



ΙΔΡΥΜΑ ΟΙΚΟΝΟΜΙΚΩΝ & ΒΙΟΜΗΧΑΝΙΚΩΝ ΕΡΕΥΝΩΝ
FOUNDATION FOR ECONOMIC & INDUSTRIAL RESEARCH

The contribution of Pfizer to the Greek economy

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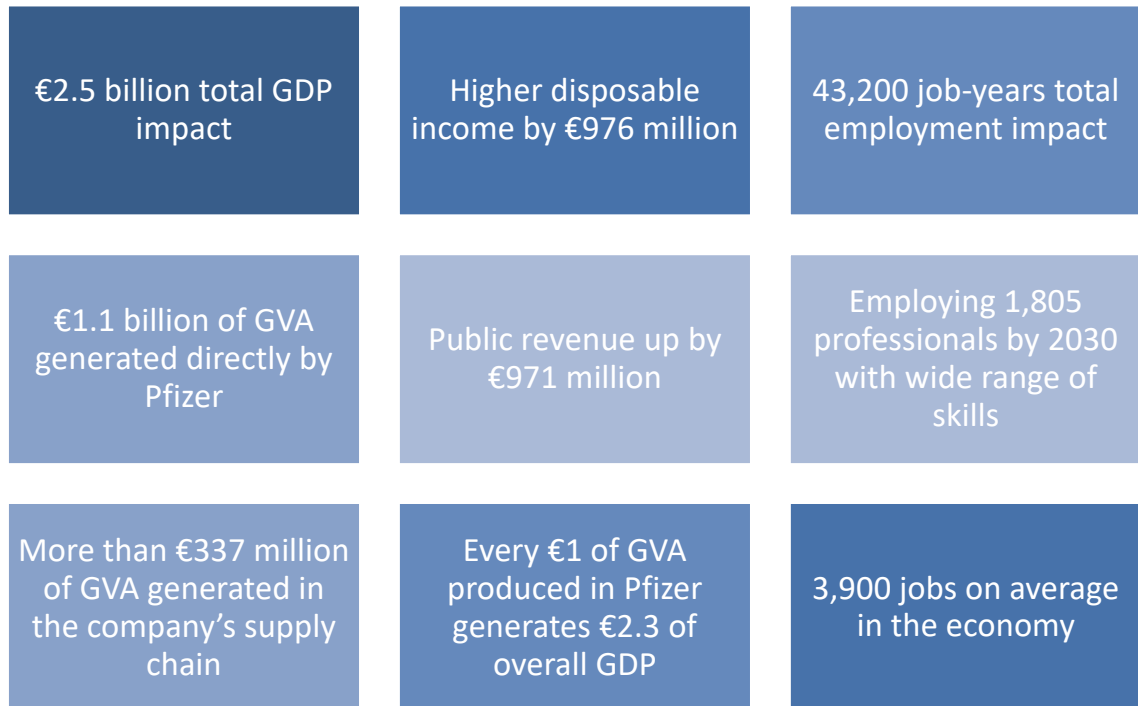
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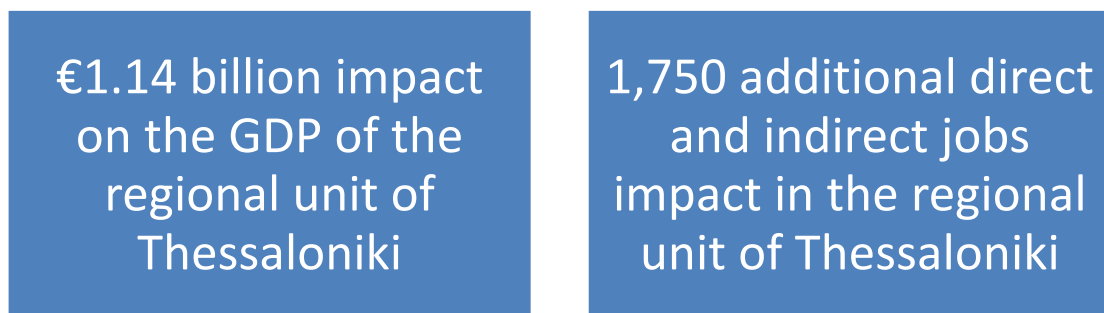
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HIGHLIGHTS

Total economic impact from the operation of Pfizer in Greece, 2020-2030



Total economic impact from the operation of Pfizer in Thessaloniki, 2020-2030

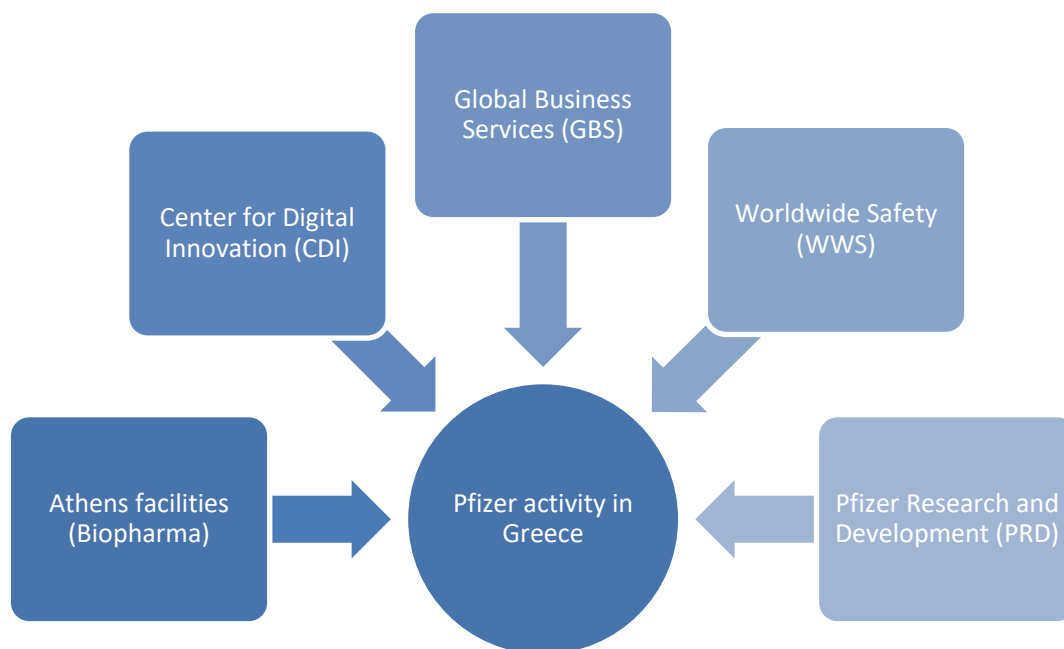


1 INTRODUCTION

Pfizer is a global pharmaceutical company based in New York. The company has developed more than 350 medicines and vaccines, including the Pfizer-BioNTech vaccine, which played a major role in limiting the spread of the COVID-19 virus, saving lives and ending the pandemic.

The company has a long presence in Greece. Pfizer in Greece was founded in 1960 and is among the leading pharmaceutical companies in Greece. The company's activity in the country is strengthened further by the creation of new units in Thessaloniki (Figure 1.1).

Figure 1.1: Pfizer activity in Greece



The Center for Digital Innovation (CDI), launched in 2020, focuses on digitization in the field of medicinal research and development and patient-centric digital solutions. CDI employs more than 490 people who are working on digital projects in collaboration with other sites of Pfizer across the world in the context of the company's digital strategy. The activity of CDI helps to deliver on three strategic priorities of the company:

1. Improving patient health outcomes with the goal of enhancing diagnosis, treatment, and adherence rates.
2. Creation of tools powered by Artificial Intelligence in order to achieve a better understanding of factors that may help predict patients' risk of developing a serious infection.
3. Development of medicines to patients faster by maximizing digital and every stage of research.

The establishment of the Global Business Services (GBS) in Thessaloniki in 2021 is part of the strategy of rationalization and concentration of services that support the company's operation in 6 sites across the world. Thessaloniki has been selected as one of the two locations for the development of a service center in Europe. It supports Pfizer's operations, mainly in Southeastern Europe, the Middle East and Africa. The main activities of the Global Business Services involve the provision of support services, such as human resources management,

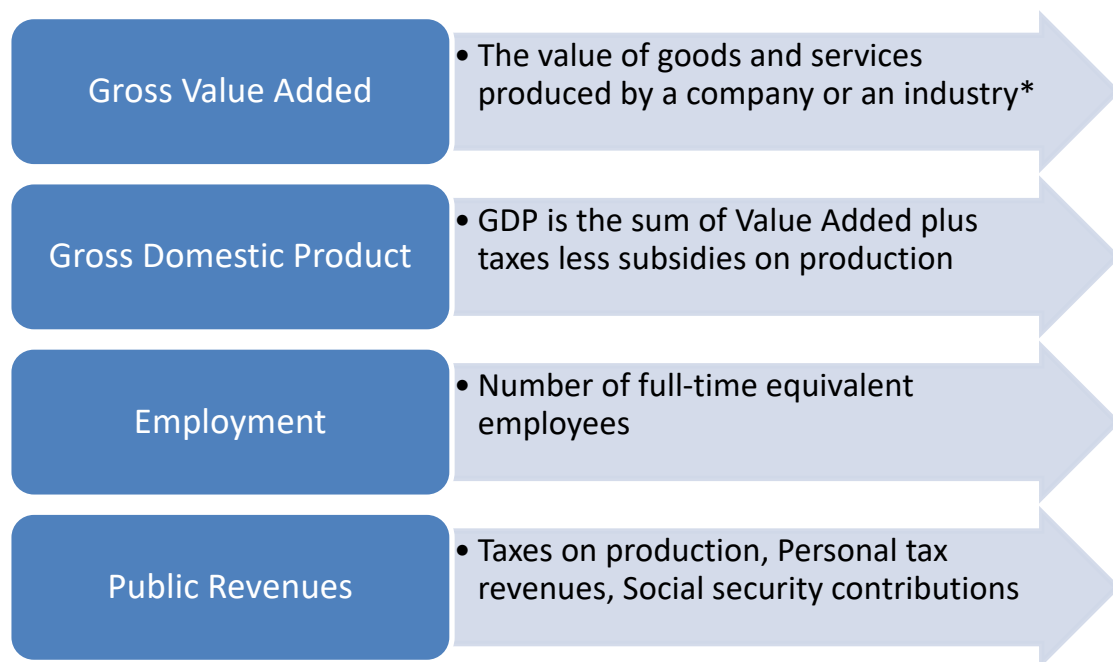
financial services, transformation-project management and procurement services. The Global Business Service hub started its operation in 2021.

Pfizer has upgraded substantially its presence, adding two more global centers to the portfolio of activities developed in Greece. In particular, the Worldwide Safety (WWS) unit is a new center for Safety Surveillance and Risk Management services, responsible for the analysis and understanding of safety data from the use of medicines worldwide, drawing on results from scientific journals, adverse event reports, clinical and non-clinical studies, and epidemiological studies. It also collaborates and interacts with regulatory authorities around the world on drug safety issues. WWS started operations in 2022.

In addition, the company has developed the Pfizer Research and Development (PRD) center - a clinical research unit in Thessaloniki that coordinates clinical trials for the development of medicines for the global market. It started operations in 2023.

The main scope of the study is to evaluate the effect from the activity of Pfizer in Greece, both in Athens and in Thessaloniki. The indicators examined in this study are Pfizer's contribution to Gross Value Added (GVA), Gross Domestic Product (GDP), employment, and tax revenues in Greece (Figure 1.2). In the next chapter, we present key figures on the current and planned activity of Pfizer in Greece. Estimates of the direct, indirect, and induced effects of this activity, at the national and local levels, are analyzed in Chapter 3. The study concludes with a discussion of Pfizer's contribution to innovation activity in Greece.

Figure 1.2: The impact of Pfizer on main economic indicators



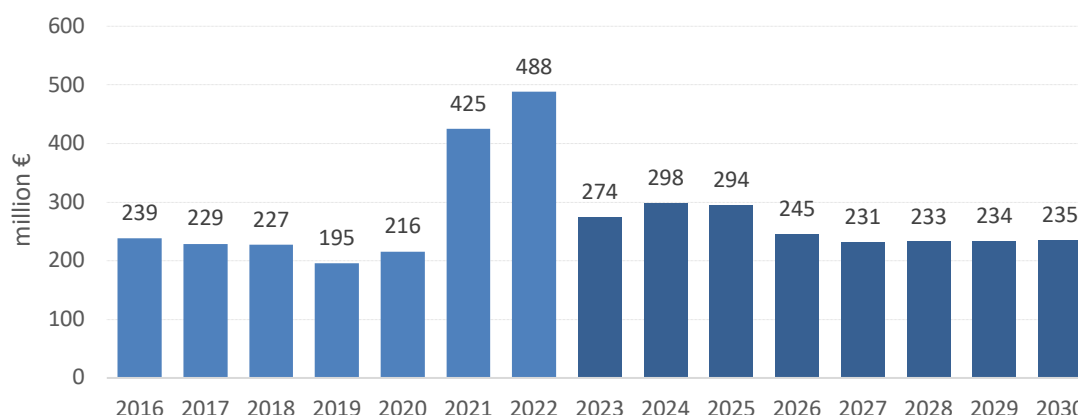
(*) GVA is a measure of the value generated in the economy and represents the difference between total output and the cost of inputs from other sectors. The value of this measure is equal to the sum of compensation of employees, taxes on production and gross operating surplus.

2 PFIZER ACTIVITY IN GREECE

2.1 Turnover

Between 2016 and 2020 the turnover of Pfizer Hellas stood at €221 on average annually. Revenues over the period 2021-2022 increased substantially due to the sales of products related to the COVID-19 pandemic (vaccine and therapy). The company's turnover is expected to remain above €200 million over the period 2021-2030 (Figure 2.1).

Figure 2.1: Turnover of Pfizer Hellas, 2016-2030



Source: Pfizer Hellas

2.2 Employment

In 2019, before the start of operation of the new units in Thessaloniki, Pfizer employed 261 people¹ in Greece. The development and operation of the new units in Thessaloniki boosted substantially the growth of jobs within the company.

During the first year of operation, in 2020, the Center for Digital Innovation (CDI) employed 111 people, while in 2023 employment in the unit stands at 550 employees. Respectively, employment in the Global Business Services (GBS), the Pfizer Research and Development (PRD) and Worldwide Safety (WWS) stands at 445, 110 and 17 full-time equivalent jobs respectively. As a result, employment in the company has expanded to 1419 jobs in 2023, which is four times higher than in 2019. Additionally, by 2030 employment in Pfizer Hellas is projected to reach 1805 jobs.

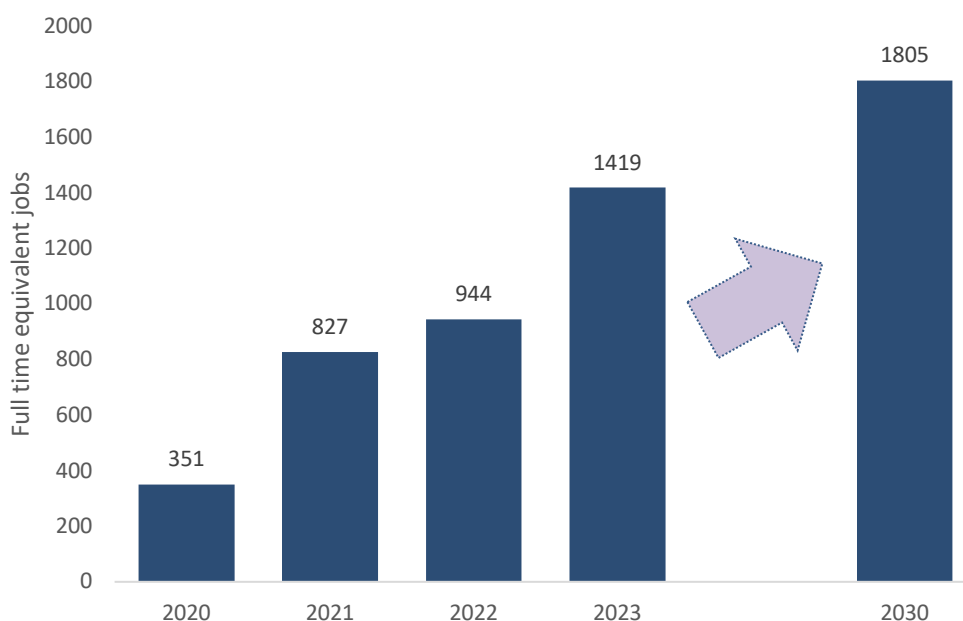
Pfizer's employment policy in Greece is well aligned with the country's strategic priorities of raising female labor participation and providing good job opportunities for highly qualified individuals. In particular, in 2022 the proportion of female employees was 55% of the total number of employees, whereas the national average in the labor market stood at 43%, according to the Hellenic Statistical Authority.

In addition, the employees in the company (in Athens and Thessaloniki sites) have a strong academic background. The share of those with a postgraduate (Master's or PhD) degree stood

¹ Full-time equivalent jobs.

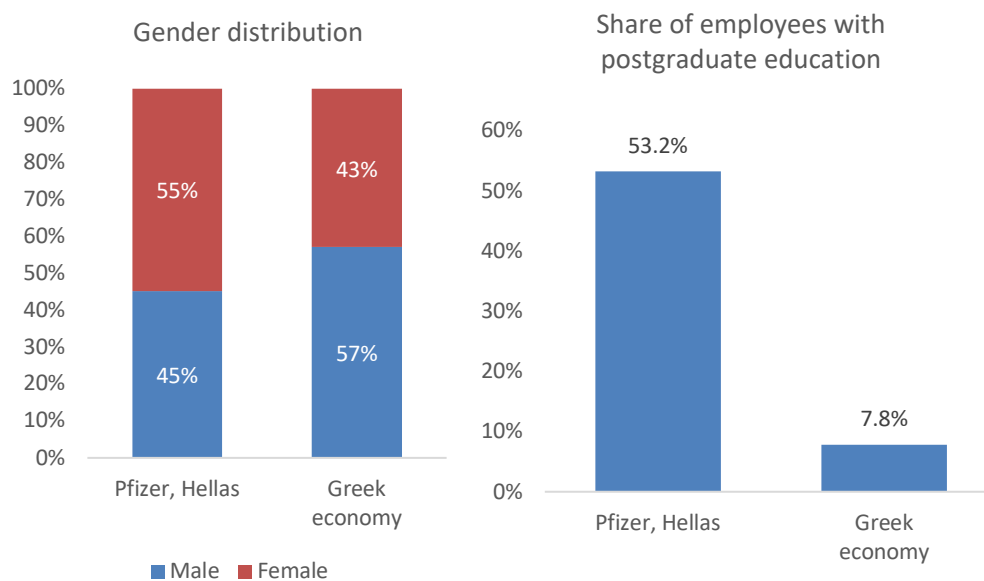
at 53.2% of total employment in the company, substantially higher than the average level in the Greek economy (7.8% - Figure 2.3).

Figure 2.2: Employment of Pfizer in Greece



Source: Pfizer Hellas

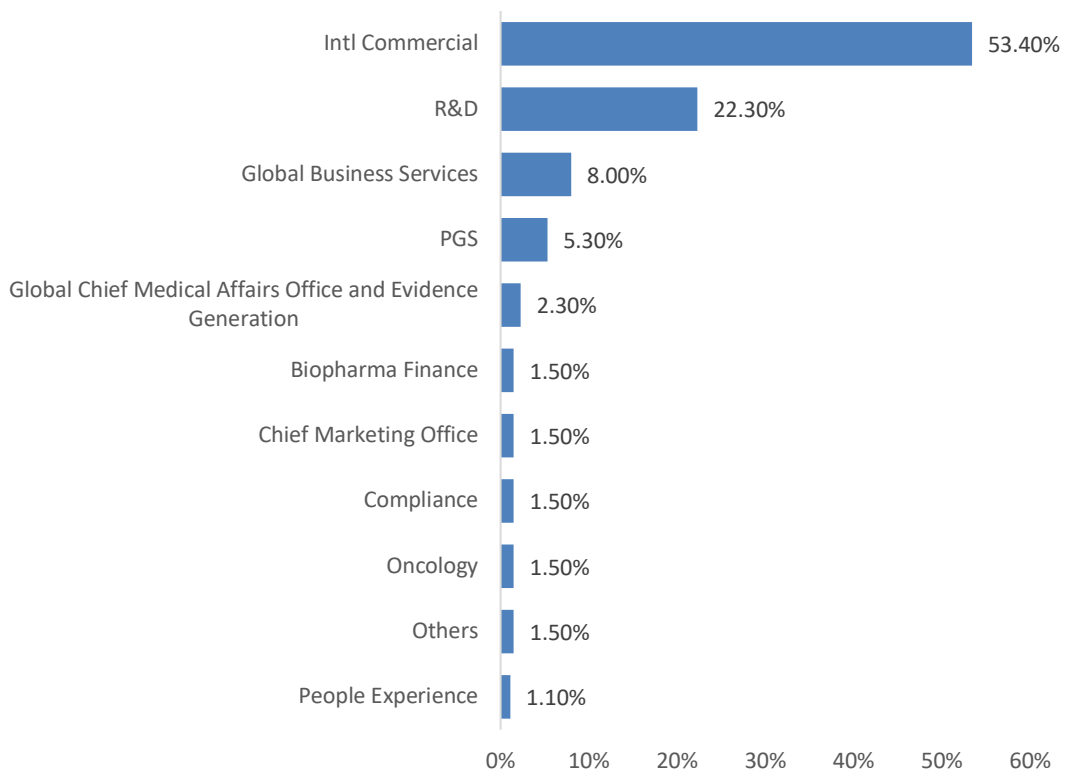
Figure 2.3: Employment by gender in Pfizer in Greece



Source: Pfizer Hellas, ELSTAT

Additionally, Pfizer in Greece employs a wide range of skilled professionals across its facilities in Athens and in Thessaloniki. These include occupations from science and technology and other areas with diverse educational and skill requirements. In the facilities of Pfizer in Athens, employees work in a variety of fields, most of them in sales (international commercial division - 53.4%), R&D (22.3%) and global business services (8% - Figure 2.4).

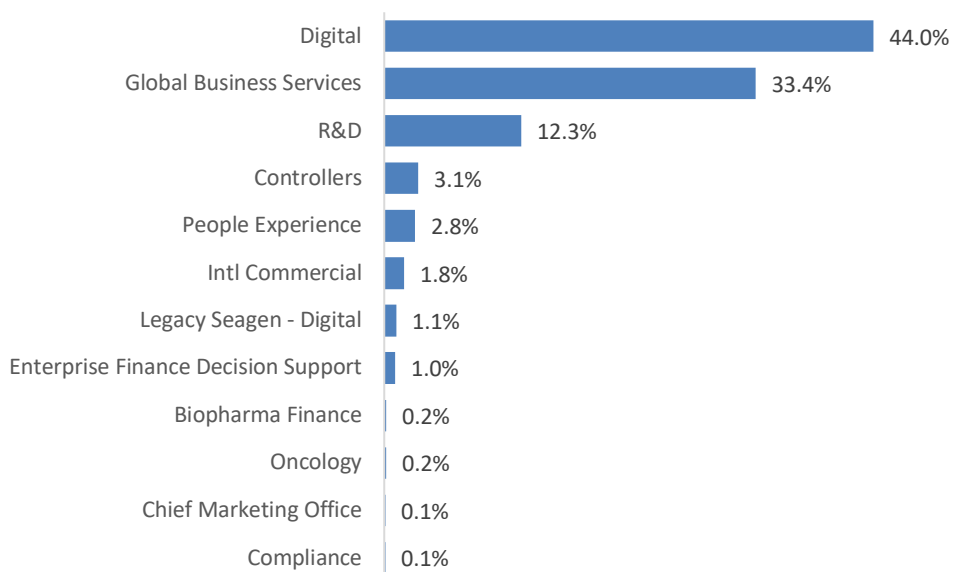
Figure 2.4: Employment in Pfizer Athens, 2024



Source: Pfizer Employees Report

In Thessaloniki, employment is mainly concentrated in professions related to digital (44,0%) and global business services (33,4), with a substantial share of the employees working in R&D positions (12,3% - Figure 2.5).

Figure 2.5: Employment in Pfizer Thessaloniki by profession, 2024



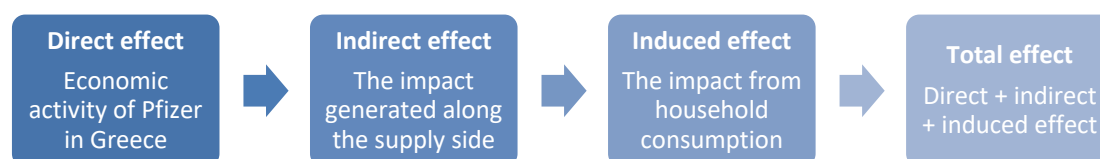
Source: Pfizer Employees Report

3 THE CONTRIBUTION OF PFIZER TO THE GREEK ECONOMY

3.1 Introduction

The purpose of this chapter is to assess the impact from the activity of Pfizer on the Greek economy, in terms of Value Added, GDP, employment and tax revenues. The assessment uses the input-output tables for the Greek economy and the Leontief input-output model, taking into account the interconnections between the different branches of economic activity.²

Figure 3.1: Direct, indirect and induced economic impact



The use of the input-output model allows us to capture the indirect and induced effects, alongside the direct economic impact, of an economic activity. The **direct impact** refers to economic activity that takes place in the Pfizer facilities in Athens and Thessaloniki.

The **indirect impact** refers to economic activity in the company's supply chain, taking into account the linkages among the sectors of the Greek economy. The activity of Pfizer in Greece requires inputs of goods and services from suppliers. The expenditure for buying these inputs provides revenue for the suppliers, which would not have arisen without the initial demand to cover the needs for Pfizer's activities in Greece. In addition, the suppliers should obtain inputs from their own suppliers, spending for this purpose resources, which constitutes revenue for their suppliers, and so on along the entire supply chain. The indirect impact on the economy is the overall result coming through the entire supply chain.

The **induced impact** refers to the effect caused by the change in consumption expenditure of workers in the sectors affected directly or indirectly by the examined economic activity. Employees in the company and its supply chain spend their wages to purchase goods and services, thus generating revenue to sectors and companies that provide these goods and services. The increased demand for consumption raises economic activity and employment in the sectors involved in the supply chain of consumer goods, which is captured in the model as induced impact.

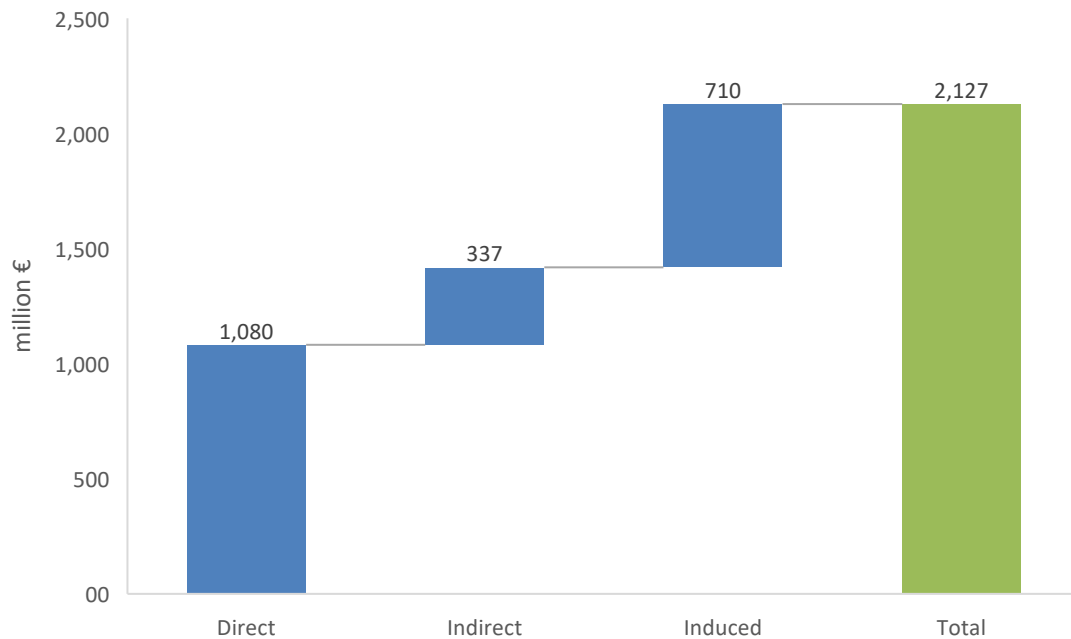
Data on turnover, direct employment, operating expenditure, and investment in fixed capital related to the operation of Pfizer in Greece over the period 2020-2030 were used for the assessment of the company's projected economic impact. The report presents cumulative figures over the period 2020-2030 in constant prices of 2023.

² The Appendix to this chapter presents the key assumptions of this method.

3.2 Economic impact from the activity of Pfizer

In terms of Gross Value Added (GVA),³ the cumulative contribution to the economy (direct, indirect, and induced effects) from the activity of Pfizer in Greece is estimated at approximately €2.2 billion (in constant prices of 2024) over the period 2020-2030 (Figure 3.2).

Figure 3.2: Cumulative impact on Gross Value Added from the activity of Pfizer in Greece over the period 2020-2030



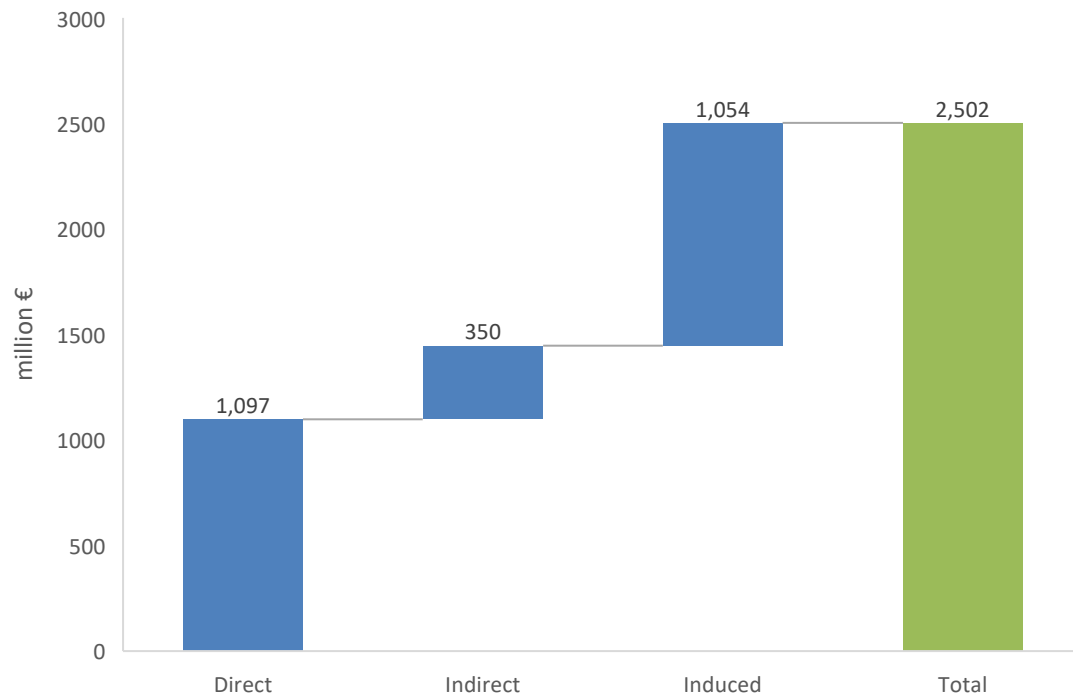
Source: IOBE estimations based on the input-output model of the Greek economy and the company's projected activity

In terms of GDP, which is equal to GVA plus taxes on production, the activity of Pfizer in Greece contributes €2.5 billion to GDP, cumulatively in constant prices of 2024, over the period 2020-2030. The cumulative direct effect (the value of the services provided by Pfizer Hellas after subtracting the intermediate consumption of goods and services used as inputs) on GDP from the operation of the company is estimated at €1.1 billion between 2020 and 2030 (in constant prices of 2024). Further €350 million of the cumulative GDP impact comes from activity in the company's supply chain (indirect effects), while the induced effects are estimated at €1.1 billion (Figure 3.3).

With respect to employment, the activity of Pfizer in Greece supports a cumulative total of about 43,200 job-years over the period 2020-2030. In annual terms, the employment in the economy will be boosted every year by about 3,920 jobs, on average over the examined period, as a result of the company's activity in Athens and Thessaloniki (Figure 3.4). In terms of tax revenues, the cumulative contribution of Pfizer Hellas is estimated at €971 million (in constant prices of 2024) between 2020 and 2030 (Figure 3.5).

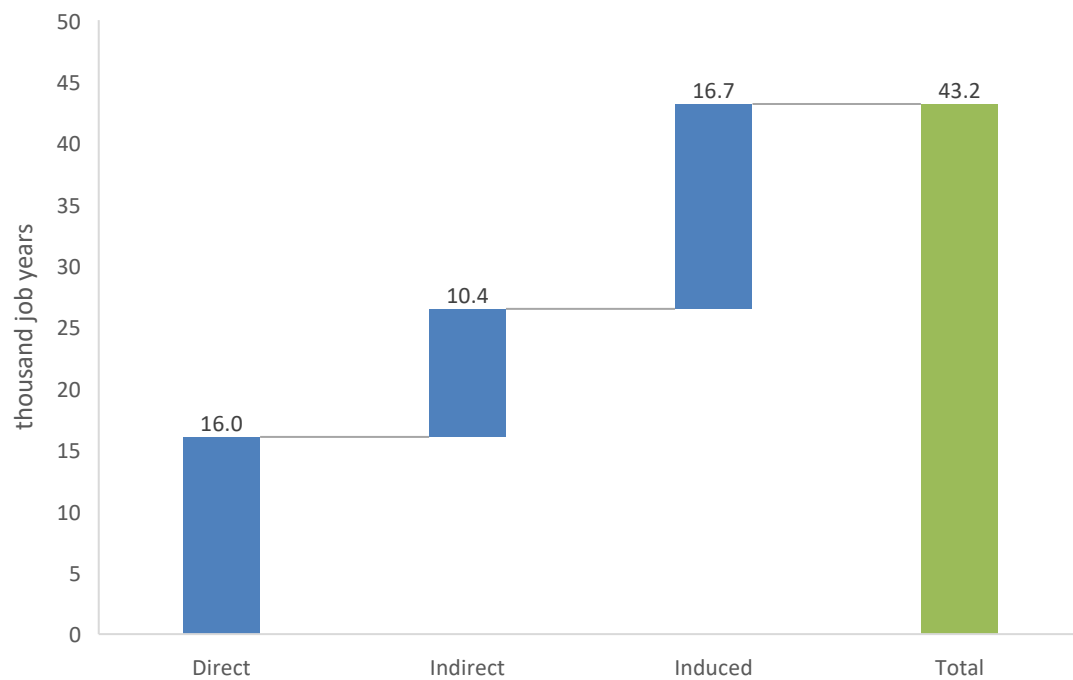
³ GVA corresponds to the value of goods and services produced less the value of materials and services used in the production process. The value of this measure is also equal to the sum of compensation of employees, taxes on production and gross operating surplus.

Figure 3.3: Cumulative impact on GDP from the operation of Pfizer in Greece by type of effect over the period 2020-2030



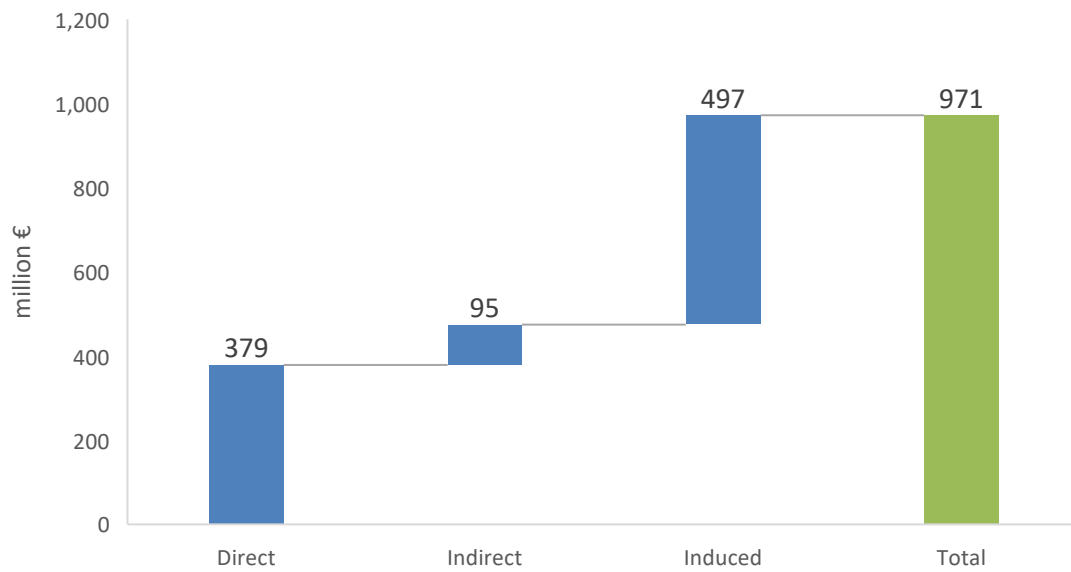
Source: IOBE estimations based on the input-output model of the Greek economy and the company's projected activity

Figure 3.4: Cumulative economic impact on employment from the operation of Pfizer in Greece over the period 2020-2030



Source: IOBE estimations based on the input-output model of the Greek economy and the company's projected activity

Figure 3.5: Cumulative economic impact on tax revenues from the operation of Pfizer, 2020-2030



Source: IOBE estimations based on the input-output model of the Greek economy and the company’s projected activity

3.3 Economic impact from the capital expenditure of Pfizer

The CAPEX of Pfizer alone contributes a total of €37.6 million cumulatively between 2020 and 2025. In terms of employment the total impact approaches 1000 job-years over the period 2020-2025 (Figure 3.6)

Figure 3.6: Cumulative impact on GDP and employment from CAPEX

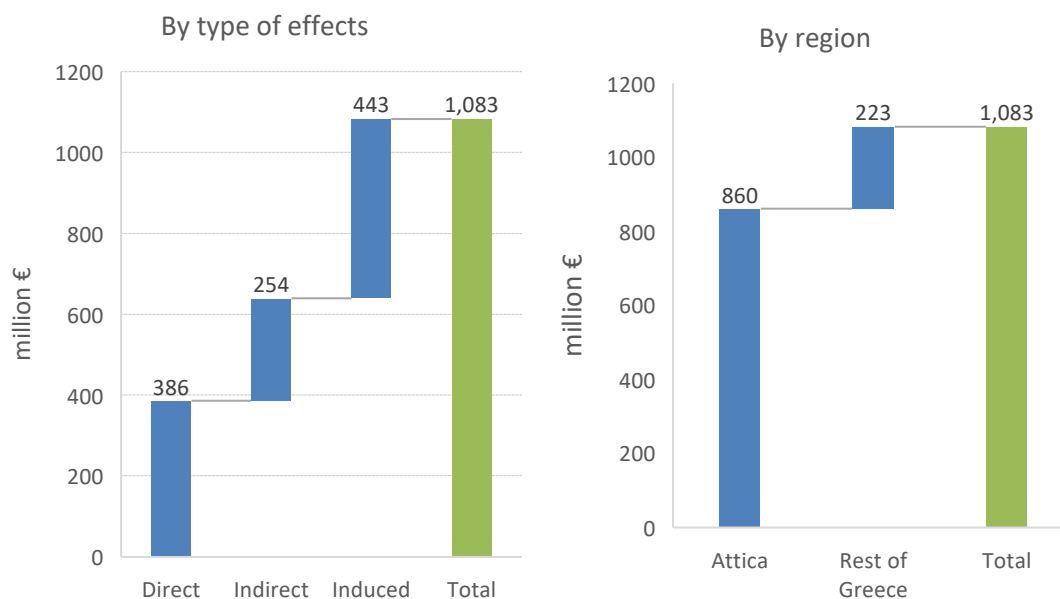


Source: IOBE estimations based on the input-output model of the Greek economy and the company’s projected activity

3.4 Economic impact from the activity of Pfizer in Athens

The cumulative impact on the Greek economy from the operation of Pfizer in Athens, in terms of GDP, is estimated at €1.1 billion (in constant prices of 2024) between 2020 and 2030 (Figure 3.7). The direct contribution (the value of the products and services provided by Pfizer in Athens after subtracting the intermediate consumption of goods and services used as inputs) represents 36% of the total impact of the site during the period considered.

Figure 3.7: Cumulative impact on GDP from the operation of Pfizer in Athens, over the period 2020-2030



Source: IOBE estimations based on the input-output model of the Greek economy and the company's projected activity

The indirect effect in the wider supply chain is estimated at 23% (or €254 million cumulatively in constant prices of 2024), while induced effects (the impact as a result of wages being spent by employees of Pfizer in Athens and of its suppliers) represent 41% (or €443 million cumulatively in constant prices of 2024) of the total impact. As a result, an increase by one euro of value added from the activity of Pfizer in Athens leads to an increase of GDP by €2.3 overall in the Greek economy.

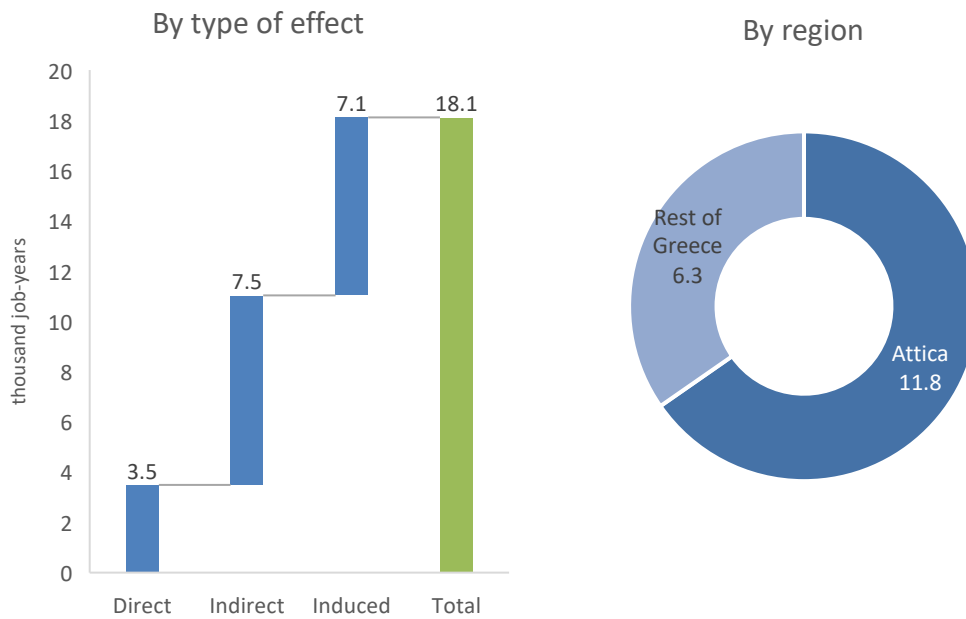
The operation of Pfizer in Greece contributes to the development of the local economies. More than 79% of the total GDP and employment effect resulting from the activities of Pfizer in Greece are generated locally. In particular, the activity of Pfizer Biopharma, generates €860 million for the economy of the Attica region, cumulatively in constant prices of 2024, over the period 2020-2030 (more than 8/10 of the total impact on GDP in the Greek economy). This corresponds to 0.1% of the GDP in the region of Attica, on average during the period examined (0.5% of the GDP of the regional unit of Northern Athens).

With respect to employment, the operation of Pfizer in Athens supports more than 18,100 cumulative job-years between 2020 and 2030 across the Greek economy. This implies that on average over the period 2020-2030, about 1645 jobs in the Greek economy are supported by

the activities of Pfizer in Athens. Therefore, every job at Pfizer in Athens supports 5.2 jobs in the Greek economy overall.

Most of the impact is centered on the Attica region. In particular, Pfizer supports a cumulated total of more than 11,800 jobs-years in the region between 2020 and 2030. In annual terms, this corresponds to 1,072 jobs per year on average in Attica over this period.

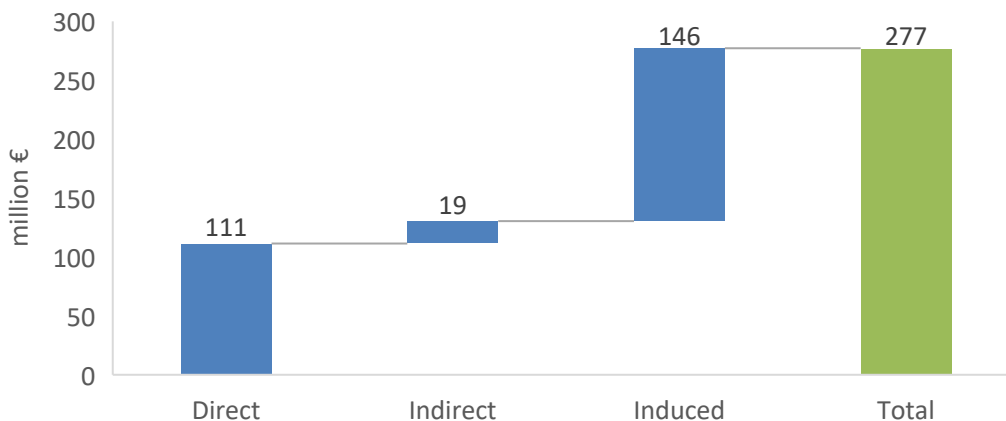
Figure 3.8: Cumulative impact on employment from the operation of Pfizer in Athens, thousand job-years, 2020-2030



Source: IOBE estimations based on the input-output model of the Greek economy and the company’s projected activity

There is also significant impact from the activity of Pfizer in Athens on tax revenues and social contributions. Cumulatively (in constant prices of 2024), the direct effect is estimated at €111 million, which increases to €277 million when the indirect and induced effects are considered, over the period 2020-2030 (Figure 3.8).

Figure 3.9: Cumulative impact on tax revenues from the operation of Pfizer in Athens, € million, 2020-2030

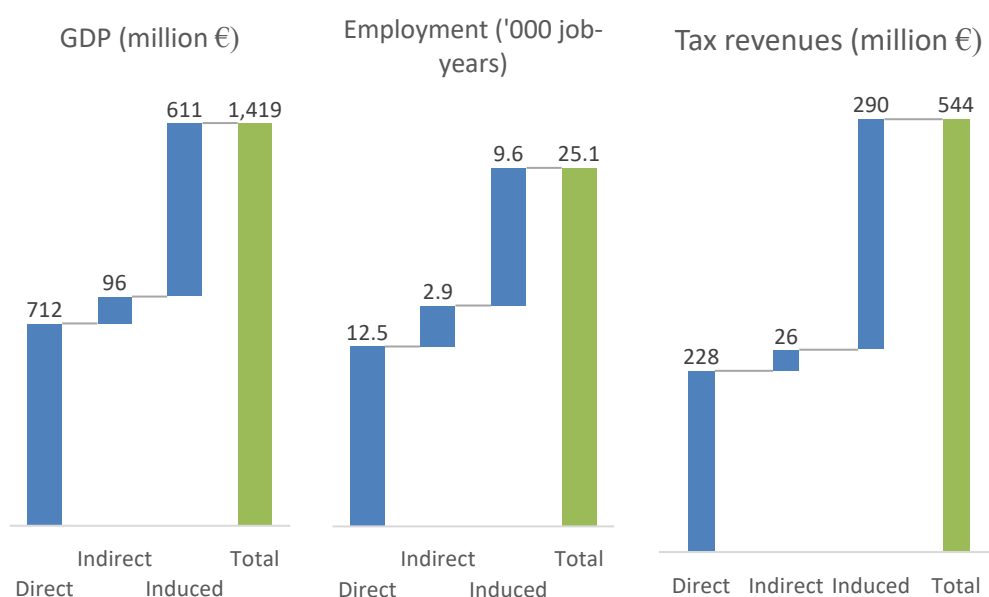


Source: IOBE estimations based on the input-output model of the Greek economy and the company’s projected activity

3.5 Pfizer in Thessaloniki

The operation of Pfizer in Thessaloniki strengthens significantly the company's activity in Greece. The development of the four new facilities leads to an acceleration of economic activity, which in turn generates additional output, value added, employment and wage income, in the second largest metropolitan area of Greece.

Figure 3.10: Cumulative impact on GDP, employment and tax revenues from the operation of Pfizer in Thessaloniki over the period 2020-2030



Source: IOBE estimations

The economic impact from the operation of Pfizer in Thessaloniki, in terms of GDP, over the period 2020-2030 is estimated at €1,419 million (Figure 3.10). Most of the impact occurs locally - the activity of the four Pfizer centers in Thessaloniki contributes €1.14 billion cumulatively to the GDP of the regional unit of Thessaloniki over the period 2020-2030. This corresponds to about 0.6% of the GDP of the regional unit of Thessaloniki (against 0.4% on average over the period examined according to the results of the study conducted in 2021). The substantial impact for the local economy is also evident by the fact that the contribution to the rest of Greece reaches approximately €0.28 billion, which is almost 20% of the overall economic impact.

Table 3.1: Cumulative economic impact on local level from the operation of Pfizer in Thessaloniki on GDP and employment over the period 2020-2030

	Thessaloniki	Rest of Greece	Total
Gross Domestic Product (million €)	1,140	278	1,418
Employment (thousand job years)	19.2	5.8	25.1

Source: IOBE estimations based on the input-output model of the Greek economy and the company's projected activity

The contribution in employment is estimated at about 25,100 job-years, of which 12,500 job-years correspond to the employment in the four Pfizer centers in the city (direct effect).

Therefore, 2,278 annual jobs will be created for the Greek economy on average over the period 2020-2030.

The regional unit of Thessaloniki also has substantial share in the employment impact. On average, 1,745 jobs will be supported each year in the region due to the activity of the four Pfizer centers in the city, of which 1,141 annual jobs correspond to direct employment in Pfizer in Thessaloniki over the period 2020-2030. Respectively, 1 position at Pfizer Thessaloniki will contribute 2.01 positions in the Greek economy (in total or 0.47 positions elsewhere in the economy).

The contribution to tax revenues from the activity of the four centers in Thessaloniki is estimated at €544 million. Of the total amount, €228 million corresponds to taxes and social security contributions collected directly from the activity of Pfizer in Thessaloniki, with the remaining €26 million and €290 million corresponding to indirect and induced effects respectively.

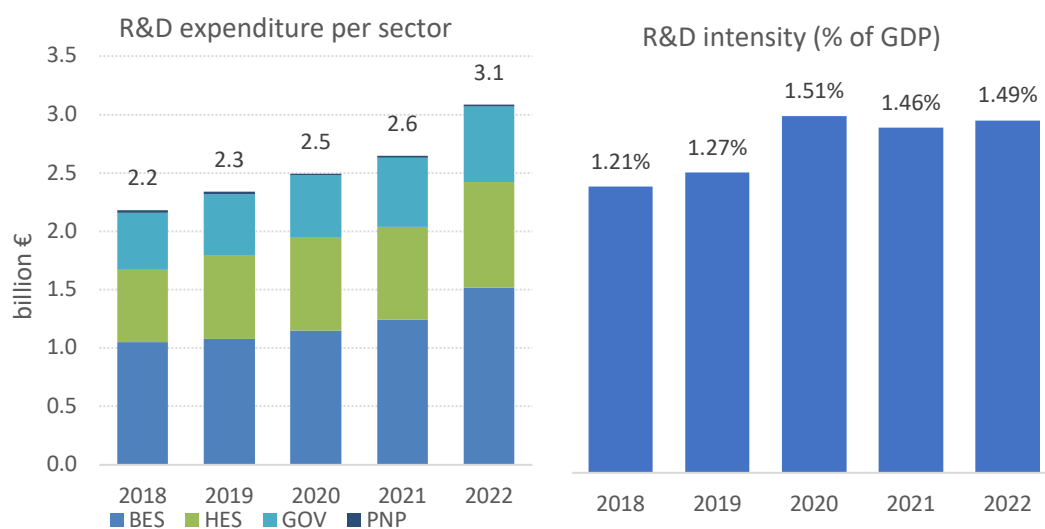
4 CONTRIBUTION OF PFIZER TO INNOVATION

4.1 Research and innovation in Greece

Innovation, research and development (R&D) are key drivers of economic development. Over the last decade the Greek economy has made progress in strengthening its innovation and technology capabilities. Greece has a research and development ecosystem that includes research centers, universities, and an increasing number of startups. The growing activity of major international companies, such as Pfizer, that have larger capacity to invest in research and innovation activities, compared to SMEs, is contributing to the strengthening of this ecosystem in Greece.

According to the National Documentation Centre (EKT), the expenditure for R&D in Greece stood at approximately €3.1 billion in 2022, higher by €0.5 billion or 19.2% compared to the previous year (cumulatively by 40.9% or €0.9 billion compared to 2018). As a percentage of GDP (R&D intensity), it stood at 1.49% compared to 1.21% in 2018. The largest share of R&D expenditure in Greece comes from enterprises (business sector). In 2022 it reached €1.5 billion against €1.2 billion in 2021 and €1 billion in 2018, followed by Higher education institutions (€906 million in 2022) and the government sector (€647 million - Figure 4.1).

Figure 4.1: Research and Development expenditure in Greece

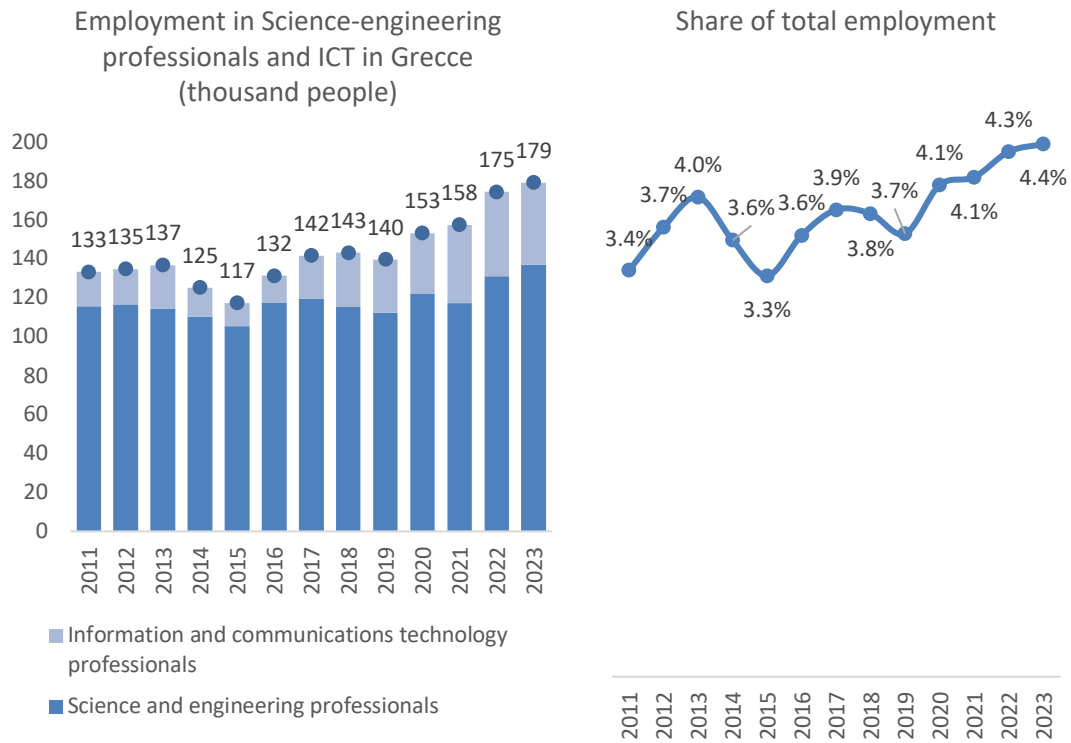


BES: Business Sector, HES: Higher education, GOV: Government sector, PNP: Private Non-profit institutions

Note: R&D expenditure by PNP in Greece is rather small, ranging between €17.3 million and €23.1 million in 2018-2022. Source: National Documentation Centre

Regarding occupations, based on the International Standard Classification of Occupation (ISCO-08), employment in “Science and engineering professionals” in Greece stood at about 137,000 in 2023 recording an increase by 2.0% on average annually between 2013 and 2023, while employment in “Information and communications technology (ICT) professionals” reached 42,300 persons in 2023 having more than doubled compared to 2013. In these two categories of occupations, employment in Greece stood at 179,300 people in 2023 (against 178,700 in 2022 and 135,700 in 2013) representing 4.4% of total domestic employment (4.3% in 2022 and 3.3% in 2013).

Figure 4.2: Employment in ICT and Science and engineering professionals in Greece



Source: Hellenic Statistical Authority (ELSTAT)

4.2 European Innovation Scoreboard

Pfizer, alongside other major international companies, is also contributing to boosting qualitative characteristics of the Greek research and innovation ecosystem. One way to analyze these characteristics is through a comparative analysis of research and innovation performance among EU member-states and other European countries, compiled in the European Innovation Scoreboard 2023 (EIS) by the European Commission.

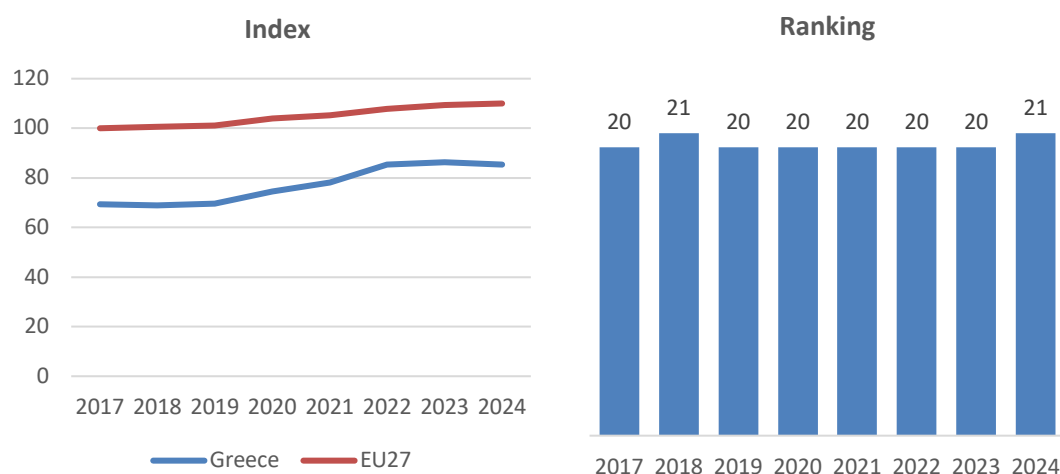
The determinants of innovation, based on the EIS, are grouped in 4 categories, namely Framework conditions, Innovation activities, Investments and Impacts (Table 4.1). Some of the determinants of each category relate to the State and its policies to develop innovation. Others relate to the activity of businesses, impacting the innovation of produced goods or services and, by extension, the economy at large.

Greece ranks 20th among the EU countries in 2024 (Figure 4.3), slightly behind Lithuania and Portugal (Figure 4.4). It is included in the countries with moderate innovation performance, while the countries from Northern Europe are classified as innovation leaders. Although Greece shows convergence trends with the EU average in recent years, the country’s performance gap to the EU expanded in 2024 (from 22.1 points in 2023 to 24.7 in 2024). Greece performs better in categories such as SMEs introducing product innovations, SMEs introducing business process innovations and Sales of new-to-market and new-to-firm innovations. By contrast, Greece underperforms compared to the EU average in categories of the EIS such as foreign doctorate students, lifelong learning and medium and high-tech goods exports.

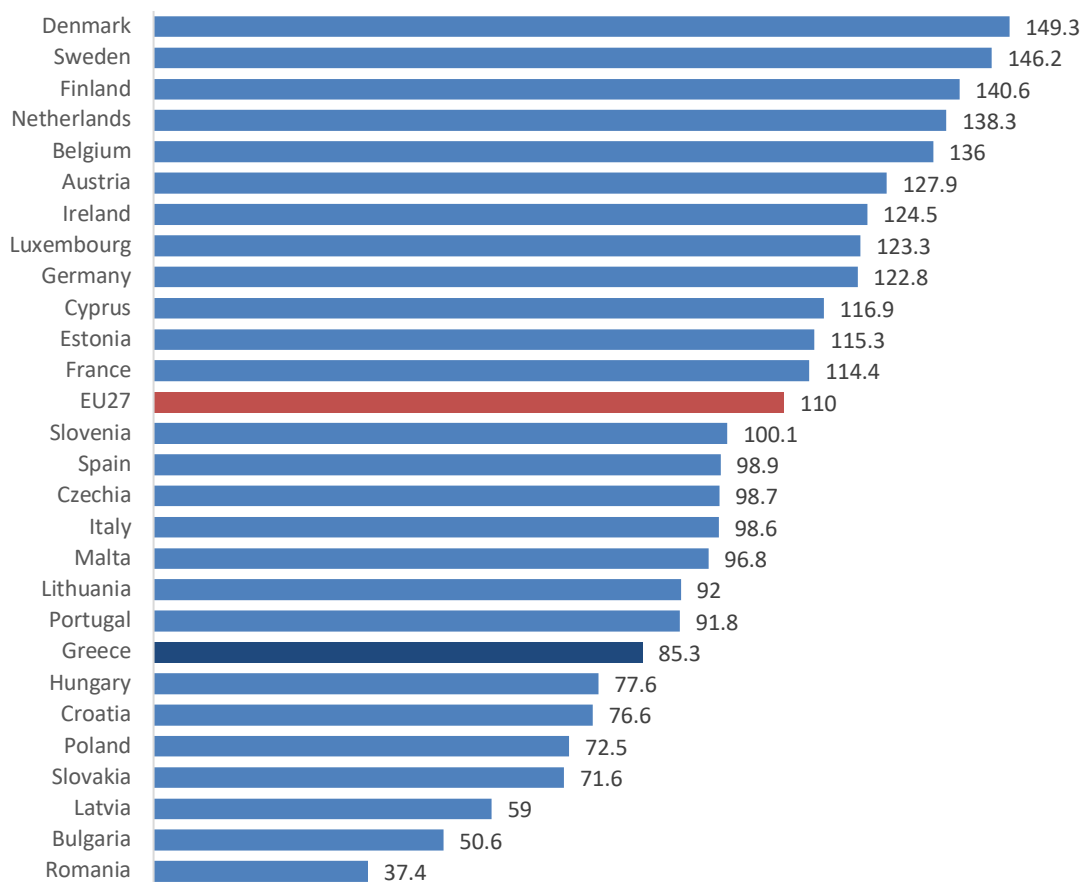
Table 4.1: Measurement framework

FRAMEWORK CONDITIONS	INNOVATION ACTIVITIES
Human Resources <ul style="list-style-type: none"> - New doctorate graduates (in STEM) - Population aged 25-34 with tertiary education - Lifelong learning 	Innovators <ul style="list-style-type: none"> - SMEs with product innovations - SMEs with business process innovations
Attractive research systems <ul style="list-style-type: none"> - International scientific co-publications - Top 10% most cited publications - Foreign doctorate students 	Linkages <ul style="list-style-type: none"> - Innovative SMEs collaborating with others - Public-private co-publications - Job-to-job mobility of Human Resources in Science & Technology
Digitalization <ul style="list-style-type: none"> - Broadband penetration - Individuals who have above basic overall digital skills 	Intellectual assets <ul style="list-style-type: none"> - PCT patent applications - Trademark applications - Design applications
INVESTMENTS	IMPACTS
Finance and support <ul style="list-style-type: none"> - R&D expenditure in the public sector - Venture capital expenditures - Direct government funding and government tax support for business R&D 	Employment impacts <ul style="list-style-type: none"> - Employment in knowledge-intensive activities - Employment in innovative enterprises
Firm investments <ul style="list-style-type: none"> - R&D expenditure in the business sector - Non-R&D innovation expenditures - Innovative expenditures per person employed in innovation-active enterprises 	Sales impact <ul style="list-style-type: none"> - Medium and high-tech product exports - Knowledge-intensive service exports - Sales of product innovations
Use of information technologies <ul style="list-style-type: none"> - Enterprises providing training to develop or upgrade ICT skills of their personnel - Employed ICT specialists 	Environment Sustainability <ul style="list-style-type: none"> - Resource productivity - Air emissions by fine particulates PM2.5 in industry - Development of environment-related technologies

Figure 4.3: Summary Innovation Index for Greece, relative to EU in 2017



Source: European Innovation Scoreboard

Figure 4.4: Performance of EU member states' Innovation System 2024, relative to EU in 2017

Source: European Innovation Scoreboard

4.3 The contribution of Pfizer Hellas in innovation

Initiatives by Pfizer in Thessaloniki and in Athens contribute substantially to the development of the Greek technology ecosystem, the absorption and diffusion of knowledge and the strengthening of innovation overall.

In particular, the activity of the Center for Digital Innovation in Thessaloniki contributes to the growth of employment in the Greek ICT sector, which is an important dimension of the European Innovation Scorecard. In particular, in 2023, CDI employed about 550 ICT specialists, representing about 1% of the total number of ICT professionals (not including ICT technicians) in the country. This figure is expected to increase further in the coming years.

Regardless of its strong educational background and working experience, the personnel in CDI receives continuous and systematic training. These training programmes incorporate at least 9,800 hours of participations in more than 300 training programs with a cumulative duration of 3.000 instructor-led training hours and 18.000 human hours of e-learning, skills and data analysis, consultations, customized training, and assessment.

Additionally, the Center for Digital Innovation offers student internship opportunities. Each summer, university students and graduates from Greek Universities can apply to join CDI as part of the internship program that offers 6-month training and aims at offering working

experience in the digital health industry. The program launched in 2022 with 7 interns. The 2023 iteration resulted in 19 interns.

In this context, the “Rotational Program”, implemented first by Pfizer in the USA, was launched in Thessaloniki in 2021. The scope of the programme, addressed at young people from all over Greece, is to promote the culture of continuous learning and personal development through the integration of Greek university graduates at Pfizer, where they will work to develop their skills in fields such as Software Engineering, Technical Architecture, Information Security and Data Analytics. At the end of a two-year rotation period, the participants choose the desired field, according to their interests and advancement potential but also based on the company’s needs. The selected candidates will have a permanent contract with the company and they will be based in Thessaloniki.

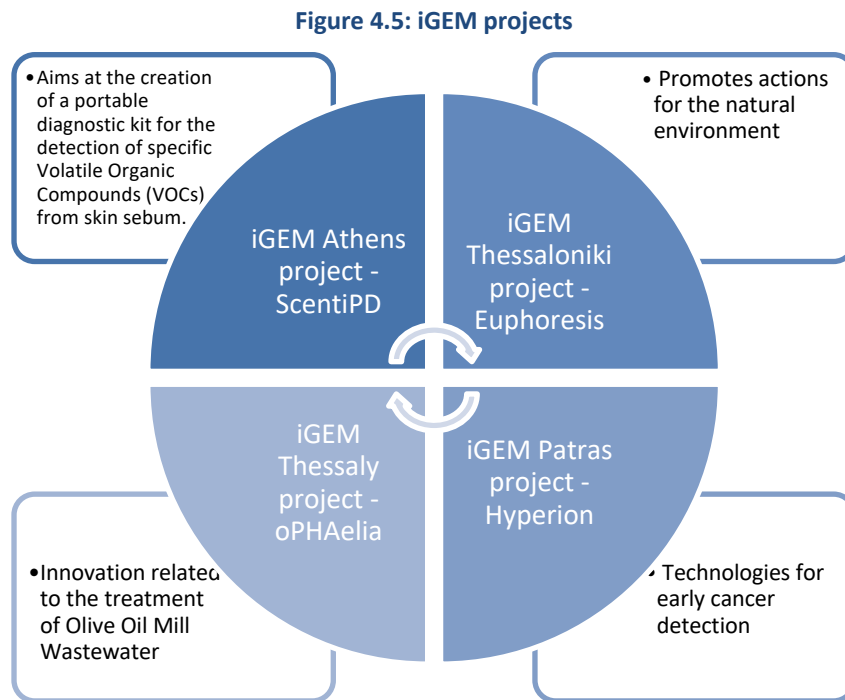
Moreover, the activity of Pfizer in Thessaloniki contributes to the development of an ecosystem of partnerships with startups, research centers, universities, healthcare professionals and patient associations. CDI collaborates with the Aristotle University of Thessaloniki, the University of Patras and the University of Ioannina, aiming at developing partnerships between the health industry and academia. High-tech projects such as quantum computing, voice-based diagnostics and fact checking for health news concern rapidly-emerging technologies. Through this collaboration, the developed knowledge transfer activities have a significant impact on human capital and the empowerment of skills in digital technology and data analytics. This can be further strengthened by the flow of knowledge among the other digital units of Pfizer across the world.

Furthermore, in collaboration with Elevate Greece, the official platform for the Greek Startup Ecosystem, and the Greek Patients’ Association, Greek startups had the opportunity in 2021 to submit digital health ideas and to compete for a cash prize along with a possible partnership with Pfizer. Another important milestone in 2022 was the launch of the 1st CDI Accelerator program (Start4Health). The program is addressed to Greek startup companies incubating digital innovative ideas on health and has attracted a lot of interest from the startup community. Five startups were selected to enter the Accelerator phases and the 2 outstanding were appointed the winners of the program, earning prizes of €25,000 and €10,000 respectively as well as the opportunity to explore a collaboration with CDI. Start4health was activated also in 2023, focusing on innovative solutions on eHealth, biotechnology, business intelligence and green technologies.

Along the activities of the four Pfizer centers in Thessaloniki, Pfizer in Athens also supports innovative projects with significant impact on society and the environment. In particular, Pfizer Biopharma has implemented a widespread research program in Greece with a substantial number of clinical trials and the participation of research centers. Additionally, it maintains productive relationships with domestic universities and research organizations.

For example, in 2019, the program "Advancing Science" that involves a cooperation between Pfizer Hellas and the National Hellenic Research Foundation was announced. The program concerned scholarships to postgraduate students, PhD candidates and post-doctoral researchers in order to support young scientists from the health sector and contribute to the reversal of the brain drain. The duration of the scholarship program was three years with a total financing of €125,000.

Pfizer Biopharma also supports the participation of iGEM student groups from four Greek Universities, in the iGEM 2023 International Synthetic Biology Competition. The International Genetically Engineered Machine (iGEM) is an independent, non-profit organization dedicated to the advancement of research in the field of Synthetic Biology. It is considered as one of the most rapidly developing scientific disciplines that has already attracted the interest of the global community.



Research and innovation is at the heart of these projects which cover diverse areas of interest from the development of better diagnostics and more effective therapies to the use of natural resources and waste management (Figure 4.5). The students from the Greek universities participating in these projects have the ability to empower their knowledge in areas related to their educational background.

Moreover, Pfizer is at the forefront of developing and manufacturing medicines and vaccines. During the outbreak of the SARS-CoV-2 coronavirus Pfizer managed in a short time to develop a vaccine against COVID-19 which was available for use in Greece at the beginning of 2021. The revolutionary digital technology and cutting-edge science and the cooperation with regulatory authorities, suppliers and researchers have substantially contributed to the development of mRNA vaccines. In addition to the existing medicines and vaccines available in Greece, over the period 2023-2025, 18 innovative medicines are expected to be launched in the Greek market (provided approval is given).⁴

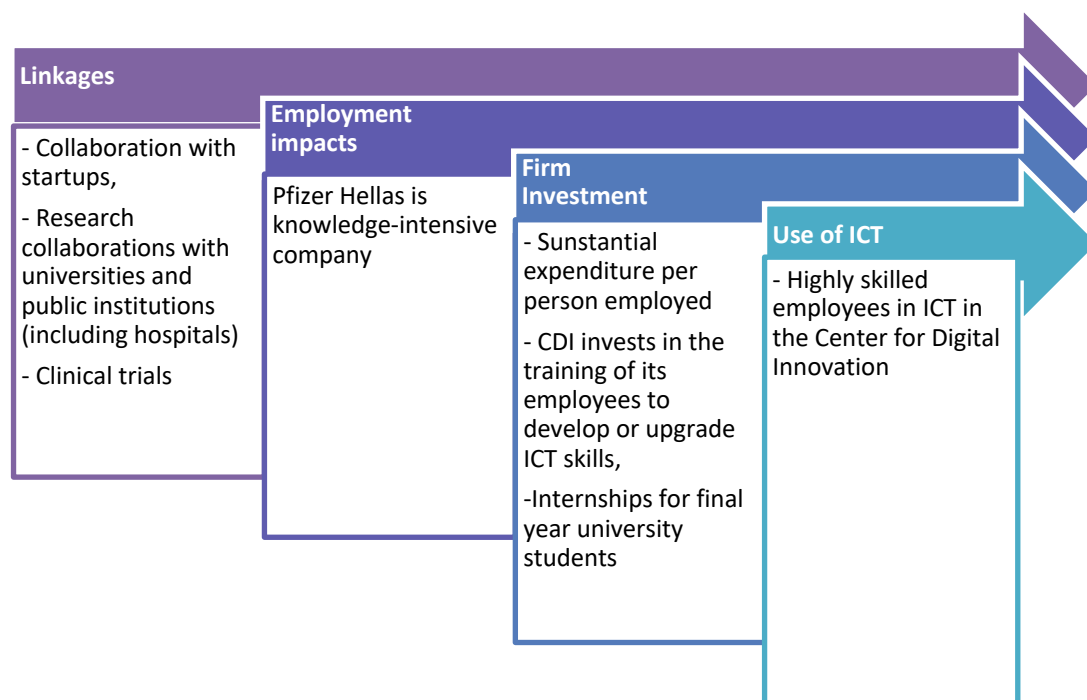
Another major area of innovation for Pfizer in Greece concerns its customer services, which include two major categories, customer management and order management. The customer service of Pfizer Hellas was facing very high call volumes (4,500 on average each month between July 2021 and 2022). To manage the large number of calls and the broad supply

⁴ Launches include placements for private purchase, insurance compensation, or early access.

chain, in June 2022 the company launched the online platform “Pfizer prime”, as a user-friendly tool for placing orders. Based on the feedback received from its customers, the platform ensures faster access to medicines. The advantages the platform offers (for instance, order submission 24/7, order tracking, complete order history, common platform for all customers, availability of invoices and shipping notes in electronic format and in detail) has resulted in high satisfaction rate given that during the eight-month period in operation, “Pfizer prime” is used by the vast majority of customers.

The initiatives mentioned above contribute substantially to the strengthening of the Greek innovation ecosystem and the improvement of the relative position of Greece in innovation performance measures, such as the European Innovation Scoreboard. Even though, the impact is difficult to measure and depict in quantitative terms, the work and activity of the Center for Digital Innovation, the other Pfizer centres in Thessaloniki and Pfizer Biopharma in Athens are closely related to specific dimensions of the European Innovation Scoreboard in which Greece has been lagging behind and is making progress. These are mainly associated with the broader categories of human resources, finance and support and use of ICT (Figure 4.6).

Figure 4.6: Indicators of the European Innovation Scoreboard Indicators related to the activities of Pfizer in Thessaloniki and Athens



In particular, the activity of the four Pfizer centers in Thessaloniki, and mainly of the Center for Digital Innovation contributes to knowledge creation and the diffusion of technologies that can lead to the development of new patents, other intellectual assets, and innovative services and products, particularly in digital sectors. The diffusion of technologies to other markets and sectors can create substantial wider effects and a link between innovation and growth. Respectively, technology can be very beneficial if it creates opportunities for people to

succeed in the labor market.⁵ The Center for Digital Innovation is making an important contribution in this direction both locally and nationally through the creation of high-skilled jobs in the Information and Technology sector, which is among the most dynamic economic sectors across the world.

Pfizer Hellas develops practices that contribute to innovation and knowledge in the fields of pharmaceuticals and health care. The activity of Pfizer in Thessaloniki and Athens contribute to the development of knowledge-intensive activities from which domestic institutions such as tertiary education (including university hospitals), the government sector and the Greek health care system can benefit substantially. Innovative research supported by Pfizer in Thessaloniki, which has an international reach through the company's network, can encourage a small country such as Greece to build a knowledge economy with high skilled workforce that invests in the production of products and services with high value added.

⁵ Growing United, Upgrading Europe's Convergence Machine, World Bank report for the European Union, 2018

5 APPENDIX

5.1 Methodology

The overall assessment of the contribution of an activity to the economy takes into account both its direct and subsequent economic effects. An activity contributes directly to the national economy, producing products or services, offering employment and wages to employees, paying employers' contributions and taxes as part of their operation.

In addition, an activity affects the economy through the demand it generates for products and services it uses from other industries as inputs to the production process. Respectively, the increased economic activity of suppliers stimulates economic activity in their own suppliers and so on. The cumulative effect of these interactions along the supply chain represents the indirect contribution of an activity.

In addition, part of the value generated directly and indirectly is distributed as income to employees, causing an increase in household consumption demand and thus further strengthening economic activity. The cumulative effect of the interactions involved to meet additional demand for consumption represents the induced effect of the activity to the Greek economy.

The assessment of the overall economic impact is based on the input-output model, a method developed by the economist Wassily Leontief, who was awarded the Nobel Prize for Economic Sciences for this work in 1973. The economic analysis using the input-output model is based on the latest available sectoral statistics of the Greek economy from the database of Eurostat.

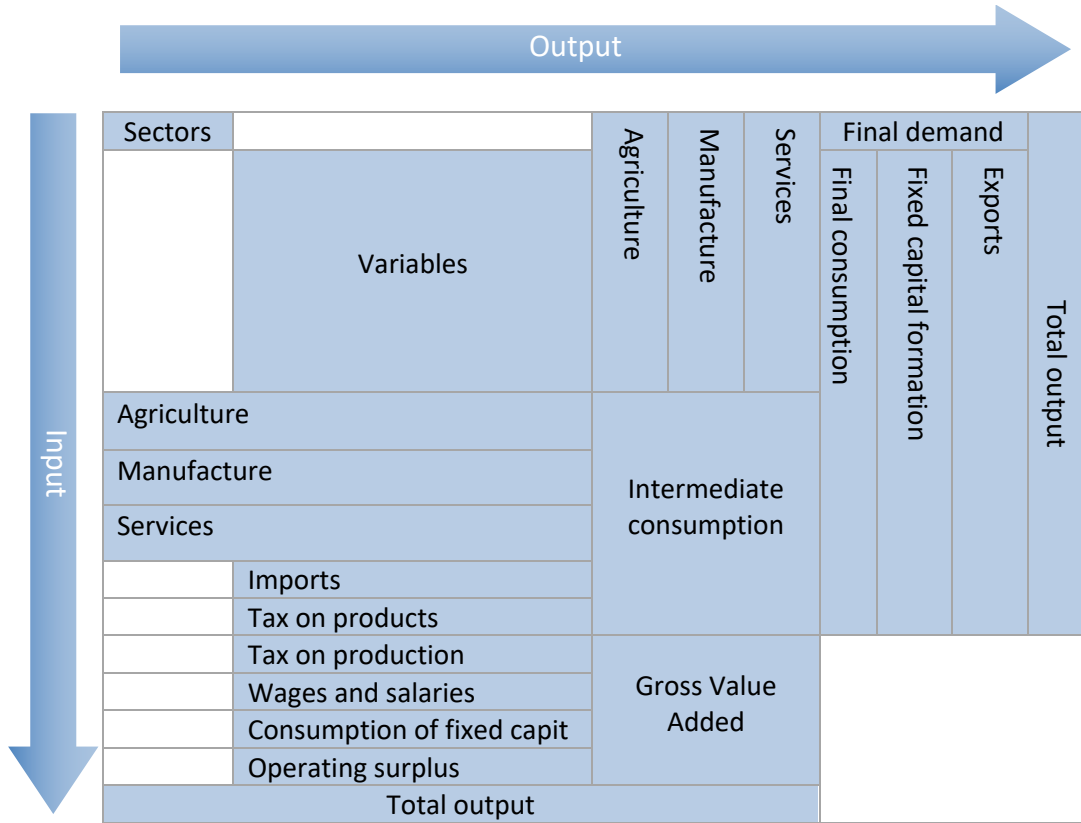
In particular, data of the national accounts are categorized into 63 sectors (such as construction, retail trade, accommodation and food services, etc.). For each sector, there is available data with regard to gross production value and the value of inputs used in the production process (such as products of other domestic industries, labor, capital and imports). There are also available data on taxes and social contributions paid by each sector during the production process and the end users of the product of each sector (final consumption by households and the government, capital formation and inventories, exports). These data are depicted in the input-output tables for the Greek economy, the outline of which — in a simplified form for an economy with only three industries — is presented in Figure 5.1.

The input-output model is based on specific assumptions. The main assumption concerns the production technology, which is considered constant with respect to changes in output. In particular, a unit of an industry's output is assumed to require inputs (products, services, capital, and labor) in fixed proportions, irrespective of the amount of the industry's total production. In addition, consumer preferences and prices in the economy are also considered constant, while there are no restrictions on the production capacity of each sector of economic activity. Thus, in the context of such a model, the production of each sector is determined by the demand for the product (or service).

Based on these assumptions, the quantity of required inputs and other indicators (such as wages) are calculated per unit value of the final product for each sector. The respective requirements of each sector related to inputs from their suppliers (indirect effect) can be determined in relation to the per unit production requirements of each sector of economic

activity. The effects of each sector’s activity on consumer demand, due to the income generated in households and consumption growth, are determined in a similar way, by introducing the households as a sector of economic activity, requiring inputs (consumer goods and services) to produce their output (labor).

Figure 5.1: Outline of an input-output table



5.2 Multi-regional input-output tables

The construction of multi-regional symmetric input-output tables for the Greek domestic production is based on the national symmetric input-output tables for the domestic production of the Greek economy, adjusted for the latest available data on national accounts.⁶ The adjustment (quantity added or deducted) for each individual use (individual intermediate consumption or final use of domestic products, use of imports or tax on products) is determined by solving an optimization problem under the following constraints.

Adjustments leave the total use of domestic products by each sector unaffected, ensure symmetry of the Input-Output table, ensure that the total of intermediate use and use for household consumption for the product of each sector does not exceed that sector’s output. These are calculated in order to minimize the sum of the percentage changes they induce on each use and to minimize the deviation of the sectoral structure of total intermediate consumption of domestic products from the corresponding structure in 2015.

⁶ The national symmetric input-output table is published every five years, with the latest table containing figures for 2015, while the remaining national accounting data are published annually.

The Input-Output table for the use of imports is calculated by allocating the total use of imports of each (column) sector and each final use, as derived from the calculation of the table for the domestic production, in the various sectors (along the rows of the table), according to the respective ratio of imports from each (row) sector to the total use of imports by each (column) sector, as reflected in the Input-Output table for the use of imports for 2015.

The calculation of the multi-regional symmetric input-output tables for the Greek domestic production was based on the following procedure. The production value of each sector in each region of the country is determined according to the production value of the industry at national level combined with regional employment data by sector of economic activity at NACE Rev. 2 two-digit level.

Based on the assumption that the production of a unit of output in a given sector requires inputs in fixed proportions, thus it requires labor in a given proportion (assumption of constant technology), the regional distribution of employment in a given sector is assumed to be representative of the regional distribution of the sector's production. Having determined the output of each sector in each region, and based on the assumption of constant technology, we calculate the total input requirements for each sector in each region, as well as the value added, the wages paid, the operating surplus of each sector in each region. We also calculate the household consumption in each region, assuming that the total household consumption is allocated to regions according to the total wages offered in each region.

Then, the regional origins of the inputs used by each sector in each region are calculated. For a given sector K, the total quantity (in terms of value) in each region that is required to cover the input needs of all other sectors in that region, as well as to cover the needs for household consumption of product K in that region is calculated. Given the requirements in product K per region and the production of product K per region, we calculate how the product K output in each region is distributed to every other region in the country, assuming that the trade among regions in the country is carried out in a manner that minimizes transportation cost.

In particular, the output of sector K in each region is distributed to the other regions in the country in such a way as to cover the requirements in product K in each region, while transporting the minimum possible amount of product K between regions, and also ensuring that the quantities of product K transferred among regions are moved from and to the geographically nearest possible regions. The calculations are based on the assumption that the transportation cost of a unit of a sector's product from one region to another is proportional to the distance between the central points of the two regions.

The problem of covering the requirements for product K in each region while minimizing transportation cost is a typical linear programming problem, which is solved using a primal-dual interior point linear programming algorithm.⁷ Each quantity of product-K transferred from one region to another is distributed between the sectors in the destination region according to each sector's requirements in product K.

⁷ We use the Primal-Dual Interior Point Linear Programming Algorithm, discussed in Mehrotra, S. (1992). On the Implementation of a Primal-Dual Interior Point Method. *SIAM Journal on Optimization*, 2, 575–601. See also Zhang, Y. (1995, July). Solving Large-Scale Linear Programs by Interior-Point Methods under the MATLAB Environment.

This process is followed for every sector in the economy. Having calculated how the output of each sector in each region is distributed for intermediate use by each sector and for household consumption in every region, we can then calculate how the remainder of each sector's output in each region is distributed to the other final uses (consumption by non-profit organizations, government consumption, gross fixed capital formation, inventories, and exports). For a sector K, in a region where there is surplus in product K, after the requirements of product K for intermediate and household consumption have been met, this surplus is distributed to the remaining final uses according to the ratio of each final use of product K on the total of final uses of product K (excluding household consumption) at the national level. This concludes the construction of the multi-region input-output table for the domestic production in Greece. This table presents the interactions between the sectors of the Greek economy at a regional level for a [number of sectors] x [number of regions] combinations of sectors and regions.

The multi-region input-output table for the use of imports is constructed based on the multi-region input-output table for domestic production as follows: each use of imports (imports of a particular sector's product) in each region is calculated based on the respective use of domestic products and the respective ratio of use of imports on use of domestic product as derived from the national Input-Output tables for the use of imports and for the domestic production.

5.3 Calculation of economic effects

The input-output tables are used to calculate the input quantities required to produce one product unit of each sector in each region of the country, with the construction of the corresponding direct requirements table (Table AI). Table AI has dimensions [819 x 819] — one line for each combination of branch and region, and respectively for columns. Each item in Table AI represents the quantity, in terms of value, of the product of the corresponding line of the table required for the production of one product unit in the corresponding column of the table:

$$A = [\alpha_{i,j}] \text{ with } i, j = 1, 2, \dots, N \text{ and } \alpha_{i,j} = \frac{\text{input use } i \text{ by sector } j}{\text{production value of sector } j}$$

where sector i is a specific sector in a specified region and respectively for sector j . Using Table AI, the Leontief Table for Indirect Effects (Leontief Type I) is calculated on the basis of the relationship:

$$L_{Type1} = (I - A)^{-1}$$

The L_{Type1} table can be used to determine the effects on the economy as a whole that are caused by an exogenous increase in demand in one or more sectors of the economy. It is worth noting that if T is the column vector [N x 1] of total demand (i.e. intermediate and final demand) for the product of each sector, W is the column vector of demand for intermediate consumption per sector in the economy and F is the column vector of final demand per sector in the economy, and assuming that household consumption is included in the final demand, that is if we have:

$$T = [t_{i,1}] \text{ with } i = 1, 2, \dots, N \text{ and } t_{i,1} = \text{total demand for the product } i$$

$W = [h_{i,1}]$ with $i = 1, 2, \dots, N$ and $w_{i,1}$ demand for good i for intermediate consumption

$F = [f_{i,1}]$ with $i = 1, 2, \dots, N$ and $f_{i,1}$ = demand for good i for final consumption

Then it holds that:

$$W + F = T$$

By construction of table A, it also holds that:

$$A \cdot T = W$$

It follows that:

$$T = L_{Type1} \cdot F$$

The latter equation allows the calculation of indirect effects on the overall output of the economy from an external shock to final demand.

To determine the indirect effects of the implementation of an investment project on the economy, we use the Leontief L_{Type1} table to calculate the impact on total output that is caused by an increase in the final demand of the sectors to which the investment expenditure is directed.

For the calculation of the induced effects, the Leontief type 2 table is constructed, assuming an extended sectoral decomposition of the economy, in which there is an additional sector of economic activity, namely households. In this context, households are assumed to be a productive sector of the economy, using inputs (household consumption) to produce output, which is labor. The output of the "quasi-sector" of households is in turn used as input from the other economic sectors.