the first signs of a mild recovery. During the crisis, GDP fell from 249.9 billion euro in 2008 to 184.2 billion euro in 2013. Following a period of stagnation at that level (see also Figure 1.1), which lasted until late 2016, economic activity started to rebound, with GDP reaching 190.8 billion euro by the end of 2018. KEPE's projections (Athanassiou et al., 2019a) indicate an increase in economic activity in 2019 by 1.7%, compared with 1.9% in 2018, indicating a partial deceleration of the recovery process. Somewhat more optimistically, BoG projections (BoG, 2019) indicate a growth rate of 1.9% for 2019, the IMF's projections (IMF, 2019) anticipate an accelerated growth rate of 2.4% for 2019, while the projections of the European Commission (EU Commission, 2019a) anticipate a growth rate of 2.2%.

By and large, this weak recovery process rests critically on a foundation of macroeconomic stability achieved through fiscal consolidation that can only be characterised as exceptional, both in character and in scope (Figure 2.1.1). After winding down deficit spending from 15.1% of GDP or 35.9 billion euro in 2009, to a surplus of 1.1% of GDP or 1.9 billion euro in 2018, the general government is currently expected to run its fourth consecutive year of surplus. Despite this result, it is critical to note that increases in taxation are exerting a significant drag on growth prospects, financial fragility remains an unresolved issue, and debt to GDP ratios remain unacceptably high, while increases in poverty and

inequality undermine social coherence and, therefore, the macroeconomic stability in the long run.

Turning to the main components of aggregate demand, on the one hand, it is possible to identify positive developments in the balance of trade and in private consumption as the main drivers of recovery. On the other hand, decreasing public consumption due to fiscal consolidation exerts a negative impact to growth, and, most significantly, investment continues to fluctuate at a subdued level (Figure 2.1.2).

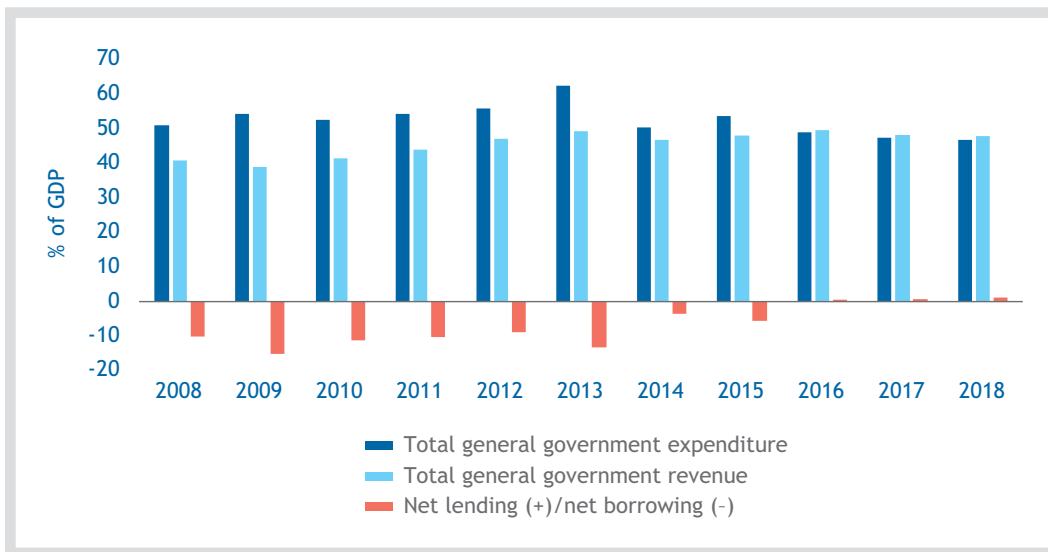
The rebound in private consumption (Figure 2.1.3) is supported by a recovering labour market, where, after the initial drastic deterioration of conditions (the unemployment rate peaked at 27.8% during the first quarter of 2014), a constant –albeit slow– recovery has taken place (the unemployment rate fell to 16.9% by the second quarter of 2019), and by rising disposable income. Moreover, recent increases in the minimum wage and the abolishment of the sub-minimum wage for youth under 25 years of age, effective from February 2019, are expected to provide an additional, possibly short-term, boost to household spending.

Investment has been volatile during the recovery phase after 2014 (Figure 2.1.4), as indicated by a significant drop in gross fixed capital formation by 12.2% in 2018, mainly due to the decline in the categories of other buildings and structures and transport equipment. The European Commission attributes a large part of this decrease to the under-execution of the public investment programme, with public investment in 2018 falling close to 29% in nominal terms. The IMF attributes this decline to the high base effects and the weak investment sentiment. The decline of gross fixed capital formation was counterbalanced by the accumulation of inventories; thus, the overall effect was subdued. It is critical to note that the underperformance of investment is closely linked to the underperformance of credit growth, the latter itself being the direct result of the weakened state of the banking sector, due to the significant percentage of existing non-performing loans.

Good export performance and falling imports during the 2008 to 2013 period narrowed the trade balance deficit and exerted a positive influence to growth dynamics (Figure 2.1.5). Given the structure of the Greek economy this recovery process, together with the increase in disposable income, has brought after 2014 a rebound in imports, which might decelerate export-led growth. Thus, under the current conditions, the growth path of the Greek economy remains vulnerable to the growth dynamics at the global and European levels, where significant downside risks are gathering force, for example, the growing trade conflict between the US and China as well as the increased uncertainty over Brexit.

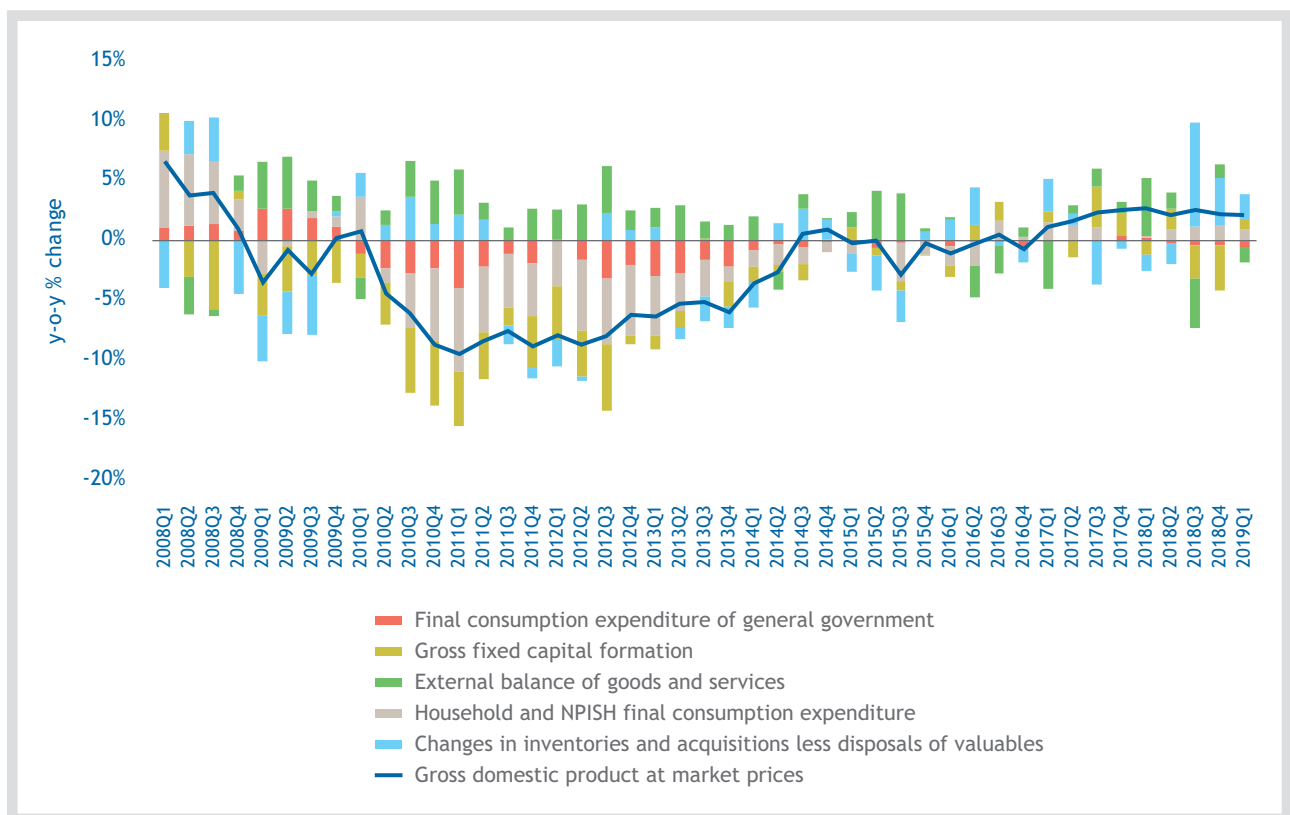
In the face of a weak recovery process compounded with growing uncertainty over the international growth prospects, the only viable long-term solution is boosting productivity. Enhanced productivity results in an increase in competitiveness without a decrease in labour remuneration or competitive currency devaluation and its toxic social and macroeconomic effects. On the contrary, it fosters prosperity and sustainable growth. Productivity growth at the national, sectoral, regional and firm levels is a key component of economic success, resulting in more jobs and better living standards. For these reasons, identifying and promoting productivity-enhancing policy measures constitute a key priority for the Greek authorities.

Figure 2.1.1
General government revenue, expenditure and balance (% of GDP)



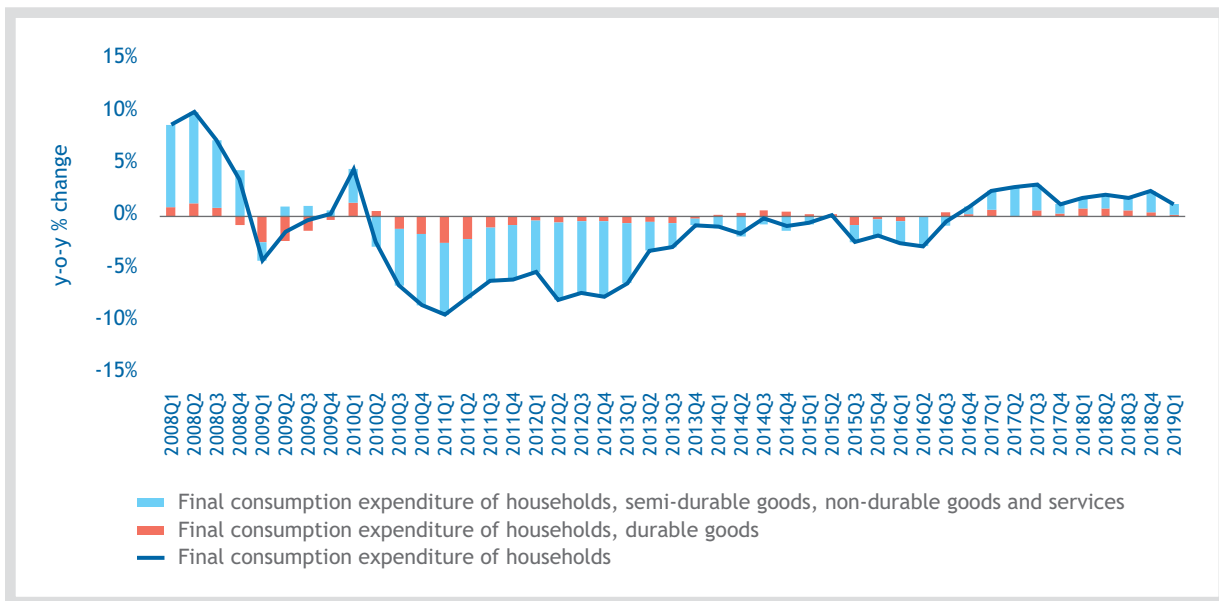
Source: Eurostat, authors' own calculations.

Figure 2.1.2
Contributions to GDP growth



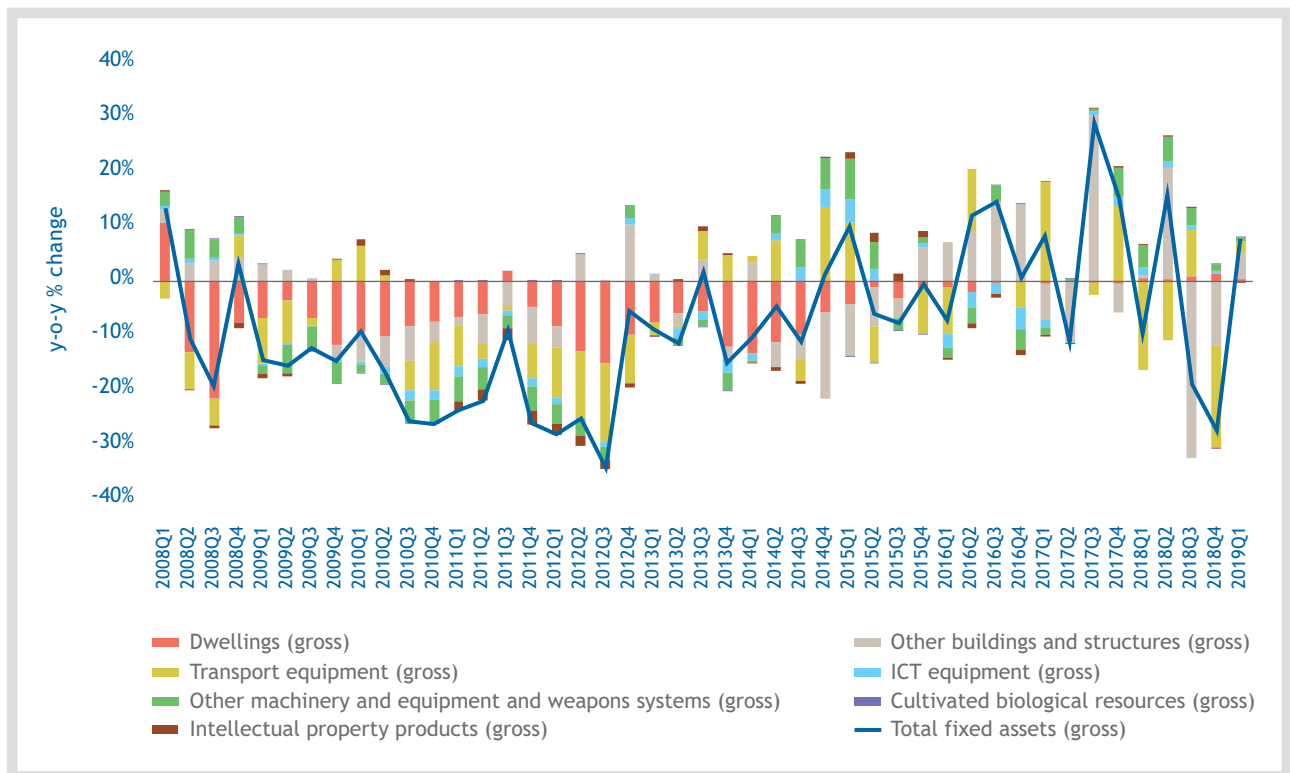
Source: Eurostat, authors' own calculations.

Figure 2.1.3
Contributions to household consumption expenditure growth



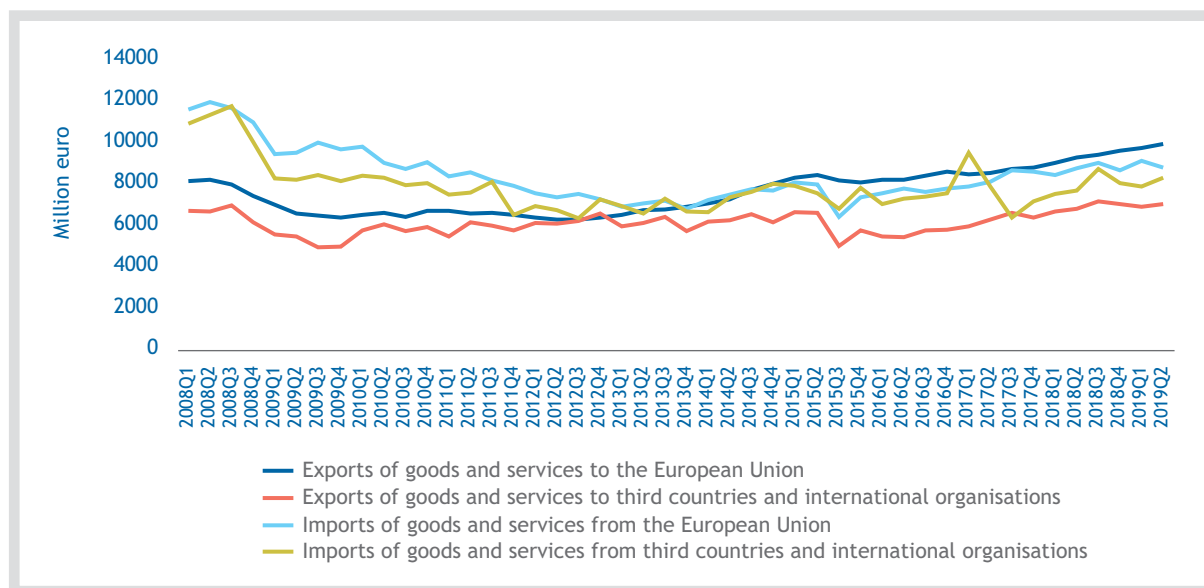
Source: Eurostat, authors' own calculations, Calendar and seasonally adjusted data.

Figure 2.1.4
Contributions to gross fixed capital formation growth



Source: Eurostat, authors' own calculations, Calendar and seasonally adjusted data.

Figure 2.1.5
Imports and exports of goods and services
(in million euro, 2010 constant prices)



Source: Eurostat, authors' own calculations, Calendar and seasonally adjusted data.

2.1.2. Aggregate productivity growth in Greece

Productivity is a measure relating the volume of economic output to the volume of input or inputs used in the production process (OECD, 2001). Such a definition makes clear that several alternative measures of productivity can be estimated out of available data, depending on the purpose of the calculation exercise. In general, two broad categories of productivity measures exist: single factor measures and multifactor measures, with the former relating output to a single input used in the production process and the latter relating output to a number of inputs. The most commonly used single input measures include those of labour and capital productivity, while the most common multifactor measure of productivity accounts for the combined effect of capital and labour on output, utilising a production function concept.

Measurement issues are a central part of productivity estimation, since economic output can be defined either in value added or in gross output terms. Labour input can be defined as persons or hours worked, while the choice of deflators and the form of the production function play a significant role in the estimation process. In what follows, unless explicitly stated otherwise, we define labour productivity as the ratio of the deflated value added to hours worked, capital productivity as the ratio of deflated value added per unit of net capital stock, and we derive the total factor productivity (TFP), or multifactor productivity (MFP), also referred to as the Solow residual (Solow, 1957), in a growth accounting framework, as the residual of output growth after accounting for the combined contribution of labour and capital growth weighted by their respective income shares.

Box 1

Production function and output decomposition

Labour productivity measures at the aggregate level are directly linked to living standard measures, such as GDP per capita, and, thus, form a benchmark for policy considerations. Following Gomez-Salvator et al. (2006), we decompose real output per capita [Y^{PC}] into two main components: labour productivity and labour utilisation. In turn, labour productivity can be further decomposed into total factor productivity [TFP] and capital intensity

$\left[\left(\frac{K}{H}\right)^{(1-a)}\right]$, where K is the physical capital stock and H is the labour input in

total hours worked, while labour utilisation can be analysed into average hours worked [H^{AV}], the unemployment rate [UR], the participation rate [PR] and the share of the working age population in the total population

$\left[\frac{P^{WA}}{P^{TOT}}\right]$. Therefore, given that a represents the labour share of income, the relationship becomes:

$$Y^{PC} = TFP \left(\frac{K}{H}\right)^{(1-a)} H^{AV} * (1-UR) PR \frac{P^{WA}}{P^{TOT}}.$$

Figure 2.1.6
Output per capita decomposition



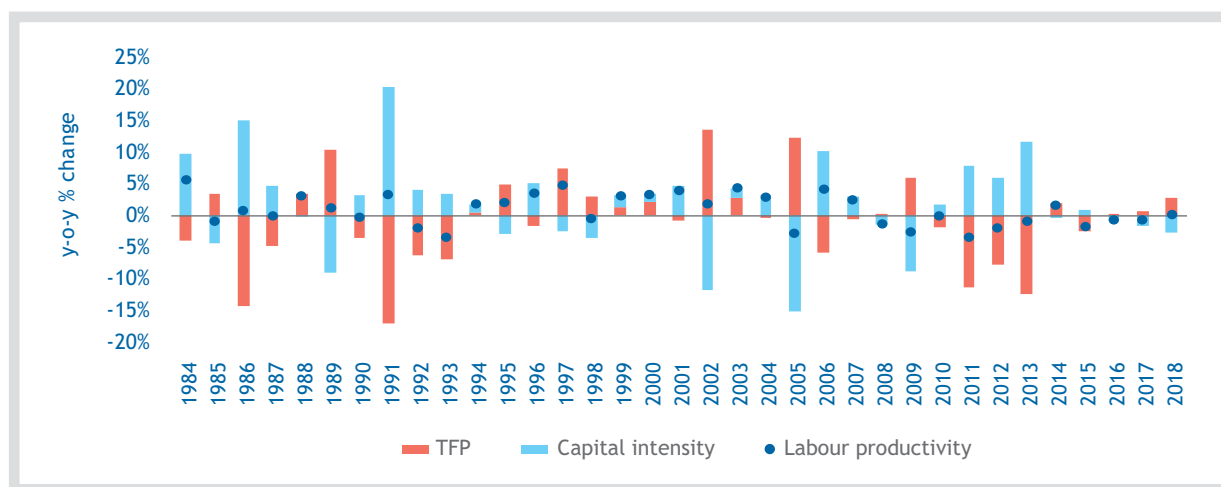
Source: AMECO, authors' own calculations.

Data indicate that output per capita grew at an average rate of 1.02% during the 1980s, increasing to 1.57% during the 1990s and further to 1.63% during the 2000s; it subsequently declined at a rate of 2.12% during the following decade (Figure 2.1.6). Labour productivity was the primary contributor to such a pattern, as it increased at an average rate of 1.37% during the 1980s, 1.44% during the 1990s, and further 1.49% during the 2000s, but turned negative during the 2010s, at an average rate of -0.80%. Labour utilisation played a minor role in the evolution of output per capita growth, as it reduced its growth during the 1980s by 0.35% and marginally contributed to its increase during the 1990s and 2000s by 0.12% and 0.15%, respectively. To the contrary, during the crisis period of the 2010s, labour utilisation had a significant role in amplifying the decreases in labour productivity, as it contributed -1.32%, more than half, to the reduction of output per capita growth during that period.

During the entire period under consideration (1984 to 2018), output per capita growth averaged a meagre 0.76%, with labour productivity increasing only marginally at 0.90% and labour utilisation contributing -0.14%. To the contrary, excluding the period after 2008, output growth averaged a healthy 2.02%, with labour productivity contributing 1.65% and labour utilisation an additional 0.37%. Such results underline the highly adverse effects of the recent economic crisis.

By further decomposing labour productivity growth and labour utilisation growth in their proximate determinants, it is possible to gain a deeper understanding of the macroeconomic processes that led to the outcomes described. Starting with the decomposition of labour productivity growth into TFP growth and capital intensity growth (Figure 2.1.7), it is important to note that TFP growth is found to be negative for the entire period. On the contrary, capital intensity growth is found to exert a positive influence on labour productivity (similar results were reached by Bosworth and Kollintzas, 2001).

Figure 2.1.7
Labour productivity decomposition



Source: AMECO, authors' own calculations.

TFP reduced labour productivity at an accelerating pace during the 1980s and 1990s, i.e., by -1.36% during the 1980s and by -1.42% during the 1990s, but during the 2000s, TFP growth became positive by 2.52. During the crisis period, TFP growth was negative. Specifically, it reduced labour productivity growth by -3.35% during the 2010s. To the contrary, capital intensity growth increased labour productivity growth at an accelerating pace during the 1980s and 1990s, by 2.72% during the 1980s and 2.86% during the 1990s. It turned negative, by -1.04%, during the 2000s and then turned positive again, by 2.55%, during the 2010s (the crisis period). Those results are indicative of the chronic technological deficiencies in the production processes in Greece and of a dearth of capital.

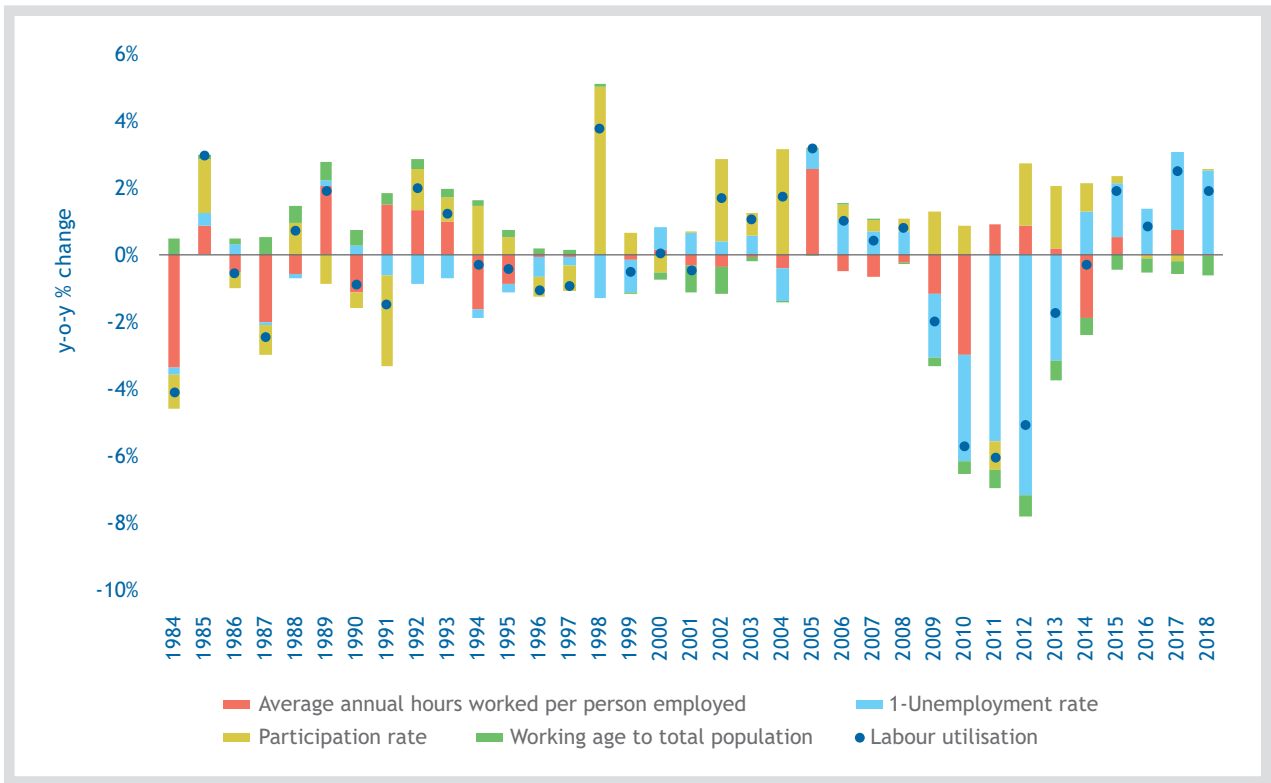
Turning to the effect of labour utilisation growth on labour productivity growth, data indicate that the growth of average hours worked per person contributed negatively to labour utilisation in all periods, except for the 1990s, where an increase in the average hours worked increased labour utilisation (Figure 2.1.8). Moreover, the participation rate exerted a positive influence on labour utilisation in all periods except for the 1980s, while the working age to total population ratio turned negative after 2000.

Changing the specification of the labour input from hours worked to persons employed and adopting a simpler growth accounting framework allows for a longer dataset (Figure 2.1.9). In order to precisely identify the relevant turning points in economic activity, we apply the Bai-Perron test on globally determined breaks on a regression of the natural log of output in constant prices over a constant and a time trend. Results indicate the presence of four structural breaks in output in 1972, 1981, 1996 and 2009. It is noted that similar results are found using a different methodology. Such results are broadly in line with those found in the literature (for example Maniatis and Passas, 2018), as well as with the results of a visual inspection of output growth.

Our main findings are as follows. First, TFP and labour productivity growth follow one another closely, especially after the early 1970s. Second, one can easily identify four periods in recent economic history: 1) from the early 1960s to the early 1970s, 2) from the mid 1970s to the early 1990s, 3) from the mid 1990s to the late 2000s, and 4) from the late 2000s until today. Such a periodisation is validated by comparing the performance of labour productivity, specified in the manner outlined above, with the rest of the EU-15 (Figure 2.1.10), since the first (1960-1973) and third (1994-2007) periods indicate the presence of a convergence process, while during the second (1974-1993) and fourth (2008-2018) periods, labour productivity in Greece declines relative to the EU-15 average. It is also noted that, based on the AMECO economic forecasts on GDP and employment, the level of labour productivity (in GDP per worker) in Greece is expected to slightly increase year-on-year (y-o-y) during 2019 and 2020, by 0.72% and 0.88%, respectively.

Returning to our empirical analysis, we find that, from 1960 to 1972, output growth in Greece averaged at an impressive 8.22% annually. This result was driven both by a high rate of capital accumulation, contributing 3.40%, and by an exceptional increase in TFP, contributing a further 5.14%, whereas increases in employment had a marginally detrimental effect on output. In the subsequent period, 1973-1980, output growth fell sharply to 3.47%

Figure 2.1.8
Labour utilisation decomposition



Source: AMECO, authors' own calculations.

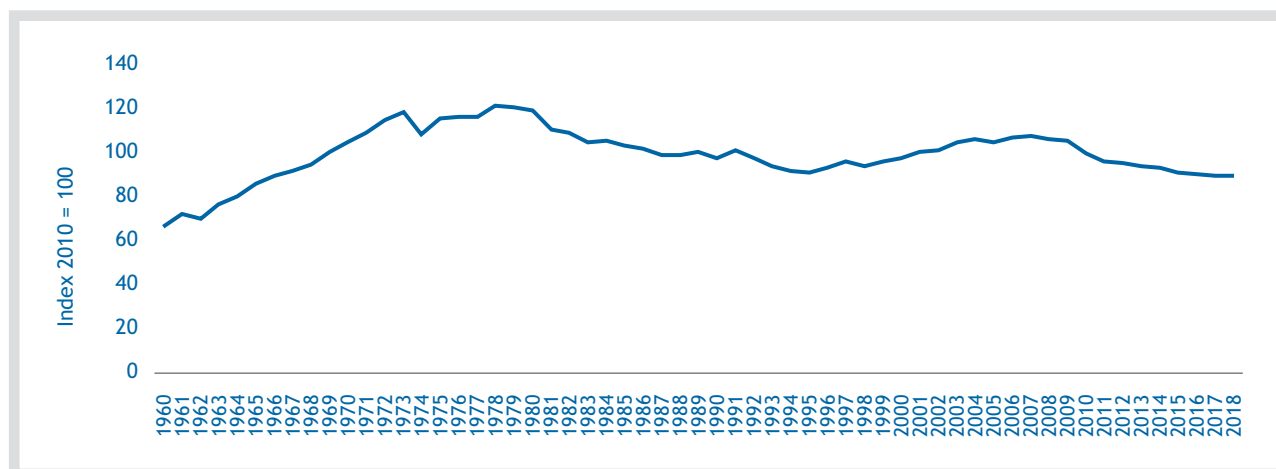
Figure 2.1.9
Labour productivity and total factor productivity y-o-y rate of change (alternative specification)



Source: AMECO, authors' own calculations.

Figure 2.1.10

Indexed ratio of the labour productivity in Greece to the labour productivity in the EU-15



Source: AMECO.

per annum, in part because of a decline in capital accumulation, contributing 2.52%, but, mainly, due to the collapse of TFP growth to 0.53%, with the labour input having only a marginally positive impact.

During the period 1981-1995, output growth was quite low (0.87%), due to a further decrease in capital accumulation, with a contribution of 0.98%, and TFP growth turned negative at -0.60%. This situation was partially mitigated by an increase in the positive influence of labour to 0.49%. During the third period, 1996-2007, output growth rebounded to 3.81%, although was still lower than the first period, and only as high as the second period. This result came after a weak uptick in capital accumulation, standing at a mere 1.11% and, mainly, because of a rebound in TFP growth to 2.05% and a further increase in the positive influence of labour at 0.65%. Finally, during the last period (2008-2018), average annual output growth was negative -2.40%, indicating a decade-long crisis in the Greek economy, coming as a result of a simultaneous and catastrophic collapse in all three sources of growth, i.e., TFP, labour growth and capital accumulation.

From the data presented above, one can broadly identify two main issues. First, capital growth influenced output growth at an ever-decreasing rate throughout the period under consideration, while labour growth had an ever-increasing influence on output growth, except for the last period. Second, TFP growth was found to be volatile and procyclical. Thus, identifying the determinants of productivity growth should become our main focus in order to explain cyclical variations in output growth.

2.2. The sectoral dimension of productivity

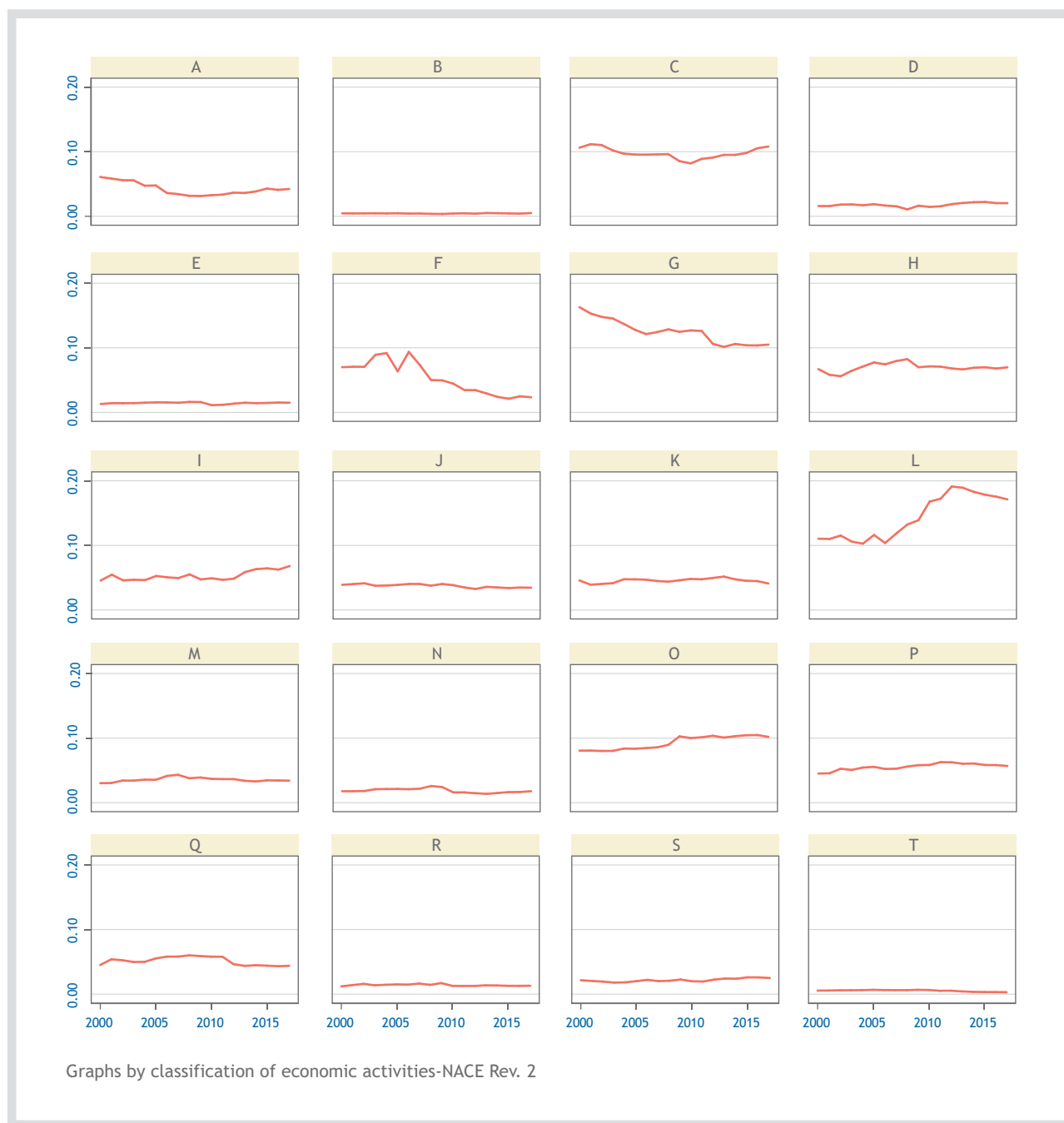
The sectoral structure of the Greek economy underwent some minor changes during the recent economic crisis, as is evident from the evolution of gross value added and employment shares (Figure 2.2.1 and Figure 2.2.2, respectively). The overall structure of the economy remains largely unchanged, as services continue to dominate as a share of employment and value added, and neither industry nor agriculture shows any significant dynamics. Turning our focus to the five largest sectors of the economy that collectively employ more than half of the labour force, we find that agriculture, historically a very significant sector for the Greek economy, shows only marginal increases as a share of total value added and employment after 2008. It can be considered that agriculture continues its historical declining path, with employment in this sector currently accounting for 11.3% and gross value added for 4.1% of the total. Manufacturing appears to be rebounding in its share of total gross value after 2008, currently at 10.5%, but continues its decline in its share of total employment, thus indicating significant increases in labour productivity.

Construction, another historically significant sector for Greece, appears to be one of the great losers during the period of economic crisis, as its share of gross value added has been halved at 2.5% and its share of employment stands at a mere 5% of the total. Trade shows a marked decline as a share of gross value added, now at 10.4%, whereas it appears to be stable in its employment share, indicating a significant decrease in labour productivity. Finally, accommodation and food services, a sector loosely corresponding to the core of the tourist industry, shows increases both as a share of gross value added and in its employment share. Therefore, it is possible to conclude that only minor changes in the structure of the Greek economy have been observed during the crisis period. This finding is troubling since, at least in part, the structure of the economy should be considered as one of the major causes of the crisis.

In order to test for the significance of changes in the sectoral structure of the Greek economy, we employ a shift-share analysis that allows for a decomposition of aggregate productivity growth into three distinct components: (a) a within-effect, (b) a between-effect, and (c) a cross-effect. The within-effect accounts for changes in aggregate productivity growth caused by changes in productivity within economic sectors. The between-effect accounts for the impact of changes in the allocation of employment between sectors of economic activity. Finally, the cross-effect accounts for changes in aggregate productivity brought about as a result of the flow of employment into sectors with growing productivity (for a similar analysis, e.g., see Denis et al., (2004)).

Splitting our data into two periods, the first one covering the years 2000 to 2008, i.e., roughly from the accession of Greece into the EA to the start of the crisis, and, the second one from 2009 to 2017, i.e., from the onset of the crisis to the last observation in our dataset, allows for a more in-depth look at the effects of the crisis on productivity growth (Table 2.2.1).

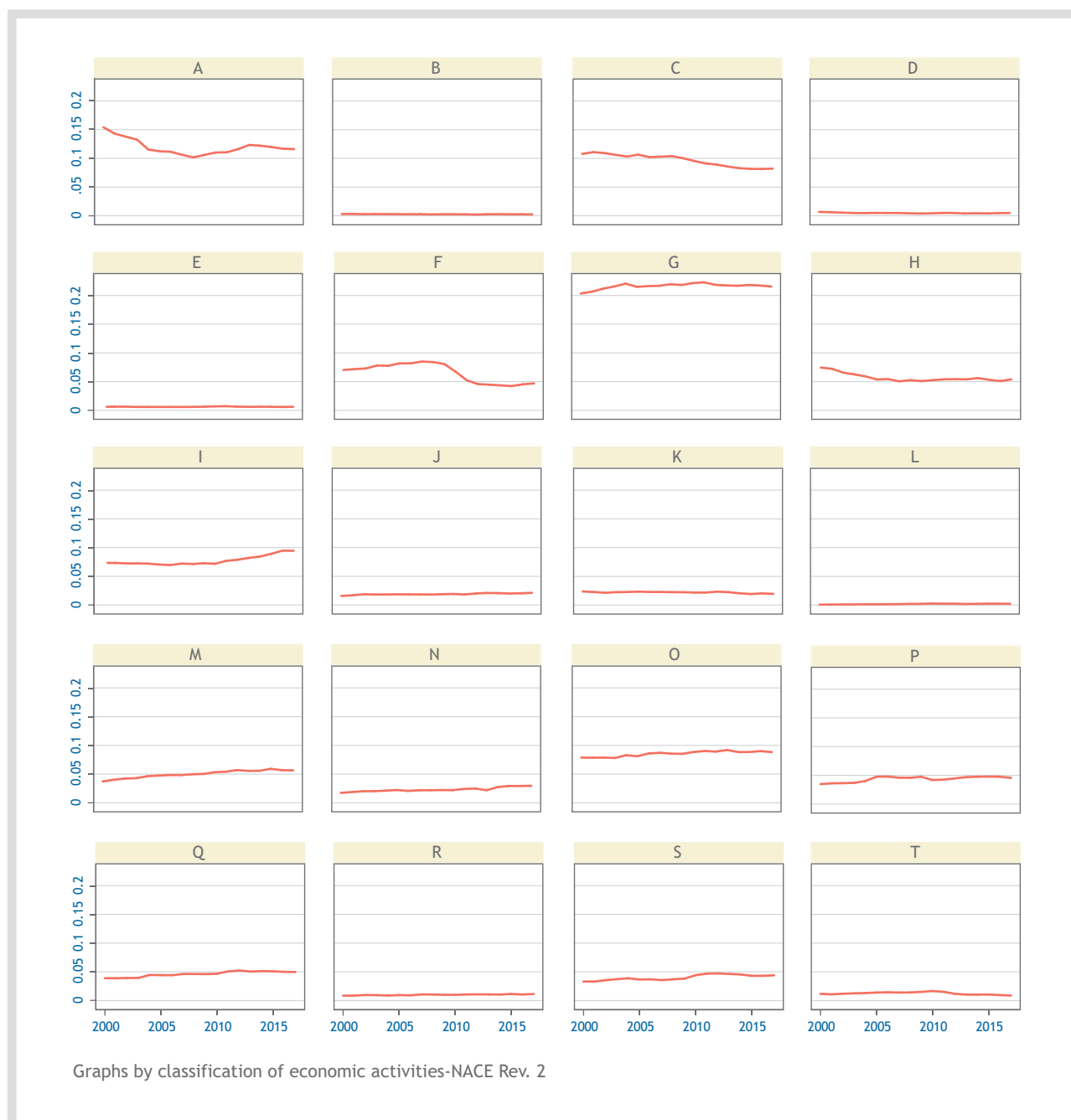
Figure 2.2.1
Sectoral gross value-added shares, 2000-2016



Source: Eurostat, authors' own calculations.

Note: A: Agriculture, forestry and fishing, B: Mining and quarrying, C: Manufacturing, D: Electricity, gas, steam and air conditioning supply, E: Water supply; sewerage, waste management and remediation activities, F: Construction, G: Wholesale and retail trade; repair of motor vehicles and motorcycles, H: Transportation and storage, I: Accommodation and food service activities, J: Information and communication, K: Financial and insurance activities, L: Real estate activities, M: Professional, scientific and technical activities, N: Administrative and support service activities, O: Public administration and defence; compulsory social security, P: Education, Q: Human health and social work activities, R: Arts, entertainment and recreation, S: Other service activities, T: Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use.

Figure 2.2.2
Sectoral employment shares, 2000-2016



Source: Eurostat, authors' own calculations.

Note: A: Agriculture, forestry and fishing, B: Mining and quarrying, C: Manufacturing, D: Electricity, gas, steam and air conditioning supply, E: Water supply; sewerage, waste management and remediation activities, F: Construction, G: Wholesale and retail trade; repair of motor vehicles and motorcycles, H: Transportation and storage, I: Accommodation and food service activities, J: Information and communication, K: Financial and insurance activities, L: Real estate activities, M: Professional, scientific and technical activities, N: Administrative and support service activities, O: Public administration and defence; compulsory social security, P: Education, Q: Human health and social work activities, R: Arts, entertainment and recreation, S: Other service activities, T: Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use.

Shift-share analysis indicates that during the 2000-2008 period and for the aggregate economy, labour productivity increased by 15%. This result can be attributed to an increase of 4% because of the within-effect, to an increase of 26% because of the between-effect, and to a decrease of 14% because of the cross-effect. Correspondingly, during the 2009-2017 period, labour productivity decreased by 6%; a result attributed to a decrease of 7% because of the within-effect, to an increase of 2% because of the between-effect, and to a decrease of 1% because of the cross-effect.

Figure 2.2.3 presents productivity trends by sector. Labour productivity in agriculture –despite minor fluctuations– has remained at the same level during the crisis. This result stems from the fact that both agriculture’s share in gross value added and in employment increased, albeit only fractionally, during the crisis. It is also significant to point out that agricultural productivity remains the lowest sectoral productivity in levels and, therefore, any increase, even a minor one, of its share in employment will have adverse effects on aggregate labour productivity in the short run.

Manufacturing shows increases in labour productivity during the crisis, mainly as a result of a decline in employment, and minor increases in its share in gross value added after 2008. Critically, its TFP declined during the crisis, pointing to the adverse effects of disinvestment and, thus, of the failure to incorporate the latest technological advances. The energy-producing sector shows a similar pattern with manufacturing, i.e., increases in the share of gross value added and decreases in employment, thus, increases in labour productivity, but a lack of TFP growth. This result indicates a strongly correlated performance in major industrial sectors. The trade sector provides for an interesting narrative, as it brings together a declining share in gross value added with a stable share in employment, pointing to a significant decline in labour productivity that appears to be exacerbated by a declining TFP. Finally, despite its growing importance as a share of gross value added and employment, labour productivity growth in the tourism sector seems to be stable after 2009, while, at the same time, TFP follows a declining pattern.

Therefore, it is possible to conclude that the decline in productivity, in terms of both labour productivity and TFP, appears to unfold in every sector, with the exception of manufacturing, during the 2009-2016 period. This outcome is a major indicator of structural deficiencies in the Greek economy that drive the need for a productivity-enhancing policy change. A critical component of such a policy should be a significant boost of investment in high-tech capital stock, a change in organizational patterns, and structural reforms to enhance macroeconomic stability. Moreover, given the outperformance of manufacturing productivity, specific recommendations for a modern and competitive industrial policy should be considered as an indispensable part of any future policy mixture.

Figure 2.2.3

Sectoral labour productivity and TFP (y-o-y rate of change), 2000-2016



Source: Eurostat, authors' own calculations.

Note: A: Agriculture, forestry and fishing, B: Mining and quarrying, C: Manufacturing, D: Electricity, gas, steam and air conditioning supply, E: Water supply; sewerage, waste management and remediation activities, F: Construction, G: Wholesale and retail trade; repair of motor vehicles and motorcycles, H: Transportation and storage, I: Accommodation and food service activities, J: Information and communication, K: Financial and insurance activities, L: Real estate activities, M: Professional, scientific and technical activities, N: Administrative and support service activities, O: Public administration and defence; compulsory social security, P: Education, Q: Human health and social work activities, R: Arts, entertainment and recreation, S: Other service activities, T: Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use.

Table 2.2.1
Contributions to Aggregate Labour Productivity Growth, 2000-2017

Sectors	2000-2008			2009-2017		
	Within	Between	Cross	Within	Between	Cross
Total	3.80%	25.67%	-14.45%	-6.78%	1.60%	-1.01%
Agriculture, forestry and fishing	0.21%	-1.53%	-0.07%	0.81%	0.28%	0.08%
Mining and quarrying	0.14%	-0.11%	-0.03%	-0.07%	-0.03%	0.01%
Manufacturing	0.53%	-0.37%	-0.02%	0.90%	-1.61%	-0.16%
Electricity, gas, steam and air conditioning supply	0.19%	-0.60%	-0.07%	-0.48%	0.30%	-0.09%
Water supply; sewerage, waste management and remediation activities	0.26%	-0.10%	-0.01%	-0.16%	-0.04%	0.00%
Construction	-0.90%	1.02%	-0.18%	0.38%	-1.93%	-0.16%
Wholesale and retail trade; repair of motor vehicles and motorcycles	-1.24%	1.18%	-0.10%	-4.42%	-0.15%	0.05%
Transportation and storage	7.92%	-1.64%	-2.33%	-1.31%	0.39%	-0.08%
Accommodation and food service activities	2.06%	-0.10%	-0.04%	0.16%	1.46%	0.05%
Information and communication	0.93%	0.48%	0.15%	-1.66%	0.54%	-0.21%
Financial and insurance activities	0.85%	-0.24%	-0.04%	-0.61%	-0.63%	0.08%
Real estate activities	-6.80%	21.70%	-11.71%	4.57%	0.81%	0.26%
Professional, scientific and technical activities	0.07%	1.10%	0.02%	-1.40%	0.49%	-0.17%
Administrative and support service activities	0.18%	0.58%	0.05%	-1.28%	0.82%	-0.43%
Public administration and defence; compulsory social security	-0.36%	0.86%	-0.03%	0.70%	0.35%	0.03%
Education	-0.09%	1.58%	-0.03%	0.37%	-0.23%	-0.02%
Human health and social work activities	-0.10%	1.14%	-0.02%	-2.10%	0.46%	-0.17%
Arts, entertainment and recreation	0.14%	0.28%	0.03%	-0.63%	0.25%	-0.09%
Other service activities	-0.19%	0.30%	-0.02%	-0.36%	0.37%	-0.06%
Activities of households as employers, etc.	0.00%	0.13%	0.00%	-0.17%	-0.29%	0.07%

Source: Eurostat, authors' own calculations.

2.3. Regional patterns of productivity

According to the OECD (2018), most regions of its member-countries have increased their productivity, but larger inequalities appear within them, so as their growth becomes less inclusive. However, the tradeoff between regional productivity growth and increased regional inequalities cannot be regarded as the general rule. In the case of Greece, the intense and persistent problem of core-periphery inequalities (Tsekeris, 2017a) renders necessary the measurement of regional labour productivity and TFP and the corresponding productivity gap among regions. As described in Papaioannou et al. (2017), the measurement of regional productivity can help determine the considerable heterogeneity among regions and identify suitable policies for reducing spatial disparities and supporting regional convergence.

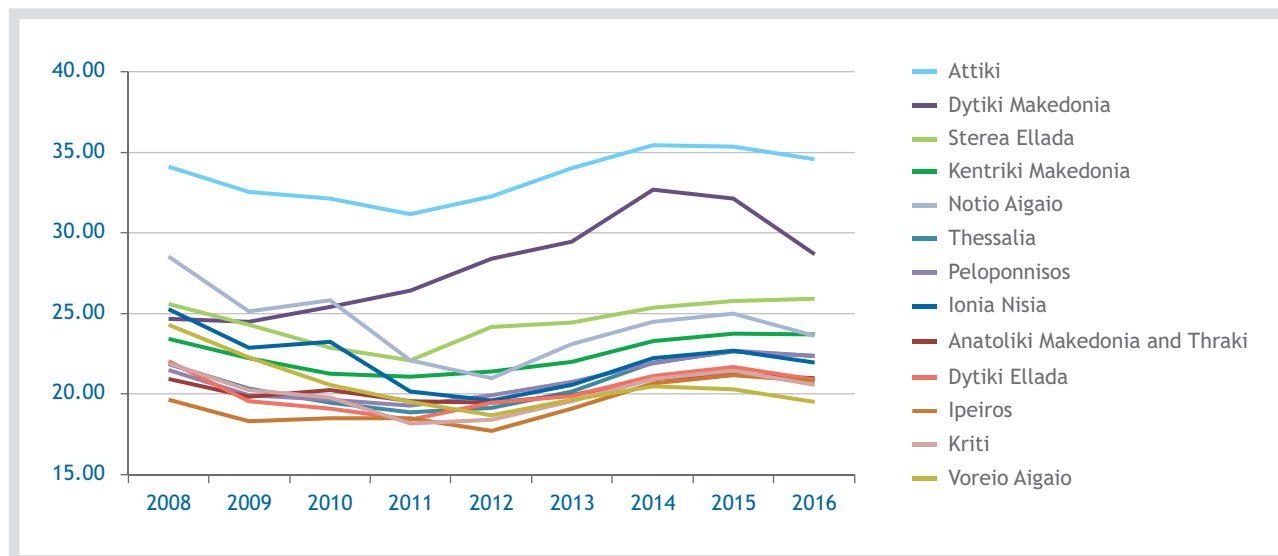
Figure 2.3.1 presents the labour productivity of Greek regions. Figure 2.3.2 shows the productivity gap (based on the natural log difference) between Attiki and the remaining regions of Greece as well as the EU-28 region with the highest labour productivity in each year of the period 2008-2016. During this period, Dytiki Makedonia and Sterea Ellada were the regions with the highest labour productivity, following Attiki. To the contrary, during 2008-2013, Ipeiros was the region with the lowest labour productivity (except for 2011, when Kriti presented the lowest labour productivity), while during 2014-2016, the region with the lowest labour productivity was Voreio Aigaio. In the given study period, the productivity gap between Attiki and the other regions increased on average. Also, during 2008-2011, the productivity gap between Attiki and the EU-28 region with the highest labour productivity (i.e., Brussels) also increased, but it then gradually diminished, reaching in 2016 a level lower than before 2013 (Figure 2.3.2).

Next, Figure 2.3.3 presents the TFP in each Greek region and Figure 2.3.4 depicts the TFP gap (based on the natural log difference) between Attiki and the remaining regions of the country, as well as between Attiki and the EU region with the highest TFP, based on labour shares of income originating from Penn World Tables (Feenstra et al., 2015). Attiki is the region with the highest TFP in the country. It is noted, however, that the ranking of the remaining regions according to the magnitude of TFP differs from that based on the magnitude of labour productivity.

Thus, while Dytiki Makedonia is ranked second on the basis of labour productivity, it drops to the last position on the basis of TFP. This notable difference can be attributed, among other factors influencing the formation of its regional output, to the operation of the electric power generation units of the Public Power Corporation in the constituent prefectures of Kozani and Florina (Tsekeris, 2017a). In 2016, the island regions of Ionia Nisia and Notio Aigaio presented the second and third highest TFP in the country, although they ranked eighth and fifth, respectively, on the basis of labour productivity. It is further noted that, in 2016, the island region of Voreio Aigaio presented the fifth highest TFP in the country, although it ranked last on the basis of labour productivity.

Figure 2.3.1

Labour productivity (gross value added per working hour, in euro, 2010 constant prices) in the Greek regions, 2008-2016

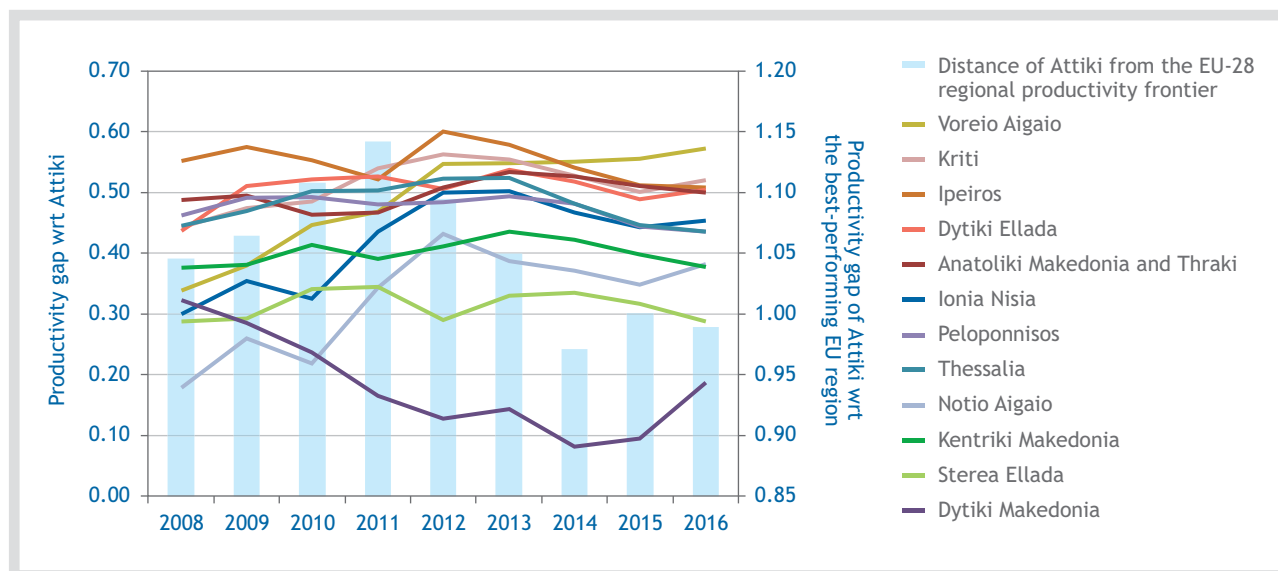


Source: Own processing of data from Eurostat.

Note: Regions are listed in descending order according to the level of labour productivity in 2016.

Figure 2.3.2

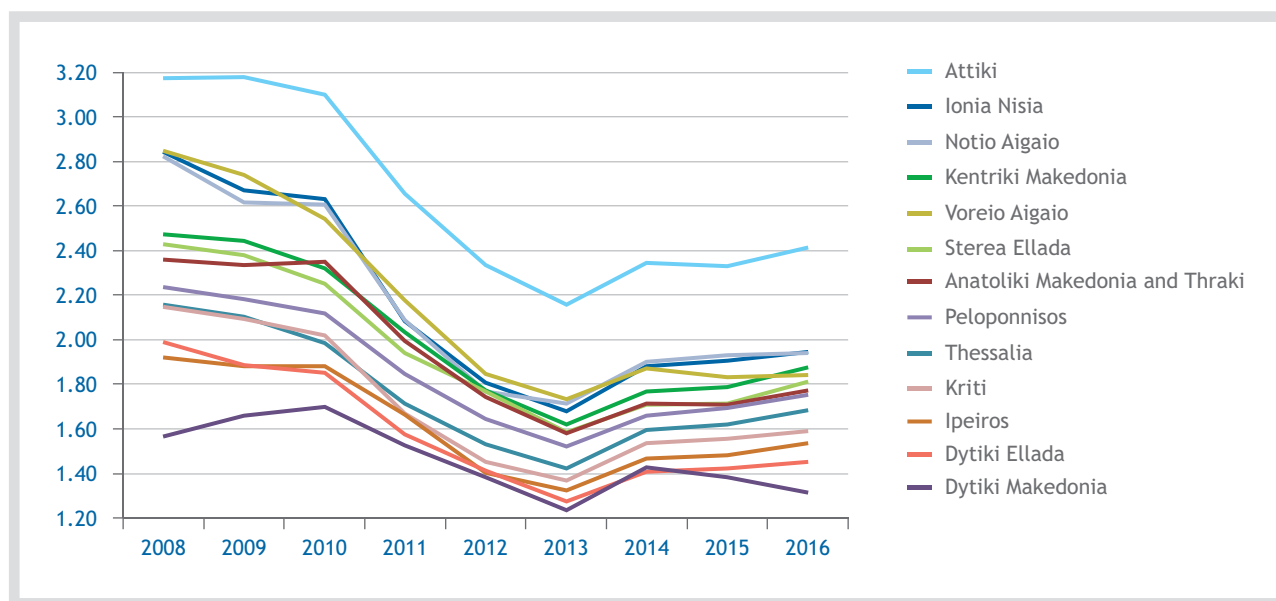
Productivity gap between Attiki and the other regions of Greece, and between Attiki and the best-performing EU-28 region,¹ 2008-2016



Source: Own processing of data from Eurostat.

Notes: 1. The EU region with the highest labour productivity during 2008-2016 was Brussels. Regions are listed in descending order according to the magnitude of their productivity gap with the region of Attiki in 2016.

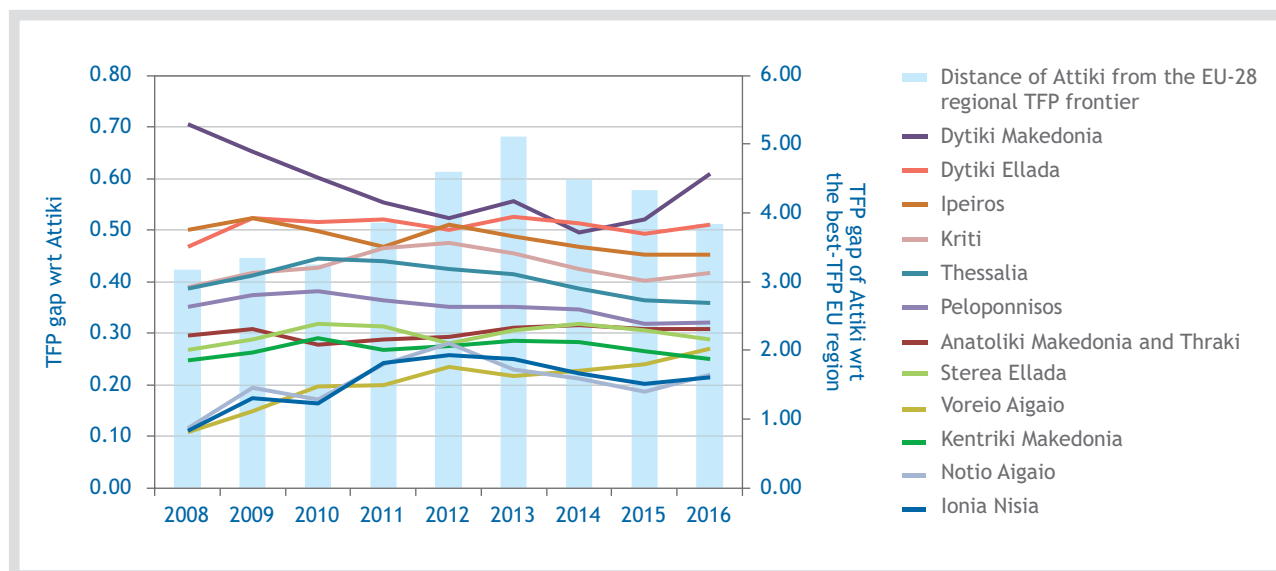
Figure 2.3.3
TFP of Greek regions, 2008-2016



Source: Tsekeris and Papaioannou (2019).

Note: Regions are listed in descending order according to the level of TFP in 2016.

Figure 2.3.4
TFP gap between Attiki and the other regions of Greece, and between Attiki and the EU-28 region with the highest TFP,¹ 2008-2016



Source: Tsekeris and Papaioannou (2019).

Notes: 1. The EU region with the highest TFP during 2008-2016 was Brussels.

Regions are listed in descending order according to the magnitude of their TFP gap with the region of Attiki in 2016.

Similar to labour productivity, during 2008-2012, TFP decreased considerably in all the regions (particularly, in the island regions) and partially recovered after 2013. Nonetheless, in contrast with labour productivity, whose performance is mixed among regions over time, the TFP of all the regions decreased in total during the given study period. Similar to the case of the labour productivity gap, during the given study period, on average, the TFP gap between the region of Attiki and the other regions of the country increased.

Map 2.3.1 depicts the intense and persistent interregional differences in TFP. The dominance of the region of Attiki is evident and steady over time, against all the other regions of the country. Some regions have slightly improved their relative position, in terms of their ranking on the basis of TFP, as they presented smaller losses (e.g., Kentriki Makedonia), in contrast with other regions that presented larger losses (e.g., Voreio Aigaio). As shown in Figure 2.3.4, the TFP gap between the region of Attiki and the best-performing EU region increased considerably during 2011-2013, and then partially recovered, reaching in 2016 the level of 2011.

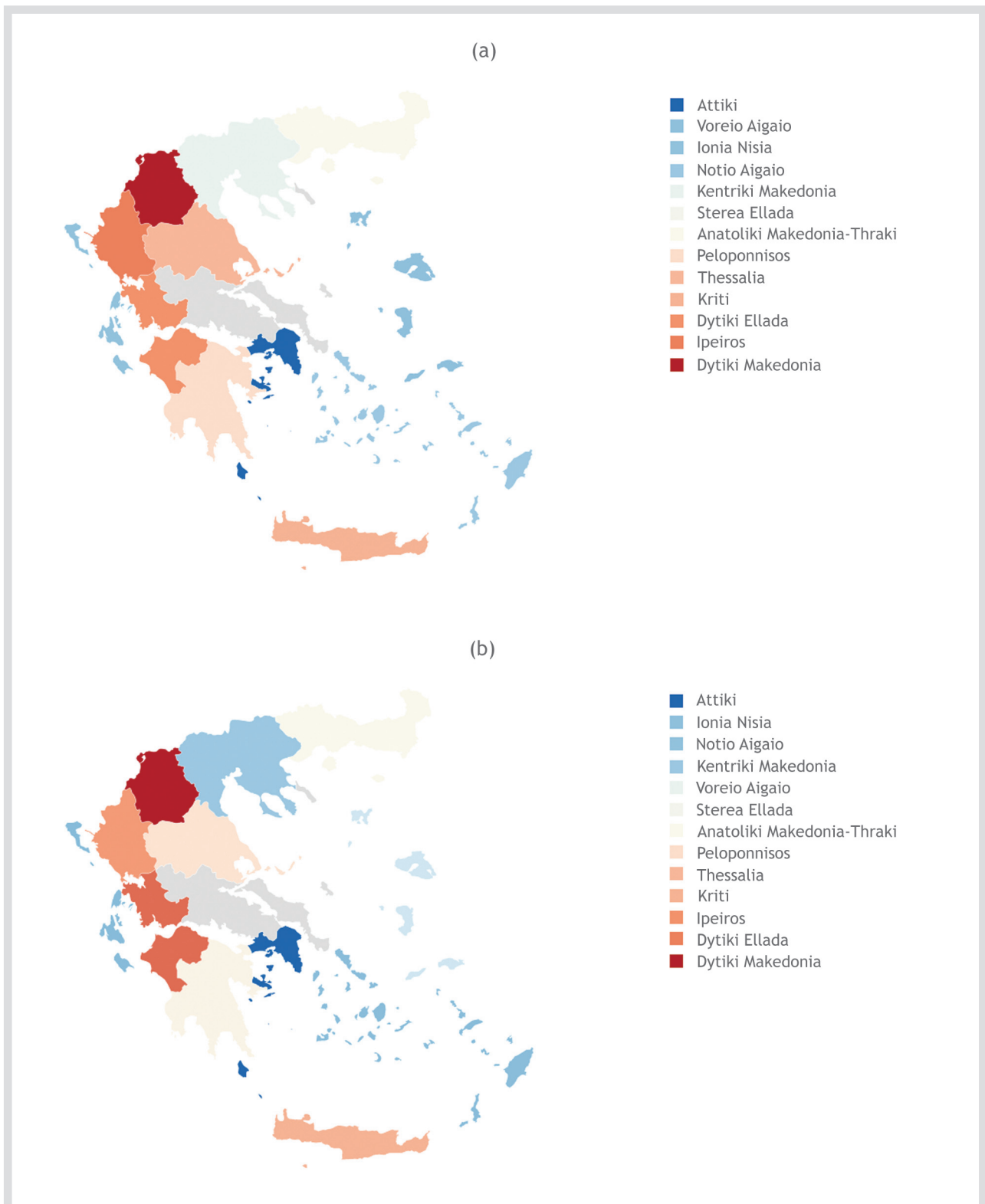
Given the considerable variations in productivity among the regions and sectors of economic activity, labour productivity is also analysed by sector in each region of the country. It is stressed that the development process of a region is significantly affected by the typology of firms located in that region and the sectoral composition of local production (McCann, 2013). For this purpose, on the basis of data originating from the business registry of the Hellenic Statistical Authority (ELSTAT), in years 2008 and 2016, the real labour productivity of each sector in a region is calculated as the ratio of the turnover of all firms belonging to that sector to the total number of employees.

The real labour productivity patterns observed by sector in each region are partially different, compared to those relying on the analysis only at the sectoral or regional level (for details, see Tsekeris, 2019). Nonetheless, it should be taken into account that the variable of real labour productivity is calculated here by adopting a different definition (firm turnover per worker), at a more detailed level of sectoral analysis. Figure 2.3.5 illustrates the real labour productivity in Attiki and the other regions of Greece in 2008 and 2016, to stress the core-periphery disparities, in favour of Attiki, in all sectors, and their changes over time.

The largest (and increasing) core-periphery productivity disparities are observed in the sector of Electricity, gas, steam and air conditioning supply. The disparities in the sector of Financial and insurance activities follow in order, but they decrease over time, as most of the other sector-level core-periphery disparities. In addition to the latter sector, the average real labour productivity of Agriculture, forestry, fishing, and Public administration, defense, compulsory social security, and Education in the peripheral regions also decreased at a considerably smaller rate than the corresponding productivity in the region of Attiki.

Map 2.3.1

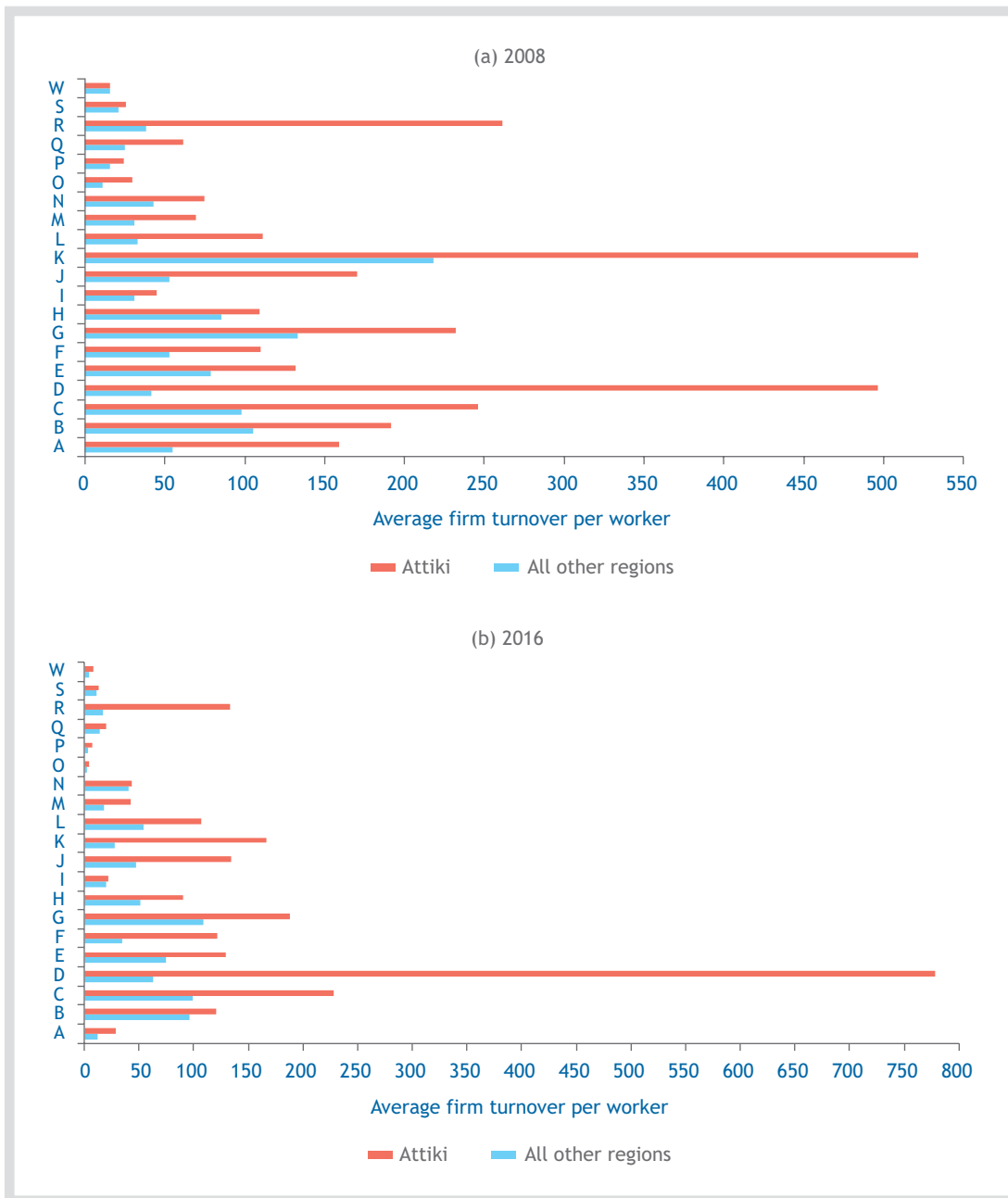
TFP in the 13 NUTS-II regions of Greece, (a) in 2008, and (b) in 2016



Note: Regions are listed in descending order according to the magnitude of their TFP per year.

Figure 2.3.5

Real labour productivity (firm turnover per worker, in thousand euro, 2010 constant prices) in Attiki and the other regions of Greece in (a) 2008 and (b) 2016



Source: Own processing of data from Business Registry, ELSTAT.

Note: A: Agriculture, forestry and fishing, B: Mining and quarrying, C: Manufacturing, D: Electricity, gas, steam and air conditioning supply, E: Water supply; sewerage, waste management and remediation activities, F: Construction, G: Wholesale and retail trade; repair of motor vehicles and motorcycles, H: Transportation and storage, I: Accommodation and food service activities, J: Information and communication, K: Financial and insurance activities, L: Real estate activities, M: Professional, scientific and technical activities, N: Administrative and support service activities, O: Public administration and defence; compulsory social security, P: Education, Q: Human health and social work activities, R: Arts, entertainment and recreation, S: Other service activities, W: Unknown activities.

3. The Competitiveness of the Greek Economy

3.1. Concepts and measurement of competitiveness

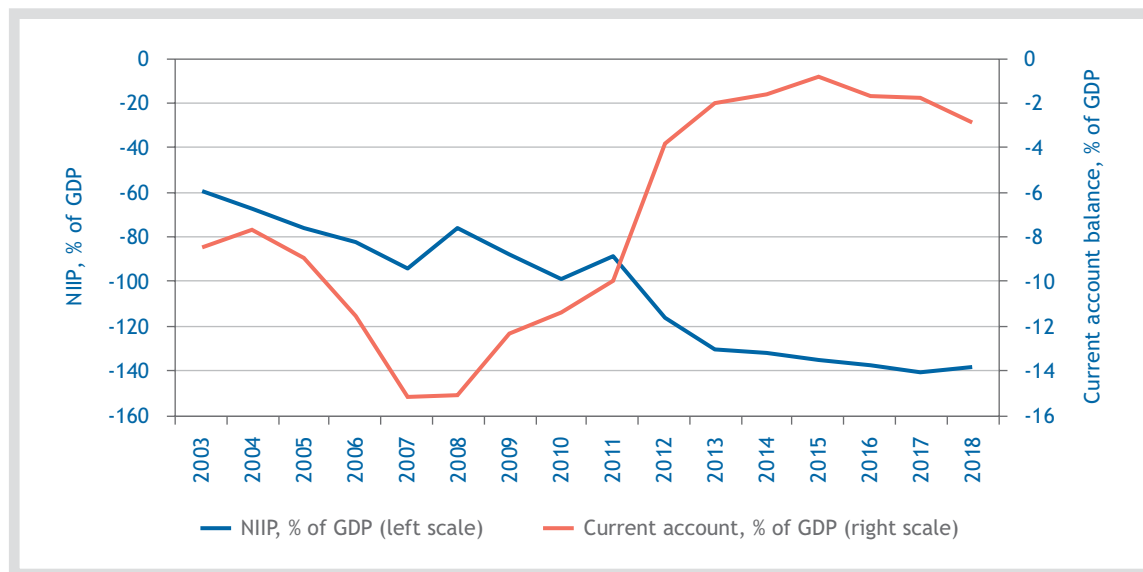
The notion of competitiveness has attracted the attention of governments, business communities and academic scholars for decades. The World Economic Forum (WEF) defines competitiveness as “the set of institutions, policies and factors that determine the level of productivity of a country” (World Economic Forum, 2013). The European Commission (EC) characterises competitiveness as a “key determinant of growth and jobs in Europe” (EC, 2018). Competitiveness is inherently linked to international trade and depends mainly on price factors (e.g., unit cost, wages) and non-price factors (e.g., technology, innovation, human capital, public policy, trade openness) (Teixeira and Barros, 2019).

The current account balance is one of the main indicators of competitiveness. It consists of the trade balance and the income balance. Greece exhibits a current account deficit (as a percentage of GDP) throughout the period under consideration, as shown in Figure 3.1.1. Nevertheless, it should be noted that the current account deficit has declined to less than 4% since 2012. The improvement of the current account balance in 2012 can be mainly attributed to the services’ balance (Figure 3.1.2).

The balance of services never exceeded 7.2% of GDP from 2002 to 2012, and did not drop below 7.2% in the subsequent years. In addition, the balance of goods remained below -13.5% from 2002-2009, while it increased above -13.5% during the remaining period. On the other hand, the Net international investment position (NIIP) of Greece fell below -100% in 2012 and stayed beneath that level for the rest of the period under examination.

Figure 3.1.1

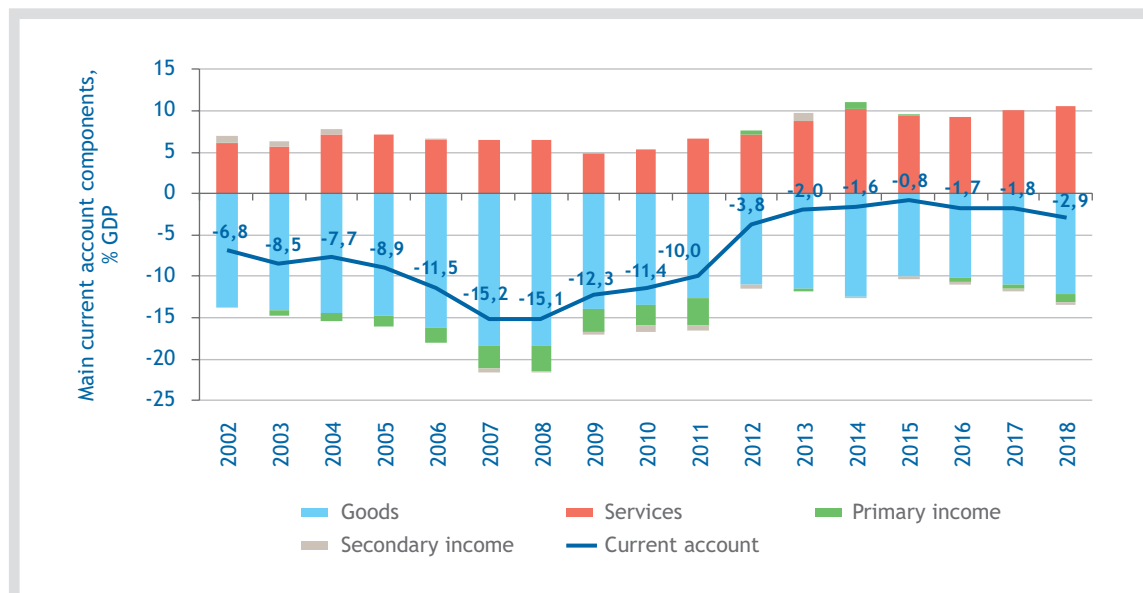
Current account balance and Net international investment position, as % of GDP



Source: Eurostat.

Figure 3.1.2

Current account balance and its components, as % of GDP (unadjusted data)



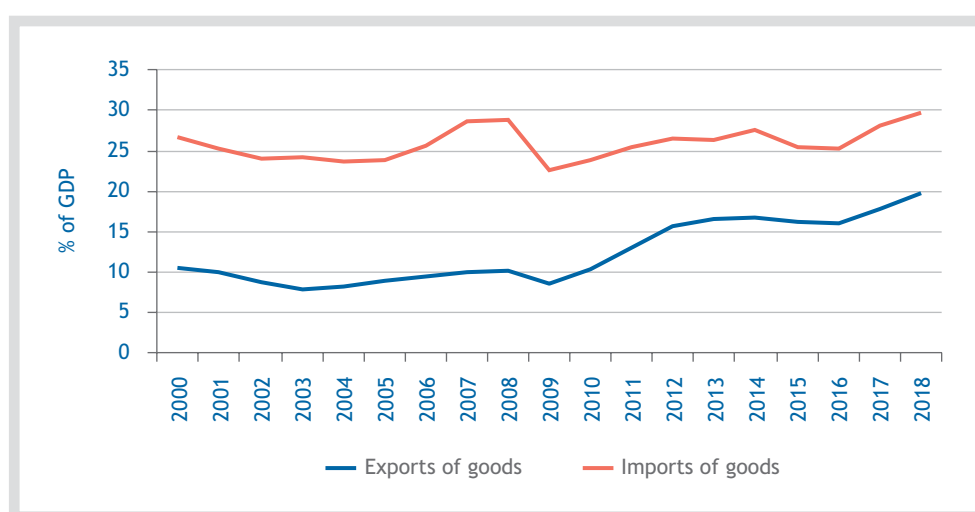
Source: Eurostat.

Note: Unadjusted data, i.e., neither seasonally adjusted nor calendar adjusted data.

In more detail, the exports of services have grown significantly, both as a percentage of GDP (Figure 3.1.3) and in current prices, while imports have stayed relatively stable. Exports of services ranged between 10.5% and 13.3% during 2000-2009 and from 11.7% to 16.3% during 2010-2018. On the other hand, the imports of goods remained well above exports throughout the entire examination period (2000-2018). Exports of goods ranged from 10.5% to 8.2% during 2000-2009 and between 10.4% and 19.8% during the subsequent period. Nevertheless, the reduction of GDP, during the economic crisis and the post-crisis period, should be taken into account. Interestingly, the exports of services exceeded the exports of goods during the period 2000-2010, while the opposite occurred during the period 2011-2018 (Figure 3.1.4).

Although exports of both goods and services follow an upward trend, in order to gain a better understanding of the country's relative competitive position, the export market shares are also examined. The export market share is calculated by dividing the exports of the country by the total exports of the world. As shown in Figure 3.1.5 the export market share of services has declined significantly (from 1.22% in 2002 to 0.76% in 2018). This means that the rate of growth of the Greek exports of services is lower than the growth rate of total world service exports. Therefore, Greece should focus on the competitiveness of services in order to maintain and build momentum. The export market share of goods has remained relatively stable, but at a very low level, compared to the other EA countries. Moreover, Greece's strong comparative advantages are concentrated in the agricultural and raw materials and fuels sectors (Konstantakopoulou and Skintzi, 2015). The share of high-tech exports on total exports is one of the lowest in the EU, accounting for 4.5% of total exports, in 2018, only above Portugal. Greece was ranked 55th (with score 0.13) out of 125 countries in the Economic Complexity Index (Simoes and Hidalgo, 2011) in 2017 (first was Japan with score 2.31), below all other EA countries.

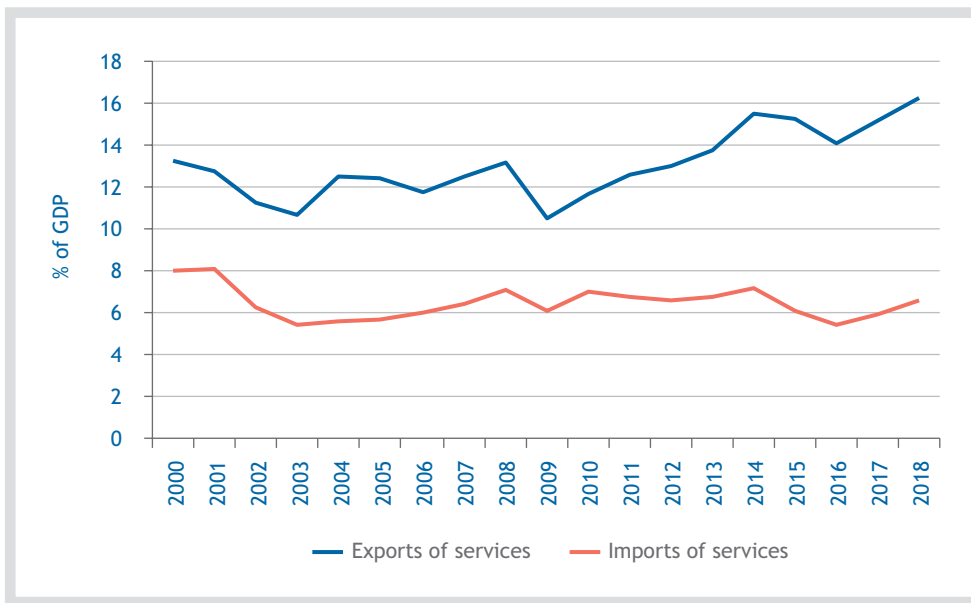
Figure 3.1.3
Exports and imports of goods, as % of GDP



Source: Eurostat.

Note: Data for 2011-2018 are provisional.

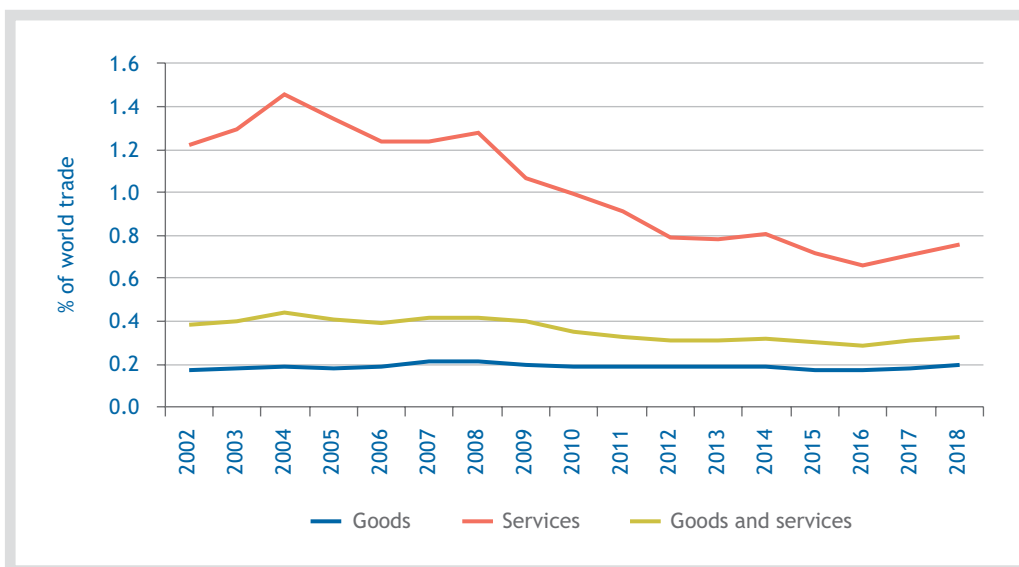
Figure 3.1.4
Exports and imports of services, as % of GDP



Source: Eurostat.

Note: Data for 2011-2018 are provisional.

Figure 3.1.5
Export market shares, as % of world trade



Source: Eurostat.

3.2. Cost/price and non-cost/non-price competitiveness indices

3.2.1. International competitiveness indices

The most well known international indicators of national competitiveness, which are widely used by governments, practitioners and academics, are: a) Doing Business (DB) by the World Bank (WB), b) the Global Competitiveness Index (GCI) by the World Economic Forum (WEF) and c) the World Competitiveness Yearbook (WCY) by the International Management Development (IMD). These three indicators are often used by the European Commission and have been very recently considered for the enhanced surveillance report for Greece published last June (European Commission, 2019d).

The annual reports of DB provide data on regulations that either enhance business activity or constrain it. It presents qualitative indicators on business regulation as well as the protection of property rights for 190 countries.⁴ These regulations are divided into 10 areas: i) Starting a business, ii) Dealing with construction permits, iii) Getting electricity, iv) Registering property, v) Getting credit, vi) Protecting minority investors, vii) Paying taxes, viii) Trading across borders, ix) Enforcing contracts and x) Resolving insolvency. According to *DB 2019*, Greece scores 68.08 and ranks 72nd among 190 countries. Despite the slight worsening in the score (-0.12) compared to the previous edition (*DB 2018*), Greece fell 5 places behind the 67th rank it held in the *DB 2018* (Table 3.2.1). This is due to the improvement of the other countries that scored above Greece. Among the EU-28 countries, Greece ranks 27th, leaving only Malta behind.

The WEF has been publishing the GCI since 1979. Last year, it modified its method so as to better fit to the new era of the 4th Industrial Revolution (4IR) (WEF, 2018). GCI has 12 major pillars: i) Institutions, ii) Infrastructure, iii) ICT adoption, iv) Macroeconomic stability, v) Health, vi) Skills, vii) Product market, viii) Labour market, ix) Financial system, x) Market size, xi) Business dynamism and xii) Innovation capability.⁵ A novelty regarding the new method is that all indicators, both from the survey and the statistics, get normalised on a scale of 0 (worst) to 100 (best) in an aggregate manner without weights. Previous editions of the GCI were based on the view that the stage of development of an economy should be taken into consideration through the application of weights. The new rationale is that in the era of the 4IR, all factors of competitiveness have similar roles to play regardless of the income level. This is the main reason why Greece's (and other developed countries) ranking jumped from the 87th place in the 2017 edition (old method) to the 57th place in the last edition (new method).

4. The way DB collects the data is standardised and based on questionnaires experts who include lawyers, business consultants, accountants, freight forwarders, government officials and other professionals routinely administering or advising on legal and regulatory requirements. However, in the case of Greece, the Greek authorities have concerns regarding the data of the DB report for Greece. Therefore, Greek authorities are partnering with the World Bank for solving this issue.

5. Each pillar has indicators, 98 in all, 54 of which are based on secondary data (statistics) provided by reliable external sources such as the OECD, the WB, etc. The remaining 44 indicators are sourced from the Executive Opinion Survey, that is, business leaders around the globe.

Table 3.2.1
Greece's score and rankings on the three major international indices

	Score	Rank	Best Performer (score)
Ease of Doing Business	68.08	72	New Zealand (86.59)
Starting a business	92.39	44	New Zealand (99.98)
Dealing with construction permits	75.29	39	Hong Kong (88.24)
Getting electricity	75.97	79	UAE (100.0)
Registering property	47.59	153	New Zealand (94.89)
<i>land administration index (0-30): 4.5</i>			<i>Lithuania, Netherlands, Rwanda, Singapore, Taiwan (28.5)</i>
Getting credit	50.00	99	Brunei, New Zealand (100.0)
<i>strength of legal rights index (0-12): 3</i>			<i>Brunei, Colombia, Montenegro, New Zealand, Puerto Rico (12)</i>
Protecting minority investors	63.33	51	Kazakhstan (85.00)
Paying taxes	76.89	65	Hong Kong (99.71)
Trading across borders	93.72	31	Austria, Belgium, Croatia, Denmark, Czech Rep., France, Italy, Netherlands, Poland, Portugal, Romania, Slovak Rep., Slovenia, Spain, Hungary, Luxembourg (100.00)
Enforcing contracts	50.19	132	Singapore (84.53)
<i>time: 1580 days</i>			<i>Singapore (164 days)</i>
Resolving insolvency	55.39	62	Japan (93.45)
Global Competitiveness Index	62.1	57	USA (85.6)
Institutions	50.5	87	New Zealand (81.6)
<i>terrorism incidence</i>	<i>97.3</i>	<i>107</i>	<i>24 countries (100.0)</i>
<i>efficiency of legal framework in challenging regulations</i>	<i>21.3</i>	<i>127</i>	<i>Finland (77.3)</i>
<i>burden of government regulation</i>	<i>22.4</i>	<i>131</i>	<i>Singapore (76.1)</i>
<i>efficiency of legal framework in settling disputes</i>	<i>19.6</i>	<i>133</i>	<i>Singapore (86.1)</i>
<i>future orientation of government</i>	<i>19.4</i>	<i>135</i>	<i>Singapore (85.6)</i>
<i>property rights</i>	<i>47.7</i>	<i>107</i>	<i>Finland (92.7)</i>
<i>quality of land administration</i>	<i>15.0</i>	<i>135</i>	<i>Singapore (96.7)</i>
<i>strength of auditing and reporting standards</i>	<i>45.8</i>	<i>119</i>	<i>Finland (92.7)</i>
Infrastructure	76.2	38	Singapore (95.7)
ICT adoption	58.9	57	Korea (91.3)
Macroeconomic stability	73.6	83	31 countries (100.0)
Health	95.7	21	Iceland, Japan, Singapore, Spain (100.0)

Table 3.2.1 (continued)

	Score	Rank	Best Performer (score)
Skills	70.4	39	Finland (87.9)
<i>quality of vocational training</i>	41.5	111	Switzerland (92.3)
<i>critical thinking in teaching</i>	27.7	119	USA (78.9)
Product Market	56.7	63	Singapore (81.2)
<i>distortive effect of taxes and subsidies on competition</i>	34.5	118	Singapore (79.9)
<i>complexity of tariffs</i>	33.7	112	Hong Kong (100.0)
Labour market	51.8	107	USA (81.9)
<i>cooperation in labour-employer relations</i>	50.1	105	Switzerland (85.8)
<i>flexibility of wage determination</i>	56.8	110	Hong Kong (86.6)
<i>workers' rights</i>	0.0	116	Austria, Finland, Iceland, Slovak Rep. (100.0)
<i>internal labour mobility</i>	46.9	120	Guinea (79.9)
<i>pay and productivity</i>	40.5	111	USA (79.2)
<i>labour tax rate: 28%</i>	72.2	119	<8.0%: 25 countries (100.0)
Financial system	49.4	114	USA (92.1)
<i>financing of SME's</i>	22.7	137	USA (79.7)
<i>venture capital availability</i>	16.8	129	USA (76.7)
<i>soundness of banks</i>	26.1	137	Finland (94.5)
<i>non-performing loans: 36.3%</i>	27.7	137	Taiwan: 0.3% (100.0)
Market size	59.0	58	China (100.0)
Business dynamism	58.0	72	USA (86.5)
<i>willingness to delegate authority</i>	48.6	100	Denmark (84.9)
<i>growth of innovative companies</i>	38.4	120	Israel (80.5)
<i>companies embracing disruptive ideas</i>	33.1	126	USA (77.5)
Innovation capability	45.0	44	Germany (87.5)
<i>diversity of workforce</i>	45.8	123	Canada (81.7)
<i>state of cluster development</i>	32.3	127	USA (79.5)
<i>multi-stakeholder collaboration</i>	33.3	123	USA (79.2)
World Competitiveness Yearbook	-	58	
Economic performance	-	61	USA
Government efficiency	-	61	Hong Kong
Business efficiency	-	59	Hong Kong
Infrastructure	-	40	USA

Note: DB ranks 190, GCI 140 and WCY 63 economies.

Specifically, Greece was grouped with the innovation-driven economies (most developed ones), which meant that infrastructure and health -where Greece performs relatively well- weighed less than ICT adoption and innovation capability. Based on the new measurement method, Greece would rank 53rd in 2017, which means that it actually lost 4 places. Within the EU-28, Greece is 27th, leaving only Croatia behind. Although the Greek economy increased its score to 62.1 (+0.3), it fell 4 places because other economies improved relatively more. Table 3.2.1 includes all indicators where Greece ranks at or below the 100th place and needs immediate improvement.

The WCY is produced every year by the International Management Development and examines 63 countries (IMD, 2019). The WCY is comprised of 4 factors, and each factor of 5 sub-factors: a) Economic (domestic economy, international trade, international investment, employment and prices), b) Government (public finance, fiscal policy, institutional framework, business legislation and societal framework), c) Business (productivity & efficiency, labour market, finance, management practices and attitudes and values) and d) Infrastructure (basic infrastructure, technological infrastructure, scientific infrastructure, health & environment and education).⁶

Greece lost one place in the last edition of 2019, relative to 2018, and now ranks 58th among 63 countries. Specifically, among the EU-27 (Malta is not included), Greece ranks 26th, only ahead of Croatia. The ranking on the 4 main factors is as follows: economic performance 61st, government efficiency 61st, business efficiency 59th and infrastructure 40th (Table 3.2.1). During the Executive Opinion Survey, respondents were asked to rank 5 key attractiveness factors among 15 indicators. Not surprisingly for Greece, the factors which got the highest percentage of responses (indicating good performance) were high educational level (75.95%), skilled workforce (72.15%) and cost competitiveness (58.23%); the factors that got the least number of responses (indicating low performance) include competency of government (6.33%), access to financing (10.13%) and effective legal environment (11.39%) (Cabolis, 2019).

It is clear that all three indices are related to and complement each other. Implicitly or explicitly, through these indices, competitiveness is connected to productivity; GCR goes a step further by providing empirical evidence for this connection (WEF, 2018, p. 43-45, Box 3). Finally, it is worth noting that, in the era of the 4IR, digital competitiveness is something that needs to be mentioned. The European Commission composes the Digital Economy and Society Index (DESI) in which Greece ranks 26th, just ahead of Bulgaria and Romania (EC, 2019b). In 2017, the IMD also launched the digital competitiveness ranking where Greece was 50th in 2017 and 53rd in 2018 (IMD, 2018).

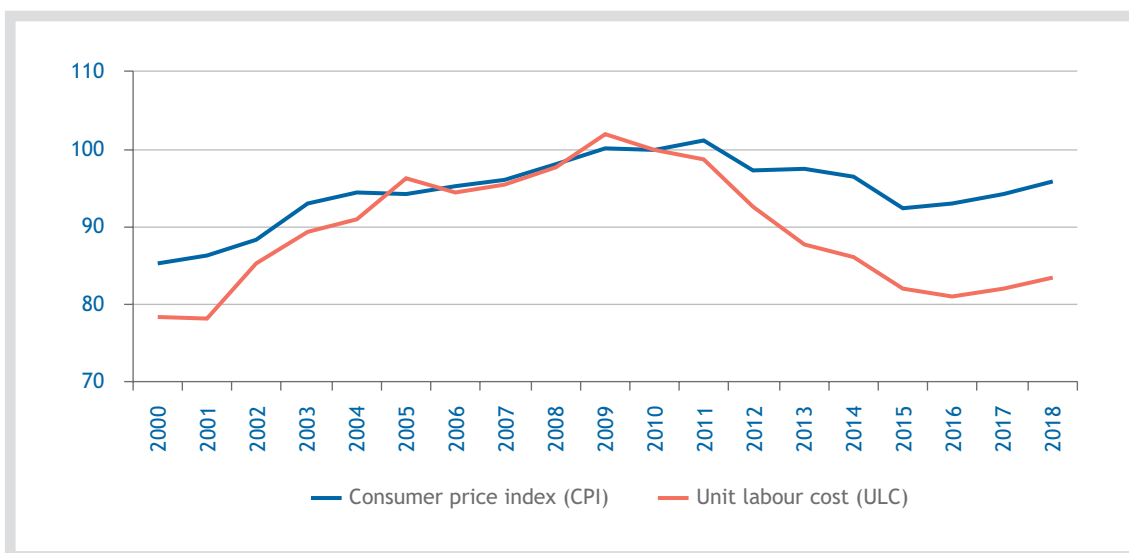
6. The sub-factors are calculated based on 330 criteria in total, the majority of which are based on secondary data (referred to as 'competitiveness that can be measured'), while the rest are based on the Executive Opinion Survey, which includes 6,200 respondents from 63 countries (referred to as 'competitiveness as it is perceived').

3.2.2. Cost/price competitiveness indices

One of the most commonly used cost/price competitiveness indicators is the Real Effective Exchange Rates (REERs). The main purpose of REERs is to depict a country's price/cost competitiveness relative to its principal competitors (in Figure 3.2.1, 37 trading partners are selected, i.e., the EU-28 and 9 other industrial countries). It is usually calculated using either the consumer price index (CPI) or the unit labour cost (ULC). Both indicators followed an upward trend until 2009. This means that the competitiveness of the Greek economy deteriorated, although this adverse situation was not depicted in the country's market share, which remained almost stable throughout that period.

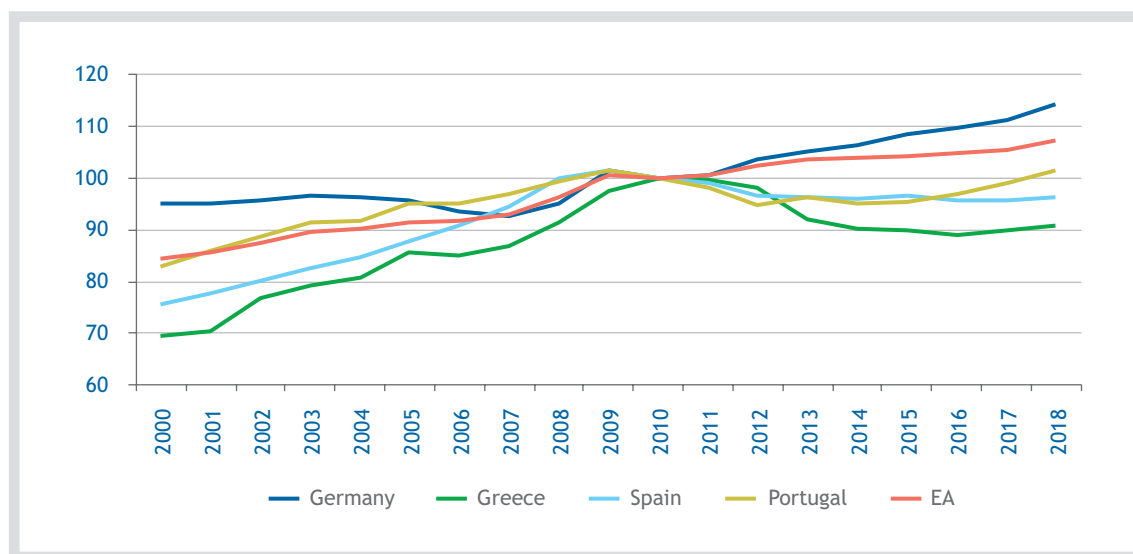
The ULC-based REER started to decrease in 2009, while the CPI-based REER started to decrease in 2011. As Greece entered the deep recession, its price/cost competitiveness improved. Exports reflected this improvement as they increased. The ULC also decreased from 2011 to 2016 (Figure 3.2.2). Spain and Portugal faced a similar reduction in ULC, as they also implemented fiscal consolidation programmes, while the EA19 average was constantly increasing. Another factor that may have affected exports was the shrinking domestic demand caused by the severe economic crisis. Greek companies have been forced to look outside the borders in order to replace lost sales. However, increased exports did not correspond to increased market share. Actually, the market share of Greece decreased from 0.4% in 2009 to 0.33% in 2018, meaning that the country cannot keep up with international competition.

Figure 3.2.1
Real effective exchange rates (37 trading partners, 2010=100)



Source: Eurostat.

Figure 3.2.2
Nominal unit labour cost based on hours worked (2010=100)



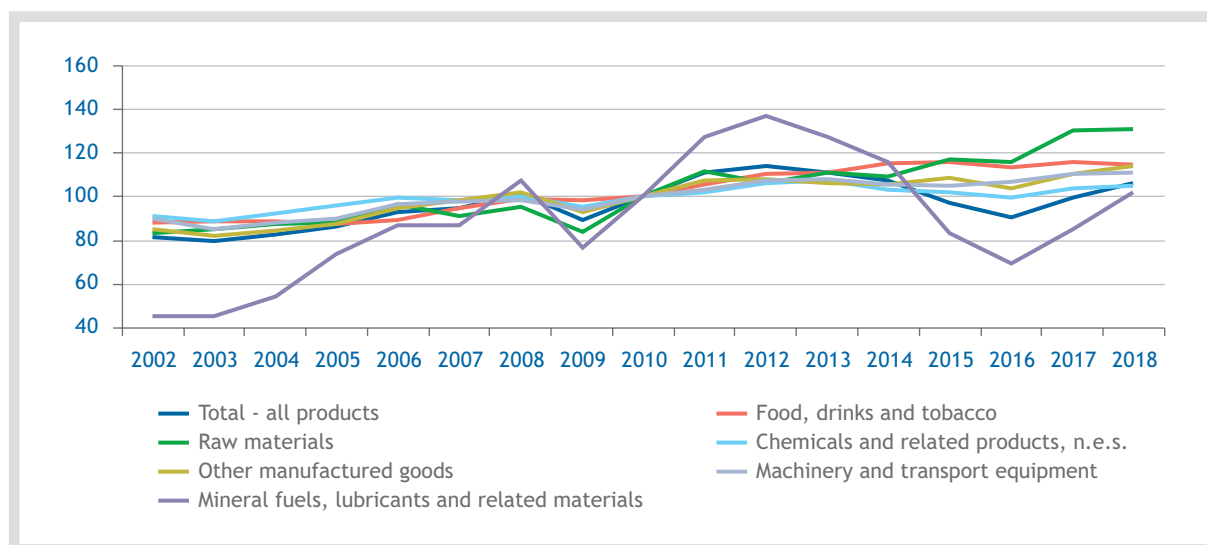
Source: Eurostat.

3.2.3. The competitiveness of main economic sectors

A commonly used approximation of the changes in prices of exported goods is the export unit value index (export value/quantity sold). The indices decreased for all sectors in 2009 as a consequence of the global financial crisis. The index of all products decreased during 2013-2016. This fall was mainly caused by a decrease in the Mineral fuels, lubricants and related materials index (Figure 3.2.3). The indices of the other sectors exhibit a mild upward trend. An increased export unit value index may be an indication of non-price competitiveness, meaning that the qualitative characteristics of the products (e.g., technology, design, and innovation) may enhance export attractiveness. Non-price competitiveness and product differentiation can play an important role when competing against low-cost countries in the international trade arena.

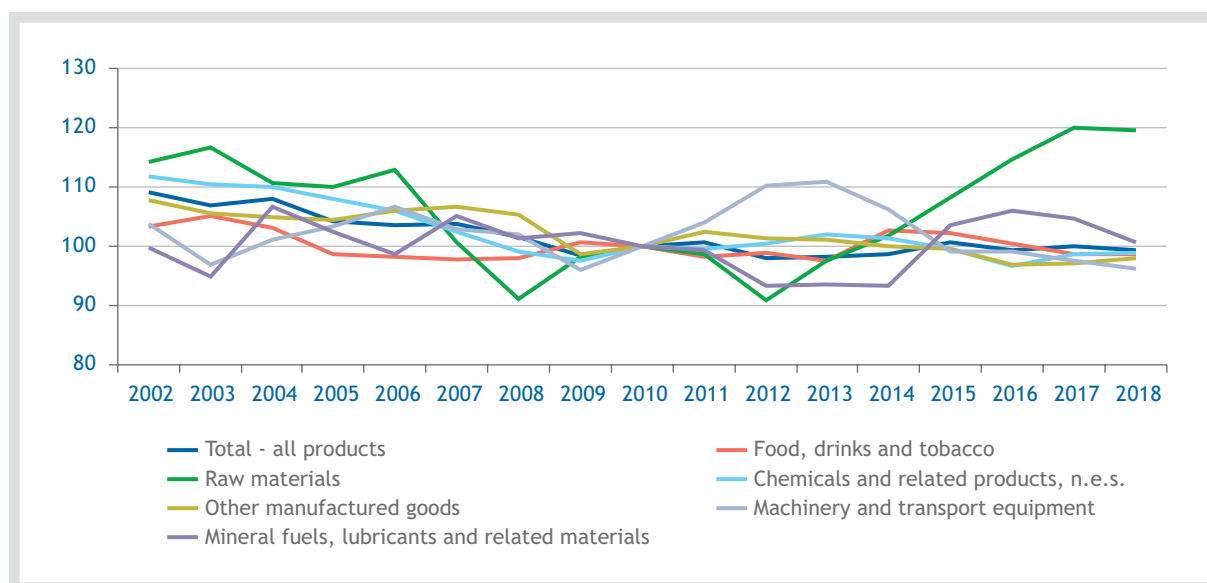
Moreover, terms of trade is used as an indicator of competitiveness, as it measures a country's export prices in relation to its import prices (Figure 3.2.4). The index for all products follows a slow downward path, which can be attributed to increasing import prices since the unit value index of exports increases. The chemicals index and the other manufactured goods index have followed a similar course. The food, drinks and tobacco index has remained rather stable while the remaining three indices exhibit significant fluctuations.

Figure 3.2.3
Export unit value index (2010=100)



Source: Eurostat.

Figure 3.2.4
Terms of trade (2010=100)



Source: Eurostat.

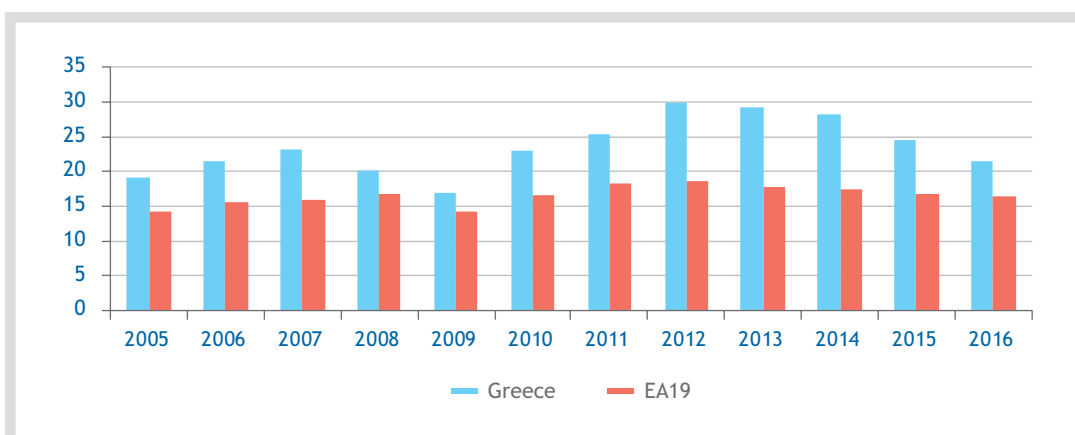
3.2.4. Competitiveness and value chain participation

In the context of increasingly interconnected economies, gross exports alone are not a sufficient indicator when assessing a country's competitiveness, as exports incorporate both domestic and foreign-sourced inputs. In addition, offshoring has prevailed as a common business practice during the last decades, enhancing the role of interconnectivity and global value chain participation in international trade (Tsekeris and Skintzi, 2017). More than two thirds of world trade occurs through the Global Value Chains (GVCs) and, although the global financial crises slowed the growth of GVCs, they augmented faster than GDP in 2017 (WTO, 2019). Global sourcing business modes are affecting the world economy in terms of competition, employment, innovation processes and countries' comparative advantages (Ceci and Masciarelli, 2010).

The foreign value added contribution to Greece's gross exports, i.e., the backward participation in GVCs, has increased since 2005, reaching its peak in 2012. Throughout the examination period (2005-2016), the corresponding EA19 average is lower than that of Greece (Figure 3.2.5). This means that Greece depends more on imported inputs in order to produce goods or services that will be exported, compared to the other members of the EA. Nonetheless, Greece's backward participation in GVCs decreased from 2013 to 2016.

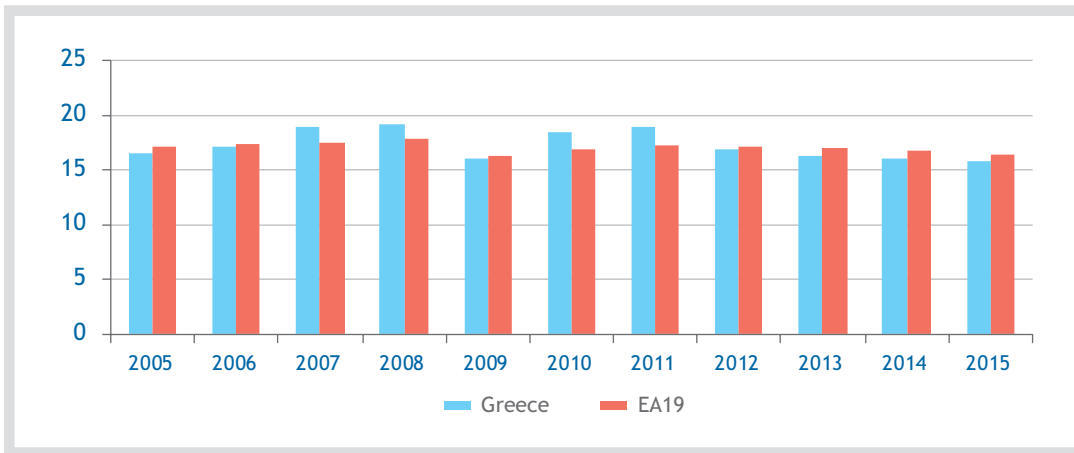
Concerning forward participation in GVCs (i.e., the domestic value added incorporated in intermediate goods or services exported to a partner economy that re-exports them), Greece is close to the EA19 average. Both Greece and the EA19 have remained rather stable during the examination period (2005-2015), but Greece shows some signs of contraction, since forward participation declined from 2012 to 2015 (Figure 3.2.6). In total, Greece's participation in GVCs (backward and forward linkages) exceeds the EA19 average (Figure 3.2.7). Both follow a similar pattern, augmenting after the global financial crisis of 2008-2009, reaching their peak in 2012 and reducing afterwards.

Figure 3.2.5
Backward participation in GVCs (% share in total gross exports)



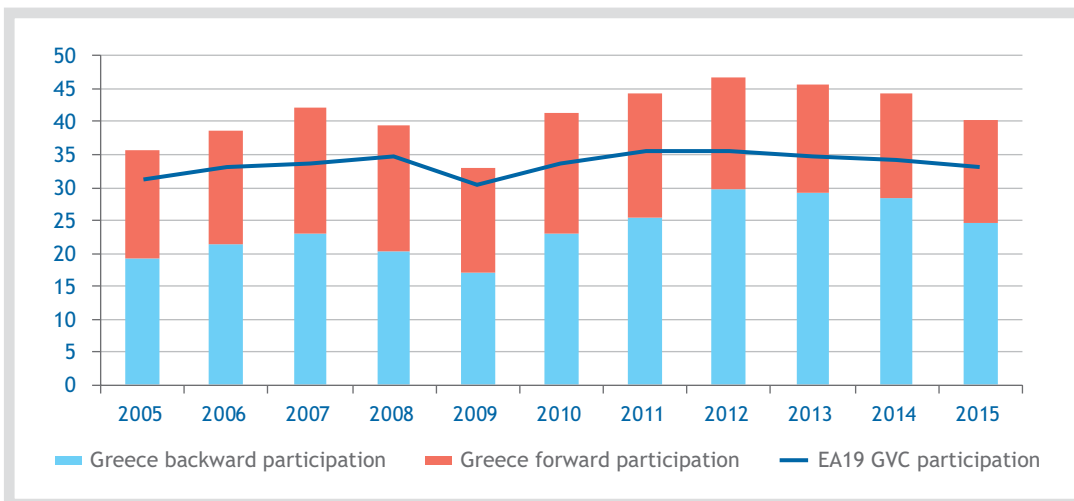
Source: OECD database, Trade in Value Added.

Figure 3.2.6
Forward participation in GVCs (% share in total gross exports)



Source: OECD database, Trade in Value Added.

Figure 3.2.7
Participation in GVCs (% share in total gross exports)



Source: OECD database, Trade in Value Added.

Examining the sectoral backward linkages, it becomes apparent that the exports of the manufacturing industry are heavily dependent on imported inputs. The foreign value added contribution to the industry’s gross exports is 36%, well above the EA19 average, while the corresponding figure for the remaining sectors is close to 15% (Table 3.2.2).

The detailed and thorough examination of GVCs (where the country is positioned in global supply chains, i.e., whether it is engaged in low-cost, labour-intensive activities or in high value-added, knowledge-intensive activities, whether it is heavily dependent on imported

Table 3.2.2**Foreign sectoral value added contributions to gross exports (percentage share in industry's total gross exports), 2016**

Export industry	Greece	EA19
Agriculture forestry and fishing	15.9	13.8
Mining and quarrying	14.4	13.0
Manufacturing	36.0	19.1
Electricity, gas, water supply, sewerage, waste and remediation services	15.2	16.3
Total services (including construction)	13.3	12.4

Source: OECD database, Trade in Value Added.

input or export intermediate products so that the greater part of the final good's value is created outside the borders, or both) should play an important role in shaping the country's competitiveness and growth strategy. Upgrading to high value-added and knowledge-intensive activities could prove vital for Greece, as low-cost economies increase their participation in GVCs. Moreover, investing in knowledge, research, innovation and technology has significant spillover effects for the entire economy. Nevertheless, it should be noted that neither the 'brain-drain' and 'brain-waste' phenomena that Greece is experiencing nor the extremely low levels of R&D expenditure (R&D expenditure in Greece as a percentage of GDP was 1.13%, i.e., 189€/inhabitant, while the EA19 average was 2.15%, i.e., 708€/inhabitant) help towards that direction. Public policies can play an important role in enhancing the participation in GVCs and in upgrading/moving up the value chain. These policies do not only refer to trade liberalisation and facilitation, but also (and maybe more importantly) to education, infrastructure and industry-specific institutes (Ravenhill, 2014).

3.3. Competitiveness indicators at the regional level

Regional competitiveness is described as “the ability of a region to offer an attractive and sustainable environment for firms and residents to live and work” (Annoni et al., 2017). Neither the characteristics nor the problems or dysfunctionalities of a country uniformly apply to all its regions. In most countries, there is a gap, especially between the capital region and other regions. This (core-periphery) gap is particularly wide in the case of Greece, as shown in Section 2.3.

The EU Regional Competitiveness Index (RCI) is a composite indicator of competitiveness mainly inspired by the GCI. It consists of eleven pillars grouped into three categories: a) basic dimension (institutions, macroeconomic stability, infrastructure, health and basic

education),⁷ b) efficiency dimension (higher education and lifelong learning, labour market efficiency and market size) and c) innovation dimension (technology readiness, business sophistication and innovation). As it becomes apparent from Table 3.3.1, Greek regions reside at the end of the scale. However, Attiki, the capital region, performs significantly better in the efficiency and innovation categories compared to the other regions.

As expected, Greece has the second largest dispersion of RCI score within countries (Annoni et al., 2017), meaning that there are significant differences among regions. Attiki scores slightly better than the EU average in only three pillars (health, higher education and lifelong learning, and market size) and significantly better only in business sophistication (Figure 3.3.1).

In more detail (see Table 3.3.2), Greek regions perform better or close to similar regions (i.e., the 15 regions with most similar GDP per capita) in only two pillars, i.e., health and business sophistication (the only exception is Notio Aigaio that underperforms in business

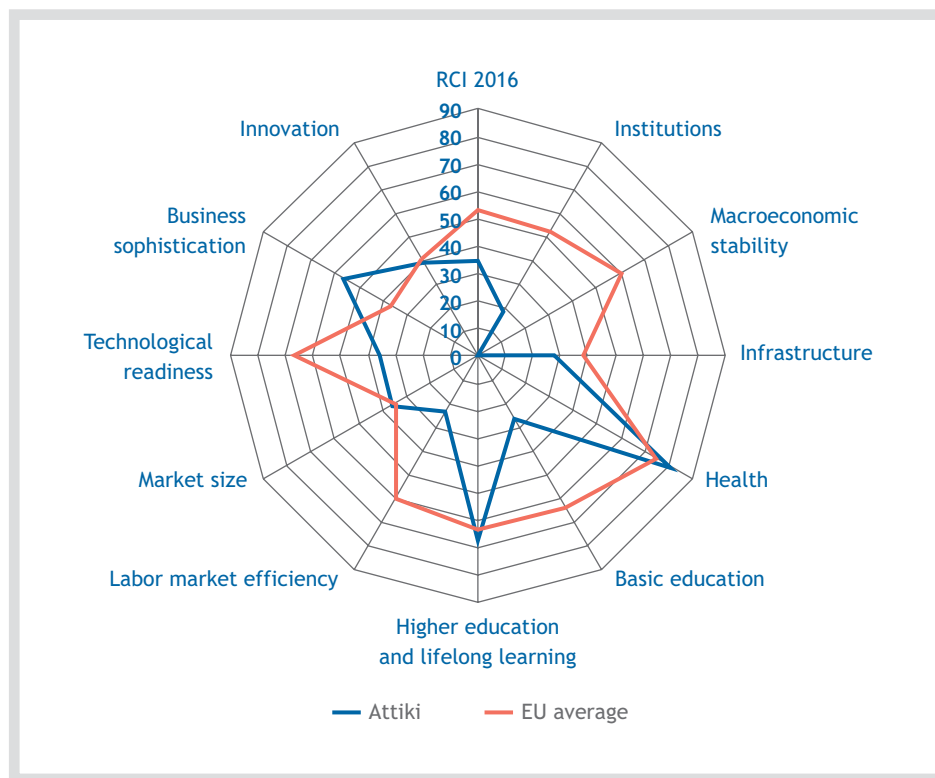
Table 3.3.1
RCI ranking of Greek regions (out of 263 regions), 2016

Region	RCI 2016	Dimensions		
		Basic	Efficiency	Innovation
Attiki	193	240	179	149
Voreio Aigaio	249	249	247	227
Notio Aigaio	244	253	234	251
Kriti	250	248	251	228
Anatoliki Makedonia, Thraki	261	260	260	249
Kentriki Makedonia	242	243	237	214
Dytiki Makedonia	252	251	244	248
Ipeiros	248	254	243	240
Thessalia	247	246	246	238
Ionia Nisia	256	243	254	245
Dytiki Ellada	257	262	256	231
Stereia Ellada	258	243	259	252
Peloponnisos	258	254	258	250

Source: European Regional Competitiveness Index 2016.

7. For the macroeconomic stability and the basic education pillars, all regions have the same ranking since they are calculated at the country level.

Figure 3.3.1
Attiki's RCI scores and the EU average



Source: European Regional Competitiveness Index 2016.

sophistication). Most regions (11 out of 13) also perform close to similar regions as far as higher education and lifelong learning is concerned. Notio Aigaio is the region that underperforms in almost all pillars with the exception of health, while all island regions (Notio Aigaio, Voreio Aigaio, Kriti and Ionia Nisia) underperform in infrastructure and market size compared to similar regions.

Macroeconomic stability and basic education are assessed at the national level and, therefore, all regions have identical scores (it should be noted that macroeconomic stability takes the value 0 and Greece is ranked last among the 28 EU member states). Apart from macroeconomic stability, the most problematic pillar is labour market efficiency, as 10 out of 13 regions exhibit weakness relative to similar regions. It is also noted here that, according to the OECD (2018), Greek regions face an increased risk of automation, in terms of the percentage of jobs with over 70% of risk of being automated, with Sterea Ellada having the highest percentage of jobs at high risk of automation in the country.

Therefore, regional competitiveness is an important aspect and should be taken into account when competitiveness is measured and competitiveness-enhancing policies are designed. The virtues, strengths and advances of a country are not equally distributed among regions, but the challenges and difficulties a country faces are the sum of all regional problems and even more.

Table 3.3.2
RCI's pillar scores and ranking (out of 263 regions), 2016

	Institutions	Macroeconomic stability	Infrastructure	Health	Basic education	Higher education and lifelong learning	Labour market efficiency	Market size	Technology readiness	Business sophistication	Innovation
Attiki	18.9 (243)	0 (28/28)	27.85 (145)	80.9 (129)	26.5 (25/28)	67.1 (101)	23.7 (241)	36.3 (104)	35.8 (232)	56.2 (27/263)	39.4 (132/263)
Voreio Aigaio	23.2 (228)	0 (28/28)	2.28 (255)	81.0 (124)	26.5 (25/28)	56.9 (181)	7 (254)	2.8 (257)	29 (236)	20.9 (209)	20.7 (206)
Notio Aigaio	23.2 (228)	0 (28/28)	0.21 (258)	79.6 (144)	26.5 (25/28)	44.9 (239)	37.9 (229)	6.9 (246)	29 (236)	15.4 (231)	5.7 (255)
Kriti	23.2 (228)	0 (28/28)	6.4 (238)	78.5 (156)	26.5 (25/28)	49.5 (220)	15.9 (245)	2.8 (257)	29 (236)	22.6 (202)	17.1 (229)
Anatoliki Makedonia, Thraki	20.6 (233)	0 (28/28)	4.61 (249)	71.1 (192)	26.5 (25/28)	42.9 (246)	9.3 (249)	4.7 (252)	26.1 (243)	18.5 (220)	6.2 (253)
Kentriki Makedonia	20.6 (233)	0 (28/28)	13.38 (203)	78.8 (156)	26.5 (25/28)	59.7 (163)	6.1 (257)	11.3 (224)	26.1 (243)	32.9 (150)	19.9 (210)
Dytiki Makedonia	20.6 (233)	0 (28/28)	5.5 (243)	79.7 (144)	26.5 (25/28)	55.5 (191)	6.5 (255)	8.8 (237)	26.1 (243)	15.9 (228)	9.7 (250)
Ipeiros	19.8 (238)	0 (28/28)	3.34 (252)	79.4 (150)	26.5 (25/28)	55 (193)	10.6 (247)	7.9 (240)	26.1 (243)	18.7 (218)	18.5 (219)
Thessalia	20.6 (233)	0 (28/28)	8.19 (227)	81.2 (124)	26.5 (25/28)	58.2 (171)	1.5 (262)	9.1 (235)	21.7 (248)	30.5 (164)	10 (248)
Ionia Nisia	19.8 (238)	0 (28/28)	2.88 (253)	87.7 (39)	26.5 (25/28)	48.3 (225)	8.9 (250)	7.4 (243)	21.7 (248)	27.2 (184)	5.6 (255)
Dytiki Ellada	19.8 (238)	0 (28/28)	2.87 (253)	67.5 (202)	26.5 (25/28)	53.4 (199)	0 (263)	5.4 (248)	21.7 (248)	26.5 (187)	17.9 (222)
Stereia Ellada	19.8 (238)	0 (28/28)	12.39 (210)	80.4 (135)	26.5 (25/28)	45.9 (236)	2.4 (261)	9.5 (233)	21.7 (248)	20.6 (212)	1.0 (260)
Peloponnisos	19.8 (238)	0 (28/28)	10.75 (218)	74 (182)	26.5 (25/28)	47.3 (230)	3.7 (259)	7.8 (241)	21.7 (248)	22 (204)	5.4 (257)

Source: European Regional Competitiveness Index 2016.

Note: Ranking is denoted in parentheses. Gray indicates weakness relative to the 15 regions with the most similar GDP per capita. Yellow indicates neither strength nor weakness relative to the 15 regions with the most similar GDP per capita. Green indicates strength relative to the 15 regions with the most similar GDP per capita.

4. Explanation of Trends in Productivity and Competitiveness

4.1. Overview of recent literature on Greek productivity and competitiveness

There have been several studies in the last years that investigate issues related to the productivity and/or competitiveness of the Greek economy. In Table A1 of the Appendix, we report the related studies conducted by KEPE. Not surprisingly, many of these studies focus on the effects of the post-2010 measures imposed on the Greek economy. Some of the central conclusions are that there is a significant productivity and competitiveness gap between Greece and its international competitors, while the process of the internal devaluation has not been proved sufficient to improve the competitiveness of the Greek economy. Thus, most of the analysts propose that an increase in the openness of the Greek economy should be achieved mainly through structural reforms.

Galanos et al. (2019) analyse the performance of the Greek economy on competitiveness and make a comparative analysis of its position before and during the crisis. More specifically, the authors explore and analyse the causes of the reduced impact of policies designed to increase the competitiveness of the country. The analysis indicates that the policies dictated by the Memoranda of Understanding (MoU), which aimed at enhancing the country's competitiveness, failed to achieve their goal due to the structural weaknesses of the Greek economy. The authors conclude that future policies should be based on the most extrovert parts of the Greek economy, like tourism and agricultural production. Ioannou et al. (2019) argue that the pre-crisis institutional framework for wage-setting policy contributed substantially to the erosion

of Greece's competitiveness. According to the authors, Greece attempted to introduce earnings equivalent to those of a higher-income developed country, without offering the framework for market operations, the institutional maturity and the possibility to develop the private economy and the sector of 'international tradable goods', as in the case of other higher-income developed countries. In this context, the authors conclude that decisions to increase wages must be linked to increased productivity in the 'international tradable' goods and services sectors and that productivity growth is a prerequisite for parallel wage growth and the only way to distribute a 'productivity dividend' to society without undermining growth.

Ioannides (2015) analysed growth-hampering features of the Greek educational system and discussed in depth growth-enhancing properties of market deregulation. The author argues that small improvements in many markets and industries can add up to significant contributions to Greece's TFP growth performance. According to the author, the fundamentals are there for a full recovery and accelerated growth, if only we let free the forces that produce and sustain economic growth, i.e., human capital and good institutions. Moreover, the adverse impact of regulation intensity on the TFP growth of less productive sectors/laggard industries of the Greek economy was demonstrated in the recent study of Athanassiou et al. (2019b), although a non-significant association was found between upstream regulation and the TFP growth of network industries (energy, transport and communication).

Leounakis and Sakellaris (2014) decompose Greek economic growth for the years 1960-2013 into the contributions of capital, labour and TFP. Employing the standard growth accounting framework, the authors conclude that the decisive factor of influence on economic growth during the last fifty-three years has been TFP. More specifically, the authors find that the average growth rate of 8.08% over the period 1960-2013 was due to TFP and capital input, contributing by 5.71% and 2.51%, respectively. Moreover, the authors argue that, contrary to widespread belief, TFP growth was very healthy before the crisis that started in 2008.

Vettas (2016) provides a sector and country analysis of growth and TFP in Greece for the period 1970-2004. His findings indicate that TFP was the main determinant of growth in the period under consideration. However, this result reflects the dominant role of TFP in the 1970s and its significant contribution in the 1980s, since it became negative in the 1990s. The sectoral analysis reveals that TFP increased during the overall period only in Industry. As for the TFP determinants, he finds that: a) there was not a statistically significant role of public capital, since TFP was determined by technological progress, technical efficiency and returns to scale; b) the positive contribution of technological progress was high and stable; c) there was a continuous drop in technical efficiency during the examined period, with a negative and increasing impact on TFP and d) there was a positive effect of returns to scale only during the 1970s. Furthermore, it is found that labour productivity increased throughout the examined period, though with fluctuations in the rate of growth. The fastest increase was in the 1970s (+2.7%) and the slowest during 2000-2004 (+1.4%). As for the labour productivity determinants, the author found that: a) it was mainly due to TFP

increase, and b) there were similar positive effects from the changes in capital per person employed and intermediate inputs per person employed.

Malliaropulos (2010) constructs sectoral indices of price and wage competitiveness of the Greek economy and combines them into two aggregate indices of Real Effective Exchange Rates. The results indicate that the competitiveness of the Greek economy has declined by 10% since 2000, both in terms of relative prices and unit labour costs, which is lower than usually reported. He finds that the deterioration in competitiveness took place in the agricultural and industrial sectors and not in the service sector, which represents about 80% of the private economy. The author argues that the need for internal devaluation is not as large as markets seem to discount and that relative wage costs will most likely decline due to the (then) ongoing recession in Greece, which, combined with higher labour market flexibility and a weaker euro, would help to restore competitiveness over the next years. Finally, the author suggests that economic policy must focus on structural reforms in product markets that enhance price competitiveness, innovation and productivity.

By using input-output data from the Symmetric Input-Output Tables for the year 2010, Mariolis et al. (2019) provide empirical estimations of the medium- and long-run effects of wage and currency devaluations on international price competitiveness and income distribution for two 'PIIGS economies', i.e., Greece and Italy. The findings reveal certain differentiated socio-technical production conditions in the economies under consideration, casting doubt on the effectiveness of demand-switching policy measures implemented in the post-2010 EA economy. Hence, they rather call for a wider and more flexible strategy framework that includes, on the one hand, an intra-EA industrial, trade and currency depreciation policy and, on the other hand, country- and sector-specific wage rate changes and demand management policies.

Malliaropulos and Anastasatos (2013) argue that the adjustment in the current account of the Greek economy primarily comes from the imports side, as a result of declining disposable incomes and the collapse of investment, the latter having negative repercussions on the growth potential of the economy. Exports have not recovered as aggressively as one would have expected, given the size of the improvement in price competitiveness, in terms of Unit Labour Cost, that the Greek economy has achieved in the previous years. The authors argue that the country's effort to regain its lost competitiveness by nominal wage cuts, i.e., internal devaluation, is not sufficient, since the problem of competitiveness is twofold and involves primarily the transfer of resources from sectors producing non-tradable services to export-oriented sectors and sectors that produce import-substituting goods. Furthermore, it is argued that horizontal wage cuts motivate the survival of labour-intensive, low technology sectors, thereby moving the specialisation paradigm of the country away from high value-added activities. The authors conclude that, in the short run, supporting the liquidity of healthy, export-oriented business should be a priority, while, in the long run, considerations of quality competitiveness should take center stage. Furthermore, it is argued that, since productivity growth has multiplicative effects on competitiveness, productivity growth should be the main tool to improve competitiveness in the long run.

We note that the findings presented in the current report (see Sections 2.1 and 4.2.2 below) regarding the evolution and the decomposition of productivity growth in its proximate determinants are broadly in line with those found in the existing literature. In particular, the use of growth accounting decomposition allows us to identify TFP as a decisive factor influencing economic growth during the entire post-war period, enhancing output growth during upswings and retarding output growth during downturns. Moreover, the close link between productivity and competitiveness is also established.

McKinsey & Company (2012) outlined a new growth model and strategy for economic development in Greece, founded on the principles of competitiveness, productivity, extroversion, investment stimulation, and employment growth. For this purpose, the study analysed the structure and development prospects of key sectors, and fundamental cross-sector macroeconomic drivers, challenges and opportunities of the Greek economy. Thereafter, the study focused on the five largest (in terms of gross value added) sectors and eight smaller areas of the economy that have significant potential to fuel the country's economic growth in the next years. According to this study, in addition to the fiscal and debt crises, the country is facing competitiveness and employment challenges. A combination of economic, political and social factors has contributed to the poor foreign investment, productivity and employment record. Productivity is lagging across sectors (then almost 30% lower than the EU-15 and 40% lower than the US), primarily due to the relative lack of larger-scale enterprises, which maximise output through economies of scale and scope. It was argued that the fiscal stabilisation programme needs to be complemented with a robust and sustainable new National Growth Model and strategy.

Finally, a Growth Strategy was prepared and implemented by the Greek authorities and was presented for the first time to the Eurogroup on April 27, 2018. The timely and effective implementation of the Strategy's reforms and policies will strengthen Greece's long-term growth potential, boost investments, support innovative and export-oriented entrepreneurship, create more and better jobs and contribute to the improvement of the welfare state, which is considered both as a factor and an indicator of development. In May 2019, the Greek authorities proceeded the first update of the Strategy, which defines 40 Key Performance Indicators (KPIs) for supporting the implementation, monitoring, evaluation and public awareness of policies.⁸ Finally, it includes reforms and policies of the 2019 National Reform Programme and puts under implementation the priorities of the European Commission's Annual Growth Survey, such as delivering high-quality investment, enhancing productivity, promoting inclusive growth, improving institutional quality and ensuring sound public finances. On the basis of the above framework (i.e., the Growth Strategy and the National Reform Programme), we will next focus on the macroeconomic drivers of the productivity growth of Greece and the per-driver policies of the Greek authorities.

8. The KPIs that are combined with the issue of productivity and competitiveness are given in Table A2 of the Appendix.

4.2. Drivers of productivity growth in the Greek economy

4.2.1. Macroeconomic drivers of productivity growth

There is a general understanding of the main determinants or drivers of productivity growth. Certain factors are critical for determining productivity growth (e.g., OECD, 2001). The main drivers, which interact with each other and underlie long-term productivity performance refer to (see, e.g., Office for National Statistics, 2007): investment, innovation, skills, enterprise and competition.

In what follows, we show how these drivers also apply to the case of Greece.⁹

- *Investment in physical capital-machinery, equipment and buildings*: The more capital workers have at their disposal, generally the more efficient they are, producing more and better-quality output. During times of economic crisis, industrially developed countries have proved to be more resilient. In addition, due to its higher contribution to productivity growth, manufacturing improves competitiveness, exports and the trade balance. The Greek authorities have systematically stressed that the development of manufacturing is not only a priority, but also a necessary condition for the long-term sustainability of the Greek economy. Furthermore, the construction of modern, efficient and accessible networks is essential for increasing productivity. Moreover, Foreign Direct Investment (FDI) supports the transfer of technology, innovation and knowledge, and enhances productivity.
- *Innovation*: This is the successful exploitation of new ideas, which can take the form of new technologies, new products or new corporate structures and ways of working. Speeding up the diffusion of innovations can boost productivity. Investments in technological equipment, innovation and the improvement of production processes have a major impact on Greek productivity. The Greek authorities are implementing a full set of actions in order to improve the country's innovation system performance, with special attention on the innovation capacity of enterprises.
- *Skills*: These are defined as the quantity and quality of different types of labour available in an economy. They complement physical capital and are required to take advantage of investment in new technologies and organisational structures. The transition to a growth model based on quality, innovation and higher value-added activities requires adequate skills and knowledge.
- *Enterprise (entrepreneurship)*: This is defined as the seizing of new business opportunities by both start-ups and existing firms. New enterprises compete with existing firms through new ideas and technologies, increasing competition. Entrepreneurs are able to combine factors of production and new technologies, forcing existing firms to adapt or exit the market. SMEs in Greece employ 6 out of 10 em-

9. More analytically, see European Commission (2019c).

ployees compared to 3 out of 10 on average in the EU. The performance gap between micro-enterprises and large ones in terms of productivity has also widened in Greece compared to other European economies. Promoting policies for increasing the productivity of SMEs is therefore a key strategic challenge.

- *Competition:* This improves productivity by creating incentives to innovate and ensures that resources are allocated to the most efficient firms. It also forces existing firms to organise work more effectively through imitations of organisational structures and technology. Therefore, improving the business environment is a key priority in order to increase business productivity. To the contrary, oligopolistic conditions create disincentives for investment, having an adverse impact on the dynamism of the economy, productivity and consumer welfare.

The per-driver policies aiming to boost Greek productivity (which are further specified in detail in section 4.3) are outlined below.¹⁰

Investment:

- The Industry Forum, the Sectoral Action Plan for the Pharmaceutical Industry and the Agriculture, Tourism and Agri-Food Forum are initiatives which aim to stimulate strategic public-private partnerships and promote sectoral linkages.
- The new Investment Law provides specific support for innovation-oriented investments in manufacturing and industry.
- The new Strategic Investment framework aims to create, attract and support high-quality investments, introducing incentives for R&D-driven investment in the industry sector. The services of “Enterprise Greece”, the official agency of the Greek State to promote investment and exports, are being upgraded.
- Actions have been implemented for the effective operation of large business units (i.e., establishing Large Business Unit Parks and providing incentives for establishments in Business Parks).
- The new Special Planning Framework for industrial activities.
- The operation of the Hellenic Development Bank (HDB) will contribute through appropriate investment tools to the development of a strong domestic production based on higher added-value, export-oriented and innovative manufacturing businesses (see also Box 2).
- Enhanced co-operation with international financial organizations (e.g., EIB, EBRD).
- Implementing, in close cooperation with the EU, integrated strategies and actions in the following network and infrastructure industries: Energy (National Energy and Climate Plan); Digital infrastructures (National Digital Strategy); Transport (National Strategic Transport Plan) and Logistics (National Action Plan for Logistics); Restructuring of State-Owned Enterprises (HCAP).

10. See European Commission (2019c) and Ministry of Economy and Development (2018a).

- A new policy framework for Public-Private Partnerships is under completion in order to increase the impact of PPPs on investment and growth.
- A gradual reduction of corporate taxation has been legislated.
- High-level diplomatic and political initiatives have been introduced in order to promote the growth potential of Southeastern European economies by facilitating regional business and investment activities (co-development of the Balkans).

Innovation:

- New institutions have been established for promoting innovation: EquiFund and the Hellenic Foundation for Research and Innovation (ELIDEK).
- “Flagship initiatives” (horizontal research actions) are under implementation in emerging research fields with a strong innovation potential.
- Implementation of 685 cooperative research and innovation projects between Higher Education Institutions, Research Organisations and Companies.
- Tax incentives for private investments in R&D.

Skills:

- Upgrading Active Labour Market Policies (ALMP): Reorganisation of the Public Employment Service (OAED) aiming at improving its efficiency and the quality of services delivered to the public.
- An institutional reform is also underway aiming to an open framework set of ALMPs.
- Framework regarding the Labour Market Needs Identification Mechanism.
- Action Plan for Human Capital Development.
- Reform of Vocational Education and Training (VET) and Vocational Schools.

Enterprise:

- Establishing a Support Network for SMEs.
- Supporting the operation of businesses in less-favoured areas.
- Supporting Business Chambers.
- Improving the access of SMEs to public procurement.
- Scaling up: Support of co-operation, networks and mergers for SMEs (specific provisions in the new Investment Law, specific programmes of the National Strategic Reference Framework, and new legislation on corporate mergers).

Competition:

- Digitising business registration (electronic One Stop-Shop) (see also Box 4).
- Modernising the General Commercial Registry.

- Simplifying licensing and inspection procedures.
- Modernising Corporate Law.
- Supporting exports through the implementation of the Export Promotion Action Plan and the removal of export-related administrative barriers.
- Completing of the National Spatial Planning Framework and Cadastre.
- Speeding-up case processing (Justice).
- Promoting e-commerce.
- Major interventions have been completed based on the three successive Competitive Assessment Reviews conducted by the OECD and the Hellenic Competition Authority (HCC) in order to identify and remove harmful regulations.
- An Entrepreneurship Observatory is being established, in collaboration with the Structural Reform Support Service (SRSS). The observatory is expected to contribute to a more effective and efficient policy design.

For a first attempt to evaluate the impact of some of these reforms, see Athanassiou et al. (2019a). Given that it is too early to assess the impact of all these reforms on the Greek economy, KEPE will have to evaluate them in the future, when the necessary data are available.

4.2.2. Sectoral-level determinants of productivity

Productivity at the sectoral level is influenced by several factors. In this section, we focus on the proximate sources of growth utilising a growth accounting framework that takes into consideration capital heterogeneity. We account for seven distinct types of capital assets, including dwellings, other buildings and structures, transport equipment, ICT equipment, other machinery, cultivated biological assets and intellectual property rights. Due to the lack of data on the quality of the labour force employed per sector of economic activity, we do not account for differences in the quality of the labour force. However, it should be noted that the intense brain-drain phenomenon during the period of economic crisis has limited the availability of labour in the Greek economy, particularly in high-tech and knowledge-intensive sectors.

Our results (Table 4.2.1) indicate that there is significantly different behaviour across the various sectors of economic activity, in terms of TFP. During the period under consideration (2000-2016), the largest TFP gains were found in the real estate sector, followed by the accommodation and food services sector (a sector closely associated with the tourism industry). Conversely, in all other sectors, TFP contributes negatively to output growth. Labour input appears to have a positive influence on the output of services sectors and a negative impact on primary and secondary industries, possibly indicating a skill gap on technical education and job training practices.

Table 4.2.1
Output growth (%) decomposition by sector of the Greek economy
during 2000-2016

Sectors	Output	TFP	Labour	ICT	Non-ICT	Other ¹
Total	-0.11%	-0.31%	-0.32%	0.03%	0.33%	0.16%
Agriculture, forestry and fishing	-0.61%	0.93%	-1.67%	0.04%	0.09%	0.00%
Mining and quarrying	-2.45%	-1.86%	-0.62%	0.02%	0.01%	0.00%
Manufacturing	-1.17%	-0.40%	-1.27%	0.03%	0.47%	0.00%
Electricity, gas, steam and air conditioning supply	0.09%	0.93%	-0.81%	0.01%	-0.03%	0.00%
Water supply; sewerage, waste management and remediation activities	-0.94%	-0.20%	-0.34%	0.16%	-0.57%	0.00%
Construction	-1.06%	-1.17%	-1.46%	0.12%	1.45%	0.00%
Wholesale and retail trade; repair of motor vehicles and motorcycles	-2.86%	-3.23%	-0.09%	0.11%	0.35%	0.00%
Transportation and storage	0.77%	-0.92%	-1.48%	0.01%	3.16%	0.00%
Accommodation and food service activities	2.32%	1.91%	0.55%	0.11%	-0.25%	0.00%
Information and communication	0.57%	-0.22%	0.57%	0.68%	-0.46%	0.00%
Financial and insurance activities	-0.40%	-0.49%	-0.86%	0.52%	0.43%	0.00%
Real estate activities	3.31%	2.41%	0.05%	-0.02%	0.09%	0.77%
Professional, scientific and technical activities	-0.25%	-2.52%	1.85%	0.15%	0.27%	0.00%
Administrative and support service activities	-1.11%	-7.54%	1.95%	1.35%	3.14%	0.00%
Public administration and defence; compulsory social security	0.96%	-0.02%	0.24%	0.03%	0.73%	-0.01%
Education	1.38%	-0.14%	1.44%	0.08%	0.00%	0.00%
Human health and social work activities	-2.04%	-3.80%	0.55%	0.23%	0.98%	0.00%
Arts, entertainment and recreation	1.06%	-1.14%	0.35%	0.01%	1.85%	0.00%
Other service activities	0.48%	-0.96%	1.08%	0.00%	0.36%	0.00%

Source: Eurostat, authors' own calculations.

Note: 1. Other include cultivated biological assets and intellectual property rights.

Turning to the impact of different capital stock assets, we find that ICT equipment played only a minor role in output growth, possibly indicating the low technological level of the capital stock employed throughout the Greek economy. Critically, though, ICT equipment

appears to have significantly influenced output growth in the sectors of information and communication, and administrative services. In those two sectors, the capital stock has accumulated more rapidly during more recent years, compared to other sectors. Intellectual property rights had a significant role in financial and insurance activities, as well as in administrative and support service activities, and in professional and scientific activities, indicating the use of highly patented products in those sectors. Non-ICT capital appears to have systematically positively influenced output growth, except for the water industry and telecommunications, and its effect was, in general, greater than that of ICT capital.

Overall, our results indicate significant heterogeneity on the effects of ICT and non-ICT capital within sectors, and also the systematic underperformance of TFP. Moving away from the proximate sources of output growth, an analysis of the deeper determinants of productivity growth is required. The literature (for example, Syverson, 2011) identifies infrastructure quality, R&D expenses, human capital, energy costs, incentives, management practices, barriers to entry, and macroeconomic stability, among others, as key parameters in facilitating productivity growth (see also the previous section). An econometric analysis of those parameters at the sectoral level requires an extensive dataset presently lacking. However, preliminary analyses on the aggregate level point to the significance of all those parameters in the medium run.

4.2.3. Regional-level determinants of productivity

Regional-level changes in productivity can be associated with effects which are either common in the EU and the whole country, or endogenous to regional economies, including how they are specialised and concentrate or disperse their industrial activities. Specifically, the processes of globalisation and the international fragmentation of labour and value-added production are considered as having intensified the sectoral concentration and the single (vs. multiple) specialisation of regions, or geographically dispersed specialisation patterns, in order for local (and more vulnerable) industries to retain their productivity levels and be protected from the exposure to globalised market competition. Compared with the concentration of new and higher-technology sectors in the core regions of Europe, traditional and lower-technology sectors tend to concentrate in the periphery, including Greece. As a result, regions in the EU periphery are likely to increase their dependence on lower-technology sectors and reduce their competitiveness with regard to the ability to innovate and produce higher value-added goods (IGEAT-ULB, 2008, Vegeulers, 2017).

Regional productivity can vary with the local market structure and competition conditions, age and size of firms, adoption and use of ICT, local government efficiency, and the ability to achieve economies of scope and scale in the same and neighbouring regions. The fact that the most diversified region of Attiki is the most developed and persistently the most productive/efficient one (see Section 2.3) can be largely attributed to the higher technology, denser value-added networks and increased complexity pertaining to its products, and its improved performance in innovation and knowledge diffusion, compared to the other regions.

Nonetheless, some peripheral regions (especially, the island ones) whose economy is traditionally concentrated in sectors which are natural-resource-based and outward-looking, in terms of being more open and more integrated to the global economy (such as agriculture, as long as it relates to agricultural exports, and tourism) have also increased TFP, compared with other regions with a more diversified productive base. Namely, the sectoral concentration of local economies can possibly allow regions to better/more easily adjust to the changing competition conditions and create or expand their networks to international markets according to their local comparative advantages.

The low productive performance of the Greek regions, in relation to core EU regions, and the considerable disparities between the core (Attiki) and peripheral regions of the country, in terms of both the labour productivity and TFP, can be attributed to a range of factors. These encompass the complex geomorphological terrain (with the large mountainous blocks and the scattered island complexes, which hinder the accessibility and the ease of service provision), the small size of firms, the difficulty of doing business and creating new and high value-added employment positions, and the limitations to developing or exploiting economies of scope and scale (Papaioannou et al., 2017; OECD, 2019b).

Several studies have underlined the significant role of local activity clusters, in the form of industrial areas, science and technology parks, and logistics parks, to promote innovation, through knowledge spillovers, and to create productivity gains, through increasing returns to scale in production, originating from additional infrastructure and specialisation/concentration of higher value-added goods and services (Vagionis and Spence, 1994; Tsekeris, 2016; Papaioannou et al., 2017). Nevertheless, past government policies failed to create a more 'even' regional development, either through the establishment of industrial areas or through the provision of investment grants and other allowances, largely due to the dominance of market or efficiency-oriented firm location processes (Labrianidis and Papamichos, 1990).

A combination of investment incentives and environmental restrictions, lower land rent and relatively easy access to amenities contributed to the strong tendency of firms to locate in large urban centres, especially in the leading metropolitan regions of Attiki and Thessaloniki, and their neighboring prefectures (Louri, 1988; Petrakos et al., 2012; Papaioannou et al., 2017). These distortions were exacerbated by the loose and reactive character of the national spatial planning system, which led to several amendments, exemptions and special (bypassing) laws, and encouraged built-up area dispersion in peri-urban areas, coastal zones and along road axes (Getimis and Giannakourou, 2014; Tsilimigkas et al., 2016).

In addition to the dominant role of urbanisation economies, the intense spatial variations in productive efficiency can be attributed to interregional market access, which is mostly related to transport connectivity, the intraregional dispersion of urbanisation economies, the degree of specialisation and sectoral concentration, and the human capital and R&D investment in each region (Papaioannou et al., 2017; Tsekeris and Papaioannou, 2018). Additionally, political factors associated with the highly centralised process of investment allocation decisions in the country have arguably inhibited productivity growth. This process often involves conflicting objectives and fails to coordinate policies and exploit synergies across tiers of government, deviating from criteria of economic efficiency and

giving emphasis to other (equity and political rent-seeking) considerations (Tsekeris, 2014; Rodríguez-Posé et al., 2016). It is also stressed that, although a decentralisation of management to regional authorities was legislated in 2011 ('Kallikratis' plan), the overlapping of responsibilities, the lack of administrative/enforcement capacity and the absence of available resources due to fiscal constraints deterred regions from exercising local-specific policies.

4.3. Public policies aiming at boosting productivity

The distribution and nature of pre-crisis investment, despite its relatively high levels, was extremely ineffective. About 50% of investments were in housing construction and non-international tradable sectors of the economy. Therefore, the structural transformation of the Greek economy is crucial. The country needs an investment boom that will focus on economic activities that increase value added, exports and employment, incorporating the relevant Sustainable Development Goals (SDGs). The goals of this strategy are to increase the extroversion of the Greek economy, accelerate the technological upgrading of businesses, increase the value added of goods and services, and support SMEs to develop and integrate them into global value chains and, of course, to increase employment. To sum up, the Greek authorities are focusing on:

- Increasing the openness of the economy by prioritizing marketable sectors with the potential to penetrate international markets.
- Increasing the value added of goods and services.
- Increasing employment through sectors and across regions.
- Supporting SME development, including through partnerships, mergers and incorporation into global value chains.
- Enhancing the R&D department staff capacity and upgrading the knowledge of employees.

Hence, it is not only a horizontal framework, but it also addresses specific needs of the Greek economy, corresponding to sectors and SMEs. In what follows, these public policies aiming to boost productivity are illustrated.

Sectoral policies

The detailed analysis of the key sectors of the Greek economy does not fall within the scope of this report. However, we refer to them in order to map the structural economic base of Greece. During the last years, several researchers have analysed the intersectoral structure of the Greek economy and have attempted to identify its key sectors.¹¹ Despite the diversity of the theoretical frameworks used in each study, it seems that the central

11. See, e.g., Belegri-Roboli et al. (2010); Athanassiou et al. (2014); Mariolis and Soklis (2015); Ntemiroglou (2016); Tsekeris (2017b); Mariolis et al. (2018).

conclusions are the same. More specifically, most studies conclude that an effective demand management policy for the Greek economy should be mainly based on the services sector and, secondarily, on the primary sector.

On the other hand, there are only a few industrial sectors that could significantly affect the output or the employment of the economy, while it has been reported that the Greek economy, and especially its industry sector, is heavily dependent on imports. Therefore, since the Greek economy has faced serious external imbalances and should strengthen its export performance (see also Oelgemöller, 2013; Collignon and Esposito, 2017), special attention should be given to the tradable sectors of the economy. In Tables 4.3.1 and 4.3.2, we present the tradable key and anti-key sectors (i.e., sectors characterised by relatively low output and employment multipliers and, at the same time, relatively high import multipliers) of the Greek economy, respectively, and their correspondence to NACE,¹² that have been detected in a recent study and that we consider as sufficiently representative.¹³

Furthermore, contrary to the initial beliefs, the public sector seems to play a significant role in terms of output and employment in the Greek economy. Table 4.3.3 reports the arithmetic means of output, import and employment multipliers for the primary sector, the industry sector, the service sector, and the public sector of the Greek economy.

Table 4.3.1
Tradable key sectors of the Greek economy

NACE	Sector
01	Products of agriculture, hunting and related services
02	Products of forestry, logging and related services
03	Fish and other fishing products; aquaculture products; support services to fishing
05-09	Mining and quarrying
16	Manufacture of wood and of products of wood and cork, except furniture; articles of straw and plaiting materials
37-39	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services
55-56	Accommodation and food services
62-63	Computer programming, consultancy and related services; information services
72	Scientific research and development services
79	Travel agency, tour operator and other reservation services and related services

Source: EPAnEK (2017).

12. Nomenclature statistique des activités économiques dans la Communauté Européenne.

13. EPAnEK (2017).

Table 4.3.2
Tradable anti-key sectors of the Greek economy

NACE	Sector
13-15	Textiles, wearing apparel and leather products
19	Coke and refined petroleum products
20	Chemicals and chemical products
21	Basic pharmaceutical products and pharmaceutical preparations
26	Computer, electronic and optical products
27	Electrical equipment
28	Machinery and equipment n.e.c.
29	Motor vehicles, trailers and semi-trailers
30	Other transport equipment

Source: EPAnEK (2017).

Table 4.3.3
Sectoral multipliers of the Greek economy

	Output multipliers	Import multipliers	Employment multipliers
Primary Sector	0.92	0.37	54.3
Industry	0.57	0.70	14.5
Services	1.19	0.36	30.8
Public Sector	1.40	0.38	37.4
Economy's Average	0.95	0.49	26.1

Source: EPAnEK (2017).

Thus, it follows that an increase of one unit of the autonomous demand induces, on average, an increase of 0.95 units in output, an increase of 0.49 units in imports, and an increase of 26.1 units in the employment of the Greek economy. Therefore, and taking into account the fiscal constraints of the economy, it is suggested that a growth-oriented policy should be directed towards the redistribution of government expenditures and increase in autonomous demand of the key industries of the Greek economy.

However, given that such a policy cannot be based on the industry and taking into account the relative calls of the European Commission, i.e. “*Commission calls on Member States*

to recognize the central importance of the industry for boosting competitiveness and sustainable growth in Europe and for a systemic consideration of competitiveness concerns across all policy areas ... the objective of revitalization of the EU economy calls for the endorsement of the reindustrialization efforts in line with the Commission's aspiration of raising the contribution of industry to GDP to as much as 20% by 2020" (European Commission, 2014), it follows that an industrial policy programme that would enhance productivity and competitiveness is a necessity for the Greek economy.

Furthermore, digitisation and the widespread use of innovation and digital technologies throughout the economy, coupled with the exploitation of the country's skilled workforce, will increase the potential and prospects of these priority areas. We are referring to indicative business support initiatives based on the country's current investment strategy. Strategies have been developed to enhance the country's economic advantages, based on sectoral analyses whose recommendations were presented above. The Hellenic Development Bank is expected to play a crucial role in this effort (Box 2).

Box 2

The Hellenic Development Bank¹⁴

The Hellenic Development Bank (HDB) should be able to play a significant role in this affair, as a crucial promoter of a multifaceted development process. The HDB aims at a multifaceted support of enterprises that are active in leading sectors of the Greek economy, especially those that are new, developing, exporting and their products are of high value added. Also, the majority of these are SMEs that have difficulty accessing external sources of financing. Furthermore, the HDB broadens the scope of its activity thereby including the support of local authorities' development projects as well as the Social and Solidarity Economy. The composite role of the HDB is not exhausted in supporting the above mentioned economic and social units to obtain financing for their projects. The HDB should also be able to carry out studies by sector and industry.

Additionally, it will seek to disseminate its know-how in issues of economic planning along with its offering of consulting services to firms and the state. Finally, it is within the duties of the new development bank to coordinate public developmental agencies and cooperate with financial institutions, public policy agents and research institutes.

14. See Loizos (2019) and Ministry of Economy and Development (2019b).

In the above context, the HDB has to launch a series of actions, such as

- Providing credit to businesses through third parties (other funding bodies). It should be noted that the HDB will not have the ability to grant loans directly.
- Providing guaranties to firms against their obligations to other financial institutions.
- Designing and implementing instruments of financial engineering which serve the purpose of the bank.
- Targeted financing of businesses aiming at their restructuring towards improving their effectiveness, innovation and competitiveness.
- Participating in various financing mechanisms and bodies in order to serve its purpose along with developing cooperation with international investment organizations.
- Supporting new and innovative entrepreneurship and businesses that are export oriented.
- Financially supporting scientific research and studies at the enterprise level to the degree that they promote firms' productive efficiency.
- Accommodating the financing of institutions that encourage social cohesion and economy as well as advancing alternative ways of funding, such as microcredit.
- Providing firms (especially SMEs) and other bodies with consultancy and dissemination of know-how concerning a wide range of issues, such as designing financing instruments, business restructuring, capital structure, organization and corporate governance, human resource management, formulating investment projects, etc.
- Conducting macroeconomic and microeconomic studies in various sectors of the economy so that policy makers can spot financing needs and fill in the gaps in institutional development caused by market deficiencies.

Finally, it should be mentioned that collaboration, networking and interconnection are critical factors in supporting sustainable, innovative and extroverted entrepreneurship. Intangible productive forces such as synergies and interconnections help remove fragmentation and development inequalities. These forces promote the creation of economies of scale, the exploitation of complementarities, the acceleration of innovation, improved access to markets as well as enhanced participation in international value chains. Greek authorities are working systematically to create a favorable ecosystem for cooperation and interconnection. This includes, inter alia, initiatives such as the

establishment of working groups for the formulation of a National Industrial Policy, the Action Plan for the Pharmaceutical Industry and, earlier, the Industry Forum. The example of the agri-food sector is presented in Box 3.

Box 3

The example of the agri-food sector¹⁵

Greek authorities predict that the agri-food sector will play an important role in the new development model. The vision is for the agri-food sector to grow to contribute to the development and competitiveness under conditions of:

- sustainable production of healthy and safe food
- increasing employment opportunities and
- reducing economic, social and spatial disparities

To fulfill this vision, challenges will need to be addressed both on structural issues in the agricultural sector and on the ability to respond to changes and opportunities in the demand side of agri-food products. The national strategic plan for the agri-food sector has therefore been drawn up on these pillars. This plan includes the strategic mapping of the business objectives, which will continue the successful absorption of financial resources launched in previous years.

This strategy aims to exploit the untapped opportunities of the Greek agri-food sector. There are, however, three crucial challenges:

- The first challenge is structural and concerns the updated Multiannual Financial Framework (MFF) and the budget of the Common Agricultural Policy (CAP). These developments introduce, inter alia, a new transport system in the context of a national strategic plan, approved by the EU, linking objectives with results and funding.
- The second challenge relates to the internationally-recognized increasing demand for agricultural products in the EU as well as international markets. Similarly, demand for safe, quality products with local identity and environmentally friendly cultivation practices, protected designations of origin (PDOs), and protected geographical indications (PGIs) is expected to increase as well, along with demand for organic products.

15. See Ministry of Economy and Development (2019a).

- The last challenge relates to the low value added, productivity and competitiveness of the agri-food sector. This is a long-standing problem that has been mentioned, independently of the ideologies, for years (see e.g., Batsis, 1947/1977; McKinsey & Company, 2012).

The first challenge requires rigorous planning, targeted policies and optimal utilisation of CAP resources. The second one requires effective preparation for the enhanced and competitive presence of products in international markets. The last one requires a vertical integration model between the agri-food sector and industry. This vision is based on two complementary strategic objectives:

- Improving, in terms of profitability, the commodities model of mass production, characterised by low prices and high competition conditions, which are unequal for Greek farmers, due to the structural weaknesses of the Greek agricultural sector.
- Gradually developing a production model of quality and identity products whose prices would be higher and the conditions of competition more favorable for domestic agricultural production. This is also linked to a more systematic integration with industry, tourism and other sectors related to the agri-food system and integrated rural development.

Policies for SMEs

The effects of the economic crisis and the devaluation policy implemented in Greece have been particularly distressing for domestic productive capacity and employment. Over 200,000 small and medium-sized enterprises have stopped their economic activity, which has resulted in, at least, 700,000 job losses during the crisis. The framework of reforms adopted in the first period of implementation of the fiscal consolidation programmes was essentially aimed at phasing out ‘non-productive small businesses’ in order to ‘consolidate’ the market and improve competition. SMEs in Greece and Europe as a whole have an important role to play in promoting employment, entrepreneurship and ensuring social cohesion. In this context, the European Commission enacted the Small Business Act in 2008, with the aim of enhancing the productive and development footprint of SMEs at local and regional levels. According to related statistics (SBA Factsheet), SMEs contribute significantly to both employment shares and value added across the Member States (99.8% of enterprises defined as SMEs account for 66.4% of total employment and 56.8% of value added).

The Greek economy is experiencing a high degree of fragmentation of SMEs. This specificity tends to negatively affect productivity and the ability to penetrate new markets due to the restrictions imposed on SMEs (99.9% of businesses generate 63.6% of gross value added and contribute to 85.2% of employment).

The main problems identified in the international reports on Greek entrepreneurship focus on the difficulties faced by SMEs in their inability to increase their productivity, penetrate new markets, secure liquidity and expand their business horizon. At the same time, the problem of private debt was worsened by private individuals, households and businesses. For an effort to improve the business environment, see Box 4.

Box 4

The One-Stop Online Service¹⁶

In 2018, the One-Stop Online Service was introduced, which reduces the time a business needs to be set up to a few hours, while reducing the relative cost by 70%. Private Equity Companies, Private Enterprises and Limited Liability Companies have already been set up, and services will be available for Sociétés Anonymes by May 2019. All required documents are digitally submitted and company creation is confirmed electronically in real time. The range of services provided is expanding. Specifically, TAXIS certification data is provided to the founders, thus removing the requirement to visit the local tax office. Social security registration will also be made faster by automatically transmitting all relevant information. This process is not only less time consuming but also more affordable for businesses. For these reasons, it has already been recognized internationally by the World Bank, the European Union and the OECD.

Deepening the reform effort of recent years, the Greek authorities implemented the project Business Intelligence and Administrative Simplification. This project, funded by the Commission's Structural Reforms Service with a completion schedule at the end of 2019, aims to extend One-Stop Shop services throughout the life of a business (simplifying and digitising processes related to access to finance, corporate change and the bankruptcy code).

Horizontal Policies

The key objective is to develop a new model of production, which would integrate knowledge and emerge from scientific research in production to increase the competitiveness of the

16. See Ministry of Economy and Development (2018b).

economy, focusing primarily on the social benefit. Commitment to this goal is reflected, in practice, with the launch of the research and innovation portfolio of the Ministry of Education and the continuous growth of R&D spending since 2015. In 2017, R&D spending reached 2.03 billion euro, equivalent to 1.13% of GDP.

The Hellenic Foundation for Research and Innovation (HFRI) was created to support quality research at universities and research centers of the country in collaboration with the EIB. Important actions are also under way to support research cooperation between enterprises, universities and research centers (e.g., the ‘Research-Create-Innovate’ programme) and to provide a range of incentives for private R&D investment. Finally, flagship initiatives are being implemented in emerging research areas.

Furthermore, the existence of high quality, durable and easily accessible sustainable infrastructure is a critical prerequisite for boosting productivity and development:¹⁷

- The National Transport Plan for Greece 2017-2037 is a key document that sets out the strategy for the development of the transport sector for the next 20 years, supporting the economic development of Greece.
- The transport-logistics sector is one of the emerging and dynamic sectors of the economy and one of the key pillars of the country’s development. A key objective of the development strategy for the supply chain is to increase the international competitiveness of the industry. In this regard, individual objectives, such as the promotion of multimodal/combined transport, the establishment and operation of well-established freight centres, the emphasis on the development of value-added transit services at the level of supply chain management and the corresponding training are expected to contribute to the development of other sectors of the national economy (industry, exports, trade, tourism, agricultural production) and the reduction of unemployment. In this context, and on the basis of the Supply Chain Action Plan, policies aimed at developing networks, logistics infrastructures and facilitating intermodal transport are encouraged.
- The Greek authorities design and implement policies for the development of digital infrastructures, which aim at enhancing access to information and telecommunication technologies, and the economy and competitiveness, while strengthening economic and social cohesion and integration. These general objectives are outlined in the National Digital Strategy, which was adopted in December 2016, creating a tangible roadmap for the country’s digital transformation. National Digital Strategy priorities include the seamless access to digital infrastructures, the acceleration of the transition to high-speed internet, the development of a functional and effective legal framework for the digital economy, building a modern e-government and e-government support. SMEs should take advantage of digital tools to enhance their productivity and competitiveness.

17. See Ministry of Economy and Development (2018a, 2019a).

- The National Plan for Energy and Climate is the country's first long-term energy plan. The Plan is based on 3 pillars: (a) restructuring the country's energy mix by 2030, by increasing the share of Renewable Energy Sources (RES) (to 32% of total consumption), (b) reducing the specific weight of lignite, and (c) utilising gas as a stabilising factor for the transition period. Energy saving across a number of sectors of the economy is sought, aiming to achieve the ambitious 1.5% annual target. Other goals refer to addressing energy poverty and reinforcing existing policies and additional measures to ensure that all citizens, especially the weaker social groups, have access to energy.
- Effective management of public property and public enterprises is an important tool for achieving the above objectives. This sector has been the subject of major reforms aimed at promoting transparency, efficiency, environmental sustainability, social and territorial cohesion and, more generally, the contribution of public property to economic growth and development and the provision of high-quality services to citizens.

Finally, the crisis has emphatically highlighted the need to modernise the Greek Public Administration and build a modern state. Through the use of extensive technical assistance and the contribution of international best practices, reform priorities focus on reducing bureaucracy through process-based management practices, improving the management capacity of digital services using digital infrastructures and tools, upgrading human resources management, coding and improving legislation, combating corruption and disseminating successful reforms throughout the public administration. Table 4.3.4 summarises the points made above and gives the timeline of the main policies of the Greek authorities to increase productivity.

Table 4.3.4

List of policies to enhance the productivity of the Greek economy

Selected policies boosting productivity	Implementation
Implement actions, policies and reforms to foster entrepreneurial and productive SME transformation	2023
Export strategy	
<ul style="list-style-type: none"> • Implementation of product and market identification tools • Full development of exporters help desk/Modernisation of 'Enterprise Greece' • National Export Promotion Information System 	2020 2021 2021
Implement a new framework for Strategic Investments	2019
Foreign Direct Investment (FDI) Observatory	2019
Exploiting research potential for productive reconstruction	2020
Enhancing Business Innovation: Equifund, 'Research-Create-Innovate', Flagship Initiatives	Ongoing
Formation of National Industrial Policy	2019
Complete procedures for simplifying the licensing of economic activities	2020
Full implementation of the new market surveillance system	2020
Integrated Exercise and Control Information System	2021
Determination of tax incentives for corporate transformations (Company Law)	2019
Modernisation of legislation on the General Commercial Register (GEMI)	2019
Upgrading anti-trafficking services	2019
Completion of an industry-specific spatial planning framework by integrating the business plan for business park development	2021
Cadastre (Full function of organisation and completion of cadastre)	2021
Integrated System for the Management of Judicial Affairs-Political and Criminal Justice (IACSD)/(Paperless Trial)	2021

5. Conclusions

The analyses included in this report stress the need for the deployment of a comprehensive policy framework, which encompasses both sectoral and regional dimensions, rather than focusing on horizontal policy measures. In turn, the following parts of this section summarise main policy directions for boosting the competitiveness and productivity of the Greek economy on aggregate, in key sectors and across regions of the country. The final part presents work in progress and future research needs and directions.

Enhancement of productivity on aggregate and in key sectors

Safeguarding and deepening the recovery of the Greek economy is of utmost importance for the continuation of conditions of macroeconomic stability that are currently taking place. Increasing the extroversion of the Greek industries and, at the same time, emphasizing the quality of jobs and human resources as key factors in boosting the productivity of businesses and sectors are necessary for the sustainable growth of the country. Given the present moderately favourable conditions in private consumption and external demand, investment should be a critical priority of policy, especially because of its current lackluster behaviour.

The intersectoral analysis of the Greek economy indicates that there are only a few industrial sectors that could significantly affect the output or the employment of the economy, while it has been reported that the Greek economy, and especially its industry sector, is heavily dependent on imports. Conversely, the public sector seems to play a significant role in terms of output and employment in the Greek economy. Taking into account the fiscal constraints of the economy, a growth-oriented policy should be directed towards the redistribution of government expenditures and the increase in autonomous demand of the key industries of the Greek economy. A comprehensive industrial policy programme that would enhance productivity and competitiveness is also a necessity.

To this effect, it is critical, on the one hand, to provide incentives to private investment towards productivity-enhancing and dynamic sectors of the Greek economy, in order to change its structure into a more productive and macroeconomic stable pattern. On the other hand, focus should be given to such investments that would enhance the technology level of the aggregate capital stock. Such a policy would have a significant impact on productivity, both through the effect of increased capital intensity and through positive developments on total factor productivity growth.

Promotion of regional productivity and convergence

At the level of national strategic growth planning, there is a need for a comprehensive treatment of a wide range of spatial sources of inefficiency to support the fast recovery and sustainable growth of Greek regions and to reduce widening productivity gaps between the core (Attiki) and peripheral regions. The objectives and policies of the sectoral growth plans (e.g., for transport, energy and the digital market) should be aligned and coordinated with each other as well as among regions. Especially, the exploitation of scale economies, the networking of firms with related activities and the creation of activity clusters (e.g., in manufacturing, ICT, transport and logistics) are particularly important for the enhancement of innovation and productivity at the local level, through providing suitable incentives, according to the comparative advantages of each region. The effective deployment of these clusters should rely on the type and degree of regional specialisation, giving priority to central locations of mainland peripheral regions with increased intraregional accessibility and urbanisation economies which diminish technical inefficiencies (Tsekeris and Papaioannou, 2018).

In addition, these plans should be integrated with the special planning frameworks for main economic activities (fisheries, mining, renewable energy, manufacturing, tourism, and logistics), established land uses and special planning regulations for realising ‘fast-track’ infrastructure investments. In this way, more locally targeted actions will be taken to strengthen productivity and reduce inequalities, avoiding possible conflicts between sectoral and regional policies. In the context of the devolution of the regional administrative system, Greek regions should undertake institutional arrangements and exploit financing initiatives suitable to their own needs and comparative advantages, in order to prioritise and coordinate the allocation of investment resources according to where they can provide the largest efficiency gains. Nonetheless, the potential effects of selected policies must always be evaluated and weighted, among other criteria, with respect to the productivity growth rate and the reduction of inequalities.

Policies to boost the competitiveness of the Greek economy

There is still a significant productivity and competitiveness gap between Greece and its international competitors; the process of the internal devaluation during the last decade was not sufficient to improve the competitiveness of the Greek economy. In particular, competitiveness, as reflected in REER, improved, but the market share of Greek goods and services in global markets is decreasing. Especially alarming is the decreased market

share of the services sector. In order to design the appropriate public policies that could improve competitiveness and assist in facing competition, a thorough analysis of the characteristics and needs of destination markets would be helpful.

Competitiveness indices produced by international organizations highlight a number of qualitative aspects that affect the country's competitiveness. In all three groups of indicators presented in this report, Greece resides at the bottom of the scale, compared to the other EU member states. Greece's performance indicates several problematic areas, such as the quality of institutions, macroeconomic stability, labour market efficiency and financing. Regional aspects should also be taken into account, especially since Greece exhibits significant disparities among regions. These factors act as a deterrent to improving competitiveness and, although they are characterised as "qualitative", in practice, they increase costs. This means that significant challenges lie ahead and a considerable number of problems need to be addressed in order to substantially raise the competitiveness and the productivity of the Greek economy.

From the perspective of GVCs, Greece's participation in international markets has increased and exceeds the EA19 average. However, more analysis is needed to assess the quality of forward and backward linkages, in order to determine whether the country is heavily dependent on imported inputs and, hence, vulnerable to price fluctuations from the suppliers' side, or is engaged in low value-added activities and increased value is added outside the borders. Upgrading to high value-added and knowledge-intensive activities could prove vital for Greece, as low-cost economies increase their participation in GVCs. Public policies that promote research and innovation can play an important role in enhancing Greece's participation in GVCs and upgrading/moving up the value chain.

Work in progress and future directions

The Greek National Productivity Board has scheduled a number of studies, and several others are in progress, to investigate the productivity and competitiveness of the Greek economy. Among others, a major challenge that should be addressed is the use of more qualitative analysis, in order to obtain insight into esoteric issues affecting the productivity of individual economic agents, compared to the current analysis based on aggregate (national, sector- and region-level) data. For this purpose, disaggregate (micro-level) data will be collected and processed, such as those originating from ELSTAT's annual industrial surveys as well as ELSTAT's annual surveys on the use of ICTs and on electronic commerce in enterprises. In addition, such micro-level analysis will allow us to identify problems related to inequalities among the frontier and laggard firms or zombie firms and idiosyncratic factors influencing their innovation, export and productive performance.

Another challenge to be addressed concerns the use of appropriate input-output and origin-destination freight flow datasets and suitable analytical techniques to determine both intersectoral and interregional value-chain (forward/backward) and supply-chain linkages and, in turn, the competitiveness of specific sectors and regions of the Greek economy. Box 5 reports two specific examples of studies in progress, which are of particular interest for the Greek NPB activities: (a) the development of a logistics observatory for monitoring

activities and assessing policies regarding freight transport and trade facilitation and (b) the impact of ICTs on the productivity and growth of Greek firms.

Box 5

Specific studies in progress concerning the Greek NPB

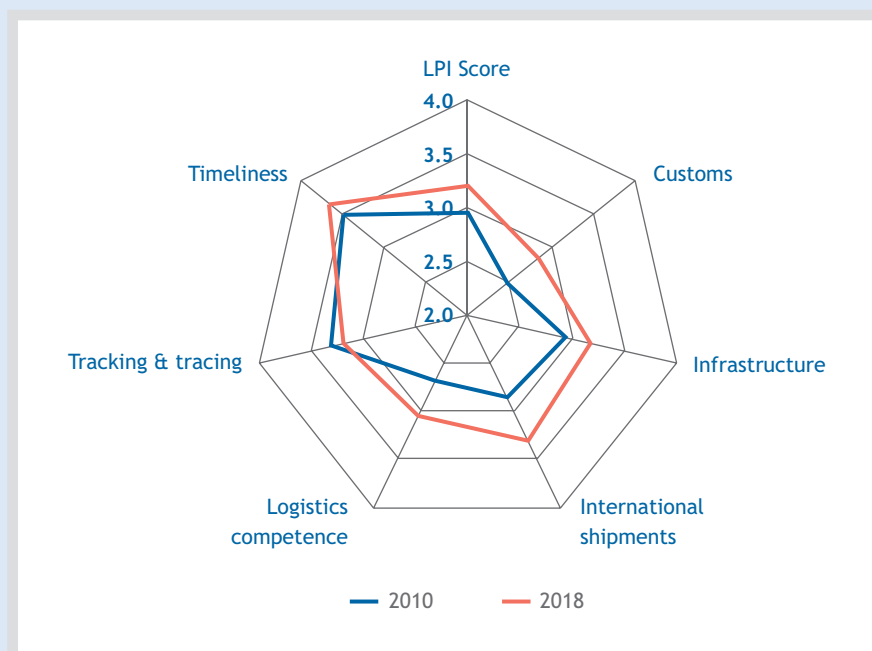
A. Development of Logistics Observatory

The improvement of the interregional and external market access of Greek firms is vital for enhancing their productivity and competitiveness in global value chains. The costly completion of the core network of highways; the low digitisation and the organisational and spatial fragmentation and inefficiency of the road haulage and logistics system; the incomplete railway, seaport and combined transport infrastructure; and the absence of modern logistics parks and urban consolidation centres still hinder access to core European markets and entail significant transport/trade costs for firms to move their products both within the country and abroad. It is noted that, according to Eurostat, the modal split of road freight transport in Greece was 98.2% in 2017, compared to 97.8% in 2010, despite the improvement in the World Bank's Logistics Performance Index (LPI), where the country improved its score and ranking from 2.96 in 2010 (54th out of 155 countries) to 3.2 in 2018 (42th out of 160 countries). More specifically, all the LPI components, except for tracking and tracing, were improved during 2008-2016, i.e., international shipments (particularly due to the increased freight transport operations in the Piraeus port terminals managed by COSCO), customs, infrastructure, logistics competence, and timeliness (Figure A1).

In the context of the Intelligent Research Infrastructure for Shipping, Supply Chain, Transport and Logistics (ENIRISST project), KEPE will contribute to the development of a national Logistics Observatory for supporting:

- The assessment of products and countries of destination (markets) and the calculation of 'attractiveness' indicators for enhancing the penetration of Greek exports and the integration to global value chains.
- The monitoring of the trends and characteristics of the freight transport and logistics service market, with emphasis on international freight transport and agri-food products.
- The optimal selection of logistics partners/providers.
- The design and evaluation of transport and trade facilitation policies.
- The decision-making processes with regard to the location of logistics parks and improvements in the transport system.

Figure A1
The Logistics Performance Index (LPI) of Greece in years 2008 and 2016



Source: Own processing of data from the World Bank (<<https://lpi.worldbank.org/>>).

Note: The country with the highest LPI is Germany (with score 4.11 in 2010 and 4.20 in 2018).

B. Impact of ICTs on the performance of Greek firms

The penetration of ICTs within businesses yields multiple benefits and gains related to cost savings, organisational effectiveness, technical efficiency, access to new business opportunities and market information, etc. These gains are usually translated in terms of innovation, productivity, competitiveness and growth at the regional, national and international levels. Following relevant studies on e-commerce and ICT adoption in Greek firms (Kontolaimou and Skintzi, 2018a, 2018b), KEPE is currently conducting systematic research on the progress that Greek firms have made in adopting new technologies during the last decade. More specifically, the study is intended to:

- Examine the development of key indicators of ICT and e-commerce use in Greek firms over time.
- Explore regional aspects as well as the role of firm size and industry in ICT adoption.

- Identify the factors that are likely to help or hinder the implementation and usage of ICTs in Greek firms.
- Explore the linkages between ICT adoption and labour productivity.
- Provide relevant policy implications.

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Appendix

Table A1
Recent publications of KEPE related to productivity issues

Title	Authors	Series, Year	Description
The Manufacturing Industry in Greece: Developments, Prospects and Policy Challenges	A. Koutroulis, E. Athanassiou	Reports, No. 80, 2018	The report outlines long-term problems of Greek manufacturing and relevant industrial policy measures and actions tailored to the requirements of the Greek economy for businesses and the state, giving emphasis to dynamic sectors and technologically advanced industries.
Developments and Prospects of the Shipbuilding Industry in Greece	E. Athanassiou, A. Koutroulis	Reports, No. 79, 2018	The report presents the Greek shipbuilding and repair industry, the relevant international environment, opportunities and prospects as well as key requirements for making use of its advantages, especially with respect to addressing the problems of the large shipyards.
Regional and Sectoral Efficiency of the Greek Economy: Measurement and Determinants	S. Papaioannou, T. Tsekeris, C. Tassis	Studies, No. 78, 2017	This study adopts a consistent econometric framework to measure the technical efficiency of regions and sectors of the Greek economy and identify factors which influence its evolution during 2000-2012. The findings reveal the existence of significant disparities in the levels of technical efficiency across regions and sectors of the Greek economy.
Assessment of Selected Structural Reforms Regarding Competition and their Economic Impact	R. Karagiannis, A. Kotsi, E. Athanassiou, E. Nitsi, I. Cholezas	Reports, No. 78, 2017	The report evaluates the process of enacting and implementing of specific structural reforms related to competition, examines the resulting changes in the operation of the relevant markets, and assesses, to the extent possible, the effects on key economic aggregates (prices, employment, and new entries).
Non-Linear Adjustment in the Greek Milk Market	I. Reziti	Studies, No. 77, 2016	This study utilises recently developed threshold co-integration tests that allow for non-linear adjustment between the consumer and producer prices of milk in Greece using data spanning the period 1/1989-8/2014. The empirical results show that if the equilibrium relative markup is squeezed by more than 58%, consumer prices ought to increase faster than producer prices to restore long-run equilibrium between consumer-producer milk prices.

Table A1 (continued)

Title	Authors	Series, Year	Description
Freight Transport and the Development of International Logistics Hubs in Greece	T. Tsekeris	Reports, No. 74, 2016	This report investigates the national strategic goal to make Greece an international transit cargo hub. At the same time, it provides an analysis of the country's possibilities to more efficiently utilise all the available means of transport, in order to maximise the diffusion of benefits arising from the attainment of this goal across the Greek regions.
Impact Assessment of the Liberalization in 20 Professions	A. Kotsi, E. Athanassiou, N. C. Kanellopoulos, R. Karagiannis, I. Katselidis	Reports, No. 73, 2016	This report assesses the process of liberalization in 20 professions in the Greek economy up to the end of 2014, as a result of wider structural reforms which have taken place in the labour market concerning the abolishment of unjustified limitations in the access and functioning of professions.
Analysis of Greek External Trade: Sectoral Analysis, Comparative Advantages, Exports and Economic Growth.	I. Konstantakopoulou	Studies, No. 76, 2015	This study examines the external trade of the Greek economy, identifies the sectors or products with strong competitive advantages and the dynamic export sectors, and finally, investigates the relationship between exports and economic growth.
Liberalization of Professions: Extent and Expected Effects	A. Kotsi, E. Athanassiou, N. Kanellopoulos, R. Karagiannis, S. Papaioannou, I. Katselidis	Reports, No. 71, 2015	This report addresses the problem of the liberalization of professions in the Greek labour market, in the context of significant reforms which have taken place for the market liberalization and the formulation of a more competitive and flexible environment, through systematically assessing some recent relevant legislative actions with the use of analytical methods.
Economic Growth in Greece: Trends and Medium-Term Prospects	S. Papaioannou	Studies, No. 74, 2013	This study provides an estimate of the medium-term growth rate of GDP in Greece between 2011-2015, based on the identity of GDP, according to which real GDP is decomposed into its five components (labour productivity, hours worked per employee, employment rate, labour force participation rate and population).

Table A2
KPIs for productivity

KKPIs for productivity	Implementation
Endowment of permissions within a 3-month period	2019
Operation of HDB	2019
Full implementation of Road Transport Equivalent	2021
Energy interconnection of Crete with mainland Greece	2023
Energy interconnection of other islands with mainland Greece	2030
Operation of the Metro of Thessaloniki	2020
Annual savings of 480 million euro through the digitalisation of public administration	2020
“Paperless trial”	2021
SYZEFXIS II: the strengthening of broadband connectivity in 34,000 public buildings and the creation of 375 public hotspots	2021
Individual support for business restructuring and expansion 400 SMEs/per year	Ongoing
Support of 50% of cultivated land with digital technologies	2020
Completion of the digitalisation of procedures for the registration and licensing of new enterprises	2020
Digitalisation of Citizen’s Services Center (KEP)	2022
Completion of the National Cadastre	2021
32% of energy consumption from Renewable Energy Sources	2023
Provision of services of at least 100Mbps in digitally lagging regions of 2.5 million citizens	2023
Creation of at least 10,000 new jobs for young researchers by Research Programmes	2021

Box A1

The National Productivity Board of Greece

Brief history and work of KEPE

The Centre of Planning and Economic Research (KEPE) was founded in 1959. Andreas G. Papandreou, at the time the head of the economics department of the University of California, Berkeley, was its first Scientific Director and Chairman. He was one of many prominent economists to join the institute. KEPE is the largest research institute in economic sciences in Greece. It is funded by the Greek State, but it is fully independent with respect to the contents of its work, which focuses on applied research projects regarding the Greek economy.

Research at KEPE is carried out on its own initiative. Research projects are assigned by the Scientific Director or start as proposals by the researchers of the Centre and are approved by the Research Planning Committee. Publication quality is monitored by the Publications Review Board, which acts as an editorial committee and sends out submitted manuscripts for blind review. KEPE also accepts commissions from government ministries, regional authorities, international organizations and, occasionally, private organizations, in order to provide technical advice on economic and social policy issues. It has its own legal mandate and is governed by a Chairman/Scientific Director and the members of its executive board, who are appointed by the Minister for Economy and Development.

In addition to its publication series (over 650 studies, reports and papers), KEPE has been very active in the production of unpublished studies, reports and position papers. Its research concerns macroeconomic analysis and forecasts, fiscal and monetary policies, human resources and social policies, sectoral and regional economic analyses and development policies. In recent years, KEPE has been actively involved in the preparation and monitoring of the strategic growth plan of the Greek government, its regional and sectoral specification, and the formulation and evaluation of structural reforms and proposals concerning the exports, industries and economic development of the country. Moreover, KEPE officials and researchers participate in several working teams, committees, boards and policy forums of the Greek government and international organisations.

Management and organisation of the board

In April 2019, the Greek government formally appointed KEPE, through a legislative act, to be the National Productivity Board for Greece. The board is managed by a steering committee with a supervisory role on the scientific research work to be conducted and published in the form of an Annual Report and relevant studies and papers. The committee is composed of the scientific director, who holds the chair of the board, a research fellow, who heads the committee, and three other research fellows of KEPE.

Objectives and scope of the board

The research at KEPE as the National Productivity Board will focus on the measurement of productivity and competitiveness and related methodological issues, the identification of driving forces and impeding factors of productivity growth, and the formulation and evaluation of policies that would enhance the productivity and competitiveness of the Greek economy. Among others, topics of related empirical research will include the regional and sectoral analysis of productivity, assessment of reforms in the labour and product markets, the impact of new technologies, R&D and investment programmes, and the relationship of productivity with inclusive growth and regional convergence.

Additionally, the Greek NPB will emphasise the comparative advantages of the country, which can be exploited to enhance its productivity, such as its geographical position, climate, culture, history and human capital. Attention will also be given to particular problems which hinder an equitable and sustainable growth, such as the intense and persistent core-periphery disparities, small average firm size, limited ICT adoption, population aging, disinvestment, ‘brain-drain’, increased capital cost as well as other adverse conditions that emerged due to the recent economic crisis.

Annual Report 2019

The Productivity and Competitiveness
of the Greek Economy



GREEK NATIONAL
PRODUCTIVITY BOARD
(NPB)



CENTRE OF PLANNING
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