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# Is the Knowledge-intensive Business Services Sector Crisis-robust or Crisis-resilient? A Comparative Study of European Union Countries

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## Abstract

The paper examines the crisis robustness and resilience of the knowledge-intensive business services (KIBS) sector. The hypothesis is tested that the KIBS sector is crisis-robust rather than crisis-resilient. The study covers 2000–2021, divided into two crisis periods (the global financial crisis and the COVID–19 pandemic) and three non-crisis periods. The growth rates of value added and employment for the sectors and periods covered by the study are compared. The study is based on data from Eurostat, and it refers to the EU–27, making it possible to carry out comparative research between EU countries, as well as between the EU members before 2004 (i.e., the EU–14 or 'old' members) and those who joined in 2004 or later (i.e., the EU–13 or 'new' members). The study contributes to the literature by demonstrating that it is necessary to distinguish between the concepts of crisis resilience and crisis robustness in both scientific research and policy strategies, as well as to pay more attention to the issue of crisis robustness. It also makes a contribution by indicating that KIBS have significant potential to contribute to building crisis resilience and crisis robustness in the companies that use them and in the whole economic system. The empirical results demonstrate that the KIBS sub-sectors, i.e., computer and information services and professional, scientific and technical services, are crisis-robust, which is not the case for the manufacturing sector. The KIBS sector's ability to maintain stable growth during crisis periods is more visible than for other service industries. The Polish sector of professional, scientific and technical services showed the most stable upward trend through all analysed periods. Poland also recorded impressive growth in value added in computer and information services during the pandemic period, but when considering the whole period, other countries achieved better results, e.g., Romania.



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JEL: F44, O14, O40

## Introduction

In today's knowledge-based economies that operate in a competitive global landscape, knowledge is an essential asset, and the ability to create and apply new knowledge is considered one of the primary sources of competitive advantage. The abilities of companies from the knowledge-intensive business services (KIBS) sector to produce knowledge and disseminate it to all parts of the economy give them an essential role in innovation and efficiency growth.

KIBS may positively affect economic efficiency in various ways: (1) by developing the KIBS sector, which involves creating highly qualified jobs in the economy, as well as through innovation activities and productivity growth in the KIBS sector; (2) using KIBS in production and innovation by enterprises from other industries, which should stimulate their output, productivity and innovation performance. Finally, KIBS may also indirectly contribute to productivity growth in other industries through their embodiment in various products used as intermediate inputs or investment equipment in production in other industries. This channel for KIBS' contribution to productivity growth should become more important as modern services can be unbundled and splintered in a value chain, just like goods, and they can be delivered online at very low costs (Wyszkowska-Kuna and Przybyliński 2021). A review of the literature demonstrates the growing interest in KIBS and their contribution to productivity growth and innovativeness (Wyszkowska-Kuna 2016).

KIBS also seem to have enormous potential to contribute to overcoming economic crises. According to the definition proposed by Gallouj (2002, p. 264): "to deliver KIBS […] this is mainly to organise the solution to the problem, not deliver the good itself. The activity of the KIBS company is aimed at putting up a package of its capabilities and competencies (human, technological, organisational) at the customer's disposal in order to process information and knowledge and then to organise the solution to the problem in the client's company". In the light of this definition, KIBS play a key role in preparing companies to cope with a crisis, i.e., managing any disruptive or unexpected emergencies as soon as possible after they happen. By supporting the stability of its clients, the KIBS sector supports the stability of the whole economic system during crises.

Finally, KIBS activities can help achieve other important goals, such as building greener, more digital and more competitive companies and economies. Knowledge-intensive services have enabled the development of new business models character-

ised by increased servitisation and dematerialisation of consumption; therefore, they have supported the development of the Circular Economy. Both enhance efficiency within the economy and thus contribute significantly to sustainable development and the transition to a green economy (EU COM 2020). In this regard, the KIBS activities can also play an important role in overcoming the current energy crisis.

There is no official definition of KIBS. In the subject literature, KIBS are generally defined as knowledge-intensive services provided for other firms (Schricke, Zenker, and Stahlecker 2012, p. 6). Eurostat's definition of knowledge-intensive services (KIS) refers to the following divisions (NACE Rev. 2): Telecommunications (J61); Computer programming, consultancy and related activities; information service activities (J62–63); Financial and insurance activities (K64–66); Legal and accounting activities; activities of head offices; management consultancy activities (M69–70); Architectural and engineering activities; technical testing and analysis (M71); Scientific research and development (M72); Advertising and market research (M73); Other professional, scientific and technical activities (M74); Employment services (N78); Security and investigation services (N80). A review of the literature shows that KIBS are defined in different ways, quite often in a narrower sense, comprising only divisions J62–63 and M69–74 (Schnabl and Zenker 2013, p. 5; Wyszkowska-Kuna 2016, p. 81). The present study refers to KIBS defined this way. However, due to the lack of relevant data on division M75, the whole section M is included.

## The concepts of crisis resilience and crisis robustness

While studying the issue of crisis resilience, the distinction between crisis resilience and crisis robustness should first be explained. Crisis resilience means the capacity to recover quickly after a disruption, while crisis robustness means the ability to continue to produce despite external or internal disruptions (Brandon-Jones et al. 2014; Miroudot 2020). Definitions of robustness focus on the ability to continue with operations while resisting the impact of disruptions.

Resilience has become central in the policy strategies of many governments and international organisations (e.g., IFRC 2012; OECD 2014; UK Cabinet 2014; UNISDR 2016; cited after Capano and Woo 2016). Building more crisis-resilient economies has also become an EU priority for the years 2021–2027 under the Recovery and Resilience Facility (European Commission 2020). In contrast, robustness is much less popular as a concept and a policy-guiding principle. Rather, robustness is very often adopted as an instrument of resilience in official documents.

The question arises regarding what is more important for enterprises and economic systems, crisis resilience or crisis robustness. Resilience involves reacting to shocks and un-

expected events. In contrast, robustness involves resisting them by facilitating the analysis and assessment of the capacities required to affect the necessary policy changes in a specific context or time (Capano and Woo 2016). Thus, robustness seems to be more important. This opinion is shared by Hunter (2021). He noted that whilst cities have made significant investments to become smarter and more resilient, large-scale shocks (e.g., lockdowns during the COVID–19 pandemic) require such robust, adaptable and unique solutions that this focus may not be enough. Thus, he demonstrated that robustness should be used to better explain how cities can improve resilience and decrease fragility. Robustness shifts the focus from cities as reactive and static systems. Instead, it moves towards cities as dynamic, proactive and predictive systems, capable of not only absorbing a shock but also sense-making before a shock occurs and adapting and maintaining the same level of system functions.

There is no one simple answer to what is more important, crisis resilience or crisis robustness. Some managers may feel it is more appropriate to invest heavily in withstanding disruptions and therefore making their supply chains more robust to disruptions. Others may instead focus on ensuring that if and when a disruption occurs, their organisation is able to recover quickly and with minimal disruption, therefore making their supply chains more resilient. Building robustness requires different strategies and investments from building resilience. It is associated with important costs, such as investing in tools to monitor risks, and thus some companies are more interested in resilience in their supply chains. Choosing a strategy in this area is influenced by performance objectives. Brandon-Jones et al. (2014) demonstrated that robustness can support supply chains that rely heavily on dependability, whereas resilience may be more suited to organisations that compete on speed and flexibility. Building robustness or resilience may also depend on the specifics of a given situation, for example when it came to distributing key medical supplies (such as face masks, ventilators, and medicines) during the COVID–19 pandemic, it was robustness that mattered, not resilience (Miroudot 2020).

The characteristics of services in general, and of KIBS in particular (described in Sections 3 and 4), indicate that the KIBS sector should be less subject to cyclical fluctuations than other industries. Thus, the present study tests the hypothesis that the KIBS sector is crisis-robust rather than crisis-resilient. For this purpose, the paper examines changes in value added (VA) (production volume) and employment in the KIBS sub-sectors, compared to other service industries, the manufacturing sector and the total economy, during two crisis periods, i.e., the global financial crisis (2008–2009) and the COVID–19 pandemic (2019–2020), and three non-crisis periods (2000–2007, 2010–2019, and 2020–2021). The study refers to the EU countries. To compare the results for the 'old' and 'new' EU member states, weighted averages for the countries that joined the EU before 2004 (referred to as EU–14) and the countries that joined in 2004 or later (referred to as the EU–13) are calculated (with weights assigned based on each country's share in the EU–14's and EU–13's VA respectively).

KIBS should play a key role in building dynamic, proactive and predictive economic entities, which is the basis for constructing more crisis-robust economic systems. This issue, however, is not a subject of the present study.

The paper is organised as follows. Section 3 describes the characteristics of service activities, and Section 4 describes the characteristics of the KIBS sector regarding their crisis robustness. Section 5 reviews the related studies. Section 6 presents and discusses empirical results, while Section 7 concludes.

## The crisis robustness characteristics of service activities

Service activities tend to be less subject to economic shocks than manufacturing ones for several reasons. First, services often involve long-term contracts or continuity in their provision that limit the role of fluctuations in demand. Long-term contracts are preferred in an uncertain environment (e.g., in the maritime shipping industry, about 85–90% of transactions are under contract). Such contracts do not offer full protection against shifts in demand; nevertheless, they mitigate the impact, particularly in terms of costs (Swinney and Netessine 2009). The tendency to conclude long-term contracts also results from the characteristics of services. A need for contact between a service provider and recipient (direct or online) and a need to build trust between them (as service output and its quality are unknown until it is delivered) should also encourage the establishment of long-term ties between service companies and their clients.

Second, services are not storable, so they are less subject to big declines in demand in downturns that affect durable goods (Baldwin and Venables 2013; Davies and Markusen 2021). When demand collapses, services cannot be overproduced, and the decrease in demand is instantly known by the producers. The economic impact is immediate, but there is no bullwhip effect or hysteresis related to inventories along the value chain, which can amplify the impact of the shock or delay the recovery. Not being storable and not being subject to inventory adjustments is actually an advantage for services (Ariu 2016).

Finally, most service activities are characterised by relatively low market entry and exit costs compared to industrial activities, which has two consequences. First, service activities usually need finance less than manufacturing activities in normal times; thus, they are less affected by the crisis-induced scarcity of finance (Borchert and Mattoo 2010). Second, service activities are more flexible in reacting to the changing economic situation than manufacturing ones. It should be remembered, however, that the service sector comprises a wide variety of economic activities, including those with large market entry costs (e.g., financial services and network services).

Therefore, different service activities may appear more or less crisis-robust or crisis-resilient. Moreover, a service sector's crisis resilience or robustness may depend on the causes and course of a crisis. The global financial crisis hit financial services hard, while during COVID–19, those services that require direct contact between service providers and recipients (e.g., hotels, restaurants, culture and entertainment, and travel) were most heavily affected.

## The crisis robustness characteristics of the KIBS sector

Economic crises can positively and negatively impact the demand for KIBS. On the one hand, an economic crisis reduces the economic activity of enterprises from different industries, which involves a decline in their demand for various components of intermediate inputs, including KIBS. Moreover, during a crisis, enterprises try to cut their expenses, and they may perceive purchasing certain KIBS as unnecessary expenses (e.g., advertising, R&D expenditures). Some companies may also stop purchasing certain KIBS (e.g., market research, marketing) from external suppliers and try to perform these tasks on their own. Finally, some companies may take advantage of free KIBS (e.g., advisory or legal services) delivered by publicly funded entities, whose activities may be expanded during the crisis period[1].

On the other hand, the demand for certain KIBS (e.g., computer and information, bookkeeping, and accountancy) seems to have contracted less than the demand for material goods (e.g., computers) because: (1) these services are constant 'necessities' for producers and, like all services, they cannot be overproduced, (2) demand for them is unrelated to the scale of production (Borchert and Mattoo 2010). KIBS companies also help their clients solve problems and adapt to the changing situation, so during a crisis, KIBS input may be more important than other types of intermediate inputs. Thanks to this role, KIBS can strengthen both the robustness and resilience of their clients' companies and the entire economic system. Some companies may also increase their demand for certain KIBS, such as bankruptcy, financial advisory and crisis management services.

During the COVID–19 pandemic, we also saw the impact of factors that increased and decreased the demand for KIBS. KIBS are among those services that can be delivered remotely, although they are provided in cooperation with a client. Additionally, as these services may require access to confidential information, delivery may require a degree of direct contact between the KIBS company and its client. During COVID–19, the functioning of global and regional value chains was also disturbed,

1 For example: The Recovery Advice for Business scheme, supported by the UK government, gave small firms access to free, one-to-one advice with an expert adviser to help them through the COVID–19 pandemic and prepare for long-term recovery.

and as KIBS are part of these chains, demand for them decreased as well. Reduced production capacities in most industries due to lockdowns and employee absences also affected the demand for KIBS, as different industries, both manufacturing and service, are KIBS users. Still, KIBS companies were able to help their clients find new solutions that were necessary to continue operations in the completely new reality of COVID–19.

To sum up, some factors will reduce the demand for KIBS during a crisis, while others will increase it. The overall change in demand largely depends on awareness among business owners about the KIBS sector's contribution to the effectiveness and stability of economic systems and the recovery process. Thus, an important question arises regarding whether KIBS activities are less subject to cyclical fluctuations than other industries. This study tries to answer this question based on the example of the EU. This question refers mainly to one of the two KIBS sub-sectors, i.e., Professional, scientific and technical activities, as the demand for the second KIBS sub-sector (Computer programming, consultancy, and information service activities) should show a constant upward trend with the ongoing digitalisation in EU.

## Literature review

The counter-cyclical role of the service sector has already been discussed in the economic literature, but mainly concerning public services (Beyers 1991; 1992; Harrison 1994; Beyers and Lindahl 1996; Atkinson and Noord 2001; Navarro-Espigares, Martin-Segura, and Hernandez-Torres 2012). Atkinson and Noord (2001) pointed out the existence of a clear counter-cyclical model of public spending on public services in most OECD countries, with strong increases in the 1975, 1982, and first recessions of the 1990s. Navarro-Espigares, Martin-Segura, and Hernandez-Torres (2012) demonstrated that in both the 1992 and 2008 economic crises, service-intensive regions in Spain showed greater resilience, defined as resistance to the loss of gross VA and jobs derived from the initial impact of the crisis (the counter-cyclical behaviour of private services is less evident than that of public services regarding the employment variable). However, if the periods are extended to 1991–1994 and 2008–2010, which show the reaction after the initial shock, greater economic resilience of the most intensive service sector regional economies is maintained only for the first period.

Holm and Østergaard (2010) found that resilience in the Danish ICT sector from 1992–2006 varied across the regions and that the variability depended on industry structure. Regions with more diversity tended to have a growth rate of ICT employment that is counter-cyclical to the ICT business cycle. By contrast, regions with less diversity had an ICT employment growth rate pro-cyclical to the ICT business cycle.

They concluded that diversity is beneficial for both the growth rate and resilience up to a certain point, beyond which it is still good for growth but decreases resilience.

The belief that the services sector would be more resilient to an economic crisis prevailed until the outbreak of the COVID–19 pandemic. The immediacy and severity of the containment measures and the supply-side shock it induced set this crisis apart from previous economic crises. Shutdowns in many industries disrupted production and cut off the flow of services that could not be provided remotely; meanwhile, changes to consumer behaviour as a result of restrictions altered demand patterns (OECD 2021). Highly customer-facing industries such as accommodation and food services, and arts, entertainment, and recreation, where fewer than 20% of jobs can be done through telework, suffered heavily from containment restrictions. By contrast, in financial services, computer and information services, and other business services, roughly 70% can be done remotely (Dingel and Neiman 2020). Moreover, shifts in demand have also benefitted some categories of services, such as e-commerce, computer services and health services (WTO 2020; Shingal 2021), giving them new development opportunities.

Miles et al. (2021) found that KIBS firms have been active in providing a substantial range of services aimed at helping their clients (and others) deal with the various contingencies thrown up by the COVID–19 crisis. Not least is the need to conform to shifting regulatory frameworks and requirements for longer-term resilience. Finally, KIBS are also likely to play an important role in the recovery from the crisis, and some KIBS are likely to be critical for rendering economies more resilient in the face of future pandemics. Miles et al. (2021) pointed out, however, that KIBS themselves have had to adapt their working practices considerably to reduce face-to-face interaction with clients and within teams collaborating on projects. Adaptation is easier for those whose tasks are relatively standardised and codified.

Similar conclusions can be drawn from the study based on a group of Polish companies (ABSL 2021). The KIBS sector in Poland showed a significant adaptability and crisis resilience higher than most of the manufacturing and other service industries. Over the past 15 years, centres operating in Poland have learned to work in virtual, global teams, and thanks to this, they were able to continue operating during disruptions caused by the COVID–19 lockdowns. Larger companies with well-established positions were more crisis-resilient due to the broader scope of their activities and available resources. Simpler tasks adapted faster to the changing environment, while more complex knowledge-based tasks that require closer collaboration with customers suffered more from the restrictions. Certain KIBS actually benefited from the crisis. COVID–19 was seen as a challenge, but also as an opportunity to digitise the sector to a greater extent (in 2020, 43% of processes in Polish KIBS companies had been digitised). This seems very important especially considering possible future restrictions imposed due to the current energy crisis.

To summarise the literature review, the papers described in this section used the term crisis resilience. However, they demonstrated that the service sector (in particular, public services) was less subject to cyclical fluctuations before COVID–19. Two studies demonstrated that KIBS companies continued operating during the pandemic. This, in turn, indicates that services, including KIBS, have more of an issue with robustness than resilience.

## Empirical results

The empirical analysis refers to VA and employment, and it is based on data derived from Eurostat. Data on VA at constant prices (from 2005) is used. Employment is measured by two indexes: the number of persons employed (EMP) and the number of hours worked (HEMP) (Eurostat, total employment, domestic concept). These two indicators are used because, during a crisis, companies mainly reduce working hours by sending employees on leave rather than dismissing them. This only affects the number of hours worked, not the number of employees (they may also get state aid to save jobs). The analysed period is divided into two crisis periods, i.e., the financial crisis (2008–2009) and COVID–19 (2019–2020) and two or three non-crisis periods, i.e., 2000–2007, 2010–2019 and 2020–2021.

Table 1 presents the growth rates of VA, the number of employees, and the number of hours worked (only for the crisis periods) in the service sector, compared with the manufacturing sector and total economy. It also shows the growth rates for each service division (G–U). Average annual growth rates are calculated for the non-crisis periods, and annual growth rates are calculated for the crisis periods.

In the period before the financial crisis, the growth rate of VA in the service sector in the EU–27 was similar to that in the total economy but lower than in the manufacturing sector. However, it was different for employment because the number of employees increased in services but declined in manufacturing. Additionally, the average annual growth rate of EMP in services was nearly twice that of the total economy. The crisis of 2008 hit the EU's service sector much less significantly than the manufacturing sector, as the decline of VA in services (–2.1%) was seven times lower than that in manufacturing (–14.2%) and twice as low as the total economy (–4.3%). Similar tendencies are visible for employment, although it generally decreased less significantly than VA, especially concerning hours worked.

In the following years, both services and manufacturing returned to growth. However, the upward trend was generally weaker than in the pre-crisis period (except for employment in manufacturing). The growth rates in services were lower than in manufacturing, and they were lower for EMP than VA. During the COVID–19 pandemic, the service

sector was again less heavily hit by the crisis than the manufacturing sector, although it was much harder than the earlier crisis. VA and the number of hours worked in the service sector recorded deep declines, which was not the case for the number of employees. The HEMP index declined five times more than the EMP index, and this large disparity, much higher than during the previous crisis, resulted from the extensive state aid to maintain jobs during the COVID–19 lockdowns. The decreased rate of VA in manufacturing was twice as low, whereas in services, conversely, it was more than twice as high compared to the global financial crisis.

Table 1. Growth rates[a] of value added (2005 prices, euro) and employment, EU–27 and Poland, 2000–2020, %

| IND[b] | Period | 2000–2007 | | 2008–2009 | | | 2010–2019 | | 2019–2020 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Index[c] | EMP | VA | EMP | HEMP | VA | EMP | VA | EMP | HEMP | VA |
| TOT | EU–27 | 0.9 | 2.2 | –1.8 | –3.2 | –4.3 | 0.7 | 1.5 | –1.4 | –6.9 | –5.8 |
| | PL | 0.6 | 4.1 | 0.4 | –0.4 | 3.1 | 0.7 | 3.6 | 0.0 | –0.8 | –2.0 |
| MFG | EU–27 | –0.7 | 2.6 | –6.3 | –9.8 | –14.2 | 0.5 | 2.1 | –2.6 | –7.7 | –7.6 |
| | PL | 0.7 | 8.6 | –5.2 | –6.1 | 1.8 | 1.9 | 4.9 | –4.0 | –4.7 | –2.6 |
| SER | EU–27 | 1.7 | 2.2 | –0.3 | –1.1 | –2.1 | 1.1 | 1.7 | –1.4 | –7.5 | –5.4 |
| | PL | 1.6 | 3.7 | 3.1 | 2.2 | 2.6 | 1.2 | 4.0 | 0.5 | –0.1 | –2.2 |
| G | EU–27 | 1.4 | 2.9 | –1.9 | –2.9 | –5.3 | 0.3 | 2.2 | –1.8 | –7.8 | –3.8 |
| | PL | 2.8 | 3.1 | 0.4 | –0.1 | 5.7 | 0.2 | 2.7 | –4.1 | –5.0 | –9.9 |
| H | EU–27 | 0.9 | 2.8 | –1.9 | –3.6 | –6.1 | 1.1 | 1.2 | –0.2 | –6.8 | –17.4 |
| | PL | 2.9 | 4.2 | –0.9 | –2.0 | –8.4 | 2.3 | 5.2 | 4.8 | 4.8 | –6.3 |
| I | EU–27 | 2.6 | 0.3 | 0.3 | –1.2 | –4.3 | 2.4 | 1.7 | –12.3 | –32.2 | –43.7 |
| | PL | 3.9 | 2.0 | 7.4 | 5.4 | 2.4 | 2.2 | 4.6 | –13.0 | –18.0 | –16.3 |
| J | EU–27 | 1.7 | 5.8 | 0.0 | –0.3 | –0.6 | 2.3 | 4.7 | 2.8 | –0.4 | 1.9 |
| | PL | 6.2 | 7.7 | 6.5 | 3.7 | 3.1 | 4.4 | 8.0 | 3.7 | 4.7 | 6.3 |
| K | EU–27 | 0.9 | 1.9 | 0.5 | 0.1 | –1.2 | –0.5 | 0.1 | –0.1 | –1.7 | 1.0 |
| | PL | 5.7 | 7.4 | 9.0 | 8.8 | –6.3 | 1.6 | 7.1 | 1.4 | 1.7 | –7.4 |
| L | EU–27 | 1.5 | 2.4 | –3.2 | –3.3 | 1.0 | 0.9 | 1.4 | –1.0 | –4.2 | –1.3 |
| | PL | –4.9 | 1.5 | 9.2 | 9.7 | –0.3 | –0.4 | 3.5 | –11.0 | –12.0 | 3.6 |
| M | EU–27 | 3.3 | 2.6 | 1.0 | –0.3 | –5.0 | 2.2 | 2.4 | 1.4 | –4.0 | –0.4 |
| | PL | 4.9 | 4.4 | 10.2 | 7.7 | 5.4 | 3.3 | 4.8 | 4.8 | 4.6 | 5.1 |
| N | EU–27 | 4.3 | 3.1 | –3.8 | –4.8 | –8.5 | 2.5 | 3.1 | –5.6 | –11.7 | –11.4 |
| | PL | 3.9 | 5.8 | 5.6 | 5.6 | 7.6 | 1.4 | 8.4 | –3.6 | –4.0 | 5.9 |

| IND[b] | Period | 2000–2007 | | 2008–2009 | | | 2010–2019 | | 2019–2020 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Index[c] | EMP | VA | EMP | HEMP | VA | EMP | VA | EMP | HEMP | VA |
| O-Q | EU–27 | 1.0 | 1.1 | 1.5 | 1.2 | 1.3 | 0.9 | 0.7 | 0.7 | – 2.4 | – 2.7 |
| | PL | – 0.7 | 3.0 | 3.5 | 3.7 | 5.3 | 0.8 | 1.7 | 0.1 | 0.2 | 5.0 |
| R-U | EU–27 | 1.9 | 1.5 | 0.9 | 0.3 | – 1.6 | 0.7 | 0.7 | – 1.6 | – 10.0 | – 17.9 |
| | PL | 2.0 | 2.9 | 2.7 | 0.8 | 1.6 | 0.8 | 3.1 | 24.1 | 21.7 | – 19.5 |

[a] Average annual growth rates for the periods 2000–2007 and 2010–2019 and annual growth rates for the periods 2008–2009 and 2019–2020.

[b] TOT – total economy; MFG – manufacturing; SER – services; G – Wholesale and retail trade; repair of motor vehicles and motorcycles; H – Transportation and storage; I – Accommodation and food service activities; J – Information and communication; K – Financial and insurance activities; L – Real estate activities; M – Professional, scientific and technical activities; N – Administrative and support service activities; O–Q – Public administration, defence, education, human health and social work activities; R–U – Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organisations and bodies.

[c] EMP – persons, total employment domestic concept; HEMP – hours worked, total employment domestic concept; VA – value added, gross, chain linked volumes (2005), million euro.
Source: own calculations based on data derived from Eurostat 2022; 2022b.

As far as the development of the service sector in Poland is concerned, during the financial crisis, it showed an upward trend for all indicators, and the growth rate of VA was only slightly weaker than in the pre-crisis and post-crisis periods. VA in manufacturing also was on the increase, although at a slower rate than in services; by contrast, employment in manufacturing suffered from a steep decline. During COVID–19, VA and hours worked in services declined, although less than in manufacturing and less than on average in the EU–27 – the HEMP index in services decreased only by 0.1%, compared to 4.7% in manufacturing and 7.5% in both sectors in the EU–27. During the non-crisis periods, the growth rates of VA were higher in manufacturing than in services. In the case of employment, this occurred only before the first crisis.

These findings show that the service sectors in the EU–27 and in Poland were robust to both crises, which cannot be said about the manufacturing sectors. This phenomenon is more clearly visible during the financial crisis than during the COVID–19 crisis, and it is more clearly visible in Poland than in the EU–27, on average.

During the non-crisis periods, in most cases, VA and employment were on the increase in all service industries, both in the EU and Poland. The situation was the reverse in the EU during both crises. VA in section N, followed by sections M, H, G, and I, was most heavily affected during the financial crisis. Interestingly, VA in section K (financial and insurance services) recorded only a slight decline in 2009 (–1.2%, compared with –13% in the USA in 2008, see: OECD 2022). During the COVID–19 crisis, section I (accommodation and food) suffered most dramatically. There were also strong declines in sections H, R–U, and N. By contrast, section J (information and communication) in-

creased, except for a slight decline during the financial crisis. Two divisions within this section, i.e., Computer programming, consultancy (J62) and information service activities (J63), referred to as computer and information (C&I) services, are one of the KIBS subsectors, and thus they are discussed in more detail later in the study, based on data for all EU countries. The same refers to section M (Professional, scientific and technical activities), referred to as professional services or PS&T. In Poland, most service industries continued to grow during the financial crisis (except for sections H and K), which was not the case during COVID–19. Sections J, M and N showed a stable upward trend through all analysed periods (except for employment in section N during COVID–19).

Regarding computer and information services, the C&I sector's development is not only stable but also continuous. The COVID–19 pandemic also accelerated the digital transformation and created new opportunities for the development of these services. Thus, the data presented in Table 2 are used not to examine the robustness of this area but to examine the advancement of this process and the differences between EU countries.

Table 2. Value added and employment in Computer programming, consultancy, and information service activities, EU, 2000–2021, %

| Country | Value added gross (2005 prices, euro) | | | | | | | Employment (persons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Share[a] | Growth rate[b] | | | | | | Share[a] | Growth rate[b] | | | | | |
| | 2021 | 2000 2021 | 2000 2007 | 2008 2009 | 2010 2019 | 2019 2020 | 2020 2021 | 2021 | 2000 2021 | 2000 2007 | 2008 2009 | 2010 2019 | 2019 2020 | 2020 2021 |
| EU27[c] | 3.9 | 5.8 | 6.4 | –0.3 | 6.5 | 4.3 | – | 2.1 | 4.8 | 5.0 | 3.1 | 5.1 | 6.0 | – |
| EU14[c] | 3.9 | 5.3 | 6.0 | –0.7 | 6.1 | 2.7 | – | 2.1 | 3.6 | 3.7 | 1.3 | 3.9 | 4.7 | – |
| EU13[c] | 4.4 | 11.6 | 11.9 | 4.8 | 11.5 | 19.4 | – | 2.0 | 8.8 | 9.3 | 9.1 | 9.1 | 10.3 | – |
| AT | 2.6 | 5.6 | 6.6 | –2.4 | 7.3 | –0.7 | 4.5 | 2.1 | 4.5 | 4.3 | –1.9 | 5.2 | 4.8 | 6.4 |
| BE | 2.7 | 5.4 | 5.3 | 4.5 | 6.0 | 3.3 | 8.6 | 1.8 | 4.4 | 3.4 | 10.8 | 4.7 | 4.2 | 6.0 |
| BG | 4.1 | 16.1 | 21.6 | 9.6 | 9.3 | 7.7 | 11.1 | 2.5 | 11.4 | 7.4 | 10.1 | 9.0 | 11.9 | 13.8 |
| CY | 3.0 | 12.9 | 10.4 | –17.5 | 17.7 | 6.5 | – | 1.8 | 10.5 | 13.6 | –3.0 | 11.4 | 6.3 | 6.6 |
| CZ | 4.1 | 8.9 | 12.3 | 0.6 | 9.0 | 5.2 | 3.0 | 2.3 | 5.9 | 8.1 | 10.3 | 4.2 | 4.9 | 3.3 |
| DE | 4.9 | 7.3 | 8.6 | –1.5 | 8.6 | 2.5 | – | 2.2 | 3.8 | 4.1 | 0.6 | 4.5 | 3.5 | – |
| DK | 3.5 | 6.7 | 8.2 | 10.1 | 3.6 | 11.3 | 12.6 | 2.1 | 3.6 | 4.4 | 4.3 | 2.1 | 1.7 | 10.2 |
| EE | 5.0 | 13.5 | 16.6 | –8.0 | 13.6 | 13.5 | 25.1 | 3.3 | 9.6 | 11.5 | 7.8 | 10.5 | 5.6 | 4.0 |
| ES | 1.9 | 4.0 | 5.9 | 1.1 | 4.4 | 0.4 | – | 1.8 | 4.2 | 4.6 | 0.4 | 4.3 | 6.4 | – |
| FI | 3.7 | 4.7 | 6.2 | –9.4 | 6.0 | 4.5 | 5.3 | 2.9 | 3.7 | 3.7 | –4.0 | 4.3 | 3.5 | 4.5 |
| FR | 3.8 | 4.3 | 4.4 | –3.3 | 4.7 | 1.7 | 9.5 | 2.1 | 2.6 | 1.8 | 0.2 | 3.3 | 3.4 | – |
| GR | 0.8 | 2.8 | 2.0 | –0.7 | 4.1 | 3.9 | 17.9 | 0.9 | 7.4 | 11.6 | 1.4 | 2.6 | 5.3 | 9.2 |
| HR | 1.9 | 8.5 | 10.8 | 2.4 | 6.3 | 10.6 | 30.9 | 1.2 | 2.3 | 2.7 | 5.5 | 3.2 | –1.7 | –6.4 |

| Country | Value added gross (2005 prices, euro) | | | | | | | Employment (persons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Share[a] | Growth rate[b] | | | | | | Share[a] | Growth rate[b] | | | | | |
| | 2021 | 2000 2021 | 2000 2007 | 2008 2009 | 2010 2019 | 2019 2020 | 2020 2021 | 2021 | 2000 2021 | 2000 2007 | 2008 2009 | 2010 2019 | 2019 2020 | 2020 2021 |
| HU | 4.1 | 9.3 | 8.4 | 9.1 | 9.3 | 8.6 | 24.0 | 2.7 | 8.2 | 8.7 | 12.5 | 8.3 | 15.5 | 12.1 |
| IE | 8.8 | 12.8 | 8.7 | -8.8 | 19.1 | 15.7 | 16.1 | 4.6 | 6.1 | 2.0 | 6.3 | 7.7 | 63.0 | 15.9 |
| IT | 2.2 | 2.3 | 3.2 | 1.7 | 2.2 | -2.6 | 6.0 | 1.9 | 2.2 | 3.0 | 2.9 | 1.8 | 2.1 | 4.6 |
| LT | 1.9 | 13.7 | 20.1 | 4.6 | 12.4 | 10.9 | – | 2.1 | 16.0 | 27.5 | 16.0 | 11.6 | 11.7 | – |
| LV | 1.9 | 9.5 | 15.0 | -19.0 | 10.0 | 3.1 | – | 3.0 | 10.5 | 12.8 | -7.8 | 12.7 | 4.6 | – |
| NL | 4.4 | 5.8 | 6.0 | -2.2 | 6.3 | 8.3 | 8.7 | 2.7 | 3.5 | 3.1 | 0.0 | 4.0 | 6.0 | 4.8 |
| PL | 3.6 | 12.8 | 8.8 | 15.1 | 13.1 | 36.8 | – | 2.0 | 9.3 | 9.3 | 14.3 | 10.2 | 7.0 | 13.6 |
| PT | 2.3 | 6.7 | 4.3 | 5.2 | 8.8 | 10.0 | – | 1.7 | 7.8 | 5.8 | 9.6 | 9.3 | 7.9 | – |
| RO | 10.3 | 15.9 | 20.8 | -24.9 | 16.0 | 11.9 | 15.2 | 1.3 | 9.5 | 8.8 | 0.9 | 11.6 | 21.3 | – |
| SE | 7.3 | 8.0 | 9.8 | 0.5 | 7.3 | 8.2 | – | 2.6 | 2.3 | 2.3 | -3.9 | 3.0 | 0.8 | – |
| SI | 3.1 | 9.2 | 10.6 | 0.3 | 8.5 | 7.4 | 16.8 | 2.1 | 8.0 | 12.5 | 7.6 | 5.3 | 6.1 | 5.4 |
| SK | 3.9 | 9.3 | 10.2 | 26.3 | 6.9 | 6.7 | 6.3 | 2.4 | 6.9 | 7.6 | 5.4 | 6.7 | 6.3 | 11.0 |

[a] Share in total value added and employment.

[b] Average annual growth rates for the periods: 2000–2021, 2000–2007 and 2010–2019, and annual growth rates for the periods: 2008–2009, 2019–2020 and 2020–2021. For countries that lack data from 2021, data from 2020 is used; the same refers to the EU–27, EU–14 and EU–13 averages.

[c]EU–27 excluding Luxembourg and Malta, EU–14 excluding Luxembourg, and EU–13 excluding Malta due to a lack of data.

Source: own calculations based on data derived from the source as in Table 1.

The average annual growth rate of C&I services in the EU–27 accounted for 5.8% in VA and 4.8% in employment between 2000 and 2021. In general, the growth rates of all indicators in this area in the 'new' EU members were double those of the 'old' members; additionally, during the crisis periods, the gap increased. As a result, in 2021[2], C&I services accounted for a higher share in VA in the EU–13 than in the EU–14. C&I services had the highest share in VA and employment in Romania (only VA – 2.6 times higher than the EU–27 average) and Ireland (double the EU–27 average for both indexes). The highest growth rates of C&I VA are in Bulgaria and Romania, but C&I employment in Lithuania. Despite the steadily growing shares of C&I services in employment through all analysed periods (the EU–27, EU–14 and EU–13 averages), in 2020/21 they accounted for only half the share in employment than in VA (only in Greece, Lithuania, and Latvia was the situation reversed). This generally results from relatively high productivity and compensation in C&I services. The largest and most visible disparities between

2 For some EU countries, data from 2021 is not available; data from 2020 is then used.

these two indexes occurred in countries with the highest shares of C&I services in VA, i.e., Romania, Ireland, and Sweden.

In 2021, Romania introduced a personal income tax break for workers with specific IT-relevant bachelor's degrees and who work directly on software development for a firm with an eligible IT sector code. In 2013, the tax break law was amended to allow a significantly larger list of eligible sector codes for firms and eligible bachelor's degrees for workers. Manelici and Pantea (2021) found that this policy reform led to strong and lasting growth for IT firms in Romania, significantly faster than the other sectors in Romania and compared to the same relative growth in similar countries. Labour productivity (measured as revenues per worker) increased thanks to the tax break, which explains the much higher share of this division in VA than in employment.

Thanks to the favourable tax regulation, the Irish economy has attracted significant investment from multinational companies in recent decades (including the largest American ICT companies, e.g., Google, Microsoft, Intel, Apple, and Facebook). It has also become the world's largest centre for telecommunications and computer and information services. The ICT sector, dominated by foreign multinationals, generated high productivity growth and dramatically increased its share in VA growth in the 2014–2019 period relative to the earlier period. As a result, the gap between the ICT sector's shares in VA and employment increased significantly (Houses of the Oireachtas 2021). However, during the COVID–19 period, the situation began to change, as C&I employment recorded tremendous growth (63% in 2020 and 15.9% in 2021).

Sweden is at the forefront of the rapid growth in digital transformation that the Nordic region is experiencing, which the COVID–19 pandemic accelerated. Sweden has excellent infrastructure and widespread Internet use, both among individuals and businesses, which makes it easier for C&I companies to adapt quickly and explore new ideas. Sweden is also the birthplace of many well-known global tech brands, such as Spotify and Skype, that play a leading role in delivering C&I services worldwide (OECD 2018; Ultiro AB 2021).

During the financial crisis, C&I services showed an upward trend in VA in half of the EU countries (mainly the EU–13) and in employment in most EU countries. The most impressive growth rates of VA occurred in Slovakia (26.3%), Poland (15.1%), Denmark (10.1%), Bulgaria (9.6%) and Hungary (9.1%). By contrast, Romania (–24.9%), Latvia (–19%), and Cyprus (–17.5%) saw the largest falls. The highest growth rates of employment were in Lithuania (16%), Poland (14.3%), and Hungary (12.5%). During the COVID–19 crisis, the upward trend was visible in nearly all EU countries regarding both VA (except for Italy and Austria) and employment (except for Croatia). The highest growth rates of VA took place in Poland (36.8%) and employment in Ireland (63%). There is data only for some EU countries for 2021 (ex-

cluding Poland). However, generally, the C&I sector is still experiencing significant growth, with the strongest growth of VA in Croatia, Estonia and Hungary, and employment in Ireland.

Poland saw a large increase in C&I VA, although five of the EU–13 achieved better results (including six regarding EMP). C&I services in Poland accounted for a slightly lower share in VA than the EU–27 average and nearly one-third that of Romania (in 2000, C&I VA in Poland was more than double that of Romania, whereas, in 2020, it was only 30% higher). However, Poland also draws attention, as in 2020, it recorded the highest growth in C&I VA, much stronger than in other EU countries. Interestingly, this was accompanied by much lower growth in the number of employees (7%) and in the number of hours worked (7.9%). This may be explained by an increased use of existing labour resources in light of the growing demand for C&I services during COVID–19 and the limited possibilities to increase employment in the short term. It appears, however, that this increased employee utilisation was largely unofficial in Poland. This means that, as it was more difficult to monitor them, the C&I employees were carrying out additional projects for other companies (Dean 2021). Alternatively, they may have worked overtime hours informally (because the excessive amount of overtime worked is inconsistent with the provisions of the Labour Code, and working this way is financially more beneficial for both parties). However, this demonstrates that there is great potential to develop the C&I sector in Poland. The growth rate of employment in this field in 2021 was almost double that of the previous year (13.6%) and was among the highest in the EU (data on C&I VA is not yet available).

The second sub-category of the KIBS sector, i.e., professional services (Table 3), accounted for higher shares in VA (7.1%) and employment (6.3%) than C&I services (3.9% and 2.1%, respectively). However, their growth dynamics (2.1–2.4%) were lower than C&I services (one-third in the case of VA and half in the case of EMP). Despite the stronger upward trend in the 'new' EU members compared to the 'old' ones, the importance of professional services was lower in the former. In 2021, Belgium (11%) had the highest shares of professional services in VA and employment; the highest growth rates in the period 2000–2021 occurred in Malta (9.5% and 7.9%, respectively). Compared to the EU–27 average, professional services in Poland accounted for a slightly lower share in VA (but higher than the EU–13 average) and a significantly lower share in employment (by 2.1 pp, below the EU–13 average).

Table 3. Value added and employment in Professional, scientific and technical activities, EU, 2000–2021, %

| Country | Value added gross (2005 prices, euro) | | | | | | | Employment (persons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Share[a] | Growth rate[b] | | | | | | Share[a] | Growth rate[b] | | | | | |
| | 2021 | 2000 2021 | 2000 2007 | 2008 2009 | 2010 2019 | 2019 2020 | 2020 2021 | 2021 | 2000 2021 | 2000 2007 | 2008 2009 | 2010 2019 | 2019 2020 | 2020 2021 |
| EU27 | 7.1 | 2.1 | 2.6 | – 5.0 | 2.4 | – 0.4 | 7.6 | 6.3 | 2.4 | 3.3 | 1.0 | 2.2 | 1.4 | 1.2 |
| EU14 | 7.2 | 1.8 | 2.3 | – 5.3 | 2.1 | – 0.6 | 7.1 | 6.9 | 2.2 | 3.3 | 0.0 | 1.9 | 1.2 | 1.3 |
| EU13 | 6.4 | 5.1 | 6.0 | – 1.3 | 5.4 | 1.9 | 12.4 | 4.4 | 3.1 | 3.5 | 4.2 | 3.2 | 1.8 | 1.0 |
| AT | 5.7 | 2.9 | 3.7 | – 3.2 | 3.4 | – 3.1 | 5.2 | 6.6 | 3.1 | 4.2 | 3.3 | 2.1 | 1.1 | 3.3 |
| BE | 11.3 | 3.5 | 4.8 | 3.1 | 2.8 | – 0.9 | 9.2 | 11.0 | 2.9 | 3.7 | 0.6 | 2.5 | 2.4 | 2.5 |
| BG | 3.4 | 7.1 | 12.0 | 15.1 | 3.5 | 14.2 | – 5.2 | 3.5 | 3.9 | 7.7 | 3.2 | 0.9 | 2.3 | 2.2 |
| CY | 9.0 | 4.1 | 5.1 | – 1.6 | 3.4 | 1.6 | 2.7 | 7.3 | 5.5 | 6.2 | 5.1 | 5.0 | 3.3 | 1.3 |
| CZ | 5.6 | 3.6 | 4.6 | – 6.6 | 4.0 | – 1.5 | 12.4 | 5.9 | 1.8 | 3.0 | – 1.0 | 1.5 | – 1.8 | 1.2 |
| DE | 6.5 | 1.0 | 1.2 | – 11.7 | 1.9 | – 0.8 | 5.6 | 6.7 | 2.3 | 3.1 | 0.8 | 2.2 | 0.3 | 0.9 |
| DK | 5.8 | 1.8 | – 0.3 | – 4.4 | 3.5 | 0.9 | 6.9 | 6.0 | 1.9 | 3.0 | – 0.6 | 1.7 | 0.6 | 4.6 |
| EE | 6.6 | 6.4 | 10.9 | – 8.2 | 5.0 | 5.4 | 15.7 | 4.8 | 3.3 | 2.6 | 4.7 | 3.8 | 2.4 | – 0.1 |
| ES | 5.9 | 3.5 | 5.0 | 0.1 | 3.5 | – 6.1 | 12.8 | 5.6 | 2.7 | 6.1 | – 2.4 | 1.9 | – 0.2 | – 0.8 |
| FI | 4.7 | 1.4 | 1.6 | – 5.7 | 2.2 | 0.8 | 5.9 | 6.2 | 2.8 | 4.4 | – 1.6 | 1.9 | 1.7 | 1.9 |
| FR | 8.9 | 2.4 | 2.7 | – 3.3 | 2.6 | – 3.7 | 7.6 | 7.7 | 2.1 | 2.0 | 1.0 | 2.4 | 2.4 | 3.0 |
| GR | 3.0 | – 0.4 | 8.0 | – 2.6 | – 4.0 | 0.6 | – 0.3 | 5.8 | 2.7 | 5.1 | 1.3 | 0.4 | – 1.6 | 3.2 |
| HR | 6.1 | 3.0 | 6.2 | – 8.5 | 2.3 | – 3.0 | 12.6 | 4.2 | 3.2 | 4.9 | – 0.7 | 2.5 | – 2.0 | – 1.0 |
| HU | 8.1 | 4.7 | 3.7 | – 3.0 | 6.0 | 2.4 | 12.3 | 6.2 | 4.6 | 3.0 | 4.8 | 6.6 | 6.4 | 1.0 |
| IE | 4.6 | 4.9 | 3.6 | – 9.0 | 6.4 | 18.7 | 8.8 | 6.7 | 3.5 | 5.4 | – 9.0 | 2.8 | 10.1 | 12.1 |
| IT | 7.1 | 0.2 | 0.8 | – 4.9 | – 0.4 | 1.9 | 6.2 | 6.9 | 1.5 | 2.6 | – 0.8 | 1.0 | 2.4 | 0.1 |
| LT | 4.5 | 5.9 | 14.1 | – 16.8 | 4.9 | – 0.3 | 12.4 | 4.5 | 3.9 | 4.8 | – 4.5 | 3.6 | 5.2 | – 5.4 |
| LU | 8.7 | 4.9 | 5.1 | – 4.2 | 7.5 | – 0.4 | – 3.8 | 10.8 | 6.0 | 6.8 | 7.0 | 5.5 | 4.2 | 3.9 |
| LV | 3.5 | 3.3 | 10.4 | – 18.6 | 2.3 | 3.3 | 5.8 | 4.5 | 3.5 | 8.7 | – 10.1 | 4.5 | – 0.6 | – 11.0 |
| MT | 10.0 | 9.4 | 7.1 | 0.6 | 13.5 | – 4.2 | 10.1 | 6.9 | 7.9 | 7.0 | 13.5 | 9.4 | 4.2 | 4.9 |
| NL | 8.7 | 1.5 | 1.2 | – 2.8 | 1.5 | 2.7 | 6.2 | 8.5 | 1.4 | 1.8 | 0.1 | 1.5 | 2.0 | 1.7 |
| PL | 6.9 | 5.2 | 4.4 | 5.4 | 4.8 | 5.1 | 17.5 | 4.2 | 4.3 | 4.9 | 10.2 | 3.3 | 4.8 | 5.3 |
| PT | 5.0 | 2.5 | 2.1 | – 4.2 | 3.5 | 0.6 | 6.3 | 4.7 | 2.6 | 3.0 | 0.4 | 2.2 | 0.8 | 6.5 |
| RO | 3.7 | 7.4 | 10.7 | – 7.3 | 12.2 | – 8.5 | 4.9 | 2.0 | 0.3 | – 1.3 | – 0.9 | 3.1 | – 3.8 | – 4.8 |
| SE | 9.0 | 4.0 | 5.3 | – 4.2 | 4.2 | 0.8 | 8.4 | 6.4 | 1.7 | 2.7 | 0.4 | 2.7 | – 1.4 | – 9.8 |
| SI | 7.4 | 3.2 | 3.6 | – 3.3 | 3.0 | – 4.4 | 9.0 | 7.9 | 4.0 | 7.0 | 5.8 | 2.0 | 0.9 | 2.6 |

| Country | Value added gross (2005 prices, euro) | | | | | | | Employment (persons) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Share[a] | Growth rate[b] | | | | | | Share[a] | Growth rate[b] | | | | | |
| | 2021 | 2000 2021 | 2000 2007 | 2008 2009 | 2010 2019 | 2019 2020 | 2020 2021 | 2021 | 2000 2021 | 2000 2007 | 2008 2009 | 2010 2019 | 2019 2020 | 2020 2021 |
| SK | 8.2 | 5.8 | 7.6 | 0.0 | 3.5 | 10.7 | 7.6 | 6.1 | 3.1 | 4.6 | 9.2 | 3.1 | 1.6 | – 1.3 |

[a] Share in total value added and employment.

[b] Average annual growth rates for the periods: 2000–2021, 2000–2007 and 2010–2019, and annual growth rates for the periods: 2008–2009, 2019–2020 and 2020–2021.

Source: own calculations based on data derived from the source as in Table 1.

During the non-crisis periods, VA and employment grew faster before the financial crisis, particularly employment, although there are some differences between the EU countries in both cases. During the financial crisis, VA in professional services decreased by 5%, more than double that of the service sector (–2.1%), but nearly one-third that of manufacturing (–14.2%). The decline in the EU–13 was four times lower than in the EU–14. The largest declines in VA in professional services occurred in Latvia (–18.6%), Lithuania (–16.8%) and Denmark (–11.7%). By contrast, five countries experienced an increase in VA, and most countries experienced an increase in employment. Poland was among the countries with an upward trend, recording the second-highest growth rates of VA and employment (5.4% and 10.2%, respectively). During the COVID–19 pandemic, VA in professional services in the EU–27 recorded only a slight decrease (by –0.4%), much lower than during the previous crisis, and lower than in the service sector (–5.4%) and the manufacturing sector (–7.6%). This happened only in the EU–14 countries. This indicates that professional services have significantly improved their crisis robustness after the financial crisis. Estonia and the Netherlands achieved the best results in this area. In 2009, they recorded strong declines in VA in professional services, but the situation was reversed in 2020. The same can be said for Ireland and Lithuania regarding employment. Overall, most EU countries improved the stability of VA and eleven improved employment in professional services during COVID–19. Employment in this area appeared to be less subject to cyclical fluctuations than VA, as it increased in both groups through all analysed periods, with higher growth dynamics in the EU–13.

The lower vulnerability of professional services to the COVID–19 pandemic can be attributed to the fact that the decline in VA in manufacturing was only half as much during the pandemic compared to the financial crisis in 2009. This indicates that the demand for professional services from manufacturing companies decreased less significantly in 2020 than it did in 2009. However, the conclusion on the improved crisis robustness of professional services seems justified considering the opposite trend in the case of VA in administrative and support services (N), a section that also plays a vital role in manufacturing activities.

In Poland, VA and EMP in professional services showed the most stable upward trend through all analysed periods, and the growth rates of both indexes in the crisis periods were slightly higher than in the non-crisis periods. Apart from Poland, only Bulgaria and Slovakia maintained positive growth rates in this field during both crisis periods. Additionally, in 2021, Poland recorded the highest growth of VA in this area. Legal and accounting activities, activities of head offices, and management consultancy activities (divisions M69–70) were the main driving force behind the rapid development of this sector in Poland – their share in VA in section M doubled in the analysed period, reaching 51.4% in 2020 (similar to the EU–27 average). Accounting, auditing, bookkeeping, and tax consulting services[3] deserve special attention due to the high comparative advantage of Polish exports in this field. In 2020, the revealed comparative advantage index in Polish exports of these services reached 4.7 in intra-EU trade and 8.3 in extra-EU trade, compared to 2.6 and 3.5, respectively, in 2010 (own calculations based on Eurostat 2022c).

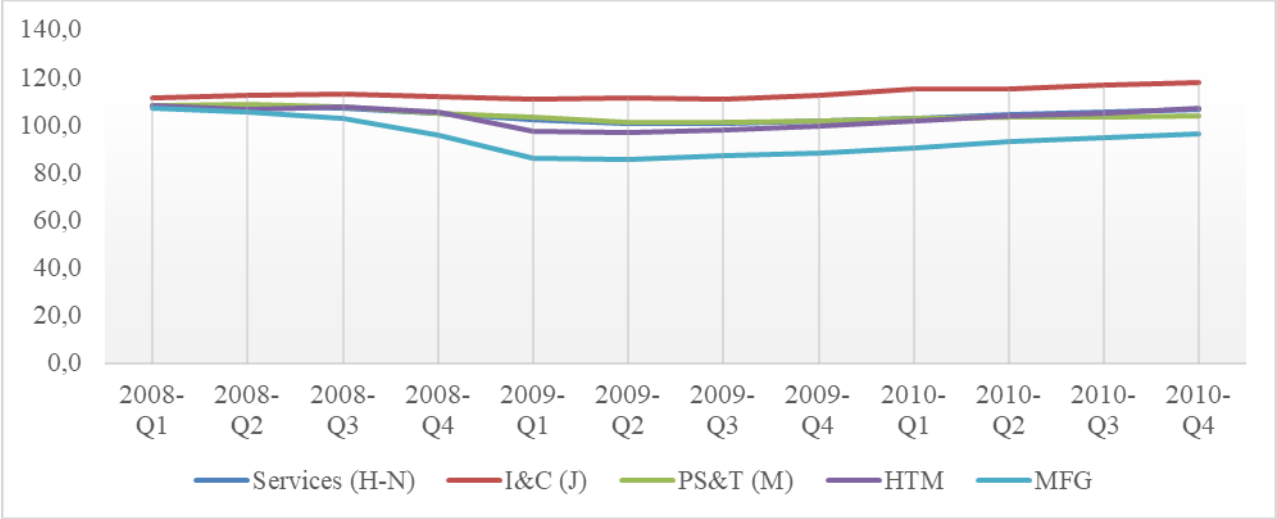
Graphs 1 and 2 present the production volume (in 2006 prices) in subsequent quarters in the periods 2008–2010 and 2019–2021. This is helpful in a more detailed examination of changes in production in the crisis year compared to the pre-crisis and post-crisis years. The charts compare the changes in production volume in the KIBS sub-sectors with such changes in the service sector (defined as comprising only divisions H–N), the manufacturing sector (MFG), and the high-tech manufacturing sub-sector (HTM). Data on division J[4] (information and communication, I&C) is used as data for division J62–63 are not available for 2021. However, generally, the curve showing the production growth in J coincides with the curve showing the production growth in J62–63.

I&C services showed stable, constant growth dynamics through all analysed periods, higher than in other areas covered by the study. During the financial crisis, the growth dynamics were stable in 2008–2009, with a slight decline in the first quarter of 2009. In the last quarter of 2009, an upward trend started. During the COVID–19 pandemic, there was an upward trend throughout almost the whole period, except for the second quarter of 2020, when the most restrictive lockdowns occurred in the EU. The growth dynamics subsequently accelerated. The curve showing the production growth in professional services coincides with the curve showing the production growth in the service sector during both crises, which is particularly visible during the financial crisis. During the COVID–19 pandemic, the production dynamics in professional services increased and were more stable than in the service sector; first, they were lower, and after the second quarter of 2020, higher than in the service sector. The second quarter of 2020

3 The categories in the national accounts do not match exactly the categories in the balance of payments.

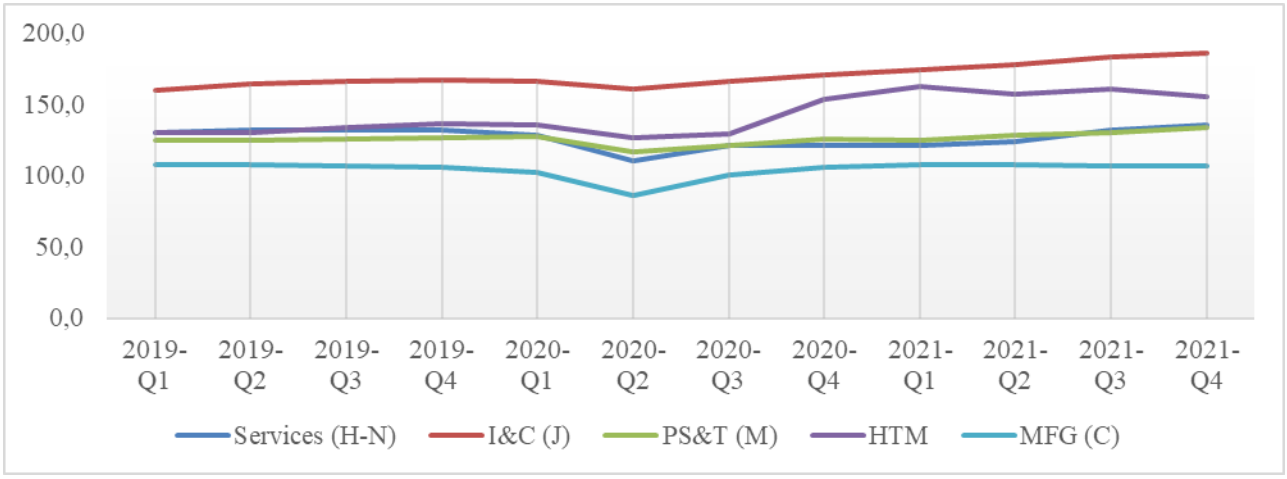
4 Section J comprises, apart from C&I services, Publishing, audiovisual and broadcasting activities (J58–60) and Telecommunications (J61).

was again an exception. The growth dynamics of I&C services are generally higher than those of professional services, and this disparity tends to increase.




Graph 1. Volume index of production (2006 prices), quarterly data, 2008–2010, EU–27

Source: Eurostat 2022d.




Graph 2. Volume index of production (2006 prices), quarterly data, 2019–2021, EU–27

Source: as in Graph 1.

Manufacturing recorded the lowest growth dynamics throughout both periods, though in the first quarter of 2008, it was at a similar level to the other analysed areas. Production in manufacturing declined most significantly in both crisis periods. During the financial crisis, as far back as 2008, the volume index of production declined to a level lower than in 2006. Moreover, the recovery was not fast or rapid, as production volumes did not manage to return to the pre-crisis level in 2010. During the COVID–19 pandemic, in the second quarter of 2020, the volume index of production again reached a value lower than in 2006. However, this time, the recovery was faster and more

rapid, as the index reached the pre-crisis level as soon as the last quarter of 2020, and since then, it has remained stable. Finally, the curve showing the production volume in high-tech manufacturing followed the same course as for manufacturing, but only in Graph 1. However, the growth dynamics in high-tech manufacturing were higher than in manufacturing, at a similar level to that in the service sector and professional services, but with a stronger decline during the financial crisis. In turn, during the pandemic, the growth dynamics declined less significantly than in manufacturing and services, and since the last quarter of 2020, it accelerated rapidly, reaching the second-highest value. This change probably results from the growing demand for electronic devices that were necessary for remote work and education during the pandemic.

## Conclusion

This study used Eurostat data to examine the crisis robustness and resilience of the KIBS sector on the example of the EU countries. Three improvements on the existing literature emerge from the study. First, there is no distinction between the concepts of crisis robustness and crisis resilience in most previous research. Most studies referred to crisis resilience, which has become central in the policy strategies of many governments and international organisations, including the EU's priorities for 2021–2027. In contrast, robustness is much less popular as a concept and policy-guiding principle. Instead, robustness is very often adopted as an instrument of resilience in official documents. The study also indicates that although robustness seems to be more important, as it involves resisting shocks and unexpected events, not only reacting to them as in the case of resilience, choosing a strategy of building crisis robustness or crisis resilience is also influenced by performance objectives of a company and the specifics of a given situation.

Second, the study demonstrated that in the literature on the counter-cyclical role of services, crisis resilience was examined. However, those papers demonstrated that the service sector, in particular, public services, was less subject to cyclical fluctuations than other industries, meaning it was crisis-robust rather than crisis-resilient.

Third, the study makes a contribution by indicating that KIBS have significant potential to contribute to overcoming economic crises. By definition, KIBS play a key role in preparing companies to cope with a crisis as they help to solve problems and adapt to the changing situation (according to Gallouj 2002: "to deliver KIBS […] this is mainly to organise the solution to the problem in the client's company"). Thanks to this role, KIBS can strengthen both the robustness and resilience of their clients' companies and the entire economic system. An important question arises

about business owners' awareness of the role of different KIBS in building crisis robustness and crisis resilience in their organisations, and this issue can be the subject of a separate study. Such awareness should be raised through research that shows the impact of KIBS input on economic performance, in particular regarding those KIBS that play a key role in building crisis robustness and resilience. Another area of study could be KIBS intensity in various companies or industries and how it affects economic performance during both crisis and non-crisis periods.

This paper helps raise such awareness by showing that KIBS activities are less subject to cyclical fluctuations than other industries based on the examples of the two most severe crises of the 21st century, i.e., the financial crisis and the COVID–19 pandemic. Service production was generally only slightly subjected to cyclical fluctuations in the EU–27 during both crises, significantly less than manufacturing production. The KIBS sector's ability to maintain stable growth during both crisis periods is even more visible than in other service industries. This indicates that the service sector, and the KIBS sector in particular, are crisis robust, whereas the manufacturing sector is more crisis resilient. Computer and information services showed a stable upward trend, as well as the highest growth dynamics, and they are not subject to any cyclical fluctuations (on the contrary, the pandemic accelerated their development). The second KIBS sub-sector, i.e. Professional, scientific and technical services, improved their crisis robustness after the financial crisis in most EU countries, with the best results in Estonia and the Netherlands. These findings make it possible to positively verify the hypothesis put forward in this paper. They also show that more attention should be paid to crisis resilience in future research.

The Polish sector of professional, scientific and technical services showed the most stable upward trend throughout all analysed periods, mainly thanks to the growing comparative advantage in the exports of accounting, auditing, bookkeeping, and tax consulting services. The crisis robustness of the whole service sector in Poland is even stronger than the EU–27. Poland also recorded impressive growth in VA in computer and information services during the COVID–19 period. However, while considering the development of the C&I services sector throughout the whole analysed period, Romania and Ireland achieved much better results. It shows that there is still great potential for further growth of this sector in Poland, but it requires improvements in the digital transformation and perhaps taking appropriate economic policy measures.

Finally, the KIBS sector has developed much faster in the 'new' EU member states than in the 'old' ones, but its role is still lower in the 'new' EU economies. This refers to both KIBS sub-sectors, except for VA in computer and information services.

The findings of this study have potential implications for further research and policy strategies. First, a distinction should be made between crisis resilience and crisis

robustness, as: (1) they require different approaches and investments, and (2) their importance may vary for different companies and under different conditions. Additionally, the issue of crisis robustness should receive more attention both in scientific research and in policy strategies. Second, we can assume that thanks to the crisis robustness of the KIBS sector, the robustness of the whole economic system is enhanced as the KIBS sector is an important part of this system. But the contribution of the KIBS inputs to building both crisis robustness and crisis resilience in the companies that use them and in the whole economic system should be further investigated, and policy strategies at all levels should be considered.

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## Czy sektor usług biznesowych opartych na wiedzy jest *crisis-resilient*, czy *crisis-robust*[5]? Badanie porównawcze krajów Unii Europejskiej

Celem artykułu jest zbadanie *crisis robustness* oraz *crisis resilience* sektora KIBS. W pracy weryfikowana jest hipoteza, że sektor KIBS należy uznać raczej za *crisis-robust* niż *crisis-resilient*. Badanie obejmuje lata 2000–2021, podzielone na dwa okresy kryzysowe (globalny kryzys finansowy i pandemia COVID–19) oraz trzy okresy pozakryzysowe. Przedmiotem badania jest porównanie zmian w wartości dodanej i zatrudnieniu w różnych sektorach gospodarki oraz w wyróżnionych okresach. Badanie oparte jest na danych Eurostatu i odnosi się do krajów UE–27, co umożliwia porównanie krajów UE, a ponadto krajów członkowskich sprzed 2004 roku (UE–14 lub „stare" kraje UE) z krajami członkowskimi po 2004 roku (UE–13 lub „nowe" kraje członkowskie). Praca wnosi wkład w dotychczasowe badania poprzez wskazanie na konieczność odróżnienia pojęć *crisis resilience* i *crisis robustness* zarówno w badaniach naukowych, jak i w strategiach politycznych, a ponadto zwracania większej uwagi na kwestię *crisis robustness*. Wkładem pracy jest również wskazanie istotnego potencjału KIBS w zakresie budowania *crisis resilience* i *crisis robustness* w przedsiębiorstwach wykorzystujących KIBS oraz w całym systemie gospodarczym. Wyniki badania pokazują, że podsektory KIBS, tj. usługi komputerowe i informacyjne oraz profesjonalne, naukowe i techniczne są *crisis robust*, czego nie można powiedzieć o sektorze przetwórczym. Sektor KIBS utrzymał bardziej stabilny wzrost w okresach kryzysowych niż inne sektory usługowe. Usługi profesjonalne, naukowe i techniczne w Polsce wykazały się najbardziej stabilną tendencją wzrostową we wszystkich analizowanych okresach. Polska notowała również imponujący wzrost wartości dodanej w usługach komputerowych i informacyjnych w okresie pandemii, ale w całym analizowanym okresie inne kraje UE, np. Rumunia, osiągnęły lepsze rezultaty w tym obszarze.

Słowa kluczowe: usługi, KIBS, kryzys, *resilience*, *robustness*, UE

5 Zarówno *crisis resilience*, jak i *crisis robustness* tłumaczone są na język polski jako 'odporność na kryzys'. Jednakże jednym z celów pracy jest pokazanie, że te dwa pojęcia nie są tożsame. Dlatego zdecydowałam się na używanie angielskich nazw dla tych dwóch pojęć.