The Importance of the Development of Industry in Romania and Its Development Potential

Lóránt Zsombor Kocsis
PhD candidate, National University of Public Service

Abstract

The first part of the study details the importance of industry in the economy in general, but it is worth nothing without continuous technological development. This is supported by classical and unquestionable theories, followed by statistical data and macroeconomic indicators to demonstrate their practical relevance. The realistic data will clearly show that countries with a strong industrial base and a strong focus on development in their economic structure will have a steady advantage over other countries on the international stage. The structure of the industry in Romania, its main areas, and the industrial characteristics of the regions will then be presented, as well as the economic differences between industrialised and less industrialised areas. The study shows that industry and R&D are the basis for economic growth and development, as they are also the basis for services. Romania is in a very special situation, as it has all the potential and resources to build and develop the industry, but the mentality of the past system still leaves its mark on how to exploit its potential. Of course, industry and its development require a considerable amount of capital, knowledge, and know-how. For this, European Union funds offer considerable opportunities, and the operational programmes that provide this type of support, both to the private sector and to public institutions, are presented in detail. At the end of the study, it will be clear what industry and R&D mean for economic growth, what the situation and characteristics of the Romanian industry are, and what financial resources are available for the implementation and development of industrial activities.

Keywords: industry, R&D, innovation, economic development, aid policy, European Union

JEL codes: O10, O14, O30, F63, H81

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Introduction

Since the first industrial revolution, certain jobs have been taken over from humans by machines and equipment, both in agriculture and in the most productive sectors. This led to an increase in productivity and efficiency, as the ever-evolving machines and production lines were able to produce a much larger quantity of products in a shorter time and, in many cases, using fewer factors of production. Since then, the importance of machines, technical tools, and technologies has only increased, since their presence in the economic structure of a nation determines the degree of economic development of its states, its economic stability, and the standard of living of its population.

Since economic processes have crossed national boundaries and become global - even in the case of pandemics and wars, although these can temporarily restrain or set back these processes - we can speak of globalism, which presupposes the specificity and regularities of the functioning of the world economy that we have been experiencing for many decades. In analysing the global economy, there are significant differences in development between regions and nation-states, the roots of which, as the renowned economist and sociologist Immanuel Wallerstein has argued in his famous theory, can be found in the centre-periphery relationship, in industry and its level of development. In general, the case of Eastern Europe, including Romania, is a special one, since for decades it was the communist dictatorship that determined the level of development of its industry, but decades have passed since the change of regime. Nevertheless, differences in economic development and living standards have persisted. The questions are therefore: what could the reasons be? Is the solution really to be found in industry and technological development? In which areas and where exactly are interventions needed? What resources can be mobilised to achieve this?

The aim of the paper is to show the importance of the presence of industry and especially its continuous development for economic development. The level of development of the industry is directly dependent on the presence of R&D and innovation activities. Furthermore, the thesis aims to present the structure, characteristics, and problems of the Romanian industry and to identify the EU resources that ensure the industrial development of the country.

Analysing, processing, comparing, and interpreting officially published national and international macroeconomic data, such as GDP, unemployment, average income, investment, and infrastructure development, can answer many questions.

In terms of implementation, we need to pay close attention to national and EU grant opportunities, which can help the private sector, especially SMEs, as well as the public sector, to deliver the necessary improvements.

1. The importance of industry and its development

The realisation of production provided by industry and the gradual development of production technologies are essential elements of economic development. Indeed, it is also the root cause and effect of the differences, or even gaps, in levels of development between states and regions. We can observe states that, measured over a longer time horizon, are among the economic leaders and others who, carrying the burden of underdevelopment, are unable to embark on a path of breakthrough development. What could be the reason for this? What might be behind it? The combined effects of several elements may provide the right answer: culture, religion, mentality, geographical location, etc., but there is a purely economic explanation for all of this, which I believe to be the most valid. This issue was also dealt with in depth by a classical and renowned expert, Immanuel Wallerstein (mentioned in the introduction), who developed the well-known centre-periphery theory of World Systems (the general centre-periphery relationship was dealt with before him, but it has other implications in regional, social and urban geography). The theory focuses on the axial division of labour, which divides production into a centre and a periphery. These represent groups of states, not in terms of geographical location, but in terms of economic performance and level of development. The most economically developed countries are in the centre, while the least developed countries are in the periphery. There is a transitional category between the two, called semi-periphery, which includes Central and Eastern Europe, and Romania can be included in this category. The basis for increasing and maintaining development is to produce with own capital, regardless of geographical location, and to ensure continuous technological development. Economic ups and downs can be observed when a leading industry emerges in the centre, quasi-monopolies are created and capital accumulation begins. There is a general prosperity, with huge profit margins and rising employment and wages. After a certain period, however, more and more firms enter the quasi-monopoly space and the market becomes increasingly competitive. Since the theory was first developed, the world economy has changed significantly, and it is therefore important to distinguish between the traditional and the current perspective. The traditional view is that competition leads to overproduction, which leads to a significant build-up of unsold goods and a decline in the profit rate, the main driver of entrepreneurial activity. From this point onwards, the economy enters a period of recession (Wallerstein, 2010). One of the most proven ways of keeping the profit margin at a constant level is to reduce costs so that the gap between revenues and costs does not shrink further, and therefore to start to externalise capital towards cheaper labour. This is like a centrifugal force from the centre to the periphery. The primary beneficiaries of this are the semi-peripheral countries, and then they drift further to the periphery. Through this process, companies ensure that they minimise their costs and maximise their profits. The outflows of production are through investment, but this has the effect of driving down wages in the centre. As a consequence, the already low demand for supply falls further. In this situation, one proven method is to raise wages in the centre, which restores

the level of demand and allows for the introduction and sale of new flagship products. This type of alternation between expansion and stagnation in the economy is called the Kondratyev cycle. Several types of cycles are distinguished according to the duration of the cycles: the Kitchin cycle (10-40 months), the classical business cycle (occurring every 8-10 years), the Kuznets cycle (alternating in 18-20-year periods), the Kondratyev cycle (40-60 years) and super-long cycles (of 150-200 years) (Lupsa & Bratu, 2016). Wallerstein emphasized the Kondratyev cycle, as it is mainly linked to technological development, and this type of development forms the basis of his theory of economic disparities, gaps, and the emergence of poles at the centre and periphery. However, as the world economy has undergone significant changes in the meantime, mainly due to the global nature of capitalism, it becomes necessary to highlight the modern perspective. In this sense, nowadays, innovations in the centre (intensive phase) are no longer intermittent but almost continuous, so that as soon as new technology is introduced, they move, so to speak, to the lower-wage regions - extensive phase - (or already have production units there), covering ever larger areas. This process has led to a spatial separation and a temporal convergence of the extensive and intensive phases. As a result, the centre-periphery role in the global arena is becoming increasingly entrenched, as the productive bases of peripheral countries are underdeveloped, vulnerable, and stuck in the extensive phase of the capital return cycle (Artner, 2014). This means that in countries with industrial production (centre), innovation and research and development (R&D) are the main activities, while in less developed areas (periphery, semi-periphery), production is carried out, but with capital from the centre. As a result, profits are eventually transferred to the centre, which in turn is used to make new improvements, thus maintaining the wage and living standard differentials between the two poles. Thus, in my view, countries or even regions that are based on industrial production and development activities can achieve and sustain breakthrough development. Production can take place in their geographical area or in a completely different area but with their capital. (Kocsis, 2022). A significant part of the services is also built around the industry. All the value produced in the economy, whether directly or indirectly, is ultimately largely attributable to industry. Industry is of course only one sector of value-added production, but in my view, it is one of the most important.

As can be seen, the importance of the industry is crucial in achieving economic development, but it is also closely linked, almost inextricably linked, to innovation, technological development, and technology transfer. Following the industrial revolution, services have come to the fore and we have entered the information and digital revolution, where human capital, its knowledge, and creativity are the main drivers of economic development. The importance of innovation is highlighted by Ayesha and Parag Khanna, who make it clear that innovation has a greater impact on the future of a nation than its military strength or GDP (Khanna & Khanna, 2012).

Technological progress was also addressed by the famous authors Samuelson-Nordhaus, although the role of technological progress was introduced into growth theory by Arrow and Mead. The former emphasised in their work that, in their view, three factors should be taken into account for economic growth,

namely labour, capital, and technological progress. These growth factors will be analysed and their contribution to growth identified. The growth of output (denoted Q) is obtained by adding together the growth of labour (denoted L) and capital (denoted K), each multiplying it by its weight, and adding to these the growth of technological progress (denoted TF). As is well known, traditional theories require the consideration of three main factors of production: land, labour, and capital. In the current calculation, the factor land (natural factor) is often omitted because land is considered to be constant. It is important to note, however, that labour and capital do not contribute equally to growth, with the former contributing three times more than the latter. To be precise (according to Samuelson-Nordhaus), labour contributes 3/4 of the total, while capital contributes only 1/4, (3/4 and ¼ express the relative contribution of each input to economic growth) to which we add the effect of technological change.

Translating this into mathematics, we get the following formula:

Q (percentage increase) = ¾ (percentage increase in L) +1/4 (percentage increase in K) + TF

where, Q - output, L - labour, K - capital, TF - technological progress (this denotes factor productivity).

It is possible to take into account even more factors in terms of economic growth, but in this section, the paper examines the issue from the point of view of the mentioned authors.

However, one important question still needs to be addressed: how can technological progress (TF) be measured? It is a residual value (obtained after calculating the values of output and input, a residual value) and therefore cannot be measured, it is obtained by extracting it from the above equation as follows:

TF = percentage increase in Q - ¾ (percentage increase in L) - ¼ (percentage increase in capital)

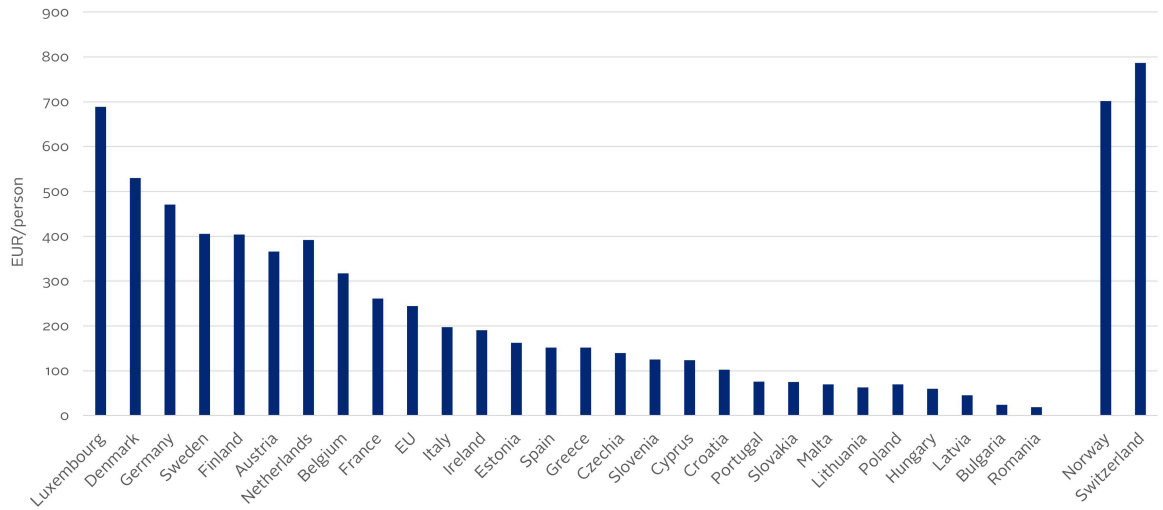
Including these formulas, the mentioned authors calculated that between 1900 and 2008, the increase in technological development in the USA contributed more than five times to the increase in output than the increase in capital intensity (Samuelson & Nordhaus, 2012). This makes it clear that technological progress resulting from innovation and research and development (R&D) is the cornerstone of a country's economic growth (Kocsis, 2023).

As the above shows, the role of industry is essential for achieving economic growth, but only if it is linked to technological progress. Technological development requires the implementation of research and development (R&D), which in turn leads to innovation. In the next part of the paper, we will examine the impact of the presence of R&D on the emergence of innovation and how this is related to the evolution of one of the most important macroeconomic indicators - Gross Domestic Product (GDP) - and average income levels in different European countries.

Let's start by looking at the presence of R&D in the European Union (EU) (this is the area to which I limit the extension of research), by ranking countries according to their R&D expenditure, since the higher the annual expenditure, the more present the activity is in the country and, consequently, the greater the impact on its economy.

The following figure (Figure 1) illustrates how much money per country per capita in the EU (including Norway and Switzerland) was devoted to R&D activities in 2021 (the latest data available at the time of writing):

Figure 1: Government budget allocations for research and development (R&D) in 2021, across Europe (EUR/person)



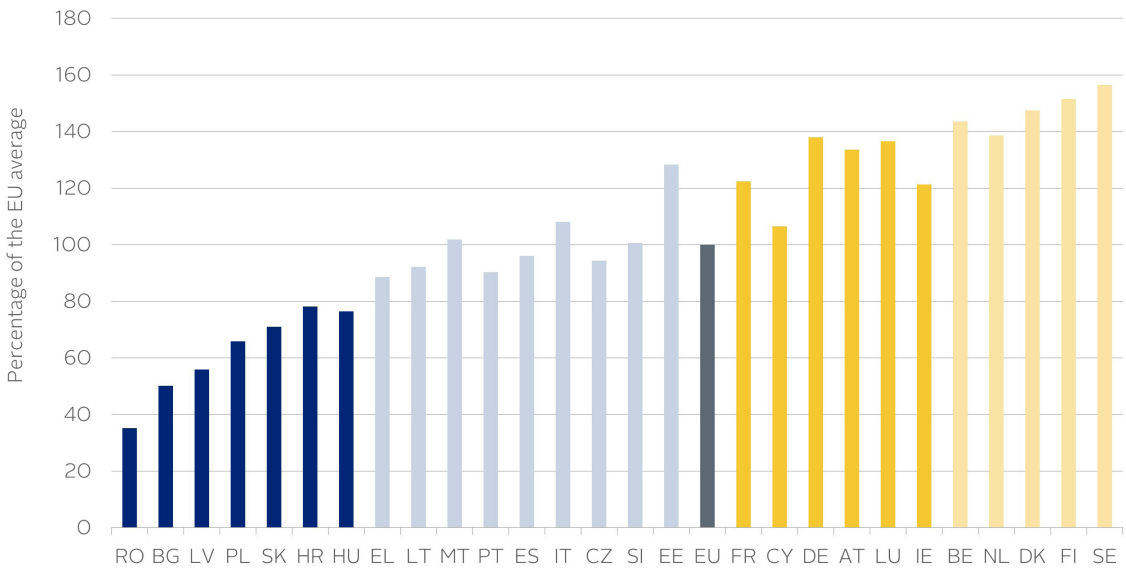
Source: Edited by the author based on Eurostat (2022)

In total, the EU spent €109.25 billion on R&D in 2021, representing 0.8% of GDP, an increase of 6% compared to 2020, when the figure was €102.79 billion, and 35% compared to 2011, when it was just €81.13 billion. As the above graph shows, the highest amounts per capita are in Luxembourg (the demographic factor of a small population increases the amount per capita, which is €689 per capita), Denmark (€530 per capita), Germany (€471 per capita), but also Sweden, Finland, Austria, the Netherlands, Belgium, and France. The lowest values are in Romania (€19 per capita), Bulgaria (€24 per capita), Latvia, and Hungary, but the highest increases (compared to 2011) are also in Latvia, Hungary, and Greece, with the EU average ranging between €200 and €300 per capita (Eurostat, 2022).

In the following, we will examine the extent to which the presence of R&D (the measure in the study is the government's allocation per capita) is related to innovation as a consequence of R&D. Of course, we should keep in mind that innovation cannot only occur in technology that affects industry, but it is a realistic guide to research.

The following figure (Figure 2) ranks EU countries according to their innovativeness in the categories of emerging innovators, moderate innovators, strong innovators, and leading innovators (2021 data):

Figure 2: Ranking of EU countries by innovativeness



Source: Edited by the author based on European Union (2021) and World Economic Forum (2022)

Note: RO, BG, LV, PL, SK, HR, HU- emerging innovators; EL, LT, MT, PT, ES, IT, CZ, SI, EE- moderate innovators; FR, CY, DE, AT, LU, IE- strong innovators, BE, NL, DK, FI, SE- innovation leaders (also taking into account the growth rate between 2015-2021).

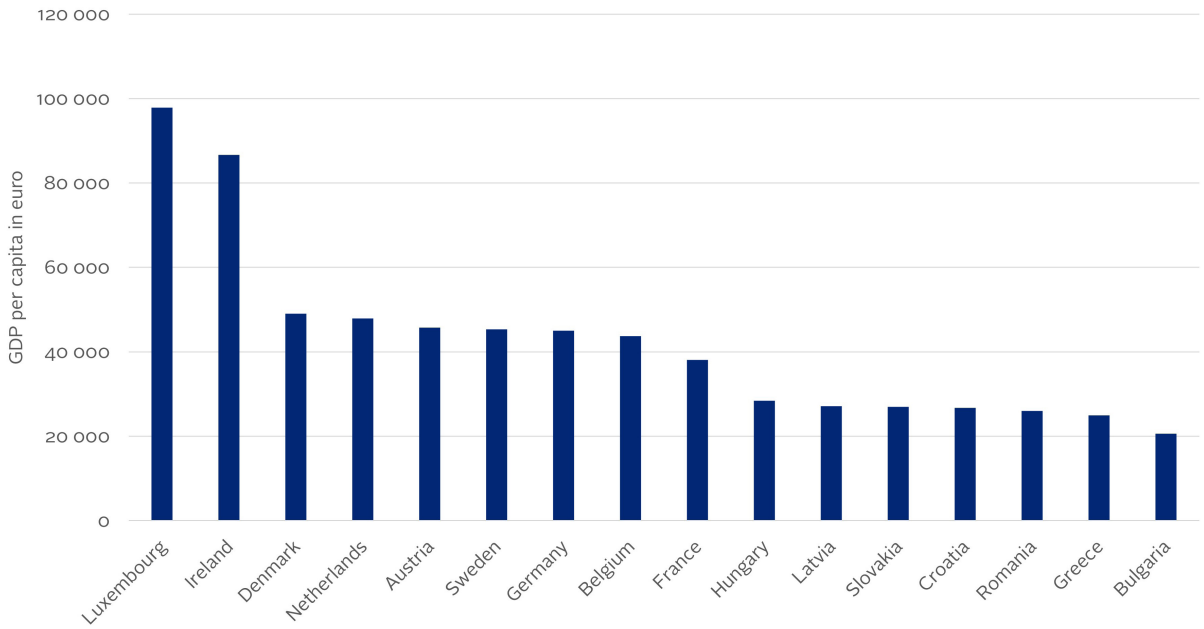
It can be observed that the meaning of this ranking is essentially the same as the previous ranking in R&D, with the notable exception of Luxembourg, due to the aforementioned population phenomenon. The top positions are also occupied by Sweden, Denmark, Finland, the Netherlands, Belgium, Austria, and Germany, while the last ones in this analysis are Romania and Bulgaria.

It is clear from the figures above, that the countries considered to be at the forefront of R&D and innovation are those that are publicly considered to be advanced, as the theory of centre-periphery relations holds, but let's look at exactly what the figures say about this below.

First, I analysed one of the most well-known and important macroeconomic indicators in the European Union, namely the Gross Domestic Product (GDP). The data show the GDP per capita (PPP) values per country, broken down in euros for the year 2021.

The national ranking of the highest and lowest GDP per capita (PPP) for the year 2021 (in euros) is shown in the figure (Figure 3) below.

Figure 3: Ranking of EU countries by GDP per capita in euro



Source: Edited by the author based on The Global Economy (2022)

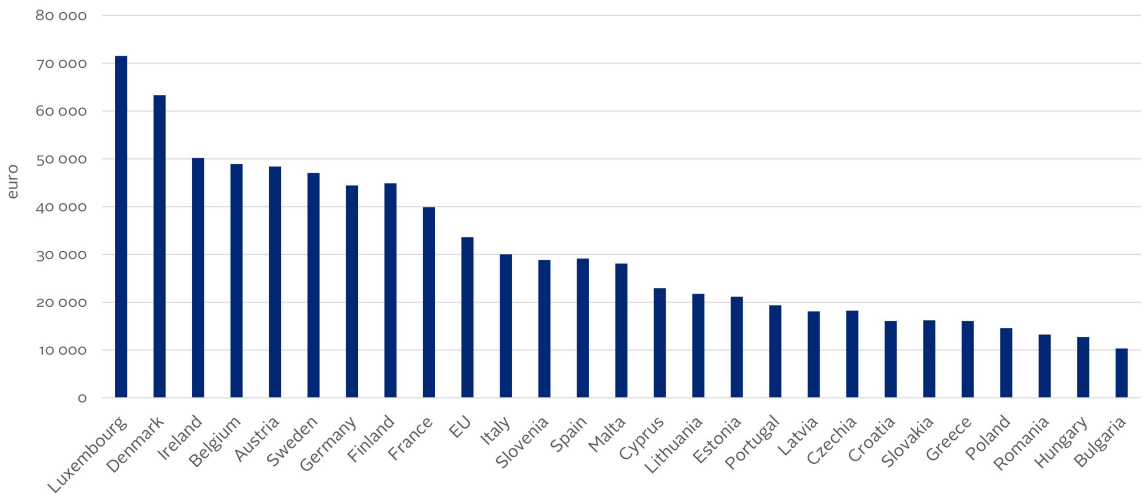
Note: Data in the source database are in US dollars (USD) and have been converted into euros using the average exchange rate in 2021 (1 USD=0.8458 Euro) (Exchange Rates, 2021).

The graph shows that the top and bottom performers are almost the same countries in terms of R&D and innovation, except for Ireland, a recent economic miracle, in the former category, and Greece, which has experienced several crises in the last few years (intermediate categories are not covered by this analysis).

The next indicator analyses average wages, ranked by country. The indicator used in this study does not use the usual earnings data, but a new indicator used by Eurostat. This is the so-called average annual full-time adjusted salary for employees, which is not the same as traditionally published data, but gives a realistic picture of the level of development of the country categories. This indicator is based on a combination of national (traditionally considered) data and Labor Force Survey (LFS) data, obtained by expressing part-time salaries in full-time equivalents (Eurostat, 2022).

As above, the average annual full-time adjusted salary for 2021, ranked nationally, is as follows (Figure 4).

Figure 4: Average annual full-time adjusted salary per employee, 2021 (in euros)



Source: Edited by the author based on Eurostat (2022)

This indicator is also almost entirely in line with the country categories presented by the other indicators (R&D, innovation, GDP), except for Hungary (but note that it is a few places higher in the ranking based on traditional data).

In the following table (Table 1.), we examine the extent to which the four indicators (R&D, innovation, GDP, average wages) used to analyse the four categories of countries (leaders, laggards) match.

Table 1: EU leading and lagging country categories for R&D, innovation, GDP/capita, and average wages

	Top performers	Power drives
R&D	Luxembourg, Denmark, Germany, Sweden, Finland, Austria, Netherlands, Belgium, France	Slovakia, Lithuania, Poland, Hungary, Latvia, Bulgaria, Romania
Innovation	Sweden, Finland, Denmark, Netherlands, Belgium, Ireland, Luxembourg, Austria, Germany, France, Netherlands	Croatia, Hungary, Slovakia, Poland, Latvia, Bulgaria, Romania,
GDP	Luxembourg, Ireland, Denmark, Netherlands, Austria, Sweden, Germany, Belgium, France	Hungary, Latvia, Slovakia, Croatia, Romania, Greece, Bulgaria
Average wage (according to Eurostat methodology)	Luxembourg, Denmark, Ireland, Belgium, Austria, Sweden, Germany, Finland, France	Croatia, Slovakia, Greece, Poland, Romania, Hungary, Bulgaria

Source: Edited by the author based on European Union (2021), Eurostat (2022), The Global Economy (2022) and World Economic Forum (2022)

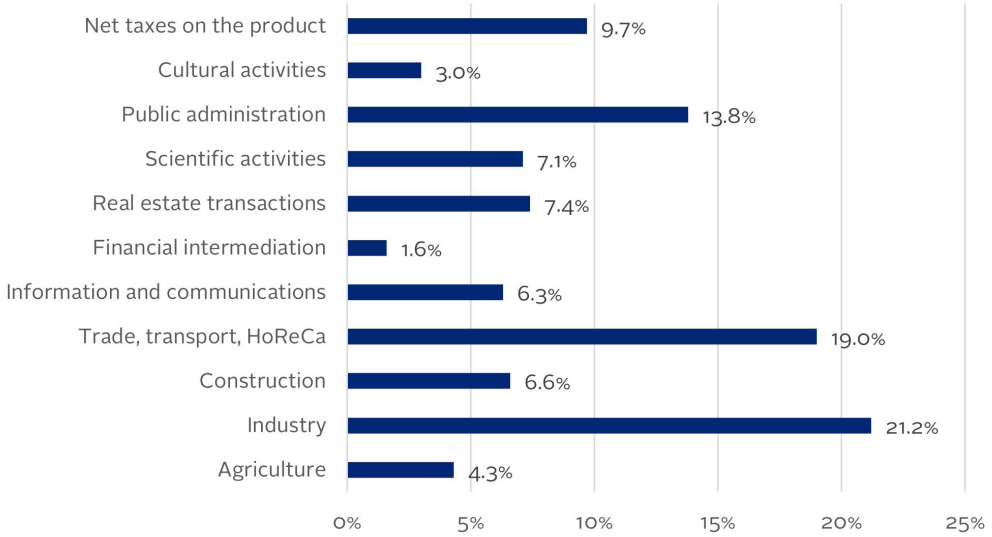
The table clearly shows that for all four indicators (R&D, innovation, GDP, average wages), the same countries are in the top and bottom groups (with some variation in the order). This demonstrates the fact that where R&D is strong, innovation is strong, and where these two factors are significant, GDP per capita is higher and average wages are higher, which (the latter two) are the most important determinants of living standards. Of course, research and development (R&D) is linked to industry, since it is mainly used to improve it, regardless of where production takes place. The important thing is that it is carried out with its capital. All this proves that industry, its level of development, and its maintenance at that level, is a major determinant of the level of development of the economy, which Romanian industry must take into account, especially as the data analysed above show that it is among the laggards in all the rankings.

2. Specificities of the Romanian industry

In Romania, industry is one of the main pillars of the economy. After the change of regime, many production units were closed down and abandoned, but over time it became clear that without industry the country could not develop. Against this background, the weight of industry is still decisive and one of the largest value-added sectors, as a result of economic reforms, restructuring, and new investment.

We now look at the contribution of industry to annual GDP at the national level (Figure 5), expressed as a percentage (2021 data).

Figure 5: Contribution of Romanian economic sectors to GDP



Source: Edited by the author based on Pele (2022)

It can be seen that industry is still the largest contributor to annual GDP in this breakdown. However, the official accounts emphasise that in just ten years, the contribution of the industry has fallen by 3.2% (Pele, 2022). Furthermore, it can be observed that when services are aggregated (not broken down into groups), their contribution is larger than that of the industry, and it is even increasing (Rudnițchi, 2022). In light of all this, however, it is necessary to highlight a fundamental fact

that the accounts do not take into consideration, namely that a significant part of services is also based on industry. More precisely, if certain areas of industry did not exist, these services would not exist either. In many cases, the much-vaunted IT services would not be present either, since the bulk of these services are provided by industrial activities, but scientific and technical activities are also provided by industry. We must also take into account the fact that the category of construction is shown separately in this breakdown, but this belongs to the construction industry.

The automotive manufacturing and assembly, extractive industries, metallurgy, food processing, textiles, wood processing, chemicals, construction, and oil refining are of particular importance. Romania's industry is one of the most important factors in terms of its contribution to GDP. It is the fourth largest car producer in Central and Eastern Europe, with significant growth every year (18% on average). The main players in the car industry are Dacia and Ford, and figures will reflect their importance, but it is also important to highlight their suppliers, which contribute significant added value and job creation to the economy. Among the leading players in terms of industrial performance are Petrom, Bitdefender, Mobexpert, Romstal, etc., but we should not forget the construction industry, which builds thousands of apartments and office buildings every year (Georgiana, 2022).

According to data published by the National Statistical Office (INS) (2020 and 2021 data), the 25 counties in the country with the largest manufacturing companies are also the largest exporters, and the stronger they are in a given region, the stronger that region will become economically. The INS data (2021) also show that the country's largest exporter is Dacia, followed by Ford and, in third place, Star Assembly. Exports are of huge importance, as the country has long been facing a trade deficit, a problem that only companies in the industry seem to be able to alleviate and, in time, solve. Romania has 800,000 companies, of which only 26,000 exported in 2021, and the number of importers is four times as high. In 2021, exports were worth €75 billion (a 20% increase compared to the previous year), while imports amounted to €100 billion (a 22% increase compared to the previous year). Although the automotive industry is doing well in terms of exports, as is the household appliances industry, the food industry is proving to be fragile in this respect, in a country where agriculture is of paramount importance. A survey by the Romanian economic journal Ziarul Financiar shows that, apart from the few large companies (Coca-Cola, Ursus, Bunge, Expur), there is not a single domestic company in the food industry in Romania with a turnover of 1 billion lei (not euros, but lei), which is a disheartening fact considering the country's resources, capabilities and potential. This is why the second place for the food industry presented in Table 2 is misleading, as the domestic meat processing, dairy, sugar, and confectionary industries have a lot of room for improvement (Ciriperu, 2022). The importance of the industry is also reflected in demographic data, which show that where the industry is not present, population decline is much more dramatic than in industrial areas (population decline is a national phenomenon). According to officially published data (2020), the manufacturing industry has a turnover of 380 billion lei

(76 billion euros), which represents 23% of the total (country-wide) turnover. If we consider the largest industrial players, the first place is occupied by Dacia (car manufacturing), while the largest manufacturing company is Aramis Invest with a turnover of 1.2 billion lei (approximately 240 million euros) (2020 data). However, there are huge differences in the size of enterprises, with 70,000 enterprises operating in the manufacturing sector, of which the 300 largest accounts for 60% of annual turnover (230 billion lei, or 46 billion euros) (Ciriperu, 2022).

When analysing industrial activity and identifying development opportunities, we must take into account the natural resources of the country/region, as these are heavily used by the industry and their presence or absence has a significant impact on production activities. In areas where these resources are abundant, they reduce the dependence of the area concerned, but can also have a significant impact on production costs, which in turn affect productivity and competitiveness. Romania is one of the countries where it can be said without exaggeration that it is abundant in almost all aspects of natural resources essential for industry. It follows that, with the right measures, it could become a leader in industrial activities, not only in Central and Eastern Europe but also at the European Union level. The country has enormous reserves of resources, the most important of which are uranium, salt, copper, nickel, iron ore, oil, natural gas, and timber. In terms of energy resources, oil, natural gas, uranium, hydropower, and coal, and in the case of metallic minerals, copper, lead, zinc, aluminium, gold and silver, and non-metallic minerals: rock salt, barites, graphite, gypsum; for construction materials: granite, basalt, limestone, travertine, marble, kaolin; and for biosphere resources: the vast tree population and arable land (Bulfon, 2013). Despite this, the country imports significant quantities of oil and coal, which suggests that either extraction is not functioning properly or that foreign capital is extracting the country's resources for itself. In the case of timber, extraction is particularly high, but by companies with foreign capital.

Romania's major unexploited natural resources are estimated to be worth more than €750 billion, but the exact amounts are kept as state secrets. Nevertheless, some figures have been released, for example: the country has 760 tonnes of gold and 12,000 tonnes of silver to be mined, worth more than €41.14 billion. It should be noted that for the last 15 years or more, there has been no gold mining in the country. In terms of copper, there are approximately two billion tonnes available, with a minimum value of €42 billion. In terms of salt, there are more than four billion tonnes to be extracted, with a value of well over €200 billion (Deutsche Welle, 2020). The list could go on, but these figures suggest that the industry for extracting natural resources, and processing and refining them needs to develop in Romania (mainly represented, of course, by domestic capital).

The potential to develop the industry exists in terms of resources, skills, and geography, but this can only be translated into the country's interests if foreign capital is kept under control and preference is given to developing the activities of domestic companies.

In the first part of the chapter, industrial activities (including some companies) that play a leading role in the Romanian industry are mentioned. In the following (Table 2.), the participation of certain sectors in terms of industrial activities in the country will be presented in detail and shown in the table below (in terms of turnover - billion lei and in terms of employees, 2020 data).

Table 2: Industrial sectors in terms of turnover and average number of employees, 2020 data

Industry	Turnover/ Return (trillion RON)	Average number of employees
Vehicle manufacturing	73.5	134.469
Food industry	47.6	147.142
Manufacture of rubber and plastic products	27.5	61.495
The manufacture of machines, equipment	26.6	47.964
Manufacture of electrical equipment	23.8	46.961
Metal construction industry	23.4	85.922
Manufacture of other products from non-metallic minerals	17.7	38.508
Wood processing	14.1	40.376
Metallurgical industry	13.3	20.102
Beverage production	13.1	19.362
Manufacture of coke oven products	12.9	2.273
Manufacture of substances and chemical products	12.5	19.454
Computer manufacturing	11.9	31.838
Furniture manufacturing	10.6	57.239
Manufacture of clothing items	7.7	87.304
Manufacture of textile products	7.5	28.145
Manufacture of other means of transport	7.2	25.629
Paper making	5.5	12.957
Repairing machines and equipment	4.5	17.882
Pharmaceutical production	4.4	9.930
Printing and reproduction of records	3.8	14.278
Tanning and finishing of hides	3.7	32.397
Other industrial activities	3	16.807
Tobacco production	2.1	2.408

Source: Edited by the author based on Ciriperu (2022)

The data in the table clearly show that the best-performing industry is the automotive industry, both in terms of turnover and employees. The food industry is in second place, but the data above suggests that this is mainly due to the first few larger companies, while the smaller ones may need to expand and improve, as this industry could perform much better considering the country's potential. It can also be observed that the industries involved in the extraction and processing/ refining of natural resources (such as coal, wood, but also furniture) are also underperforming relative to their potential, but this is also supported by the data above. What is striking is that the light industry has slipped very far down the rankings, such as textiles, clothing, paper, and pharmaceuticals.

To sum up, the data presented and analysed in this chapter show that the manufacturing sector in Romania in general, and the SME sector in particular, needs to be developed, as the first few giant companies are also performing exceptionally well. This is also confirmed by the fact that very few industrial firms can export, which has an impact on the macroeconomic level. In particular, the extractive and processing/refining industries (coal, timber, salt, precious metals, etc.), the light industry (textiles, clothing, paper), and the food industry, with the right improvements, could also achieve better results, especially for small and medium-sized enterprises. Development means the introduction of new machinery, equipment, technologies, and know-how, which increase efficiency and productivity, and thus competitiveness at the international level. All this will have an impact on the country's export capacity, which will reduce (and could reverse) the current external trade deficit (due to the surplus value of imports over exports). Of course, in order to achieve the expected results, we must not forget the importance of knowledge, creativity, and research and development (R&D), in which areas (as the study has shown so far) the Romanian industry is performing very poorly. To achieve this, financial resources are undoubtedly needed, and the use of EU development funds, which are non-repayable, can provide an appropriate response. The mapping and identification of these can be followed up in the next chapter.

3. Development opportunities offered by EU funds

In the previous two chapters, the importance of industry and its specificities in Romania were presented and analysed. However, the study does not only aim to explore the situation but also to provide possible solutions. In my view, one of the important pillars of development is the use of EU grants. This option is worth highlighting, because, as well as being reliable and realistic, it is a great help to economic entities not to have to repay the sums in question (subject, of course, to strict conditions).

Romania will benefit from €32 billion in the current 2021-2027 budget period under the "Investing in jobs and growth" objective (this includes the European Regional Development Fund, the European Social Fund+, the Cohesion Fund, and the Just Transition Fund). If we add to this the amount of national contribution (the amount the country contributes to the implementation of investment projects), the total comes to almost €46.5 billion. However, to get a true picture of the over-

all aid, we need to take into account a fund that the European Union has set up for this budget period as an exceptional measure for its Member States to compensate for the damage caused by the pandemic. This fund is called in Romania the National Recovery and Resilience Plan (Planul Național de Redresare și Reziliență - PNRR), which provides a total of €29.2 billion in aid. Adding up these funds (including agricultural aid, which totals €15.8 billion), the total aid envelope for this budgetary period is over €90 billion (Fonduri Structurale, 2023).

Of course, it is easy to get lost in the maze of support schemes, but there is also a lot of support available. This chapter highlights the possibilities of grants that specifically provide non-reimbursable financial support for industrial activities and related R&D, innovation, digitalisation, and knowledge.

In the following, operational programmes that are relevant to the study and through which concrete improvements can be made are presented. Operational programmes are precise plans for the allocation of aid, broken down into well-defined areas, which each Member State must draw up individually and within which calls for proposals to be made and launched for the prospective beneficiaries.

The first such operational programme presented is the so-called Regional Operational Programme (Programul Operațional Regional - POR), with a total budget of €11.4 billion at the national level for the current budget period. Romania is divided into eight development regions (each region includes several counties) and each region will draw up its development plan, taking into account its specificities. The programmes are divided into so-called priority axes (axă prioritară) and each has a well-defined objective and area of support. The priority axes of the Central Development Region (Regiunea de Dezvoltare Centru), which includes the counties of Mures, Harghita, Covasna, Alba, Brasov, and Sibiu, are presented below (these are broadly the same as the areas of support for the other development regions, although the amounts allocated to certain areas may change after the call for proposals and are not covered in detail in this study).

From the point of view of industrial development, the following priority axes of the Regional Operational Programme are highlighted for the Central Region (Central Development Region, 2022):

> **Priority 1:** A competitive region through innovation and dynamic enterprises for a smart economy (O regiune competitivă prin inovare și întreprinderi dinamice pentru o economie inteligentă):

- Specific Objective 1.1 (Obiectiv specific): to develop and enhance research and innovation capacities and the use of advanced technologies. The intervention aims at regional research and development (R&D), strengthening innovation capacities, technology transfer, fostering business-to-business cooperation, achieving a low-carbon economy, helping adaptation to climate change, achieving a circular economy, and supporting small and medium-sized enterprises (SMEs). The main beneficiaries are entrepreneurs, researchers, R&D, private and public innovation centres, universities, technology transfer centres, local administrations, companies, NGOs, and clusters.

- Specific Objective 1.3 (Obiectiv specific): to increase sustainable growth and the competitiveness of SMEs and create jobs within them, including productive investment. The aim is, on the one hand, to develop SMEs through investment, industrial modernisation, technological development, and the promotion of a sustainable regional economy and, on the other hand, to develop support structures for SME development.
- Specific Objective 1.4 (Obiectiv specific): to develop the skills needed for smart specialisation, industrial transition, and entrepreneurship. The main objective is to support education and training related to the specific objectives listed.

Priority 2: Digital Region (O regiune digitală):

- Specific Objective 1.2 (Obiectiv specific): to bring the benefits of digitalisation to citizens, businesses, research organisations, and public administrations.
- Specific Objective 1.4 (Obiectiv specific): Developing the skills needed for smart specialisation, industrial transition, and entrepreneurship. In Priority 2, this is a complementary intervention aimed at increasing the capacity to create added value for the supported projects (the same name has already been used for Priority 1).

The operational programmes presented below are national-level calls for proposals.

The Operational Programme "Smart Growth, Digitalisation and Financial Instruments" (Creștere inteligentă, digitalizare și instrumente financiare) also includes support opportunities that directly or indirectly support the development of industry. These include, in particular, Priority Axis 1, entitled Supporting and Promoting an attractive and competitive research, development, and innovation system. The total budget for this priority is €2.2 billion for the 2021-2027 budget period.

This financial instrument will specifically support research and development (R&D) and innovation activities, which, as the previous parts of the study have shown, are of paramount importance for the development of industry. The following areas are targeted (Ministry of Investment and European Projects, 2023):

support for the private sector (especially private equity) and public-private partnerships in R&D&I,

supporting innovation hubs in areas of strategic importance,

integrating the national R&D&I ecosystem into the European and international Research Area.

Next, I would like to highlight the Operational Programme for Sustainable Development, including priority axis 4, which is called Energy Efficiency, Smart Energy Systems and Networks and Reducing Greenhouse Gas Emissions. A total of €5.25 billion is available for this operational programme in the current budgetary period.

This support instrument, as we shall see, focuses specifically on the implementation of energy efficiency, which is essential both for industrial activities and for tackling the increasingly pressing environmental problems.

This priority axis includes the following actions (acțiuni) (Ministry of Investment and European Projects, 2023):

Action 4.1: Improving energy efficiency in SMEs and large enterprises,

Action 4.2: Reduce greenhouse gas emissions and increase energy efficiency in heat generation systems,

Action 4.3: Reduce greenhouse gas emissions and increase energy efficiency in heat distribution and transport systems,

Action 4.4: Promote the use of renewable energy sources,

Action 4.5: Support for smart energy systems and networks,

Action 4.6: Conversion, modernisation, and extension of gas transmission and distribution networks.

The Education and Employment Operational Programme can be of paramount importance for industrial development, but also for economic development in general, since, as the current study has shown, knowledge and creativity contribute to R&D and innovation, which in turn contribute directly to the development of the industry. The total budget for this operational programme is €4.32 billion for the 2021-2027 budget period.

Within this support instrument, priority axis 2, entitled Unlocking the labour market potential of young people (youth employment), should be highlighted, including the following measures (Fonduri-Structurale, 2023):

Action 2.a.2: Active packages of training and employment institutions,

Action 2.a.3: Promoting the entrepreneurial potential of young people.

Last but not least, the National Recovery and Resilience Plan (Planul Național de Redresare și Reziliență - PNRR) should also be taken into account, as it contains options that are relevant to the study. This aid instrument was specifically created for the current budgetary period to offset the losses caused by COVID-19. A total of €29.2 billion is available for Romania from this fund for the budget period 2021-2027. Of particular relevance for the present study is the so-called Component 9 of the Fund, entitled: Support to the private sector for R&D and innovation. This component also contributes to the development of industrial activity through the following measures (Ministry of Investment and European Projects, 2023):

Measure C9.I3: Aid of up to €100 000 (de minimis aid) for SMEs active in the introduction of digital technologies,

Action I8: Attracting highly qualified foreign human resources for R&D and innovation.

The following table (Table 3.) summarises the main country-specific problems identified in terms of industrial development and assigns to each of them EU support opportunities that can address the identified gaps.

Table 3: Main gaps/problems identified in the industry and EU resources/subsidies allocated

Sort.	Identified problems/gaps	EU funding opportunities
1.	The manufacturing sector requires development (as evidenced by the semi-peripheral situation and macroeconomic data presented in the study), which justifies the acquisition of new machinery, equipment, and technologies, especially in the SME sector. This will help to increase productivity and efficiency, which will improve the country's international competitiveness.	Within the Regional Operational Programme (Programul Operațional Regional), Priority 1, including Specific Objective 1.3 (Obiectiv specific) - for the Central Development Region (Regiunea de Dezvoltare Centru). This is the case for priority axis 4 of the Operational Programme for Sustainable Development, which promotes energy efficiency, and within this priority axis, Measures 4.1 to 4.6.
2.	Research and development (R&D) and innovation activities (the data revealed in the study place Romania among the last in the EU in this respect).	Priority axis 1 of the Operational Programme for Smart Growth, Digitalisation and Financial Instruments (Creștere inteligentă, digitalizare și instrumente financiare). Priority 1 of the Regional Operational Programme (Programul Operațional Regional), including Specific Objective 1.1 (Obiectiv specific) - for the Central Development Region (Regiunea de Dezvoltare Centru). The 9th Component of the National Recovery and Resilience Plan (Planul Național de Redresare și Reziliență - PNRR), and within it Measure I8.
3.	Developing education and learning, which directly contributes to the implementation of R&D, the introduction of know-how, appropriate skills, and the development of entrepreneurial skills, especially in the SME sector.	Priority 1 of the Regional Operational Programme (Programul Operațional Regional), including Specific Objective 1.4 (Obiectiv specific) - for the Central Development Region (Regiunea de Dezvoltare Centru). Priority Axis 2 of the Education and Employment Operational Programme, including Actions 2.a2, 2.a.3.
4.	Developing digitalisation (linked to the two previous problems, its importance is mentioned in the same breath as R&D and innovation activities - almost inseparable from them - and it also affects the development of industry).	Priority 2 of the Regional Operational Programme (Programul Operațional Regional), including Specific Objective 1.2 (Obiectiv specific) - for the Central Development Region (Regiunea de Dezvoltare Centru). Smart Growth, Digitalisation and Financial Instruments Operational Programme The 9th Component of the National Recovery and Resilience Plan (Planul Național de Redresare și Reziliență - PNRR), and within it Measure C9.I3.

Ibid. Details and sources of the programmes identified in Table 3. are given in the section above.

Conclusions

To sum up, the economic differences at the global level are the result of well-defined, tangible, and scientifically verifiable processes and laws. The theory of the centre-periphery relationship presented at the beginning of this paper is evidence of this. In my view, the differences identified here, and the permanent advantage of the centre can be attributed to the presence of industry and its level of development. The presence of industry, as it turns out, is very strongly linked to research and development (R&D), technological development, and innovation. More specifically, these developments can be felt where industry has a significant presence in economic life. In developed countries, these activities are predominantly carried out with their capital. It can therefore be seen that where there is industry, there is a high level of development activity, and where there is a higher level of development, as can be seen from the data, macroeconomic data are more favourable (in our case GDP and average income), and this is directly related to living standards. In the case of Romania, the need to develop the industry, preferably with its capital, and to increase R&D and innovation activities, especially in manufacturing and especially in the SME sector, is also clear. The structure of the industry in Romania was also described, showing that the automotive industry is in the first place, followed by the food industry, manufacturing, and, sliding back, light industry. The analysis shows, however, that the numbers are boosted by a few large companies (turnover, number of employees), but that the SME sector requires significant development (as evidenced by the country's external trade deficit). Therefore, within the manufacturing sector, improvements are needed, especially in the light industry, but also in the extractive and food industries, especially in the above-mentioned sectors, to the extent possible. At the same time, it should be borne in mind that the development of the industry also has an impact on other sectors of the economy, since a significant proportion of services is also based around industry. However, financial resources are needed to expand and develop industrial activities. The European Union's aid policy (largely non-repayable grants) provides opportunities to achieve this. Romania has a total budget (including national contributions) of more than €90 billion for the 2021-2027 budget period. This will be mainly supported by the European Regional Development Fund (ERDF), the European Social Fund + (ESA+), the Cohesion Fund (CF), the Just Transition Fund (JTF), and the National Recovery and Recovery Plan. Detailed plans for their use are provided by the so-called Operational Programmes, under which calls for proposals are published. It can be seen that there are funding opportunities for each of the problems and gaps identified. The most relevant programmes for this study are the Regional Operational Programme, the Operational Programme for Sustainable Development, the Operational Programme for Smart Growth, Digitalisation and Financial Instruments, the Operational Programme for Education and Employment, and the National Recovery and Recovery Plan (the measures within these programmes are described in the section above). The measures within these programmes provide opportunities for the expansion and development of the industry and (as a prerequisite) for the implementation of research and development, innovation, educational activities, and digitalisation. Further research directions are the comparison of the Romanian industry with the industry of other EU countries (also between certain regions) and the drawing of conclusions.

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