

Article

Sectoral Transformation of the Economic System during Crisis and Stable Growth Periods (A Case Study of the European Countries)

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Abstract: Sectoral structures are one of the critical and dynamic components of any social system subjected to either external or internal factors. The purpose of the paper is to reveal and validate characteristic features of transformation regarding economic sectoral structures during the crisis of the socio-economic system and the period of its coordinated development in order to determine the most stable industry sectors. This paper reveals the specificity of sectoral transformations in European countries during the crisis of 2008–2009 and the stable growth of 2010–2019. The analysis is premised on Robert B. Reich’s sectoral structure, comprising production, in-person, intellectual, and communication services sectors. To conduct the research, statistical data analysis using the Gatev coefficient, and correlation and comparative analysis are applied. It is concluded that the mutable nature of sectoral dynamics depends on the planned changes resulting either from business expectations and interests, or state intervention. Yet, transformation is likely due to external and internal shocks (economic upheavals and wars), and unexpected events (natural disasters, epidemics, and pandemics). Over the last 15 years, the sectoral structure has been subjected to most of the above collisions. In-person, intellectual, and communication services sectors are least affected during the economic crisis. In the European countries, the period of economic growth is characterized by the growing dominance of intellectual and communication services sectors. There is a trend of decreasing the share of mining and quarrying in the sectoral production structure in favor of manufacturing industries and services.

Keywords: sectoral structure; sectoral dynamics; transformation; economic growth; economic crisis



Citation: Vasin, Sergey Mikhailovich. 2022. Sectoral Transformation of the Economic System during Crisis and Stable Growth Periods (A Case Study of the European Countries). *Economies* 10: 148. <https://doi.org/10.3390/economies10060148>

Academic Editor: Edward C. Hoang

Received: 8 May 2022

Accepted: 13 June 2022

Published: 16 June 2022

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1. Introduction

The sectoral structure is considered to be one of the decisive factors in achieving high productivity of the state. According to Collin M. Constantine, “it is not institutions that cause growth; rather, it is a country’s economic structure that is the fundamental cause of economic performance. Therefore, differences in economic structures across time and space can explain the differences in economic development” (Constantine 2017).

To determine the adjusting elements for the dynamics models of the sectoral structure, it is necessary to:

- Introduce a concept of the sectoral structure;
- Construct a theoretical model for the sectoral structure;
- Present the dynamics of changes in the sectoral structure in the context of systematic development;
- Display changes in the sectoral structure in the context of major transformations;
- Determine transformation vectors for sectoral dynamics models.

Provided these problems are solved, it is feasible to advance in building an efficient and stable sectoral structure resistant both to predictable crisis phenomena and to sudden impacts affecting the socio-economic system.

The purpose of the paper is to reveal and validate characteristic features of transformation regarding the economic sectoral structure during the crisis of the socio-economic system and the period of its systematic development in order to determine the most stable industry sectors.

The specification of regular transformations of the sectoral structure and identification of the most stable industry sectors under varying factors of economic dynamics (crisis and stable growth periods) are considered as the added value of the paper.

2. Literature Review

It is generally accepted that the sectoral structure is the ratio of the industrial output indicators relating to gross domestic product (GDP).

The sectoral structure represents the composition, quantitative ratios, and forms of interconnection among industries and products; the degree of differentiation and specialization of these industries, and the specifics of economic relationships between them; and the qualitative state of the economy (Aliev et al. 2002).

Sectoral structures are presented both in classical economic literature and by modern researchers in various forms. Naturally, these structures have been expanded over time. The three-sector model in economics developed by Colin Clark divides economies into three sectors of activity: extraction of raw materials (primary), manufacturing (secondary), and service industries, which exist to facilitate the transport, distribution, and sale of goods produced in the secondary sector (tertiary) (Clark 1940). The five-sector model by Daniel Bell is supplemented with the service sector comprising transport, communications, and public utilities, trade, finance, insurance, real estate, healthcare, education, science, recreation, and public administration (Bell 1973). According to the five-sector model by Robert B. Reich, the third sector is specified as production services, the fourth is the sector of in-person services, and the fifth is the intellectual and communication services sector. The sectors are designated by the selection criteria for each group (Reich 1992). Some authors propose the structure of the economic system consisting of two groups. On the one hand, this is a group of production of goods and services; on the other hand, it is a group of the termed virtual production. The first group refers to the ideas of Robert B. Reich, while the second group of virtual production includes the so-called “ideas” along with virtual currency circulation and mass media activities (Lyubimtseva 2003). This group involves ideas for the technological updating of the material production of goods and services, rationalizing management and managerial work, and improving information support. Thus, it is urgent to solve the problem of calculating indicators having a significant impact on the sphere of material production (Vasin 2013). Addressing the issues of sectoral structures greatly simplifies the presence of various official classifiers worldwide, which are constantly being improved in terms of updating and the relevance of new industries and activities (Shirapov 2015). Some authors premise on the ten basic sectors of the Global Industry Classification Standard (GICS) used by Morgan Stanley Capital International (MSCI) and Standard & Poor’s (S&P) (Taylor and Csomós 2012; Csomós 2013). However, for the purposes of our study, a larger grouping of inherently similar industries is preferable.

Coordinated development is associated with diverse gradual dynamics of socio-economic indicators. It is changes in the regional sectoral structure that mark the process of socio-economic dynamics.

Initially, the states have already determined their own specific structure estimated in the ratio between high-tech and low-tech manufacturing. This determines both the production capabilities of the state’s economy and the effectiveness of institutional functioning (Constantine 2017). The priority of high-tech production in the structure of the economy enables sustainable economic growth (Andreoni and Scazzieri 2014; Hidalgo et al. 2007; Nelson and Winter 1990; Reinert 2008; Schumpeter 2008) due to economies of scale resulting in increasing returns. Conversely, with low-tech manufacturing, diminishing returns will denote a decline in the efficiency of production activities due to the rapid competitive increase.

Moreover, the indicators of the country's economy largely depend on the production structure that determines the rate of firm level innovation, diversification of economy, opportunities and diversity in the labor market, etc. Furthermore, institutional development is also associated with sectoral structures: either formal market institutions develop due to financial opportunities in the functioning of efficient industries, or there is an increase in nonmarket mechanisms viewed as corruption, shadow relations, political patronage, etc. in the absence of profitability of formal costs with a low-efficiency production structure (Constantine 2017).

When evaluating the sectoral structure efficiency of different territories, it is advisable to analyze the whole set of industries. It would be erroneous only to parallel the shares of a single type of production in cross-country or inter-regional comparisons. There are single-industry (Paci and Pigliaru 1997) and two-branch (Temple and Wößmann 2006) growth models. However, the latest research tends to analyze a wider range of industries, which is justified in terms of achieving territorial efficiency goals.

This is exemplified by the structure of Norway with the prevailing extraction of natural resources relating to industries with diminishing returns. Meanwhile, the country has been among the leaders in socio-economic development for many decades. Despite the devaluation of the national currency resulting from lower energy prices, the Norwegian economy is effective because of a high diversification of its production structure and an increase in the competitiveness of nonenergy export goods. However, even despite the efficient structure of production, "a decision was made to gradually sell energy assets in order to reduce dependence on fluctuations in energy prices" (Grigoryev et al. 2019, pp. 6–7), in which international organizations provide different project estimates for the growth rate of the country's economy. In particular, the Organisation for Economic Co-operation and Development (OECD) predicted a slowdown in growth rates due to a decrease in nonprimary exports (ibid., p. 14).

The question arises as to whether it is possible to change the existing structure and transform the economy toward increasing production returns.

Constantine (2017) noted that structural changes come from the two types of sources: state intervention and external shocks. However, the question arises if there are possible internal (intra-business) motives that serve as an incentive for business structures to diversify production, subjected to the factors of a competitive environment and affecting changes in the sectoral structure and labor market of the region and the state. If so, then all sources of industry dynamics can be divided into four groups:

1. Planned changes caused by business expectations and interests;
2. Structural changes caused by state intervention;
3. Expected external and internal shocks: economic shocks (positive and negative), wars;
4. Unpredicted sudden impacts: natural disasters, epidemics, pandemics.

We dwell on regional sectoral structural changes in Italy during the Italian "economic miracle" from 1951 to 1970 to consider systematic changes caused by both business expectations and interests, and political intervention. During this period, there was an intensive shift in the labor force from agricultural to the manufacturing, market service, and nonmarket service sectors, in which the role of the state was significant and especially noticeable in comparing the two periods. During the first period, the state stimulated industrialization with the help of a centralized supply-side top-down approach; in the second period, the approach of regional development policy changed toward demand-oriented measures, in particular, the provision of fiscal subsidies to firms, household income support, and public sector job creation (Piras 2022). The transition of the labor force between the agricultural and urban nonagricultural sectors is typically due to marginal product differences and intersectoral wage gaps (Temple and Wößmann 2006).

The example of Japan is also indicative in terms of the gradual change in the sectoral structure associated with various economic factors. In the 1970s, rising wage costs led to the reduction in the textile industry, and rising energy resources resulted in a decrease in the profitability of aluminum production. Instead, the production of automobiles,

electronics, and synthetic materials was developed in the 1980s. In turn, in China, since the 1970s, the heavy industry sector was accorded top-priority with high capital intensity, low employment, and value added. Industrial reorientation turned the priorities to light and food industries, bringing greater added value with a higher level of employment (Ishmuratov and Malganova 2013).

Various economic crises, in particular, the 2008 financial crisis, can serve as examples of sudden but predictable changes. Such periods are characterized by major changes in the nature of the socio-economic dynamics of states in comparison with the dynamics of coordinated development, and diversification of the behavior of economic entities. Said phenomena are viewed while analyzing territorial entities during major crises in dominant sectors in the total industry structure (Raźniak et al. 2017) and while searching for prerequisites for the sustainability of cities and key industries in a crisis situation (Raźniak et al. 2020).

The COVID-19 pandemic is a vivid example of unpredictable shocks.

The remainder of the paper is organized as follows. Section 3 presents the methodological framework and provides empirical support for our research. Section 4 describes the dataset used in this work and highlights the research results. In Section 5, we discuss the results obtained, summarize the main findings, and propose future research perspectives.

3. Data and Methodology

3.1. Methodological Approaches

We used the following approaches for the empirical analysis of the sectoral structure:

1. Static analysis. This is the basic position of the structure in an interstate comparison at a specific date;
2. Analysis of sectoral structure dynamics in a crisis;
3. Analysis of sectoral structure dynamics during stable (planned) growth.

In some cases, the 2nd and 3rd approaches could be combined into a single sequence of analysis.

3.2. Stages and Methods of Analysis

Methods for collecting and analyzing statistical data were applied in the context of each approach as follows:

1. Selection of statistical data group according to territorial and sectoral characteristics. Most of the European countries were selected for the study. The sample was limited by the availability of the necessary statistical data in the database of the statistical office of the European Union (Eurostat 2022a, 2022b). The list of countries, and their initial and calculated indicators required for the study are presented in Appendices A–C.

To conduct sectoral analysis, we used indicators characterizing the production of goods and services integrated into five sectors:

- Sector I: Mining and quarrying.
 - Sector II: Manufacturing.
 - Sector III: Electricity, gas, steam, and air conditioning supply; water supply; sewerage, waste management and remediation activities; wholesale and retail trade; repair of motor vehicles and motorcycles; transportation and storage.
 - Sector IV: Real estate activities; accommodation and food service activities; administrative and support service activities.
 - Sector V: Knowledge-intensive market services; information and communication; professional, scientific, and technical activities; information sector; computer-related services.
2. Data collection for a specific date, and grouping thereof on a territorial basis. Key indicator: the share of the industry in the total volume, in percentage. The calculation was premised on the total volume and absolute values of the industry, represented by the value added at factor cost, in million euro.

3. Time period choice for the analysis of sectoral dynamics during the economic crisis. We chose the period of 2008–2009 to analyze sectoral dynamics.
4. Data collection in dynamics for the period of critical impacts of sudden factors, and grouping thereof on a territorial basis (state).
5. Time period choice for the analysis of systematic dynamics of territorial development (lacking critical impacts). We chose a period of stable growth from 2010 to 2019 to exclude the influence of expected critical impacts and sudden unexpected events. The analysis resulted in the identified trends in the sectoral ratio that occur in a systematic manner.
6. Data collection in dynamics for the period of 2010–2019, and grouping thereof on a territorial basis (state).
7. Analysis of the indicator dynamics within the selected periods and deductions on the dynamics of territorial development. Structural shifts over a certain period were determined using the Gatev coefficient (C_{Gat}):

$$C_{Gat} = \sqrt{\frac{\sum (d_1 - d_0)^2}{\sum d_1^2 + \sum d_0^2}} \quad (1)$$

where d_1 is the share of the indicator at the end of the period; d_0 is the share of the indicator at the beginning of the period.

In our opinion, this coefficient is optimal and illustrative for this type of calculation and is devoid of some shortcomings characteristic of other indicators. In particular, in contrast to the linear and quadratic coefficient of absolute structural shifts, the values of the Gatev coefficient vary from 0 to 1, and approaching 1 indicates notable differences in structural shifts. An alternative to the Gatev coefficient is the Salai coefficient, but its value alters greatly with the changes in values of the elements the totality is divided into. An application of various coefficients in calculations, and their advantages and disadvantages are clearly shown in regional studies of sectoral structures (Trifonov and Veselova 2015).

A visual interpretation of statistical information was implemented with a graphical analysis of sectoral dynamics using techniques for constructing linear and polynomial trends. The tightness of the connection between sectoral changes was determined using a correlation analysis by comparing absolute data of sectoral dynamics indicators. The sectoral dynamics of different countries was compared using a graphical method via the construction of graphs and normalized stacked bar charts.

8. Judgments on territorial sectoral transformation.

As the periods of crisis and stable growth follow each other in our research, in some cases, they were concomitantly analyzed, with the results being considered in terms of comparison and mutual effect.

4. Results

An analysis of the sectoral structure in European countries in the period from 2008 to 2019 has showed mainly a loss in value added in the mining and quarrying industry, and an increase in the share of the manufacturing industry.

Thus, there is a decrease in the share of the mining and quarrying sector in 21 out of 25 analyzed countries, with major effects in 14 states (Table 1). There is just an increase in production in four countries. The Gatev coefficient indicates significant changes in the dynamics of the mining and quarrying industry in Romania, Denmark, Czechia, Italy, Ireland, Germany, France, the Netherlands, and Cyprus. Major changes have taken place in Norway, Spain, Austria, Poland, etc. European countries continue reorienting toward manufacturing industries and the service sector.

Table 1. Calculation of the Gatev coefficient for the mining and quarrying industry for 2008–2019. Source: own elaboration based on Eurostat (2022a).

	d_0	d_1	$(d_1 - d_0)^2$	d_0^2	d_1^2	$(d_1 + d_0)^2$	C_{Gat}	
Bulgaria	1.50	1.23	0.073359	2.247745	1.508963	7.440056	0.14	↓
Czechia	1.48	0.46	1.047083	2.201818	0.212135	3.780823	0.66	↓
Denmark	4.12	0.90	10.37231	16.98081	0.810307	25.20992	0.76	↓
Germany	0.30	0.12	0.031251	0.087332	0.0141	0.171613	0.56	↓
Estonia	0.77	0.76	0.000203	0.593898	0.572145	2.331883	0.01	↓
Ireland	0.36	0.14	0.049233	0.131108	0.019657	0.252296	0.57	↓
Greece	0.17	0.19	0.000615	0.027908	0.03681	0.128821	0.10	↑
Spain	0.24	0.12	0.013854	0.058485	0.015409	0.133932	0.43	↓
France	0.15	0.06	0.008455	0.02357	0.003791	0.046267	0.56	↓
Italy	0.40	0.15	0.060496	0.157568	0.022798	0.300235	0.58	↓
Cyprus	0.36	0.11	0.061623	0.130922	0.012903	0.226026	0.65	↓
Latvia	0.27	0.42	0.02354	0.072053	0.177962	0.476491	0.31	↑
Lithuania	0.38	0.23	0.024018	0.14808	0.052825	0.377792	0.35	↓
Luxemburg	0.09	0.07	0.000556	0.008001	0.00434	0.024127	0.21	↓
Hungary	0.23	0.26	0.001204	0.052914	0.070084	0.244792	0.10	↑
Netherlands	1.54	0.67	0.750741	2.360717	0.448913	4.868519	0.52	↓
Austria	0.44	0.26	0.032448	0.192319	0.066775	0.48574	0.35	↓
Poland	2.74	1.61	1.267959	7.48341	2.590636	18.88013	0.35	↓
Portugal	0.33	0.25	0.006108	0.106788	0.061817	0.331102	0.19	↓
Romania	3.03	0.62	5.799461	9.180251	0.386493	13.33403	0.78	↓
Slovenia	0.41	0.31	0.009368	0.165057	0.09578	0.512308	0.19	↓
Slovakia	0.52	0.35	0.028192	0.271361	0.124621	0.763772	0.27	↓
Finland	0.23	0.35	0.014961	0.054128	0.126004	0.345303	0.29	↑
Sweden	0.62	0.48	0.019352	0.382931	0.230115	1.20674	0.18	↓
Norway	28.15	15.71	154.7713	792.5343	246.8442	1923.986	0.39	↓

The graphs showing the dynamics of changes in the share of the mining and quarrying industry in the European countries with the largest production volume are presented in Figure 1. Changes for all analyzed states based on the submitted primary data are shown in Appendix A.

An analysis of the dynamics has revealed a general trend of the decline in the level of the mining and quarrying industry in the European countries. This is evidenced by linear trends built on the basis of statistical data.

However, the decline is not steady. The fifth-degree polynomial exponential curves vividly express the decline in the crisis of 2008–2009 with a subsequent recovery in production, and a further gradual drop to below the 2008 levels in 2019. However, a sharp post-crisis recovery in mining, often being higher than the pre-crisis level, is related to a natural increase in demand and the restoration of lending opportunities. Apparently, the aggregate demand was made up of the volumes of current consumption and replenishment of stocks, probably being used during the crisis. In addition, there is some rise in the share of the mining and quarrying industry in the sectoral structure in 2018, which is due to an increase in prices rather than a sharp production growth.

On the contrary, there is growth as a share of GVA in the manufacturing industry. As the given dynamics is less intense than the dynamics of changes in the share of the mining and quarrying industry, we analyze the crisis period of 2008–2009 (Table 2), and the period of stable growth of 2010–2019 (Table 3).

According to Table 2, there is a negative trend in the share of the manufacturing industry in almost all countries during the crisis period from 2008 to 2009. This is mainly due to a drop in demand and credit problems. However, the largest decline, as shown by the Gatev coefficient, was recorded in Luxembourg, Finland, Spain, and Slovakia.

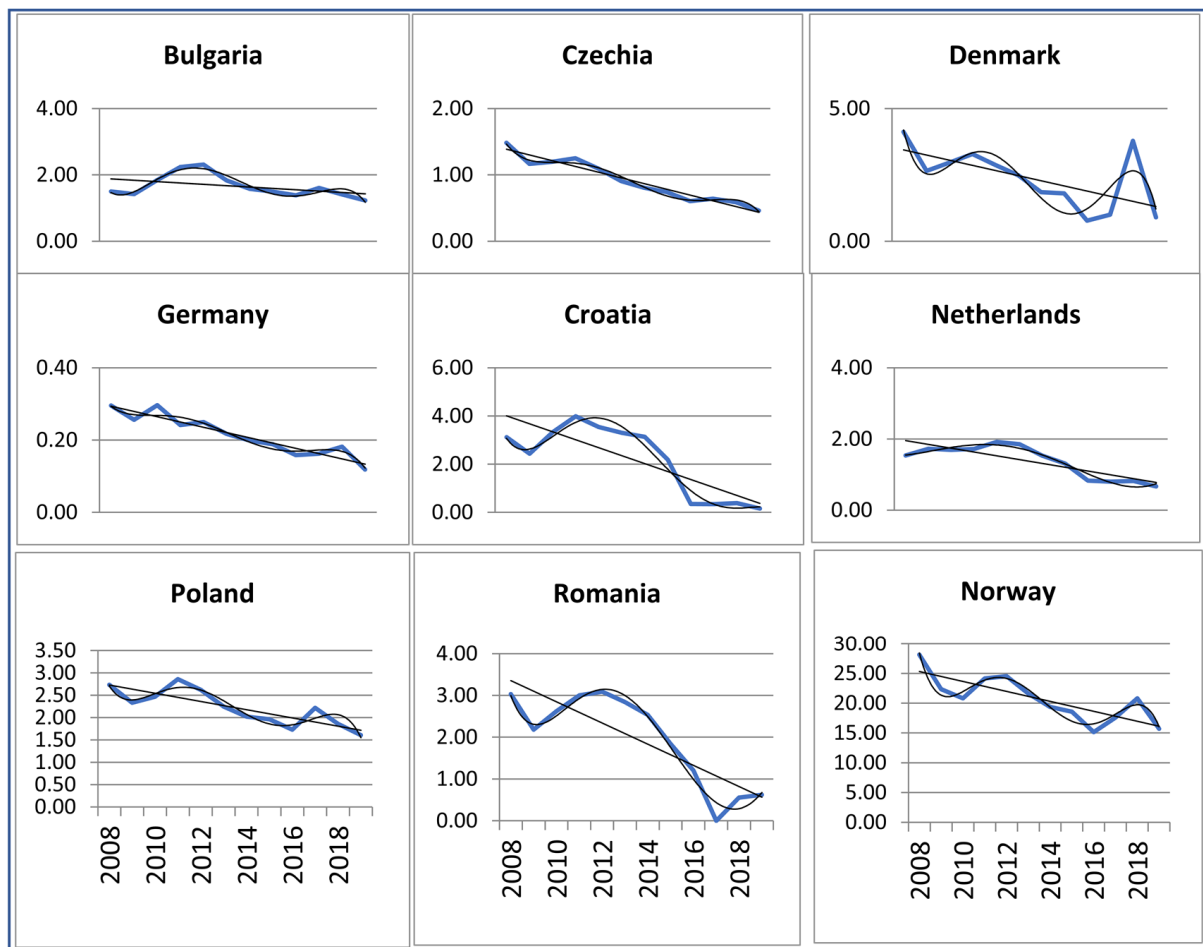


Figure 1. Dynamics of mining and quarrying industry share in the structure of gross value added (GVA) at factor cost for 2008–2019, in % of total GVA. Source: own elaboration based on Eurostat (2022a).

Table 2. Calculation of the Gatev coefficient for the manufacturing industry for 2008–2009. Source: own elaboration based on Eurostat (2022b).

	d_0	d_1	$(d_1 - d_0)^2$	d_0^2	d_1^2	$(d_1 + d_0)^2$	C_{Gat}	
Bulgaria	13.66	11.94	2.950376	186.6196	142.6403	655.5696	0.09	↓
Czechia	21.58	19.34	5.035438	465.8047	373.9787	1674.531	0.08	↓
Denmark	13.84	12.46	1.898609	191.4714	155.2372	691.5186	0.07	↓
Belgium	15.66	14.46	1.439332	245.1369	209.0085	906.8515	0.06	↓
Germany	19.82	17.40	5.85546	392.8147	302.7512	1385.276	0.09	↓
Estonia	14.53	12.90	2.660762	211.0901	166.3521	752.2236	0.08	↓
Ireland	20.83	21.27	0.191323	433.8645	452.2776	1772.093	0.01	↑
Greece	7.97	7.96	0.000151	63.51891	63.32326	253.6842	0.00	↓
Spain	12.39	10.06	5.42473	153.5366	101.2415	504.1315	0.15	↓
France	11.34	10.31	1.053693	128.5341	106.3125	468.6396	0.07	↓
Croatia	14.92	13.30	2.647902	222.7061	176.7864	796.337	0.08	↓
Italy	14.33	12.65	2.840278	205.4498	159.9771	728.0136	0.09	↓
Cyprus	7.48	7.24	0.058532	55.96369	52.40245	216.6737	0.02	↓
Latvia	8.49	7.22	1.602198	72.07419	52.18433	246.9149	0.11	↓
Lithuania	9.24	8.98	0.069457	85.41409	80.61216	331.9831	0.02	↓

Table 2. Cont.

	d_0	d_1	$(d_1 - d_0)^2$	d_0^2	d_1^2	$(d_1 + d_0)^2$	C_{Gat}	
Luxemburg	8.29	5.66	6.889863	68.65691	32.04796	194.5199	0.26	↓
Hungary	20.76	19.20	2.445387	431.0359	368.549	1596.724	0.06	↓
Netherlands	10.26	9.43	0.675946	105.1651	88.97853	387.6113	0.06	↓
Austria	17.80	16.06	3.021628	316.7378	257.8865	1146.227	0.07	↓
Poland	17.92	16.25	2.779406	320.9763	264.0188	1167.211	0.07	↓
Portugal	11.99	10.77	1.499338	143.8758	116.0004	518.253	0.08	↓
Romania	11.78	10.06	2.959616	138.819	101.2397	477.1578	0.11	↓
Slovenia	20.31	16.77	12.51678	412.4602	281.2735	1374.951	0.13	↓
Slovakia	13.38	10.83	6.509648	178.9882	117.2293	585.9254	0.15	↓
Finland	18.77	14.28	20.18457	352.3933	203.9018	1092.406	0.19	↓
Sweden	15.99	14.09	3.620525	255.8149	198.5689	905.1472	0.09	↓
Norway	8.32	7.72	0.359956	69.227	59.60323	257.3005	0.05	↓

Table 3. Calculation of the Gatev coefficient for the manufacturing industry for 2010–2019. Source: own elaboration based on Eurostat (2022b).

	d_0	d_1	$(d_1 - d_0)^2$	d_0^2	d_1^2	$(d_1 + d_0)^2$	C_{Gat}	
Bulgaria	12.34	15.68	11.18568	152.2621	245.9864	785.3114	0.17	↑
Czechia	21.52	21.57	0.00272	462.9697	465.2167	1856.37	0.00	↑
Denmark	14.77	15.24	0.223058	218.0568	232.2282	900.347	0.02	↑
Belgium	19.77	14.88	23.93418	390.7748	221.2885	1200.192	0.20	↓
Germany	14.76	21.04	39.45148	217.8837	442.7627	1281.841	0.24	↑
Estonia	22.61	14.21	70.47417	511.1571	202.0348	1355.909	0.31	↓
Ireland	8.03	32.97	622.1624	64.44472	1087.082	1680.892	0.74	↑
Greece	10.77	7.53	10.52329	116.0307	56.66769	334.8736	0.25	↓
Spain	10.79	11.12	0.108006	116.3607	123.5589	479.7311	0.02	↑
France	12.79	11.57	1.475763	163.482	133.8926	593.2734	0.07	↓
Croatia	14.18	15.32	1.279013	201.19	234.5516	870.2042	0.05	↑
Italy	6.77	15.54	76.97044	45.83293	241.5936	497.8827	0.52	↑
Cyprus	9.65	6.54	9.650671	93.09709	42.79947	262.1424	0.27	↓
Latvia	9.94	10.58	0.402601	98.87769	111.899	421.1509	0.04	↑
Lithuania	6.23	12.60	40.5592	38.85539	158.8109	354.7734	0.45	↑
Luxemburg	20.65	5.40	232.5079	426.2531	29.13506	678.2685	0.71	↓
Netherlands	17.12	10.69	41.3362	293.1651	114.3347	773.6635	0.32	↓
Austria	15.53	17.55	4.073901	241.0801	307.8321	1093.75	0.09	↑
Poland	11.41	18.29	47.45665	130.0831	334.6806	882.0708	0.32	↑
Portugal	11.41	12.14	0.535514	130.2222	147.4593	554.8277	0.04	↑
Romania	19.53	11.62	62.48617	381.3173	135.0832	970.3148	0.35	↓
Slovenia	15.62	21.65	36.3464	244.1386	468.8841	1389.699	0.23	↑
Slovakia	16.10	17.22	1.262687	259.0997	296.5376	1110.012	0.05	↑
Finland	15.37	13.81	2.418091	236.0978	190.7286	851.2349	0.08	↓
Norway	16.74	6.57	103.3142	280.1533	43.20987	543.4121	0.57	↓

Based on Table 3, there is a steady increase in the share of the manufacturing industry in such countries as Ireland, Italy, Lithuania, Poland, Slovenia, and Germany during 2010–2019. There was a decrease in the share of mining and quarrying industry in most countries during the same period. This is largely due to the political decisions of governmental authorities to reduce mining volume. The development of manufacturing enterprises as producers of goods with a greater added value provided higher guarantees for the stability of the entire socio-economic system and helped to accelerate the recovery from the recession.

Correlation coefficients showing the feedback tightness between the dynamics of the absolute indicators of mining and manufacturing industries are presented in Table 4. Absolute indicators provide more reliable data in correlation than relative ones, as the latter are initially interconnected with each other.

Table 4. Correlation between the volume dynamics of mining and manufacturing industries (value added at factor cost, in EUR million) for 2008–2019, $p < 0.05$. Source: own elaboration based on Eurostat (2022b).

	<i>r</i>	<i>t</i> -Test
Czechia	−0.6995	5.4976
Germany	−0.702	7.2902
France	−0.84	7.0469
Croatia	−0.90	7.7919
Italy	−0.765	5.3466
Netherlands	−0.874	8.3166
Romania	−0.755	6.3407

As we see, there is a strong inverse relationship between mining and quarrying output and the production of manufacturing industries in a number of countries. However, there is no significant correlation regarding many European countries in spite of tendencies of opposite changes in mining and manufacturing industries. In addition, there is a positive correlation concerning two countries, including Norway as the leading mineral producer. The results of the correlation analysis of all studied countries are presented in Table A2 in Appendix B.

Overall, it can be concluded that there is a trend toward an increase in the volume of manufacturing industries with a decrease in the level of mining and quarrying. As a rule, such a replacement occurs gradually. However, it should be recognized that higher value-added industries, which are usually manufacturing ones, provide greater independence and stability than depleting natural resources.

These results are supported by the ratio between the volume of mining and the volume of services (Table 5). A significant inverse correlation is observed in the countries with a relationship between the volumes of mining and manufacturing industries: Germany, France, Italy, the Netherlands, and Romania. Table A3 in Appendix B presents the results of the related correlation analysis and other analyzed states.

Table 5. Correlation between the volume dynamics of mining industry and services in the total (value added at factor cost, in million euro) for 2008–2019, $p < 0.05$. Source: own elaboration based on Eurostat (2022b).

	<i>r</i>	<i>t</i> -Test
Germany	−0.826	7.6528
France	−0.862	6.5121
Croatia	−0.718	3.5611
Italy	−0.888	6.8903
Cyprus	−0.5798	2.9366
Netherlands	−0.8798	7.6160
Romania	−0.835	7.7867

Let us carry out a comparative analysis of sectoral dynamics in the production of goods and services in the sectoral structure of the European countries for 2008–2009 and 2010–2019 (Figure 2). Primary data are given in Appendix C.

In most European countries, the 2008 economic crisis was accompanied by a decrease in the share of production of goods and services in Sectors I–III. These sector-specific industries were the most affected by the economic environment, and the countries focused mainly on these industries found the worst position. The largest decline in the share of production in Sectors I–III was observed in Hungary (by 2.22%), Slovenia (by 2.62%), and Denmark (by 7.39%) in 2009 compared to 2008.

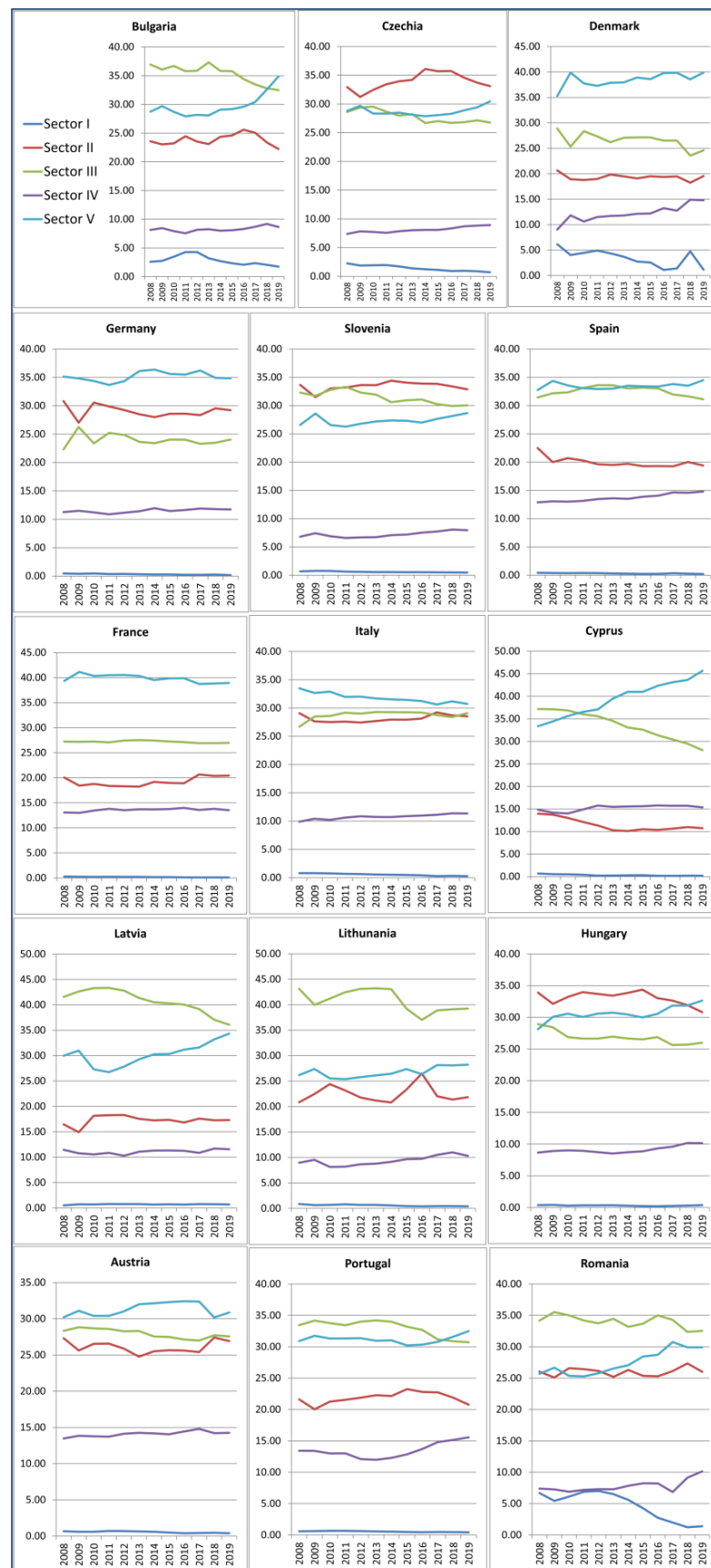


Figure 2. Dynamics of sector indicators specific for the production of goods and services for 2008–2019, in %. Source: own elaboration based on Eurostat (2022a).

However, the period of 2008–2009 was characterized by a predominant increase in the share of Sector IV and, especially, Sector V industries. This was especially pronounced in Denmark and Bulgaria (by 1.25%), Czechia (by 1.33%), and Slovenia and Lithuania (by 1.76%).

Figure 3 clearly illustrates the shares of the above sectors in the European countries by years. There is an evident trend of increasing the share of Sector V during the period of stable growth of 2010–2019 after the crisis of 2008–2009: the share of intellectual and communication services increased by 6.18% in Bulgaria, by 10.36% in Cyprus, by 7.04% in Latvia, by 4.53% in Romania, by 2.83% in Lithuania, by 2.11% in Slovenia, by 2.07% in Hungary, and by 1.18% in Portugal. An increase in the share of knowledge-intensive services is due to a decrease in the volume of mining and quarrying, and a decrease in the share of manufacturing services. At the same time, it should be noted that, in general, the service sectors are less demanding on the availability of a permanent source of credit, which reduced their dependence on shocks in the financial sector and allowed both to enter a positive development trend and to somewhat compensate for the countries' losses from the decline in the manufacturing and especially the mining industry.

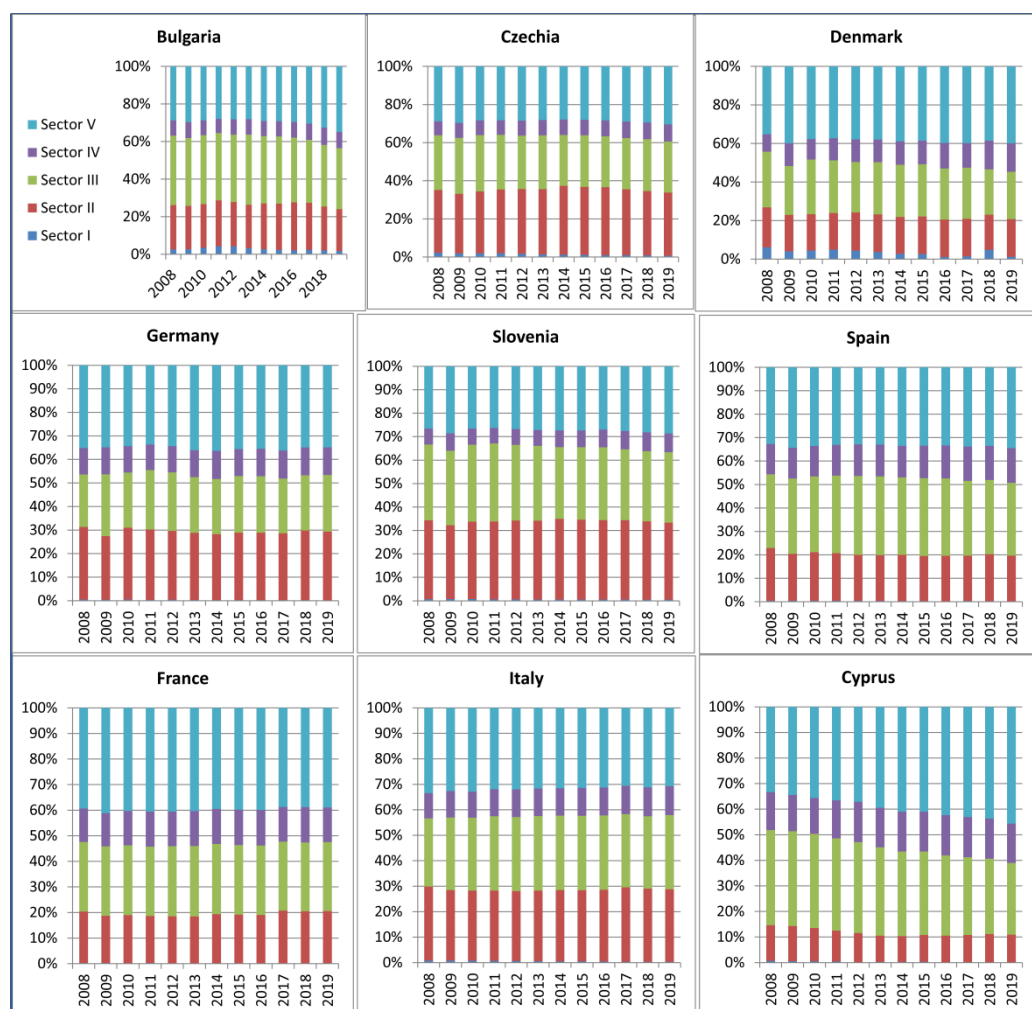


Figure 3. Cont.

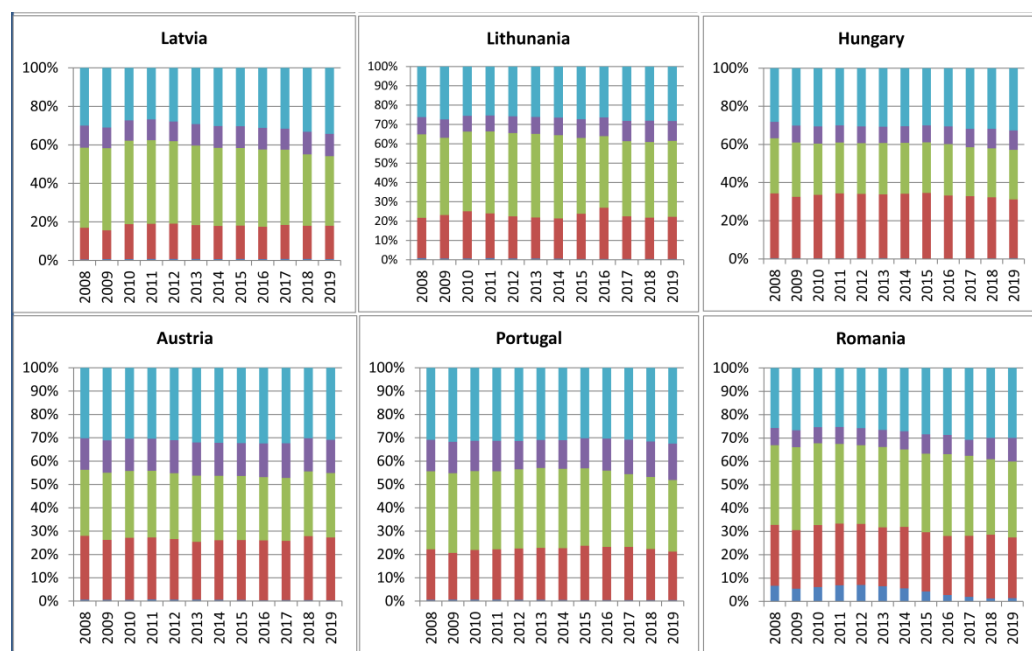


Figure 3. Ratio of the share in the sectors specific for the production of goods and services for 2008–2019, in %. Source: own elaboration based on Eurostat (2022a).

A vivid example is Norway, which, being the leader in oil production in Europe, reduced the share of mining and quarrying by 7.13% during 2009–2019, in which the share of industries in Sectors IV and V increased by 7.57% (Table 6).

Table 6. Ratio of sectors specific for production of goods and services in Norway for 2009–2019, in %. Source: own elaboration based on Eurostat (2022a).

Norway	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Sector I	30.35	29.03	33.23	33.41	30.04	27.52	26.19	22.20	25.58	30.03	23.22
Sector II	10.48	10.76	9.94	9.62	9.76	10.40	10.48	10.48	9.95	9.07	9.72
Sector III	21.42	21.70	19.50	19.13	20.58	20.92	21.94	23.50	21.92	20.52	21.74
Sector IV	8.82	8.89	8.89	8.99	9.18	9.60	9.78	10.75	10.63	10.08	10.94
Sector V	28.94	29.63	28.44	28.85	30.44	31.55	31.61	33.06	31.92	30.29	34.38

5. Discussion and Conclusions

In this paper, we have raised issues concerning the correlation between the sectors of production of goods and services in the European countries, affecting both the effective functioning of the socio-economic system during the stabilization period and successful counteracting crisis shock factors.

It has been noted that the sectors of information and communication services are the least affected during the economic crisis. The manufacturing sector, in particular, the mining and quarrying industry, is less resilient because of a sharp decline in prices. Yet, manufacturing industries also experience a decline in productivity.

The information and communication services sector has evidenced the greatest growth during the past 10 years of stability.

Thus, it is expedient to develop programs for the advancement of these industries, especially in tandem with the sectors of traditional and innovative production of goods.

It should be noted that the revealed changes in the structure of industries during the crisis and the stable growth periods are the symbols of the fourth industrial revolution (Schwab 2016). The emergence of this concept has been evidenced not merely from statistical sources but the modern society actually being faced with an active growth of Sector V industries. Undoubtedly, advanced smart technologies are a major benefit for the state

and business (Müller et al. 2018; Lopes de Sousa Jabbour et al. 2018; Carvalho et al. 2018). However, the researchers have revealed a number of challenges entailed by the fourth industrial revolution. For instance, it is emigration and immigration (McKenzie 2017), fear of total control, job loss, etc. (Caruso 2018). A major social challenge and a danger of the fourth industrial revolution is related to an increase in the annual demand for highly qualified developers of the emerging technologies to the detriment of lower-qualification employees (Balatsky 2019).

This paper has examined a case study of some European countries being quite attractive for highly qualified personnel in the information and communication service sectors. It is evident that the pace of high-tech industrial development is higher in the countries with a relatively high standard of living. However, there are some limitations of our research. Its outcomes cannot be unambiguously applied either on a global scale or to any state. Within the framework of our research, we have shown that every European country is not subject to the specific characteristics of the studied economic dynamics. It seems that even greater differences in economic behavior will be revealed in the analysis of transformations in similar periods in less developed and backward countries. In future research, we plan to analyze the statistics of these countries, and to study the migration flows of highly qualified personnel.

There is another subject area regarding sectoral dynamics to be investigated. Currently, there are a lot of debates related to the efficiency of the economic sectoral structure. On the one hand, some disputers advocate the ideas of total world globalization and, accordingly, the narrow specialization of a particular territory; on the other hand, the others advocate a full cycle of production within one region or state. Some are trying to prove that a high level of economic security is possible only in the presence of strategic natural resources, while the others pragmatically defend the thesis of rich mineral resources as being significant trouble for the state. It should be noted that different concepts of economic advantages may have priority at certain stages of history. However, this is the weakness of either concept as advantages sometimes turn into disadvantages, leading to a bifurcation. There is either a completely new model of the sectoral structure or a return to the previous one in the light of the revealed problems.

A striking example of a sudden factor emergence having had a shock effect on the global economy is a pandemic due to COVID-19 outbreak (World Health Organization 2020). One of the most important reactions of the countries at the virus epicenter was the closure of borders. This decision would likely only affect these countries if production were localized exclusively within the borders thereof. However, world globalization and the desire to reduce the cost of production have made economies of scale almost critical in making decisions on the distributed nature of production and building global value chains. Undoubtedly, economies of scale have affected the global competitive environment to further strengthen global approaches to economic activity. As a result, a number of countries having decided to suspend their production knocked out certain links from the global value chains, which led to an overstocking of intermediate products in those industries that had existed before the “knocked-out” link and the stoppage of the rest. This affected the output volume of final products and, consequently, the structure of the goods offered on the market.

Indeed, there would be no particular change on a global scale if these were only a few cases. However, as the pandemic has seriously affected most developed countries, they have revised this concept of organizing production.

China was one of the first to react with its own ideas and plans to change the concept of production. China actually turned out to be more prepared for the emergence of such an unpredictable factor as a pandemic than many countries did, as it had already taken certain actions in terms of revealing potential shortcomings in the existing world order. In fact, the pandemic has only accelerated the transformation of China’s manufacturing model toward stimulating domestic demand, giving rise to a “dual circulation” strategy (Lukonin and Zakliazminskaja 2020). Transformation in the sectoral structure as such will

occur through the shifting of a key producer during the same production cycle to move as many links in the value chain as possible within the country borders. Even though China's previous functions were to assemble a finished product from imported components, modern production is focused on the same components via the domestic market.

However, we are talking about changes in the sectoral structure and the structure of global production, rather than about full rejection of international relations in terms of supplying certain links in the global chain. If China, focusing on import substitution with its own production, is currently unprepared to completely close the entire cycle within its borders, it will inevitably affect the quality of finished products.

This is rather about reglobalization than deglobalization (Smorodinskaya and Katukov 2020), although the bias toward the latter is quite noticeable. These issues also require special research.

Funding: This research was funded by the Russian Science Foundation, grant number 22-28-01976. Available online: <https://rscf.ru/project/22-28-01976/> (accessed on 12 June 2022).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data that support the findings of this study are openly available via Eurostat Data Browser at <https://ec.europa.eu/eurostat/web/main/data/database> (accessed on 20 April 2022).

Conflicts of Interest: The author declares no conflict of interest.

Appendix A

Table A1. Dynamics of mining and quarrying production share in the structure of gross value added (GVA) at factor cost for 2008–2019, in % of total GVA. Source: own elaboration based on Eurostat (2022a).

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Bulgaria	1.50	1.42	1.84	2.24	2.31	1.83	1.58	1.49	1.38	1.61	1.41	1.23
Czechia	1.48	1.17	1.20	1.25	1.10	0.91	0.80	0.74	0.61	0.64	0.59	0.46
Denmark	4.12	2.65	2.96	3.29	2.88	2.48	1.85	1.80	0.78	1.00	3.78	0.90
Germany	0.30	0.26	0.30	0.24	0.25	0.22	0.20	0.19	0.16	0.16	0.18	0.12
Estonia	0.77	0.97	1.08	1.06	0.98	1.27	1.22	1.05	0.95	1.04	0.91	0.76
Ireland	0.36	0.30	0.36	0.38	0.34	0.32	0.28	0.11	0.23	0.28	0.18	0.14
Greece	0.17	0.16	0.18	0.18	0.15	0.19	0.22	0.23	0.27	0.51	0.29	0.19
Spain	0.24	0.19	0.20	0.20	0.19	0.16	0.15	0.13	0.13	0.19	0.15	0.12
France	0.15	0.13	0.12	0.14	0.12	0.11	0.10	0.09	0.07	0.06	0.05	0.06
Italy	0.40	0.36	0.39	0.34	0.32	0.27	0.25	0.24	0.22	0.15	0.17	0.15
Cyprus	0.36	0.28	0.26	0.20	0.10	0.12	0.14	0.17	0.10	0.08	0.11	0.11
Latvia	0.27	0.34	0.37	0.40	0.40	0.40	0.37	0.39	0.39	0.43	0.44	0.42
Lithuania	0.38	0.26	0.28	0.36	0.30	0.30	0.27	0.22	0.23	0.24	0.25	0.23
Luxembourg	0.09	0.09	0.09	0.09	0.08	0.07	0.06	0.05	0.06	0.06	0.06	0.07
Hungary	0.23	0.25	0.18	0.22	0.22	0.23	0.19	0.16	0.14	0.18	0.23	0.26
Netherlands	1.54	1.72	1.69	1.72	1.92	1.85	1.53	1.31	0.83	0.80	0.82	0.67
Austria	0.44	0.37	0.39	0.47	0.46	0.43	0.39	0.32	0.26	0.29	0.30	0.26
Poland	2.74	2.33	2.47	2.86	2.62	2.25	2.02	1.96	1.73	2.22	1.86	1.61
Portugal	0.33	0.34	0.35	0.34	0.31	0.28	0.27	0.25	0.24	0.27	0.26	0.25
Romania	3.03	2.18	2.62	3.00	3.09	2.84	2.53	1.84	1.20	0.00	0.55	0.62
Slovenia	0.41	0.41	0.45	0.37	0.35	0.33	0.33	0.33	0.34	0.34	0.32	0.31
Slovakia	0.52	0.55	0.48	0.50	0.47	0.47	0.46	0.48	0.40	0.39	0.40	0.35
Finland	0.23	0.27	0.37	0.70	0.33	0.27	0.08	0.26	0.36	0.41	0.41	0.35
Sweden	0.62	0.36	0.79	0.84	0.70	0.53	0.46	0.42	0.47	0.66	0.41	0.48
Norway	28.15	22.36	20.82	24.15	24.55	21.63	19.36	18.57	15.13	17.60	20.82	15.71

Appendix B

Table A2. Correlation between the volume dynamics of mining and manufacturing industries (value added at factor cost, in million euro) for 2008–2019, $p < 0.05$. Source: own elaboration based on Eurostat (2022b).

	<i>R</i>	<i>t</i> -Test	Reliability of Correlation
Bulgaria	0.194	4.1840	No
Czechia	−0.6995	5.4976	Yes
Denmark	−0.3	2.1134	No
Belgium	−0.51	4.3922	No
Germany	−0.702	7.2902	Yes
Estonia	0.747	1.2966	Yes
Ireland	0.0001	6.8833	No
Greece	−0.12	2.2076	No
Spain	0.314	0.58654	No
France	−0.84	7.0469	Yes
Croatia	−0.90	7.7919	Yes
Italy	−0.765	5.3466	Yes
Cyprus	0.498	−0.6566	No
Latvia	0.937	0.04727	Yes
Lithuania	0.232	5.3818	No
Luxemburg	0.249	4.7387	No
Hungary	0.547	0.30675	No
Netherlands	−0.874	8.3166	Yes
Austria	−0.42	4.4649	No
Poland	0.007	5.0537	No
Portugal	−0.19	3.9199	No
Romania	−0.755	6.3407	Yes
Slovenia	0.170	4.8757	No
Slovakia	−0.18	16.165	No
Finland	0.222	0.09862	No
Sweden	0.425	−0.2088	No
Norway	0.715	−1.393	Yes

Table A3. Correlation between the volume dynamics of mining industry and services in the total (value added at factor cost, in million euro) for 2008–2019, $p < 0.05$. Source: own elaboration based on Eurostat (2022b).

	<i>R</i>	<i>t</i> -Test	Reliability of Correlation
Bulgaria	0.250	1.7458	No
Czechia	−0.563	4.0303	No
Denmark	−0.5062	2.5075	No
Belgium	−0.5927	4.5700	No
Germany	−0.826	7.6528	Yes
Estonia	0.613	1.3951	Yes
Ireland	0.023	3.2881	No
Greece	−0.266	2.1904	No
Spain	0.142	0.4458	No
France	−0.862	6.5121	Yes
Croatia	−0.718	3.5611	Yes
Italy	−0.888	6.8903	Yes
Cyprus	−0.5798	2.9366	Yes
Latvia	0.7745	−0.7139	Yes
Lithuania	0.518	1.6837	No
Luxemburg	0.110	5.8733	No
Hungary	0.732	−1.157	Yes

Table A3. Cont.

	R	t-Test	Reliability of Correlation
Netherlands	−0.8798	7.6160	Yes
Austria	−0.56	4.6735	No
Poland	−0.02	3.4291	No
Portugal	−0.09	2.2725	No
Romania	−0.835	7.7867	Yes
Slovenia	0.470	1.6368	No
Slovakia	−0.22	7.2030	No
Finland	0.206	−0.1199	No
Sweden	0.174	0.8078	No
Norway	0.062	1.2585	No

Appendix C

Table A4. Dynamics of sector indicators specific for the production of goods and services for 2008–2019. Source: own elaboration based on Eurostat (2022a) (... —no data).

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Bulgaria												
million euro												
Sector I	469.5	462.7	616.5	810.3	848.7	664.2	588.9	590.7	581	726.1	687.9	652.9
Sector II	4278	3883.3	4123.5	4641.8	4677.9	4778.2	5315.2	6213.1	7135.1	7767.2	7819.7	8336.1
Sector III	6710.4	6082.6	6520.2	6795.7	7127.5	7721.2	7821.4	9044.7	9597.2	10,382.9	10,973.3	12,177.1
Sector IV	1479.6	1424.3	1407.6	1435.7	1624.4	1707.5	1747.5	2039.8	2313.6	2694.4	3075.4	3238.9
Sector V	5217.9	5006.8	5100.3	5304.1	5602.8	5808.3	6347.1	7372.5	8251	9433.2	10,909.7	13,070.6
%%												
Sector I	2.59	2.74	3.47	4.27	4.27	3.21	2.70	2.34	2.08	2.34	2.06	1.74
Sector II	23.56	23.03	23.21	24.45	23.53	23.11	24.36	24.60	25.59	25.05	23.37	22.24
Sector III	36.96	36.08	36.70	35.79	35.85	37.34	35.84	35.81	34.43	33.49	32.79	32.49
Sector IV	8.15	8.45	7.92	7.56	8.17	8.26	8.01	8.07	8.30	8.69	9.19	8.64
Sector V	28.74	29.70	28.70	27.93	28.18	28.09	29.09	29.19	29.60	30.43	32.60	34.88
Czechia												
million euro												
Sector I	2181.8	1576.9	1713.5	1867.7	1602.4	1294.5	1148.6	1127.5	965.7	1120.2	1117.4	938.7
Sector II	31,734.1	26,175.3	29,002.4	31,611.4	31,463.7	31,457	33,590.4	3,5823.8	37,469.3	39,930.5	42,498.6	43,959
Sector III	27,588.7	24,623.9	26,405	27,122.5	25,915.4	25,984.9	24,850.6	27,115.5	28,009.1	30,993.6	34,202.6	35,554.9
Sector IV	7119.2	6565.8	6917.5	7165.6	7267.9	7376.8	7522	8114.4	8748.7	10,057.4	11,129.9	11,845.5
Sector V	27,747.1	24,878.2	25,325	26,779	26,413.4	25,879.9	25,946.1	28,169.1	29,669.8	33,376.4	37,065.4	40,444.2
%%												
Sector I	2.26	1.88	1.92	1.98	1.73	1.41	1.23	1.12	0.92	0.97	0.89	0.71
Sector II	32.93	31.23	32.45	33.43	33.96	34.19	36.10	35.70	35.73	34.58	33.73	33.12
Sector III	28.63	29.38	29.55	28.69	27.97	28.25	26.70	27.02	26.71	26.84	27.14	26.78
Sector IV	7.39	7.83	7.74	7.58	7.84	8.02	8.08	8.09	8.34	8.71	8.83	8.92
Sector V	28.79	29.68	28.34	28.32	28.50	28.13	27.88	28.07	28.29	28.90	29.41	30.47
Denmark												
million euro												
Sector I	8541.4	5291.1	6214	7034.4	6319.5	5557.5	4271	4271.2	1906.3	2561.5	9922.5	2434.4
Sector II	28,681.5	24,846.9	26,197.1	27,203.3	28,764.5	29,364.8	29,796.7	32,518.2	33,722.4	35,623.4	38,106.9	41,212.1
Sector III	40,113.5	33,233.6	39,568.3	39,236.9	37,991.9	40,811.1	42,366.4	45,236	46,141	48,479.9	49,192.6	51,848
Sector IV	12,548.1	15,502.8	14,812.6	16,485.2	16,969.4	17,768.6	18,950.6	20,297.1	23,043	23,302	31,119	31,156.5
Sector V	48,974.8	52,329.2	52,655.5	53,468.6	54,930.5	57,176.3	60,719.7	64,292.4	69,269.8	72,826.9	80,540.5	84,122.6
%%												
Sector I	6.15	4.03	4.46	4.90	4.36	3.69	2.74	2.56	1.10	1.40	4.75	1.15
Sector II	20.66	18.94	18.79	18.97	19.84	19.49	19.09	19.52	19.37	19.49	18.24	19.55
Sector III	28.89	25.33	28.38	27.36	26.21	27.08	27.14	27.15	26.51	26.52	23.55	24.60
Sector IV	9.04	11.82	10.62	11.49	11.70	11.79	12.14	12.18	13.24	12.75	14.90	14.78
Sector V	35.27	39.88	37.76	37.28	37.89	37.95	38.90	38.59	39.79	39.84	38.56	39.91

Table A4. Cont.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Belgium												
million euro												
Sector I	...	...	290.2	310.8	271.4	259.2	292.1	235.8	257.5	271.2	188.3	269.8
Sector II	49,160.0	44,746.5	47,895.5	46,816.9	47,110.2	49,191.2	49,919.1	50,931.8	55,191.8	56,092.4	59,249.6	63,504.7
Sector III	51,737.5	55,157.4	63,516.6	65,637.5	67,593.5	65,675.	65,407.3	66,201.	68,075.5	72,960.6	73,583.1	83,561.4
Sector IV	18,938.5	20,732.	22,029.1	24,161.9	25,023.2	25,356.4	26,799.	30,204.1	32,160.4	33,344.3	33,340.6	37,027.7
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
%%												
Sector I	...	...	...	...	...	...	...	...	...	...	...	...
Sector II	...	...	...	...	...	...	...	...	...	...	...	...
Sector III	...	...	...	...	...	...	...	...	...	...	...	...
Sector IV	...	...	...	...	...	...	...	...	...	...	...	...
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
Germany												
million euro												
Sector I	6766.1	5621.2	6834.7	5843.8	6157.2	5487.0	5240.1	5128.7	4470.5	4784.7	5522.0	3717.4
Sector II	453,779.2	381,547.6	455,788.2	490,206.5	481,846.9	490,616.9	519,792.5	534,931.9	569,863.5	592,027.2	650,200.9	658,751.4
Sector III	328,599.7	370,933.7	348,908.8	413,558.8	409,860.3	406,875.4	434,592.3	449,969.4	478,382.6	486,823.	516,876.2	542,014.2
Sector IV	165,591	162,235.3	167,227.8	178,389	183,926.1	196,328.9	222,133.7	214,260	231,800.5	248,284.4	259,432	264,385.9
Sector V	517,348.8	491,871.9	512,695.7	552,349	566,140.8	621,568.6	675,617.6	666,506.1	706,678.9	756,367.2	768,260.9	785,734.9
%%												
Sector I	0.46	0.40	0.46	0.36	0.37	0.32	0.28	0.27	0.22	0.23	0.25	0.16
Sector II	30.83	27.02	30.56	29.88	29.24	28.51	27.99	28.59	28.62	28.35	29.55	29.22
Sector III	22.32	26.27	23.39	25.21	24.87	23.64	23.40	24.05	24.02	23.31	23.49	24.04
Sector IV	11.25	11.49	11.21	10.88	11.16	11.41	11.96	11.45	11.64	11.89	11.79	11.73
Sector V	35.14	34.83	34.38	33.67	34.35	36.12	36.37	35.63	35.49	36.22	34.92	34.85
Estonia												
million euro												
Sector I	114.2	119.0	139.7	154.8	154.0	211.0	213.4	187.8	178.9	215.5	204.6	182.2
Sector II	2153.0	1582.0	1903.8	2296.8	2347.3	2476.9	2659.6	2693.6	2862.7	3018.2	3314.9	3423.8
Sector III	3028.6	2581.	2777.5	3215.9	3517.6	3708.9	3918.	3889.3	4212.1	4408.1	4834.8	4949.9
Sector IV	975.2	861.2	944.3	1260.5	1251.8	1393.2	1467.4	1587.7	1773.8	1974.6	1942.9	2286.6
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
%%												
Sector I	...	...	...	...	...	...	...	...	...	...	...	...
Sector II	...	...	...	...	...	...	...	...	...	...	...	...
Sector III	...	...	...	...	...	...	...	...	...	...	...	...
Sector IV	...	...	...	...	...	...	...	...	...	...	...	...
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
Greece												
million euro												
Sector I	357.2	348.9	358.3	328.9	254.9	298.7	350.1	357.1	416.1	780.0	456.5	304.6
Sector II	17,041.1	16,901.2	15,873.2	13,629.1	11,873.5	10,288.3	9687.8	10,911.4	10,425.7	11,521.2	11,849.9	11,951.3
Sector III	33,163.	33,405.8	31,008.8	27,139.3	23,180.9	21,780.6	19,121.9	19,925.	20,827.6	22,059	20,346.7	20,644.
Sector IV	7689.5	7826.4	7275.6	6624.4	5734.1	5281.7	6090.4	5949.4	5203.8	5984.7	6922.3	8333.2
Sector V	28,037.7	26,689.5	20,835.2	19,100.6	18,045.6	15,492.6	15,279.4	15,584.6	13,795.8	15,729.7	16,742.8	18,048.7
%%												
Sector I	0.41	0.41	0.48	0.49	0.43	0.56	0.69	0.68	0.82	1.39	0.81	0.51
Sector II	19.75	19.84	21.07	20.40	20.09	19.36	19.17	20.69	20.58	20.55	21.04	20.16
Sector III	38.43	39.22	41.15	40.61	39.23	40.99	37.84	37.79	41.11	39.34	36.13	34.82
Sector IV	8.91	9.19	9.66	9.91	9.70	9.94	12.05	11.28	10.27	10.67	12.29	14.06
Sector V	32.49	31.34	27.65	28.58	30.54	29.15	30.24	29.56	27.23	28.05	29.73	30.45
Spain												
million euro												
Sector I	2472.9	1938.4	1953.0	1976.2	1847.8	1495.9	1365.6	1267.4	1290.4	2021.3	1634.2	1400.8
Sector II	126,704.3	100,824.6	106,153.4	103,869.8	95,650.5	93,133.7	97,577.3	101,928.0	105,309.8	110,841.4	120,875.6	125,438.6
Sector III	177,167.7	162,178.2	165,929.5	169,538.1	163,892.9	160,403.	163,667.	175,373.3	180,129.2	183,987.4	191,085.4	201,225.3
Sector IV	72,620.7	65,864.7	66,740.3	67246	65,654.4	64,931.6	66,867.9	73,400.3	76,698.3	84,277.1	88,063.8	95,668.3
Sector V	184,625.4	173,168.6	172,269.8	169,350.8	160,519.9	157,501.5	165,999.8	176,647.1	181,934.6	194,584.8	202,330.1	222,945.7
%%												
Sector I	0.44	0.38	0.38	0.39	0.38	0.31	0.28	0.24	0.24	0.35	0.27	0.22
Sector II	22.48	20.01	20.69	20.29	19.62	19.51	19.69	19.28	19.31	19.25	20.01	19.40
Sector III	31.44	32.18	32.34	33.11	33.61	33.59	33.03	33.18	33.03	31.96	31.64	31.12
Sector IV	12.89	13.07	13.01	13.13	13.47	13.60	13.50	13.89	14.06	14.64	14.58	14.79
Sector V	32.76	34.36	33.58	33.08	32.92	32.99	33.50	33.42	33.36	33.80	33.50	34.48

Table A4. Cont.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
France												
million euro												
Sector I	2752.4	2353.4	2227.4	2582.1	2316.3	2175.0	1834.0	1813.0	1464.4	1151.2	1150.4	1335.7
Sector II	203,255.5	180,452.0	193,928.7	195,284.6	193,437.4	192,888.7	201,020.1	208,141.9	213,731.6	240,268.1	241,204.6	251,010.4
Sector III	275,954.8	266,204.6	281,369.9	287,851.3	289,888.6	291,231.4	287,636.2	299,107.9	306,551.	313,152.7	318,555.9	331,008.4
Sector IV	132,628.7	127,072.4	139,023.	146,687.7	143,012.6	145,108.4	143,396.5	150,919.5	157,936.9	157,937.5	163,256.2	166,201.6
Sector V	398,671.5	402,745.1	416,788.8	430,394.3	428,364.	426,675.	414,075.7	437,299.8	450,673.1	450,491.	459,613.1	477,920.9
%%												
Sector I	0.27	0.24	0.22	0.24	0.22	0.21	0.18	0.17	0.13	0.10	0.10	0.11
Sector II	20.06	18.44	18.77	18.37	18.30	18.23	19.18	18.97	18.91	20.66	20.38	20.45
Sector III	27.23	27.20	27.23	27.08	27.43	27.52	27.45	27.26	27.12	26.93	26.91	26.97
Sector IV	13.09	12.98	13.45	13.80	13.53	13.71	13.68	13.75	13.97	13.58	13.79	13.54
Sector V	39.35	41.15	40.33	40.50	40.53	40.33	39.51	39.85	39.87	38.74	38.83	38.94
Croatia												
million euro												
Sector I	...	944.4	1288.6	1547.4	1328.7	1223.7	1147.6	819.9	137.6	141.9	165.5	74.0
Sector II	6103.9	5164.1	4951.1	4786.9	4585.4	4541.6	4646.5	4924.3	5767.6	6126.4	6249.3	7007.2
Sector III	8545.7	7514.4	7379.	7049.8	6636.	6950.7	7664.	8301.8	8500.5	8483.2	9382.2	10,331.2
Sector IV	1969.7	1950.3	1937.7	1984.2	1977.9	2349.2	2392.7	2515.3	3039.1	3170.6	3616.	3712.8
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
%%												
Sector I	...	...	...	...	...	...	...	...	...	...	...	...
Sector II	...	...	...	...	...	...	...	...	...	...	...	...
Sector III	...	...	...	...	...	...	...	...	...	...	...	...
Sector IV	...	...	...	...	...	...	...	...	...	...	...	...
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
Italy												
million euro												
Sector I	5864.0	5174.3	5682.9	5045.5	4706.8	3941.3	3715.8	3591.3	3407.9	2357.5	2715.2	2430.4
Sector II	211,744.7	180,256.8	205,589.3	208,093.5	199,296.5	198,678.9	204,053.7	212,949.5	224,994.7	241,413.9	246,941.3	250,193.2
Sector III	194,358.3	185,785.9	213,569.	219,949.6	210,648.8	210,165.7	213,687.1	223,046.9	233,657.4	237,380.4	244,162.1	255,028.1
Sector IV	72,081.5	67,938.1	76,407.7	80,061.7	78,907.2	77,086.2	78,330.	82,961.4	87,768.	91,752.2	97,843.8	99,627.7
Sector V	243,806.3	212,968.7	245,701.1	241,006.3	232,498.1	227,471.1	230,339.	239,710.5	249,880.7	252,887.8	268,216.	269,443.7
%%												
Sector I	0.81	0.79	0.76	0.67	0.65	0.55	0.51	0.47	0.43	0.29	0.32	0.28
Sector II	29.09	27.64	27.52	27.59	27.45	27.70	27.95	27.94	28.13	29.23	28.72	28.54
Sector III	26.70	28.49	28.59	29.16	29.01	29.30	29.27	29.26	29.22	28.75	28.39	29.09
Sector IV	9.90	10.42	10.23	10.62	10.87	10.75	10.73	10.88	10.97	11.11	11.38	11.36
Sector V	33.50	32.66	32.89	31.96	32.02	31.71	31.55	31.45	31.25	30.62	31.19	30.73
Cyprus												
million euro												
Sector I	59.4	45.4	44.8	34.6	16.4	18.8	21.9	26.1	16.2	14.9	21.4	22.9
Sector II	1228.1	1188.6	1158.3	1057.1	951.2	818.9	823.7	887.4	962.8	1077.6	1201.8	1318.9
Sector III	3270.8	3211.2	3281.8	3138.	2986.4	2749.2	2695.6	2753.5	2918.2	3084.6	3231.2	3448.
Sector IV	1305.5	1226.3	1247.	1296.2	1322.7	1230.9	1267.9	1317.8	1469.6	1591.5	1721.5	1886.5
Sector V	2934.7	2978.6	3173.2	3180.7	3114.3	3141.3	3339.6	3461.8	3939.6	4369.9	4780.7	5609.1
%%												
Sector I	0.68	0.52	0.50	0.40	0.20	0.24	0.27	0.31	0.17	0.15	0.20	0.19
Sector II	13.96	13.74	13.01	12.14	11.34	10.29	10.11	10.51	10.35	10.63	10.97	10.74
Sector III	37.17	37.12	36.85	36.04	35.59	34.54	33.08	32.60	31.36	30.42	29.49	28.07
Sector IV	14.84	14.18	14.00	14.89	15.76	15.47	15.56	15.60	15.79	15.70	15.71	15.36
Sector V	33.35	34.43	35.63	36.53	37.11	39.47	40.98	40.98	42.33	43.10	43.63	45.66
Latvia												
million euro												
Sector I	59.3	58.2	59.3	68.8	78.8	80.5	77.2	85.3	86.6	102.0	111.8	112.6
Sector II	1875.5	1230.5	1540.2	1626.6	1877.8	1883.1	1958.5	2073.5	2156.3	2333.9	2589.1	2823.5
Sector III	4732.1	3516.	3672.9	3860.5	4392.2	4438.9	4596.4	4816.2	5132.5	5196.8	5558.6	5881.7
Sector IV	1303.3	887.2	894.1	966.4	1054.7	1189.5	1281.6	1352.	1440.5	1439.	1755.2	1886.3
Sector V	3412.2	2554.6	2314.8	2381.9	2855.3	3137.8	3435.5	3624.3	3993.9	4190.7	4978.2	5594.9
%%												
Sector I	0.52	0.71	0.70	0.77	0.77	0.75	0.68	0.71	0.68	0.77	0.75	0.69
Sector II	16.48	14.92	18.16	18.27	18.30	17.55	17.26	17.35	16.83	17.60	17.27	17.32
Sector III	41.57	42.64	43.31	43.36	42.81	41.37	40.50	40.30	40.07	39.18	37.07	36.09
Sector IV	11.45	10.76	10.54	10.85	10.28	11.09	11.29	11.31	11.25	10.85	11.71	11.57
Sector V	29.98	30.98	27.29	26.75	27.83	29.24	30.27	30.33	31.18	31.60	33.20	34.33

Table A4. Cont.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Lithuania												
million												
euro												
Sector I	112.8	62.3	71.2	100.7	91.0	94.2	89.3	75.3	79.8	90.6	101.2	100.9
Sector II	2709.1	2178.4	2507.4	2905.8	2878.8	2875.3	3280.0	4034.5	5213.0	4552.7	4984.7	5532.4
Sector III	5607.2	3875.4	4231.3	5323.6	5700.9	5865.9	6790.4	6777.9	7285.1	8043.9	9123.3	9939.7
Sector IV	1165.5	923.9	837.4	1028.2	1143.2	1192.	1440.5	1669.5	1915.5	2176.4	2565.6	2613.1
Sector V	3403.9	2654.7	2622.3	3183.3	3410.8	3545.7	4170.9	4726.1	5185.8	5821.8	6551.4	7145.1
%%												
Sector I	0.87	0.64	0.69	0.80	0.69	0.69	0.57	0.44	0.41	0.44	0.43	0.40
Sector II	20.84	22.47	24.42	23.17	21.77	21.18	20.80	23.34	26.49	22.01	21.37	21.84
Sector III	43.14	39.97	41.20	42.45	43.11	43.22	43.06	39.22	37.02	38.89	39.11	39.24
Sector IV	8.97	9.53	8.15	8.20	8.64	8.78	9.13	9.66	9.73	10.52	11.00	10.32
Sector V	26.19	27.38	25.53	25.38	25.79	26.12	26.45	27.34	26.35	28.14	28.09	28.21
Luxemburg												
million												
euro												
Sector I	32.2	31.7	32.7	36.2	32.0	31.5	29.9	27.0	30.6	33.0	33.7	37.5
Sector II	2982.8	1988.0	2383.4	2487.4	2409.0	2375.3	2523.5	2600.3	3118.2	3125.2	3170.5	3072.5
Sector III	5428.6	4800.4	5767.1	6647.9	6435.9	6606.6	7419.3	6899.7	7430.4	7799.6	8184.3	7997.8
Sector IV	2857.8	2946.4	2682.8	2893.1	3099.5	3131.7	3373.9	3567.3	3703.	4069.5	4429.3	4767.1
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
%%												
Sector I	...	...	...	...	...	...	...	...	...	...	...	...
Sector II	...	...	...	...	...	...	...	...	...	...	...	...
Sector III	...	...	...	...	...	...	...	...	...	...	...	...
Sector IV	...	...	...	...	...	...	...	...	...	...	...	...
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
Netherlands												
million												
euro												
Sector I	8886.7	9670.3	9728.8	10,090.2	11,324.8	11,048.2	9269.6	8137.8	5272.5	5301.5	5676.5	4857.3
Sector II	59,313.6	52,935.7	58,360.8	60,600.1	59,907.1	57,776.9	58,676.8	63,067.1	67,208.2	70,850.4	74,284.4	77,518.1
Sector III	100,817.6	97,720.5	103,746.8	107,752.9	106,759.4	110,282.	110,159.	115,634.6	119,191.6	124,869.7	131,672.4	142,894.5
Sector IV	40,166.1	41,960.	41,618.3	43,732.8	46,287.9	47,615.5	48,887.3	54,045.4	57,963.3	62,344.7	69,429.7	75,610.3
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
%%												
Sector I	...	...	...	...	...	...	...	...	...	...	...	...
Sector II	...	...	...	...	...	...	...	...	...	...	...	...
Sector III	...	...	...	...	...	...	...	...	...	...	...	...
Sector IV	...	...	...	...	...	...	...	...	...	...	...	...
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
Hungary												
million												
euro												
Sector I	213.6	200.7	151.6	189.7	183.1	201.0	171.0	147.5	136.9	193.1	259.2	327.4
Sector II	19,278.5	15,447.7	17,495.5	18,817.1	18,019.8	18,585.0	19,881.0	21,918.8	21,785.1	24,176.0	26,097.3	26,232.0
Sector III	16,450.	13,670.8	14,155.7	14,763.6	14,250.7	14,985.3	15,658.5	16,926.6	17,723.3	18,982.4	20,987.9	22,132.1
Sector IV	4926.2	4286.5	4746.7	4961.1	4672.2	4736.4	5125.2	5657.2	6145.4	7107.2	8314.5	8646.6
Sector V	15,990.5	14,464.1	16,098.7	16,653.4	16,353.	17,090.4	17,886.5	19,134.	20,144.4	23,595.8	26,028.	27,797.7
%%												
Sector I	0.38	0.42	0.29	0.34	0.34	0.36	0.29	0.23	0.21	0.26	0.32	0.38
Sector II	33.91	32.14	33.23	33.98	33.70	33.43	33.86	34.36	33.04	32.65	31.95	30.81
Sector III	28.93	28.44	26.89	26.66	26.65	26.95	26.67	26.54	26.88	25.63	25.69	26.00
Sector IV	8.66	8.92	9.02	8.96	8.74	8.52	8.73	8.87	9.32	9.60	10.18	10.16
Sector V	28.12	30.09	30.58	30.07	30.58	30.74	30.46	30.00	30.55	31.86	31.86	32.65
Austria												
million												
euro												
Sector I	1150.8	950.3	1026.4	1295.2	1294.0	1245.4	1162.4	991.5	838.2	952.2	1022.6	918.1
Sector II	46,702.3	41,218.4	45,139.5	48,392.1	48,315.3	47,493.2	49,257.3	51,585.0	54,390.3	56,265.9	61,584.6	62,336.3
Sector III	48,424.4	46,367.9	48,753.	52,065.4	52,796.1	54,290.1	53,171.4	55,260.5	57,646.2	59,786.	62,278.4	63,874.5
Sector IV	23,028.7	22,276.8	23,405.9	24,990.9	26,380.8	27,327.	27,362.8	28,258.8	30,671.7	32,775.3	31,925.4	33,035.7
Sector V	51,648.2	50,022.1	51,690.6	55,362.5	57,933.1	61,344.	62,047.9	64,913.	68,851.9	71,720.7	67,815.7	71,493.1
%%												
Sector I	0.67	0.59	0.60	0.71	0.69	0.65	0.60	0.49	0.39	0.43	0.46	0.40
Sector II	27.32	25.63	26.55	26.57	25.88	24.77	25.52	25.66	25.61	25.40	27.42	26.91
Sector III	28.33	28.83	28.68	28.59	28.28	28.32	27.55	27.49	27.14	26.99	27.73	27.57
Sector IV	13.47	13.85	13.77	13.72	14.13	14.26	14.18	14.06	14.44	14.80	14.21	14.26
Sector V	30.21	31.10	30.40	30.40	31.03	32.00	32.15	32.29	32.42	32.38	30.19	30.86

Table A4. Cont.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Finland												
million euro												
Sector I	397.7	424.6	602.0	1200.1	580.3	466.7	151.1	481.5	671.7	806.2	826.6	735.8
Sector II	32,089.1	22,713.7	26,505.1	25,797.9	23,760.8	24,507.5	24,610.7	25,154.4	23,983.5	29,753.2	29,385.4	28,627.0
Sector III	26,938.2	25,058.1	26,079.	27,092.6	27,099.4	27,234.1	27,251.9	27,330.6	28,190.	28,762.2	29,906.1	30,525.3
Sector IV	9957.5	9838.3	10,236.7	6821.8	11,661.3	11,001.4	11,237.2	11,799.	12,808.2	13,441.9	14,565.4	15,177.2
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
%%												
Sector I	...	...	...	...	...	...	...	...	...	...	...	...
Sector II	...	...	...	...	...	...	...	...	...	...	...	...
Sector III	...	...	...	...	...	...	...	...	...	...	...	...
Sector IV	...	...	...	...	...	...	...	...	...	...	...	...
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
Sweden												
million euro												
Sector I	1944.6	1003.9	2615.1	3056.5	2686.1	2,093.9	1779.9	1694.8	1927.7	2798.5	1716.8	2031.6
Sector II	50,261.2	39,112.9	50,798.6	53,970.0	53,204.8	52,660.2	51,824.4	52,988.0	53,528.4	55,108.7	59,971.2	59,697.7
Sector III	52,478.8	48,122.6	57,914.5	61,974.5	63,928.5	64,080.6	64,412.1	64,617.4	66,227.9	67,673.9	66,403.9	69,558.7
Sector IV	25,804.1	23,419.7	26,863.5	31,640.8	34,269.3	35,837.9	36,147.5	37,690.4	39,291.3	40,994.1	38,840.8	38,535.
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
%%												
Sector I	...	...	...	...	...	...	...	...	...	...	...	...
Sector II	...	...	...	...	...	...	...	...	...	...	...	...
Sector III	...	...	...	...	...	...	...	...	...	...	...	...
Sector IV	...	...	...	...	...	...	...	...	...	...	...	...
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
Norwai												
million euro												
Sector I	...	55,536.5	60,020.0	77,417.7	87,198.0	76,167.7	65,075.4	57,448.0	44,626.3	55,096.1	68,576.6	50,475.3
Sector II	...	19,172.0	22,251.2	23,150.3	25,102.4	24,759.0	24,599.3	22,986.0	21,075.4	21,429.9	20,700.4	21,118.3
Sector III	...	39,204.6	44,856.2	45,421.4	49,929.	52,179.	49,473.8	48,133.4	47,235.8	47,215.7	46,861.3	47,253.7
Sector IV	...	16,137.1	18,373.5	20,710.1	23,457.	23,283.8	22,707.9	21,447.5	21,618.2	22,890.	23,024.7	23,786.5
Sector V	...	...	...	...	...	...	...	...	...	...	...	...
%%												
Sector I	...	30.35	29.03	33.23	33.41	30.04	27.52	26.19	22.20	25.58	30.03	23.22
Sector II	...	10.48	10.76	9.94	9.62	9.76	10.40	10.48	10.48	9.95	9.07	9.72
Sector III	...	21.42	21.70	19.50	19.13	20.58	20.92	21.94	23.50	21.92	20.52	21.74
Sector IV	...	8.82	8.89	8.89	8.99	9.18	9.60	9.78	10.75	10.63	10.08	10.94
Sector V	...	28.94	29.63	28.44	28.85	30.44	31.55	31.61	33.06	31.92	30.29	34.38

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