The industrial sector in Ukraine and EU countries: competitive advantages and structure optimization models

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Wydawnictwo
Wyższej Szkoły Bankowej w Poznaniu

Poznań 2020

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Redakcja techniczna i skład
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Projekt okładki
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ISBN 978-83-7205-378-7

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Druk i oprawa: Zakład Poligraficzny Moś i Łuczak, Poznań

Content

Introduction

One of the consequences of globalisation, which is accompanied by stagnating demand, is the increased competition. in essence, it is the competition for capital, which is taking place at the level of countries, regions and between individual entities (Krawczyk-Sokołowska, Pierścieniak, & Caputa, 2019). in the current conditions, to acquire and multiply capital, businesses need to offer differentiated value propositions, which cannot be supplied by others, while being able to pursue their own interests (Caputa, Janik, & Paździor, 2019).

In order to achieve this goal, it is necessary to look for and implement a business model that can direct activities undertaken by all entities involved in the social division of labour and the consumption of its effects towards satisfying not only their own needs but also those of other stakeholders, and society as a whole (Adamczyk, 2001; Caputa, 2018). This model is supposed to be not only a way of creating and supplying value for a wide range of stakeholders (Kardas, 2016; Nogalski, 2009), but should constitute the core of all activities, generating energy which will be distributed through key channels (components) and provide the economy with the necessary momentum to secure future benefits, while minimizing the risk of losing the supply of capital.

In search for such a model, one has to remember that the society of the 21st century is a digital society (Castells, 2008), which is based on knowledge and networks of relationships that are increasingly built in the virtual space (Pierścieniak, 2015; Caputa, 2020; Krawczyk-Sokołowska, Pierścieniak, & Caputa, 2018). As a result, it is necessary to go beyond the traditional process of offering value and focus on developing the space of behaviours (Pachura, 2016), and consequently, creating relationships based on cooperation, partnership and trust, using the Internet ecosystem (Manu, 2012; Bradley et al., 2015; Poniatowska-Jaksch, 2016; Bartkowiak, Dudek, & Wszendybył-Skulska, 2019; Caputa, 2020).

It follows from the above that new business models should be based on a shared information space and the knowledge potential of its participants (Jabłoński & Jabłoński, 2019). in this turbulent world, what is particularly valuable is information that can facilitate innovation (Caputa & Szwajca, 2010; Krawczyk-Sokołowska, Paździor, & Caputa, 2019). This raises the following question: compared to other EU countries, are the economies of Ukraine and Poland innovative and what do they rely on to build their competitive advantages?

The monograph highlights the results of a comprehensive study of the industrial sector of the economy of Ukraine and the EU countries. Based on the author's methodological approach, a comparative assessment of the competitive advantages of Ukrainian and Polish industry at the macro and meso levels was conducted. The key trends in the development of Ukrainian industry are identified on the basis of assessing the dynamics of many indicators which characterize the activity (production, export, investment, capital, innovation) and efficiency (resource, economy) of functioning of the industrial sector of Ukrainian economy in the regional context. A comparative assessment of the dependence of the economy of Ukraine and the EU countries on imports of industrial products (by segments of its consumption) in terms of 16 manufacturing industries, classified by the level of manufacturability, according to the Eurostat classification, was performed.

A comprehensive study of intersectoral relations between the chemical, woodworking and textile industries of Ukraine and the EU countries in the areas of use of their products (in the segment of intermediate consumption) by all types of economic activity, was carried out. A comparative assessment of the level of consumption, export orientation and import dependence of chemical, woodworking and textile industries was conducted.

A comparative analysis of the structural advantages of the industry of Ukraine and the EU countries in terms of the share of industry in: output of the economy, gross value added (GVA) of the economy, exports of GVA; as well as in terms of the efficiency indicator (the share of GVA in the industry's output), was performed. The place of Ukraine among the EU countries was determined based on the set of relative and absolute indicators of functioning of the industrial sector of the economy. A detailed comparative assessment of the structure of the industry's GVA of Ukraine and Poland was conducted.

Taking into account the assessment of the results of the transformation of Polish industry, the key criteria and ways of optimizing the industrial sector of Ukrainian economy in the direction of its transition from raw material type to innovation one were substantiated.

Using the methods of correlation and regression analysis, the author's hypotheses regarding the impact of the share of high-tech and medium-high-tech industries in the output structure, as well as the share of imports in intermediate consumption of named industries, on the efficiency (the GVA share of output) of processing industry, were substantiated. Economical and mathematical models of optimization of output structure and intermediate consumption of processing industry of individual EU countries according to the criteria of increasing the technological level and reducing the level of import dependence, were created and solved by the method of linear programming.

Chapter 1

Competitive advantages of the industrial sector of the economy of Ukraine and the EU countries

1.1. Competitive advantages of Ukrainian and Polish industry

The multifaceted and the dynamic nature of the "competitiveness" category, as well as its connection with many socio-economic and socio-political phenomena and processes, especially in the context of increasing globalization of the world economy, cause ambiguity in the interpretation of this category and understanding of the issue in general.

The founder of the theory of perfect competition was A. Smith (1937, as cited in Landreth & Colander, 2012). A. Cournot (1838, as cited in Amir, 1996) developed a theory of pure monopoly, duopoly and oligopoly, D. Ricardo (see Landreth & Colander, 2012) proposed the principles of comparative competitive advantage, A. Marshall (see Landreth & Colander, 2012) identified the positive features of monopolies, the creative and destructive competition, E. Chamberlin (1962) and J. Robinson (1969) investigated the problems of monopolistic competition. The theoretical foundations of market competition and the formation of a competitive environment, effective mechanisms for managing competitive advantage at the levels of corporations, countries and regions were studied by E. Helpman and P. Krugman (1985), F. Martin (2000) and the other.

In 1970-s the theory of competitiveness continued to develop actively, resulting in the formation of some of its schools, in particular:

– American, represented by M.E. Porter (the concept of national competitive advantage) (1986) and M.J. Enright (the concept of regional clusters) (2000);

– british – J.H. Dunning (eclectic OLI-paradigm) (1997) and Ch. Freeman (the concept of techno-economic paradigm) (2008);

– scandinavian – B.-Å. Lundvall and B.H. Johnson (the concept of learning economics) (1994), G.B. Asheim (the concept of the learning region) (2017).

In Ukraine, the most thorough assessments of the competitiveness of individual sectors of the economy in the context of the globalization, the internationalization and the international competition are conducted by a group of researchers

led by V. M. Geets. At the same time, given the scale and heterogeneity of the industrial sector of the national economy, it needs in-depth research in the regional dimension, especially in the context of the transition to an innovative model of the development announced by the government.

Despite the slowdown in industrial development in Ukraine due to influence of the many factors (primarily socio-political), industry remains the leading economic activity. The introduction of a free trade area between Ukraine and the EU, which resulted in a partial reduction (complete abolition) of trade duties, on the one hand, had a positive impact on foreign trade, and on the other – increased competition between European and Ukrainian industry, a key link in the process of forming commodity exports. Under such conditions, the need to expand the presence of domestic producers in world markets becomes relevant. This requires increasing their competitiveness to the level of EU member states.

The problems of the functioning of industry in Ukraine have a negative impact on the level of its competitiveness. As a result, industrial products of many domestic producers today are not competitive on external markets, and with the introduction of a free trade area with EU member states may lose a significant part of the domestic market due to low quality and the price parameters. It is obvious from this that the assessment of the competitiveness of the industrial sector of the economy of Ukraine and its regions, in particular the border regions, is important in order to determine the prospects of their participation in the competition for global product markets. Such an assessment is correct for the Ukrainian industry and the Republic of Poland as neighboring countries, similar in many socio-economic characteristics.

The indicators of realization of the competitive potential of the industry are the results (expressed by absolute and relative indicators) of its functioning. The place of the country among competitors on these indicators reflects the actual competitiveness or competitiveness of the industrial sector. The competitiveness (achievement of high competitive positions) is determined by the presence of certain advantages. These advantages, on the one hand, are conditions for ensuring competitiveness, and on the other – its features (results).

The main competitive advantages of the industrial sector include: activity (production, export, investment, capital and innovation) and efficiency (resource and economic) of the subjects of industrial activity. For a thorough characterization of each of the selected competitive advantages of the industry an appropriate system of indicators has been formed (Table 1.1).

The integral assessment of the competitive advantages of the industry of the countries or their regions takes place in three stages. At the first stage, primary indicators are calculated (shown in), which collectively reflect different aspects of the activity and efficiency of the industry.

Table 1.1. Indicators characterizing the competitive advantages of the industrial sector of the economy

Competitive advantages						
Activity					Efficiency	
Industrial	Export	Investment	Capital	Innovation	Resource	Economic
the rate of growth of the volume of industrial products sold	the share of industrial goods in the export of goods and services	the growth rate of capital investments of industrial enterprises	the rate of growth of non-current assets	the share of enterprises introducing innovations in the total number of industrial enterprises	donation fund	profitability of turnover
share of industrial production in the volume of sales of products (goods, services)	the share of exports in the volume of industrial products sold	the rate of growth of foreign direct investment in industry	share of non-current assets in assets	the share of realized innovative products in the total volume of industrial products sold	product labor	profitability of operating activities
–	–	the share of industry in the total volume of direct foreign investment inflows	–	the share of expenses on innovations in the total volume of capital investments	–	profitability of assets

Source: developed by the author.

At the second stage, the partial integral indices (in the context of the 7 groups) of the competitive advantages of the industry of the countries (or the regions) are determined by the valuation of the values of the primary indicators calculated in the first stage and their further integration by the method of the arithmetic mean.

The third stage defines the general integral index of the competitive advantages of the industry of the countries. We accept the condition of competitive advantages are equivalent. Thus, the general integral index of the competitive advantages of the industrial sector of the economy of each country is calculated by the next formula:

$$I_I^K = \sqrt[7]{I_i^{prod} I_i^{ex} I_i^{inv} I_i^{cap} I_i^{inn} I_i^{res} I_i^{econ}}, \tag{1.1}$$

where

I_I^K – the general integral index of competitive advantages of industry of the country;

I_i^{prod} – the integral index of production activity of the *i*-st country;

I_i^{ex} – the integral index of export activity of industry of the *i*-st country;
I_i^{inv} – the integral index of investment activity of industry of the *i*-st country;
I_i^{cap} – the integral index of the capital activity of the industry of the *i*-st country;
I_i^{inn} – the integral index of innovation activity of industry of the *i*-st country;
I_i^{res} – the integral index of resource efficiency of industry of the *i*-st country;
I_i^{econ} – the integral index of economic efficiency of industry of the *i*-st country.

The integral index can acquire values from 0 to 1. The greater the value of the index, the higher the competitiveness of the industrial sector of the economy of the region.

Calculations of the partial integral indices (conducted in the context of the seven competitive advantages) of the Ukrainian and Polish industries revealed the prevalence of the values of the most of indicators of the latter, which is a sign of the higher level of activity and efficiency of the functioning of the industrial sector of the economy of this country (Table 1.2).

The most important competitive advantages of the Polish industry were identified in terms of economic efficiency – during the period under review, with the strengthening of negative trends since 2011, when the difference between indices of integrated indices in favor of the Polish industry was 0.032 points (or 1.77 in times), and in 2016 reached 0.52 points (or 5.39 in times). This is due to higher values in Poland of indicators of both profitability and return on assets (the negative in Ukraine since 2014) and operating profitability (to 0.16 points (or 1.62 in times in 2016).

By the resource efficiency in 2016, the Polish industry dominated at the Ukrainian 3.29 in times (compared to 2.66 in times in 2011). This is due to a significantly higher value of the Polish labor productivity index (to 0.346 points or 3.6 in times in 2016). At the same time, the average number of workers in the Polish industry surpassed the same indicator in Ukraine at 1.11 in times (or 272.2 thousand people), where as in 2011, by contrast, the number of workers in Ukrainian industry was higher than 1.25 in times (or for 671.4 thousand people).

By the level of innovation activity in 2016, the Polish industry prevailed in Ukraine 1.6 in times (vs. 3.09 in times in 2014), which was a sign of the gradual restoration of the innovation activity in Ukraine. The most (8.89 in times in 2015 compared to 4.65 in times in 2014), the Ukraine yielded Poland by the value of the indicator of the share of realized innovative products in the total volume of industrial products sold, the data of which since 2016 are absent from official sources of the State Statistics Service of Ukraine.

Also, a significant predominance of Polish industry during the analyzed period was observed in the share of enterprises that introduced innovations in the total number of industrial enterprises (more than in twice) and an indicator of the share

of expenses on innovations in the total volume of capital investments (2.77 in times in 2014). At the same time, it should be noted that in 2016, compared to the previous year, in Ukraine the values of these indicators increased to 1.4 percentage points (pp.), so it's up to 16.6% and 5.0 pp. (or up to 20.8%) respectively.

The values of the indicators of capital activity of the Polish industry during the analyzed period (except for 2014) prevailed in similar indicators of Ukrainian one, in particular, in 2016 to 1.24 in times. This is due to the higher share of non-current assets in the total assets of the industrial sector of Polish economy and the declining trend in Ukraine in this indicator (45.6% in 2016 compared to 54.5% in 2012). At the same time, the growth rates of non-negotiable assets of industry in Ukraine were higher than in Poland, in particular 2.1 in times in 2016.

According to the level of investment activity, Ukrainian industry prevailed in Poland in 2012, 2013 and 2016. This is due to a generally higher rate of growth of capital investments and foreign direct investment (FDI) in Ukrainian industry, as well as a decrease in the share of industry in the total volume of FDI in Poland in 2014-2016.

In terms of the export activity, Ukrainian industry during the analyzed period prevailed in Polish. However, this advantage was characterized by a declining trend – from 1.22 in times in 2011 – to more than once in times in 2016. The preponderance of the Ukrainian industry is the higher (but falling) share of industrial goods in the export of goods and services (59.5% in 2016 compared with 75.7% in 2011), while Poland has the highest (and growing) share of exports in the volume of trade sold (38.7% vs. 35.3% respectively).

The relatively higher level of industrial activity in Ukraine in 2014-2016 is due to higher rates of growth of the volume of industrial products sold in this period, in particular 21.5% vs. 5.7% in Poland in 2016. However, this activity is partly explained by the inflation factor. At the same time, the value of indices of the share of industrial production in the total volume of sales of products (works, services) in Ukraine and Poland almost coincides (31.4% vs. 31.2%). Its indicates the same level of industrialization of the economy of these countries.

The results of the analysis of the values of the overall integrated index of the competitive advantages of the industrial sectors of the economy of Ukraine and Poland for 2011-2016 revealed the predominance of Polish industry in all years of the analyzed period (Fig. 1.1). The largest gap was in 2015 (0.436 points), but in 2016 it dropped significantly, indicating a tangible increase in industrial activity in Ukraine. The largest gap was in 2015 (0.436 points), but in 2016 it dropped significantly, indicating a tangible increase in industrial activity in Ukraine.

However, low innovative activity, along with inefficient capital investment and high cost of economic activity, negatively affects the level of competitiveness of Ukrainian industry. As a result, the products of many domestic producers today are not competitive on external markets, and with the introduction of a free trade

Table 1.2. Indicators of the state and performance of industry in Ukraine (Ukr) and Poland (Pl)

Indicator	2011		2012		2013		2014		2015		2016	
	Ukr	Pl	Ukr	Pl	Ukr	Pl	Ukr	Pl	Ukr	Pl	Ukr	Pl
The production activity												
The rate of growth of the volume of industrial products sold	0.251	0.154	0.048	0.036	–0.033	0.004	0.080	0.023	0.243	0.038	0.215	0.057
The share of industrial products in the volume of sales	0.311	0.310	0.307	0.312	0.305	0.304	0.320	0.309	0.311	0.308	0.314	0.312
The integral index	**0.281**	**0.232**	**0.177**	**0.174**	**0.136**	**0.154**	**0.200**	**0.166**	**0.277**	**0.173**	**0.264**	**0.185**
The export activity												
The share of industrial goods in the export of goods and services	0.757	0.601	0.692	0.577	0.668	0.574	0.670	0.559	0.609	0.547	0.595	0.529
The share of exports in the volume of industrial products sold	0.411	0.353	0.350	0.355	0.330	0.372	0.362	0.378	0.359	0.388	0.326	0.387
The integral index	**0.584**	**0.477**	**0.521**	**0.466**	**0.499**	**0.473**	**0.516**	**0.469**	**0.484**	**0.467**	**0.460**	**0.458**
The investment activity												
The rate of growth of capital investment in industry	0.421	–0.013	0.164	0.139	0.065	0.025	–0.116	0.146	0.016	0.154	0.343	–0.259
The rate of growth of foreign direct investment in industry	0.085	1.626	0.127	–0.392	0.049	–0.545	–0.177	0.935	–0.104	–0.023	–0.284	0.247
The share of industry in the total volume of foreign direct investment	0.347	0.356	0.315	0.671	0.310	0.696	0.323	0.259	0.306	0.198	0.255	0.258
The integral index	**0.284**	**0.656**	**0.202**	**0.139**	**0.141**	**0.059**	**0.010**	**0.446**	**0.073**	**0.109**	**0.105**	**0.082**
The capital activity												
The rate of growth of non–current assets	0.130	0.118	0.452	0.089	0.079	0.060	0.034	0.052	0.081	0.037	0.103	0.049
The share of non–current assets in assets	0.476	0.611	0.545	0.639	0.552	0.647	0.531	0.647	0.490	0.648	0.456	0.644
The integral index	**0.303**	**0.364**	**0.499**	**0.364**	**0.315**	**0.353**	**0.283**	**0.350**	**0.285**	**0.342**	**0.279**	**0.347**

The innovative activity												
The share of enterprises that introduced innovations in the total number of industrial enterprises	0.128	0.350	0.136	0.342	0.136	0.365	0.121	0.362	0.152	0.363	0.166	0.363
The share of realized innovative products in the volume of industrial	0.038	0.118	0.033	0.124	0.033	0.115	0.025	0.116	0.014	0.125	–	0.104
The share of the cost of innovation in the total volume of capital investment	0.182	0.285	0.125	0.262	0.098	0.246	0.089	0.248	0.158	0.275	0.197	0.208
The integral index	**0.116**	**0.251**	**0.098**	**0.242**	**0.089**	**0.242**	**0.078**	**0.242**	**0.108**	**0.254**	**0.182**	**0.286**
The resource efficiency												
The return on assets	0.020	0.016	0.014	0.016	0.013	0.015	0.013	0.014	0.015	0.014	0.017	0.014
The productivity	0.144	0.419	0.167	0.441	0.160	0.450	0.131	0.452	0.119	0.464	0.133	0.480
The integral index	**0.082**	**0.218**	**0.090**	**0.228**	**0.086**	**0.232**	**0.072**	**0.233**	**0.067**	**0.239**	**0.075**	**0.247**
The economic efficiency												
The cost effectiveness of operating activities	0.047	0.075	0.034	0.059	0.030	0.061	0.016	0.059	0.009	0.057	0.042	0.068
The return on assets	0.042	0.077	0.012	0.059	0.007	0.059	–0.083	0.053	–0.077	0.047	–0.003	0.060
The profitability of turnover	0.045	0.078	0.016	0.060	0.010	0.063	–0.116	0.057	–0.102	0.051	–0.004	0.065
The integral index	**0.045**	**0.077**	**0.021**	**0.059**	**0.016**	**0.061**	**–0.061**	**0.057**	**–0.057**	**0.051**	**0.012**	**0.064**
The general integral index	**0.259**	**0.339**	**0.205**	**0.249**	**0.163**	**0.215**	**–0.139**	**0.286**	**–0.203**	**0.233**	**0.184**	**0.237**

PS.: The integral index of innovation activity of Ukraine and Poland for 2016 is calculated on the basis of two indicators.
PPS.: The labor productivity of Ukraine and Poland is calculated in PLN for the average yearly rate of the National Bank of Ukraine in corresponding years.

Source: elaborated by the authors based on SSSU, 2019; CSOP, 2017.

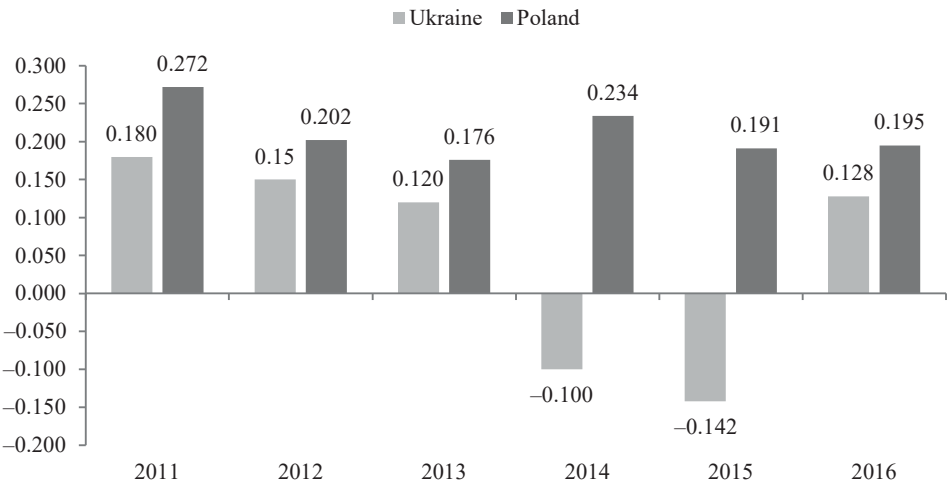


Fig. 1.1. Integral index of competitiveness of industry of Ukraine and Poland, share of unit
Source: elaborated by the authors based on SSSU, 2019; CSOP, 2017.

area with EU member states may lose a significant part of the domestic market due to low quality and price parameters. Hence, the relevance of assessing the competitiveness of the industrial sector of the economy of the border regions is obvious in order to determine the prospects for their participation in the competitive struggle for the European market of products. (Krawczyk-Sokołowska, Caputa, & Łukomska-Szarek, 2018; Caputa, Janik, & Paździor, 2019).

By the level of economic efficiency, Polish industry on the meso-level (as at the macro level) completely prevailed in Ukraine (Table 1.3). in particular, the indicators of profitability of operating activity, turnover and assets in Podkarpackie Voivodeship were higher during the analyzed period than in Lvov region, and in the years 2014-2015, this advantage was further exacerbated by the negative financial result prior to the taxation of the industry of the latter (Grzebyk et al., 2020).

The resource efficiency of Podkarpackie Voivodeship industry was 3.37 in times higher in 2011-2016. A key advantage of the voivodship industry (as well as Poland in general) is the relatively high level of labor productivity (4.19 in times higher than in the oblast). At the same time, it should be noted that the average number of workers in the industry of Lvov region is 1.16 in times higher than in the voivodeship.

The level of innovation activity of the industry in Podkarpackie Voivodeship is more than 3 in times higher than in Lvov region. This is due to the relatively higher values of all the indicators analyzed, which characterize this competitive advantage.

Instead, according to the level of capital activity of the industry, Lvov region dominated the voivodship in 2013-2014 due to the substantially higher (in particular, more than 5 in times in 2013) the rate of growth of non-current assets. However, the share of non-current assets in the industry's assets in the region, as compared to the voivodship, is low and tends to further decrease – 37.4% in 2016, vs. 53.7% from 2013.

In terms of the investment activity, Lvov region prevailed in Podkarpackie Voivodeship during 2013-2016. This is due to higher rates of growth of capital and FDI in the region industry. in contrast, the province has the highest share of industry in total foreign direct investment, due to the higher level of investment attractiveness of the economy of this region.

The export activity of the industry in Lvov region during the analyzed period was higher than in Podkarpackie Voivodeship and resulted in a higher (to 6.8 pp. in 2016) the share of industrial goods in the export of goods and services, which, however, tended to decline. Instead, for the voivodship, the share of exports in the volume of industrial products sold is slightly higher (to 1.6 pp.).

The level of industrial activity in Lviv region was generally higher than in Podkarpackie Voivodeship. This is due to the growth in the growth of volumes of industrial products sold, especially in 2014-2016. At the same time, the province's industry dominated (except for 2015) by the share of industrial output in the volume of sales of products (goods and services), which is a sign of a somewhat higher level of industrialization of the economy of this region.

To summarize, it can be argued that in 2015-2016 the gap between the levels of competitive advantage of the industry in Lvov region and Podkarpackie Voivodeship increased significantly in favor of the latter. The highest advantages of the voivodship are due to the significantly higher level of economic, resource and innovation activity of its industry, as well as the higher level of capitalization of the latter. It follows that the industrial sector of economy of Podkarpackie Voivodeship (in comparison with the similar sector of the economy of Lviv region) is more efficient and innovative. The similar advantages exist at the macro level.

The calculation of values of the general integrated index of the competitive advantages of the industry of Lvov region and Podkarpackie Voivodeship (Fig. 1.2) revealed a tendency to increase (except for 2014 and 2015) the overall level of development of the industrial sector of the region's economy. However, the index of competitive advantages of Podkarpackie Voivodeship industry over the analyzed period exceeded the value of a similar indicator in Lvov region on average to 1.5 in times.

To improve the innovation of the industrial sector of Ukraine's economy, on the one hand, it is necessary to improve the macroeconomic conditions of the operation of the subjects of industrial activity in the direction of promoting the expansion of domestic demand for domestic industrial products and increasing

Table 1.3. Indicators of the state and performance of industry in Lvov region (LR) and Podkarpackie Voivodeship (PV), share of the unit

Indicator	2011		2012		2013		2014		2015		2016	
	LR	PV	LR	PV	LR	PV	LR	PV	LR	PV	LR	PV
The production activity												
The rate of growth of the volume of industrial products sold	0.263	0.151	0.077	0.046	–0.007	0.031	0.143	0.001	0.478	0.032	0.152	0.041
The share of industrial products in the volume of sales	0.265	0.283	0.264	0.290	0.264	0.293	0.264	0.310	0.326	0.325	0.329	0.330
The integral index	**0.264**	**0.217**	**0.171**	**0.168**	**0.129**	**0.162**	**0.204**	**0.155**	**0.402**	**0.179**	**0.241**	**0.185**
The export activity												
The share of industrial goods in the export of goods and services	0.857	0.721	0.824	0.715	0.731	0.672	0.702	0.621	0.665	0.612	0.676	0.608
The share of exports in the volume of industrial products sold	0.287	0.285	0.295	0.312	0.285	0.324	0.362	0.375	0.391	0.412	0.399	0.415
The integral index	**0.572**	**0.503**	**0.560**	**0.514**	**0.508**	**0.498**	**0.532**	**0.498**	**0.528**	**0.512**	**0.538**	**0.512**
The investment activity												
The rate of growth of capital investment in industry	0.207	0.191	0.110	0.055	0.319	0.001	–0.213	0.066	0.327	–0.008	0.745	–0.122
The rate of growth of foreign direct investment in industry	0.018	1.100	0.718	0.014	0.138	0.084	–0.283	–0.224	–0.119	–0.128	–0.091	0.249
The share of industry in the total volume of foreign direct investment	0.273	0.466	0.390	0.663	0.425	0.427	0.378	0.423	0.367	0.421	0.380	0.426
The integral index	**0.166**	**0.586**	**0.406**	**0.244**	**0.294**	**0.171**	**–0.039**	**0.088**	**0.192**	**0.095**	**0.345**	**0.184**
The capital activity												
The rate of growth of non-current assets	0.082	0.241	0.215	0.144	0.193	0.037	0.072	–0.173	0.074	–0.058	0.097	0.021
The share of non-current assets in assets	0.487	0.670	0.513	0.640	0.537	0.660	0.481	0.660	0.447	0.650	0.374	0.651
The integral index	**0.285**	**0.456**	**0.364**	**0.392**	**0.365**	**0.349**	**0.277**	**0.244**	**0.261**	**0.296**	**0.235**	**0.336**

The innovative activity												
The share of enterprises that introduced innovations in the total number of industrial enterprises	0.098	0.420	0.108	0.398	0.120	0.428	0.126	0.407	0.184	0.445	0.186	0.461
The share of realized innovative products in the volume of industrial	0.015	0.121	0.021	0.132	0.030	0.125	0.021	0.118	0.019	0.131	–	0.112
The share of the cost of innovation in the total volume of capital investment	0.067	0.298	0.104	0.293	0.074	0.277	0.080	0.351	0.076	0.347	0.067	0.349
The integral index	**0.060**	**0.280**	**0.078**	**0.274**	**0.075**	**0.277**	**0.076**	**0.292**	**0.093**	**0.308**	**0.127**	**0.405**
The resource efficiency												
The return on assets	0.018	0.013	0.016	0.012	0.013	0.012	0.014	0.014	0.019	0.015	0.022	0.019
The productivity	0.074	0.273	0.089	0.291	0.086	0.306	0.068	0.301	0.068	0.309	0.075	0.314
The integral index	**0.046**	**0.143**	**0.053**	**0.152**	**0.050**	**0.159**	**0.041**	**0.157**	**0.043**	**0.162**	**0.048**	**0.166**
The economic efficiency												
The cost effectiveness of operating activities	0.032	0.078	0.017	0.067	0.038	0.082	0.015	0.07	0.011	0.082	0.039	0.087
The return on assets	0.020	0.038	0.007	0.038	0.018	0.043	–0.059	0.039	–0.05	0.050	0.013	0.058
The profitability of turnover	0.024	0.046	0.009	0.049	0.026	0.056	–0.059	0.045	–0.059	0.056	0.010	0.069
The integral index	**0.025**	**0.054**	**0.011**	**0.051**	**0.027**	**0.060**	**–0.034**	**0.051**	**–0.033**	**0.063**	**0.021**	**0.071**
The general integral index	**0.126**	**0.251**	**0.130**	**0.209**	**0.132**	**0.200**	**0.103**	**0.169**	**–0.146**	**0.187**	**0.145**	**0.224**

PS.: The integral index of innovative activity of Lviv region and Podkarpackie Voivodeship for 2016 is calculated on the basis of two indicators.
PPS.: The productivity of the Lviv region and Podkarpackie Voivodeship is calculated in PLN for the average yearly rate of the National Bank of Ukraine in corresponding years.

Source: elaborated by the authors based on DSLR, 2017; SOPV, 2017.

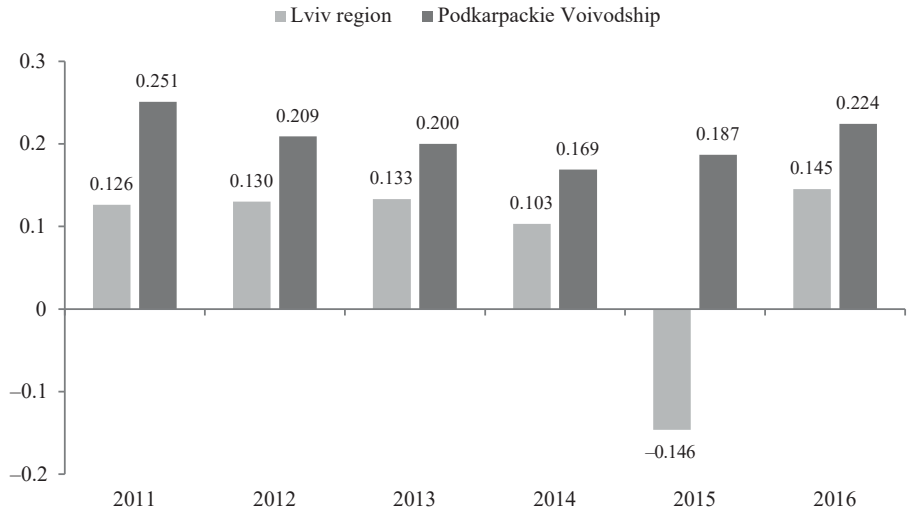


Fig. 1.2. Integral index of industry competitiveness of Lvov region and Podkarpackie Voivodeship, unit of unit

Source: elaborated by the authors based on DSLR, 2017; SOPV, 2017.

its supply, as well as improving the quality management system of industrial products and accelerating the international certification of enterprises. From the other hand, increase the efficiency of capital investments and the level of implementation of innovations in production. There is also a need for a gradual reorientation of investment flows in the development of high-tech industries, in particular through tax and customs incentives for domestic investors and state guarantees for foreign protection.

An effective tax incentive can be a reduction in the tax rate on income (or tax holidays) for high-tech manufacturers, while increasing the rate for commodity producers. It may be of interest and involve small and medium-sized businesses in the process of investing in high-tech manufacturing.

In its turn, the expansion of opportunities for the introduction of innovations into the industry requires to the next:

– the development of innovation infrastructure by creating innovative clusters or technological parks (for example, Poland), in particular on the basis of institutes of the National Academy of Sciences of Ukraine;

– the monitoring, on the one hand, the needs of enterprises in innovations, and, on the other hand, developments in the scientific and design institutions for sale, and the creation on this basis of the information catalog of innovations on the basis of the "supply-demand" principle;

– the formation of an effective organizational and financial mechanism for the support and development of innovation activities by providing financial and credit

assistance to economic entities that implement investment projects of innovative direction, in particular, in energy and resource conservation;

– the organization of an effective network of "science-production" based on the establishment of technology transfer centers for combining the potential of science, production and financial capital (with the involvement of small and medium-sized businesses).

In order to increase the access of the subjects of industrial activity to investment resources, in particular, foreign ones, it is necessary:

– the formation of a system of monitoring of the investment projects implemented in the framework of public-private partnership, and continuous monitoring, in particular public, for their implementation in order to prevent inefficient use of capital investments;

– a conducting an annual rating assessment of the investment attractiveness of the administrative-territorial units and leading commodity producers in the region, with further placement of its results on the investment portal of the region;

– the creation of conditions for closer cooperation of the oblast with European organizations and funds involved in financial support for regional development within the framework of international cooperation programs, in particular EU funds through the Neighborhood and Partnership Instruments, border cooperation programs, the other international programs and donors (World Bank, European Bank for Reconstruction and Development, European Investment Bank etc.).

1.2. Key trends in the development of the industrial sector of the regions of Ukraine

The industrial sector of the national economy lays the solid financial grounds for socio-economic growth in Ukrainian regions. in 2017, the shares of industry, trade and agriculture in the domestic GDP (by production method and in reported prices) were 21.7%, 14.1%, and 10.2%, respectively. The industry had the largest employment: 2440.6 thousand persons or 15.1% of total employment (against 2182.3 thousand in trade and 658.8 thousand in agricultural sector, or 13.5% and 4.1% respectively). The share of large tax payers in this economic sector in the total tax revenues to the public budget was higher than 40%. The industry is the principal part (with the share of 60%) in the value added chain of the Ukrainian exports.

However, in spite of possessing large industrial capabilities along with the transit, natural, resource and human capital, Ukraine had 30-fold lower industrial output and nearly 44-fold lower gross value added than Germany, the EU leader. The domestic industry specialization is typical for countries with the commodity-

based model of economy, resulting in the poor competitiveness by technological level: the share of high tech industries in the total industrial output in Ukraine is 1.8 times less than in a country like Poland, and their share in the exports is even lower (3.2 times less).

The intensifying Eurointegration processes have emphasized the need to enhance the competitiveness of Ukrainian manufacturers to the level EU member countries. This objective cannot be achieved without structural modernization of the Ukrainian industry. The choice of directions and mechanisms for practical implementation of the new industrial policy of Ukraine (at regional level in particular) has to be based on the results of respective analytical assessments.

In spite of the slowing rates of the industry development in Ukraine due to the impact of many factors (socio-political, monetary etc.), the industry still remains the core type of economic activities. The share of industrial output in the total sales of goods and services in 2016 reached 34.6%, vs. 32.5% in 2012, but in 2017 it fell to 0.5 pp. (Table 1.4). This share grew only in seven regions (against 15 in 2016), with the highest growth recorded in Donetsk (to 6.2 pp.), Ivano-Frankivsk (6.2 pp.) and Poltava (6.0 pp.) regions.

Our analysis of the Ukrainian regions by industrialization level is based on the share of industrial products in the total sales of goods and services. The top five regions which economy has the highest level of industrialization were Donetsk, Zaporizhzhia, Ivano-Frankivsk, Poltava and Sumy regions, with the shares larger than 60%. The cumulated share of these regions in the total sales of industrial products was 34.23% in 2016, of which 12.47% accounted for by Donetsk region, 9.04% and 8.72% – for Poltava and Zaporizhzhia regions. Since 2014 and on, the largest share (≈20%) in the total has been in Dnipropetrovsk region.

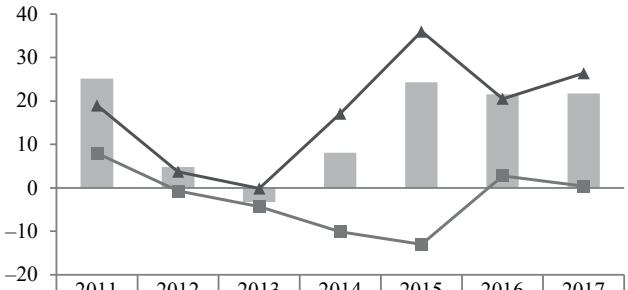
The index of industrial output in Ukraine grew essentially in 2016 (to reach 2.8%, after the negative dynamics in 2012-2015), but fell in 2017 by 2.4 pp. (Fig. 1.3). At the same time, the rate of growth in the total sales of industrial products was higher by 0.2 pp. in 2017 (after 3.2 pp. decrease in 2016). However, the core reason for its increase was the increased index of producer prices in the industry. That is, the production activity in the Ukrainian industry (in value terms) was going up in 2015-2017 on account the heavy inflationary pressure.

The rates of growth in the total sales of industrial products were up in 2017 in 12 regions, with the highest ones recorded in Ivano-Frankivsk (23.7 pp.), Donetsk (19.1 pp.), Sumy (18.7 pp.) and Dnipropetrovsk (13.0 pp.) regions. Due to the intensive growth in the production activity in Donetsk region in 2017, this region could approach, by 99.68%, the level of 2011 by the total sales of industrial products. However, in Luhansk region, the essential increase in the rates of growth of the total sales of industrial products (up to 35.9%) was reversed in 2017, when the production activity fell down below the level of 2015. As a result, the total sales of industrial products in this region made only 23.26% of 2011.

Table 1.4. Industry indicators, by Ukrainian region, %

Region	The share of industrial products in the total sales of goods and services							The rate of growth in the total sales of industrial products						
	2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017
Ukraine	**32.7**	**32.5**	**32.7**	**34.3**	**34.4**	**34.6**	**34.1**	**25.1**	**4.8**	**–3.3**	**8.0**	**24.3**	**21.5**	**21.7**
Vinnytsia	50.1	48.8	54.6	46.2	42.5	44.4	43.5	16.0	7.3	13.2	21.0	37.8	24.5	19.3
Volyn	27.8	21.6	19.4	22.3	23.2	22.3	19.3	29.1	7.7	–3.5	25.5	42.0	20.3	25.0
Dnipropetrovsk	43.5	49.2	49.0	53.1	51.8	51.4	49.1	20.5	9.9	–1.3	15.9	20.0	14.2	27.2
Donetsk	39.0	36.4	38.3	47.1	58.6	60.9	67.1	31.4	–9.4	–8.9	–19.7	7.7	9.1	28.2
Zhytomyr	52.8	54.2	51.8	48.5	54.5	45.8	41.9	19.2	13.9	0.4	11.3	40.9	30.9	10.3
Zakarpattia	33.6	36.2	33.4	32.0	34.4	45.5	45.0	25.2	12.3	0.8	11.1	24.4	33.2	21.3
Zaporizhzhia	65.6	66.4	69.4	70.8	71.2	70.3	66.3	21.8	1.2	–4.4	24.0	33.7	17.0	21.9
Ivano- Frankivsk	69.9	65.9	53.1	59.2	64.5	55.2	61.4	74.8	4.5	–12.9	14.2	38.2	7.3	31.0
Kyiv	24.8	24.8	28.3	26.1	25.6	26.6	27.6	18.7	24.3	15.7	3.1	24.7	22.7	10.0
Kirovohrad	36.5	35.2	39.8	36.0	35.8	34.1	35.2	22.4	29.6	17.0	11.5	12.9	9.5	1.1
Luhansk	76.8	72.0	69.7	73.4	73.9	60.6	58.4	32.2	–13.6	–14.0	–53.8	–28.9	35.9	–29.9
Lviv	26.5	26.4	26.4	26.4	32.6	35.3	34.9	26.3	7.7	–0.7	14.3	47.8	23.7	26.3
Mykolaiv	44.7	45.8	41.8	40.3	36.1	38.6	40.3	17.7	9.9	–6.3	13.7	35.8	32.6	15.7
Odesa	19.9	20.2	20.3	21.5	25.3	21.1	20.6	–12.3	4.0	–2.5	21.7	58.9	9.9	14.5
Poltava	66.4	67.7	64.3	65.7	61.1	68.5	74.5	22.6	10.8	–11.3	21.3	28.4	29.5	34.0
Rivne	60.5	47.8	55.1	50.8	63.0	63.2	60.8	22.5	–19.7	28.6	22.0	40.2	16.0	17.6
Sumy	71.2	67.9	69.4	66.4	61.0	51.5	49.6	59.5	6.2	–4.0	11.2	38.0	–1.7	18.7
Ternopil	24.1	15.8	16.2	15.5	18.0	35.6	36.3	48.3	–4.6	5.0	16.3	43.3	21.7	31.5
Kharkiv	37.8	43.3	48.2	39.7	47.5	56.3	55.9	21.5	22.0	0.9	–11.2	64.3	34.5	20.2
Kherson	39.6	38.0	40.3	37.8	38.0	46.3	43.0	14.7	–7.0	6.6	11.3	42.9	48.6	9.3
Khmelnytskyi	52.5	50.5	50.3	37.9	34.8	36.7	35.5	27.4	10.5	5.6	–8.6	25.0	22.0	29.8
Cherkasy	52.3	50.8	50.9	51.3	46.2	49.5	47.9	20.9	12.3	–5.1	23.2	27.9	20.4	17.8
Chernivtsi	32.2	30.9	32.7	32.5	37.7	45.6	38.6	27.4	1.0	–0.2	14.1	45.9	38.1	10.7
Chernihiv	56.4	58.3	56.2	53.8	46.4	50.6	49.4	25.5	27.2	–3.2	16.7	28.1	37.8	22.5

Source: elaborated by the authors based on SSSU, 2019.



	2011	2012	2013	2014	2015	2016	2017
The growth rate of sales of industrial products	25.1	4.8	–3.3	8.1	24.3	21.5	21.7
Industrial production index	8.0	–0.7	–4.3	–10.1	–13.0	2.8	0.4
Industrial producer price index	19	3.7	–0.1	17.1	36	20.5	26.4

Fig. 1.3. The dynamics of industrial production indicators in Ukraine, %
Source: elaborated by the authors based on SSSU, 2019.

A negative tendency in the domestic industry is its weakening export positions. The share of industrial goods in the total exports of goods and services from Ukraine fell by 16.2 pp. in 2011-2016 (Table 1.5). It so happened because this share decreased in 15 regions of Ukraine.

In 2017, the share of industrial goods in the total exports of goods and services from Ukraine grew by 1.8 pp. and reached 61.3%, against 75.7% in 2011. The growth was recorded in 11 regions, especially in Ivano-Frankivsk (by 20.9 pp.) and Chernihiv (by 17.7 pp.) regions. Industrial products used to prevail in the export structure in Dnipropetrovsk, Donetsk, Zakarpattia, Zaporizhzhia, Luhansk, and Poltava regions, where their shares reached 80%. But in Kyiv, Mykolaiv, Odesa, Khmelnytskyi, and Chernihiv regions, the share of industrial goods in the total exports was smaller than 50%.

The rates of growth in the exports of industrial products from Ukraine fell down in 2012-2016 to below zero level, but rapidly grew in 2017, to reach 19.82%. The rates were up in all the regions (except for Kyiv, Kirovohrad, and Luhansk regions), with the most essential growth recorded in Cherkasy region (1.46 times). The intensified export activity of the domestic industry in 2017 increased the share of exports in the total sales of industrial products by 0.8 pp. This share was up in 14 regions; its average for Ukraine was 33.4%, against 37.8% in 2011. The export activity of the industry in 2017 grew to the highest extent in Ivano-Frankivsk region. As a result, the share of this region in the total exports of industrial goods from Ukraine grew by 0.49 pp. Also, a growth was recorded

Table 1.5. Indicators of industry exports, by Ukrainian region, %

Region	The share of industrial goods in the total exports of goods and services							The share of exports in the total sales of industrial products						
	2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017
Ukraine	**75.7**	**69.2**	**66.8**	**67.0**	**60.9**	**59.5**	**61.3**	**37.8**	**34.2**	**32.2**	**36.7**	**36.1**	**32.6**	**33.4**
Vinnytsia	83.2	77.2	75.0	66.8	66.9	72.9	68.6	22.1	19.1	17.3	20.8	31.3	37.0	37.5
Volyn	80.4	83.0	75.2	79.1	79.4	79.9	77.0	41.5	37.7	37.8	51.2	61.0	57.8	52.7
Dnipropetrovsk	95.0	94.9	93.3	94.5	93.8	95.0	96.3	40.6	36.2	35.4	40.7	45.3	42.4	41.8
Donetsk	96.0	93.8	94.4	93.5	89.4	86.7	93.7	50.9	45.8	44.6	55.7	41.7	41.3	42.6
Zhytomyr	90.7	87.3	85.5	77.3	79.3	74.1	72.3	26.7	24.7	26.9	35.4	31.9	29.5	33.3
Zakarpattia	94.7	94.8	80.9	86.6	83.1	84.4	82.0	44.5	40.8	47.8	54.0	51.3	52.8	54.7
Zaporizhzhia	82.8	91.5	92.3	91.1	88.3	85.8	86.6	35.6	37.9	36.5	43.5	45.3	35.3	38.7
Ivano- Frankivsk	87.7	88.2	74.1	71.6	71.2	53.7	74.6	29.7	24.5	14.5	18.7	18.7	23.1	29.3
Kyiv	68.2	62.2	58.6	58.7	55.2	52.0	49.3	25.8	21.2	17.5	23.1	27.5	24.7	23.1
Kirovohrad	82.9	85.6	90.2	86.1	71.8	69.0	67.4	25.2	28.2	43.9	42.8	29.6	31.8	26.6
Luhansk	94.7	95.5	95.0	92.9	91.9	96.1	84.6	53.0	39.5	38.7	67.1	22.9	31.3	25.9
Lviv	85.7	82.4	73.1	70.2	66.5	67.6	68.5	28.7	29.5	28.5	36.2	39.1	39.9	40.8
Mykolaiv	59.5	50.2	38.9	38.7	36.7	33.1	34.8	40.3	43.2	38.4	41.3	47.0	38.2	40.7
Odesa	46.1	50.8	42.7	40.6	39.2	33.9	37.7	36.4	42.9	34.5	40.0	41.9	33.9	38.3
Poltava	83.9	92.8	91.6	85.3	82.7	81.8	80.4	31.2	31.7	28.0	25.9	24.9	21.3	21.0
Rivne	80.3	80.2	79.3	79.2	81.2	76.1	69.6	26.9	30.2	22.1	25.7	26.4	21.7	21.2
Sumy	92.5	90.1	88.6	81.2	76.3	79.1	66.2	33.3	34.1	28.9	28.3	29.2	31.7	28.7
Ternopil	86.0	70.4	61.4	57.0	57.2	57.0	59.3	21.1	18.2	25.6	29.8	30.8	33.1	31.8
Kharkiv	76.4	74.9	72.5	74.1	67.7	67.1	63.9	20.6	18.1	17.3	26.9	20.4	14.4	13.9
Kherson	58.5	57.3	61.3	46.9	52.4	49.2	52.8	16.1	16.4	18.5	18.3	17.5	13.6	16.0
Khmelnytskyi	66.7	65.5	68.5	58.0	46.3	54.3	49.0	15.1	15.8	16.5	22.9	21.4	19.2	20.3
Cherkasy	78.5	76.6	72.9	64.2	60.6	57.6	64.3	23.3	19.5	15.1	13.0	12.4	12.5	16.1
Chernivtsi	90.4	87.9	85.9	72.8	66.0	72.7	66.6	25.4	23.0	23.8	26.7	27.2	27.5	29.7
Chernihiv	65.6	64.0	63.9	58.1	45.7	30.9	48.6	21.3	14.5	15.7	22.7	20.2	17.7	17.8

Source: elaborated by the authors based on SSSU, 2019.

in Lviv (0.18 pp.), Odesa (0.13 pp.) and Cherkasy (0.27 pp.) regions. However, the export capacities of the domestic industry are determined by Dnipropetrovsk, Donetsk, and Zaporizhzhia regions, which cumulated share in the industry exports is higher than 50%. The respective shares of each of these three regions in the total exports of industrial goods in 2017 made 25.37%, 15.68%, and 10.03% (against 18.64%, 31.18%, and 6.64% in 2011).

2015-2016 marked the recovery of capitalization-related activities at industrial enterprises: the rate of growth in non-current assets increased by 6.9 pp. relative to 2014 (Table 1.6). But this rate decreased again in 2017 (by 3.4 pp. in average), being negative in four regions: Dnipropetrovsk, Donetsk, Luhansk, and Mykolaiv; in the latter two regions the strongest decrease was recorded.

At the same time, in spite of the rapidly falling rates of growth in non-current assets (from 15.2% in 2011 to –5.6% in 2017), industrial entities located in Donetsk, Dnipropetrovsk, and Kyiv region had the largest production capacities among the Ukrainian regions. The cumulated share of the three regions in the structure of non-current assets of the domestic industry was nearly 50%.

The share of non-current assets in the total industrial assets in Ukraine, which decreased by 11.9 pp. in 2014-2017, has continued to go down. in 2017, it decreased in 13 regions (against 21 regions in 2016), with the strongest decrease (24.9 pp.) recorded in Mykolaiv region. The decreasing capital activity worsened the structure of industrial assets in Ukrainian regions. in 2017, non-current assets dominated in the structure of industrial assets only in two regions (Zakarpattia and Kyiv): their share, higher than 50%, met the recommended level, whereas in 2013 such regions numbered 14.

In fact, the negative dynamics of non-current assets shows that the Ukrainian industry has lost its production capacities. For comparison, in Poland the share of non-current assets in the industrial assets continued to be higher than 60% and had upward tendency: from 61.1% in 2011 to 63.8% in 2017 (the author's calculations by use of data from the CSOP, 2017). The decreasing share of non-current assets in the total industrial assets in Ukraine limits the capabilities for its future development. This problem is aggravated by the dominance of resource-intensive and energy-intensive technologies, high depreciation of fixed assets (59.1%), especially in manufacturing industries (64.6%), and negative dynamics of investment processes.

Beginning with 2012, the rate of growth in capital investment in the Ukrainian industry was downward, and beginning with 2013 the similar trend occurred in the rate of growth in e foreign direct investment (FDI), which fell below zero level in 2014-2016 (Table 1.7). in 2016, the former indicator grew substantially (by 32.7 pp. relative to 2015), and approached the level of 2011 (the difference was 7.8 pp.). But the rate of FDI growth in the industry continued to fall (to –28.4%). As a result, the share of the industry in the total FDI in 2016 decreased by 5.1 pp.

Table 1.6. Indicators of capital in the industry, by Ukrainian region, %

Region	The rate of growth in non-current assets							The share of non-current assets in the total assets						
	2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017
Ukraine	**13.0**	**45.2**	**7.9**	**3.4**	**8.1**	**10.3**	**6.9**	**47.6**	**54.5**	**55.2**	**53.1**	**49.0**	**45.6**	**43.3**
Vinnytsia	–4.1	41.4	20.8	11.2	28.5	12.6	19.5	46.1	50.8	51.3	56.1	52.3	47.2	42.0
Volyn	2.2	7.9	3.1	5.5	32.2	5.2	17.1	50.7	53.0	53.6	51.2	49.4	44.5	42.5
Dnipropetrovsk	21.4	2.0	–1.4	41.4	0.1	9.9	–4.1	53.1	54.1	52.5	55.0	49.7	46.0	37.5
Donetsk	15.2	10.8	7.5	–1.8	8.1	–1.5	–5.6	43.2	48.4	49.0	49.9	47.7	42.2	37.7
Zhytomyr	6.6	20.9	5.8	10.0	–1.8	27.3	7.1	56.3	58.9	57.6	55.7	52.1	50.4	48.4
Zakarpattia	6.8	26.1	8.6	15.2	24.1	16.0	5.9	49.6	53.2	57.9	56.9	55.4	53.8	51.2
Zaporizhzhia	19.7	25.7	4.5	24.8	17.8	3.0	15.2	50.6	55.1	54.9	53.7	52.1	44.0	40.6
Ivano- Frankivsk	26.4	25.5	21.8	20.6	–17.3	–1.9	23.1	54.2	65.2	61.9	59.4	35.6	31.3	32.7
Kyiv	8.4	21.0	31.9	13.0	12.6	18.9	14.2	51.2	51.2	55.1	54.5	52.8	53.2	60.9
Kirovohrad	16.7	14.3	11.2	13.4	–6.9	–4.9	40.4	35.5	35.8	36.2	41.0	45.7	43.5	44.5
Luhansk	4.1	18.5	–35.6	7.4	–15.0	2.3	–17.4	46.3	46.3	43.4	43.2	36.3	29.4	28.1
Lviv	8.2	21.5	19.3	7.2	7.4	9.7	38.6	48.7	51.3	53.7	48.1	44.7	37.4	41.0
Mykolaiv	5.6	9.9	21.3	–4.2	249.9	–5.5	–60.5	44.9	41.2	45.0	43.4	63.1	60.6	35.7
Odesa	3.1	46.9	2.2	0.4	11.9	12.3	9.4	53.8	62.9	62.8	50.4	52.9	49.5	47.3
Poltava	8.7	30.6	15.8	12.1	4.7	2.2	19.3	40.4	46.4	48.5	45.8	40.4	37.5	41.3
Rivne	–2.2	11.7	31.3	23.4	–0.1	–2.9	5.4	42.2	39.8	39.3	44.9	37.6	36.1	43.4
Sumy	17.6	3.6	5.4	–6.3	6.9	15.1	18.4	42.5	40.2	41.1	35.4	32.2	33.9	33.4
Ternopil	0.0	–11.1	38.5	13.4	–37.0	19.0	24.3	50.5	48.1	57.2	58.3	42.5	34.2	37.5
Kharkiv	1.1	25.4	6.0	5.1	7.0	15.9	24.3	38.8	37.0	38.9	37.1	34.5	32.7	33.9
Kherson	14.5	14.4	11.4	–5.1	13.6	6.4	25.6	43.9	44.9	52.1	42.9	39.6	35.7	41.5
Khmelnytskyi	14.9	12.6	11.3	6.3	18.0	9.8	26.5	56.1	57.0	58.6	53.2	51.5	48.0	48.6
Cherkasy	38.3	21.8	–1.7	2.6	2.3	6.9	9.3	26.9	26.7	28.1	22.6	19.5	19.6	21.2
Chernivtsi	4.4	–12.0	6.8	–4.4	21.4	14.1	8.5	59.8	58.6	63.2	58.7	58.9	50.3	47.7
Chernihiv	–10.7	17.4	20.4	18.7	6.3	15.8	13.2	40.5	45.5	49.0	49.6	42.9	35.4	32.7

Source: elaborated by the authors based on SSSU, 2019.

Table 1.7. Indicators of industrial investment, by Ukrainian region, %

Region	The rate of growth in capital investment in the industry							The rate of growth in foreign direct investment in the industry							The share of industry in the total foreign direct investment						
	2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017
Ukraine	**42.1**	**16.4**	**6.5**	**–11.6**	**1.6**	**34.3**	**15.9**	**8.5**	**12.7**	**4.9**	**–17.7**	**–10.4**	**–28.4**	**11.0**	**34.7**	**31.5**	**31.0**	**32.3**	**30.6**	**25.5**	**33.4**
Vinnytsia	24.8	50.0	36.9	–12.2	0.2	–19.6	32.5	11.2	11.0	13.1	–4.6	–16.7	5.2	17.6	55.5	56.8	56.5	59.9	66.9	73.2	77.9
Volyn	36.6	3.0	19.2	19.3	196.7	–39.4	9.4	12.2	4.2	3.0	–14.1	–1.6	–0.6	1.9	67.8	57.0	62.5	67.0	72.2	78.5	72.2
Dnipropetrovsk	45.5	–6.5	0.1	8.0	18.4	11.5	45.7	1.7	5.7	2.7	–12.6	–5.8	–65.0	19.7	74.1	75.1	70.8	72.5	73.8	53.7	60.1
Donetsk	75.4	19.0	–1.9	–52.3	–37.3	44.4	38.1	14.3	13.6	3.9	–40.1	–35.1	–4.1	14.7	46.7	44.8	39.5	32.6	29.5	36.2	53.1
Zhytomyr	15.1	25.1	7.9	–2.5	11.8	45.3	29.6	31.6	9.1	–0.3	–21.6	–16.0	–12.5	6.1	80.6	82.0	76.7	81.5	78.5	79.2	80.2
Zakarpattia	2.6	45.2	10.2	2.6	15.1	54.3	15.9	–6.8	10.9	10.3	–9.6	–18.6	5.4	3.1	78.2	74.3	74.7	80.1	78.9	81.7	82.1
Zaporizhzhia	45.0	23.9	–5.7	25.3	–11.2	26.9	61.7	6.6	27.3	–5.5	–13.6	–14.8	–12.9	18.2	70.7	76.7	73.7	81.0	65.6	65.3	69.1
Ivano-Frankivsk	5.4	20.8	–16.4	54.0	–21.0	34.5	31.7	33.1	–0.2	29.5	10.8	–10.2	–3.7	12.5	78.0	75.6	77.3	75.3	74.9	73.0	75.0
Kyiv	63.7	39.3	25.3	11.7	2.6	45.0	–18.2	4.8	10.8	5.6	–13.0	–2.7	–0.1	4.4	46.9	46.4	48.4	49.7	49.1	52.6	52.4
Kirovohrad	123.5	–57.8	–22.4	–3.1	–4.6	77.8	26.9	3.4	42.6	106.9	–45.4	–14.1	–37.5	–0.9	42.1	41.9	56.8	59.9	65.5	44.8	37.3
Luhansk	26.2	16.3	46.4	–44.6	–72.1	20.8	–69.1	26.7	5.0	2.4	–44.1	7.3	–10.8	–1.1	82.7	79.4	77.2	54.8	70.2	83.6	82.4
Lviv	20.7	11.0	31.9	–21.3	32.7	74.5	34.2	1.8	71.8	13.8	–28.3	–11.9	–9.1	19.5	27.3	39.0	42.5	37.8	36.7	38.0	53.5
Mykolaiv	–5.0	35.1	44.3	–51.2	–26.1	212.7	–15.8	97.7	63.1	5.0	–27.5	–14.8	14.9	–3.7	49.0	48.0	46.7	40.9	38.1	43.6	43.5
Odesa	13.1	288.1	–21.8	–61.6	5.5	48.9	15.6	11.4	53.1	16.1	–13.0	–5.2	–3.5	4.8	30.0	34.5	39.0	39.6	40.2	39.0	45.2
Poltava	19.5	25.7	16.3	–8.4	–26.6	–1.0	64.4	24.9	–24.8	12.7	85.1	–2.7	–6.2	–0.3	78.1	43.6	43.5	83.3	83.3	78.0	77.3
Rivne	–11.5	27.4	–2.8	44.7	90.7	–35.0	27.3	2.0	15.8	–2.9	–5.0	–33.6	–23.0	–24.0	49.9	57.3	53.1	58.7	47.6	44.4	45.8
Sumy	78.3	–22.6	8.3	–8.8	2.1	80.7	21.6	0.6	4.2	2.8	–41.7	–33.5	–34.0	0.0	80.1	80.7	72.7	68.5	59.8	41.9	43.8
Ternopil	31.6	25.3	–19.4	2.4	40.0	68.1	54.1	–16.5	3.7	8.7	–17.0	–10.9	7.7	–18.5	57.2	56.8	58.5	58.7	58.9	66.0	57.6
Kharkiv	21.4	22.5	–1.7	–2.7	21.2	17.0	25.9	15.0	–14.0	–2.5	–18.4	–14.9	–17.8	2.9	16.1	17.5	16.7	17.5	16.4	33.2	34.1
Kherson	103.5	–12.2	12.8	3.2	4.3	–11.5	270.3	3.9	5.6	30.7	–21.1	14.7	–9.3	15.9	55.8	49.6	56.9	59.6	68.3	64.9	69.2
Khmelnytskyi	10.4	–48.0	33.9	4.0	26.6	76.5	24.5	0.9	–2.5	4.7	–11.2	–9.6	–7.7	11.6	79.5	70.5	68.2	72.3	74.1	72.1	74.6
Cherkasy	22.0	23.8	–16.0	–38.4	33.7	53.0	1.1	–7.6	272.8	1.9	–46.7	–30.4	–4.4	–1.9	71.7	86.4	87.4	81.2	81.8	82.5	80.7
Chernivtsi	30.6	–31.4	20.7	–7.9	34.4	61.7	10.6	–12.9	–5.9	–5.5	7.3	–4.9	–11.7	–5.6	54.1	49.0	42.6	46.5	51.2	46.9	59.4
Chernihiv	4.1	7.8	15.6	46.9	3.7	66.9	0.6	1.0	13.3	4.5	–7.4	–12.6	209.1	83.8	74.5	78.7	67.3	77.3	76.0	90.0	92.7

Source: elaborated by the authors based on SSSU, 2019.

In 2017, the average rate of growth in capital investment in the Ukrainian industry decreased by 18.4 pp. (to 15.9%). Its decrease was registered in 18 regions, with the strongest one (to below zero level) in Luhansk, Kyiv, and Mykolaiv regions. At the same time, Vinnytsia, Volyn, Dnipropetrovsk, Zaporizhzhia, Kharkiv, and Kherson regions could increase the capital investment in the industry, with the strongest increase (3.7 times) in the latter region. The highest capacities in terms of capital investment in the industry were kept by Dnipropetrovsk, Donetsk, Zaporizhzhia, and Kyiv regions: their respective shares in 2017 were 22.57%, 9.14%, 9.17%, and 10.58%.

Ukraine could overcome the persisting negative tendency of 2013-2016 in the inflow of FDI to the national economy as a whole and industry in particular. in 2017, the average rate of growth in FDI to the domestic industry reached 11.0%. The rate became positive in 15 regions (against 4 in 2016).

The highest growth in the industrial FDI in 2016 and 2017 was recorded in Chernihiv region: 209.1 i 83.8% respectively. High rates of growth in FDI (more than 18%) were reached in Dnipropetrovsk, Zaporizhzhia, and Lviv regions. Kharkiv region could slightly increase FDI in the industry (by 2.9%) its cumulative reduction in 2012-2016 by 52.1%. This region had the lowest share of industry in the total FDI, which dynamics was nevertheless upward: 34.1% in 2017 against 16.1% in 2011.

Due to the intensified inflow of FDI to the domestic industry in 2017, the industry's share in the total FDI in Ukraine grew by 7.9 pp. This growth was reported by 14 regions; the highest one was in Donetsk (by 16.9 pp.) and Lviv (by 15.5 pp.) regions. The highest shares (more than 80%) of the industry in the total FDI could be kept in Zhytomyr, Zakarpattia, Luhansk, Cherkasy, and Chernihiv regions. But the largest potentials in terms of attracting FDI to the industry are in Dnipropetrovsk region (leaving the rest of the regions far behind), although its share in the total FDI in the domestic industry decreased by nearly twice in 2016-2017 in relation to the previous period.

To sum up this part of the study, the investment climate in Ukraine could be considerably improved, which is confirmed by the increasing rates of growth in FDI in the domestic industry.

The innovation activity of the domestic industry grew in 2015-2016, but decreased in 2017. The share of enterprises introducing innovation in the total number of industrial enterprises reduced by 2.3 pp. relative to 2016, and the share of innovation expenditures in the total capital investment decreased by 13.3 pp. (Table 1.8). As a result, the share of innovation expenditures became 2.5 pp. smaller than in crisis-hit 2014. The share of innovative products in the total sales of industrial products was falling year by year in the period under study (the cumulative decrease was 5.43-fold), and made only 0.7% in 2017. Note that this indicator is missing for 2016.

Table 1.8. Indicators of innovation in the industry, by Ukrainian region, %

Region	The share of enterprises introducing innovations in the total number of industrial enterprises							The share of in the innovation expenditures total capital investment							The share of innovative products in the total sales of industrial products					
	2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2017
Ukraine	**12.8**	**13.6**	**13.6**	**12.1**	**15.2**	**16.6**	**14.3**	**18.2**	**12.5**	**9.8**	**8.9**	**15.8**	**19.7**	**6.4**	**3.8**	**3.3**	**3.3**	**2.5**	**1.4**	**0.7**
Vinnytsia	11.4	13.7	15.2	11.8	12.9	14.1	9.6	2.5	21.8	26.2	34.2	24.7	38.6	4.0	2.2	1.6	2.3	2.3	0.6	0.9
Volyn	11.1	12.1	10.0	9.0	10.6	10.2	15.1	12.7	16.1	25.1	20.6	2.4	8.8	8.8	5.6	1.7	3.0	2.5	2.2	0.3
Dnipropetrovsk	7.1	7.7	7.8	8.0	8.9	13.8	9.9	7.9	9.5	9.0	6.5	50.3	85.0	4.6	0.5	0.8	1.9	0.7	0.4	0.1
Donetsk	9.5	10.9	10.3	9.1	7.1	11.6	11.5	19.3	8.6	5.6	6.5	16.7	8.5	7.3	2.1	2.2	3.0	1.7	0.5	1.3
Zhytomyr	13.8	15.6	17.2	8.6	14.9	14.5	13.9	34.5	6.3	5.9	5.0	2.4	7.3	0.4	3.8	5.1	5.5	1.4	1.8	0.5
Zakarpattia	8.5	6.6	5.5	4.5	8.0	7.5	9.0	2.5	5.0	3.4	2.2	2.6	4.5	1.7	11.9	13.4	15.5	8.4	4.6	1.8
Zaporizhzhia	18.3	17.8	18.0	15.9	19.2	21.1	16.8	17.4	5.3	6.9	6.2	6.6	7.9	14.0	3.2	2.2	2.3	1.7	1.2	2.4
Ivano- Frankivsk	17.4	17.1	17.0	15.9	18.4	14.8	17.8	12.5	10.1	29.0	3.7	4.5	2.9	3.7	5.2	7.5	4.3	3.8	1.3	0.4
Kyiv	7.4	8.0	9.7	8.8	13.0	15.2	11.0	6.5	2.7	1.2	1.3	1.5	4.3	2.5	2.3	1.7	2.4	2.2	0.8	0.8
Kirovohrad	12.5	12.8	13.1	11.7	21.8	14.7	14.2	5.8	31.8	12.0	12.0	17.0	20.5	31.1	5.3	2.8	6.4	2.9	2.1	1.8
Luhansk	12.5	11.4	9.9	7.6	8.8	8.8	7.2	3.5	6.1	4.7	0.8	2.0	2.9	4.4	2.7	3.4	2.1	0.2	0.1	0.1
Lviv	9.8	10.8	12.0	12.6	18.4	18.6	14.9	6.7	10.4	7.4	8.0	7.6	6.7	3.6	1.5	2.1	3.0	2.1	1.9	0.8
Mykolaiv	9.7	13.8	11.7	10.1	23.7	19.8	17.2	23.7	21.1	28.8	50.0	32.5	22.5	13.7	3.3	0.9	3.0	1.5	0.3	1.0
Odesa	12.8	14.0	11.3	9.8	17.2	18.8	15.3	11.6	27.1	2.1	19.5	2.8	9.7	5.0	2.2	3.6	3.6	2.4	2.1	0.3
Poltava	7.4	7.4	6.9	6.8	14.6	12.8	8.9	2.8	2.8	4.0	7.2	3.6	6.0	1.2	24.3	14.4	6.5	8.9	1.9	0.2
Rivne	10.5	14.2	13.4	14.5	9.8	11.9	5.2	5.0	6.9	3.1	1.2	0.4	3.3	0.5	0.9	0.6	0.8	0.8	0.6	0.0
Sumy	16.0	16.8	13.2	12.3	19.0	17.8	15.4	27.9	26.1	27.1	61.9	16.8	19.4	28.1	12.4	10.6	10.4	10.4	7.1	2.0
Ternopil	17.8	17.4	11.8	9.5	17.4	25.0	27.5	19.0	17.5	6.1	14.1	2.6	9.0	7.4	7.6	7.4	2.6	1.7	1.4	0.8
Kharkiv	17.5	20.8	21.4	21.0	23.7	25.8	26.6	19.9	25.3	22.2	25.3	19.6	28.8	17.8	2.4	4.8	4.8	3.8	3.4	2.2
Kherson	11.9	12.3	13.3	10.8	20.7	16.7	15.5	7.0	25.5	22.8	12.4	9.2	11.1	2.3	4.9	5.6	4.0	5.4	1.4	1.5
Khmelnytskyi	20.9	22.2	17.9	9.9	12.3	12.1	5.7	43.6	34.0	12.7	14.4	5.7	2.3	1.0	2.1	2.3	1.6	0.9	0.7	0.1
Cherkasy	17.0	15.5	14.6	10.1	17.2	15.4	23.7	2.9	6.9	2.5	4.3	5.7	3.1	8.6	3.8	1.2	2.0	1.6	0.7	1.1
Chernivtsi	11.4	9.5	8.2	9.2	15.1	20.4	14.5	5.8	30.6	24.8	36.1	7.3	4.6	5.7	4.9	3.5	2.6	2.0	2.4	0.9
Chernihiv	10.6	13.7	12.0	7.8	12.4	14.3	9.6	5.8	7.2	21.1	11.4	3.6	4.1	4.4	1.7	1.4	0.9	1.0	0.5	1.0

Source: elaborated by the authors based on SSSU, 2019.

In spite of the shrinking innovation activity across the domestic industry, there were some regions in 2017 that could increase some of the innovation-related indicators. Thus, the share of enterprises introducing innovations in the total number of industrial enterprises grew in Volyn, Zakarpattia, Ivano-Frankivsk, Ternopil, Kharkiv, and Cherkasy regions. in the latter three regions, the share exceeded 23% (against 14.3% across Ukraine).

The share of innovation expenditures in the total capital investment increased in 2017 in 8 regions and became the highest in Kirovohrad (31.1%) and Sumy (28.1%) regions. But the share of innovative products in the total sales of industrial products was smaller than 1% in 14 regions. It was higher than 2% only in Zaporizhzhia, Sumy, and Kharkiv regions.

The highest innovation activity in the industry (assessed by three analyzed indicators) could be found in 2017 in Zaporizhzhia, Kirovohrad, Sumy, Kharkiv, and Cherkasy regions, the lowest one – in Rivne and Khmelnytskyi regions. The overall innovation activity of the Ukrainian industry was relatively low. in 2017, Ukraine performed 1.3 times worse than Poland by the share of enterprises introducing innovations in the total number of industrial enterprises, and 12.6 times worse by the share of the innovative products in the total sales of industrial products.

The production capacities utilization in the industry is measured by two key indicators: capital productivity and labor productivity, showing the effectiveness of management of fixed and human assets. in the period under study, these indicators had different dynamics (see Table 1.9).

The capital productivity decreased by 1.55 times in 2011-2013, but grew by 1.5 times in the following four years relative to 2013. The labor productivity showed an upward tendency over the period under study (except for a slight decrease in 2013); in 2017 it exceeded the figure of 2011 by 2.8 times.

The resource efficiency in the Ukrainian industry in 2017 compared with the previous year was dependent on the following factors: the increased sales of industrial products (in value terms, by 21.68%); the increased value of non-current assets (by 6.93%); the reduced employment across the industry (by 2.17%).

The highest per capita labor productivity in the industry could be found in Poltava region: 1.956 million UAH (against 1.451 million UAH in 2016). This indicator grew in Poltava region as a result of the increased sales of industrial products (by 34.0%) in parallel with the reduced average employment in the industry (by 0.6%). Also, the industry in Poltava region could reach considerable growth in the capital productivity (by 47.8 pp.), allowing it to join, once again, the group of top five by this indicator: Poltava, Sumy, Kharkiv, Cherkasy, and Chernihiv regions (higher than 4 UAH / UAH).

One of the remarkably positive tendencies was the slowing rates of employment reduction in the domestic industry. The industrial employment grew in eight regions in 2017 (against seven in 2016 and one in 2015); the largest growth was

Table 1.9. Indicators of resource efficiency in the industry, by Ukrainian region

Region	Capital productivity, UAH / UAH							Labor productivity, million UAH / person						
	2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017
Ukraine	**1.980**	**1.429**	**1.280**	**1.338**	**1.539**	**1.695**	**1.929**	**0.389**	**0.409**	**0.404**	**0.493**	**0.690**	**0.865**	**1.076**
Vinnytsia	3.168	2.404	2.252	2.449	2.626	2.901	2.896	0.280	0.290	0.336	0.410	0.574	0.743	0.896
Volyn	1.764	1.760	1.648	1.959	2.104	2.408	2.569	0.196	0.206	0.201	0.261	0.382	0.465	0.576
Dnipropetrovsk	1.471	1.585	1.587	1.300	1.559	1.620	2.148	0.488	0.542	0.540	0.658	0.813	0.977	1.288
Donetsk	2.359	1.928	1.634	1.336	1.331	1.473	2.000	0.516	0.465	0.444	0.419	0.772	0.893	1.328
Zhytomyr	1.739	1.638	1.555	1.573	2.256	2.319	2.388	0.183	0.204	0.211	0.254	0.361	0.465	0.509
Zakarpattia	2.029	1.806	1.676	1.618	1.622	1.862	2.133	0.145	0.161	0.166	0.187	0.237	0.314	0.382
Zaporizhzhia	2.209	1.779	1.627	1.616	1.834	2.083	2.204	0.422	0.430	0.419	0.566	0.785	0.938	1.159
Ivano- Frankivsk	2.006	1.671	1.194	1.131	1.890	2.066	2.200	0.338	0.348	0.305	0.366	0.510	0.542	0.715
Kyiv	1.248	1.283	1.125	1.027	1.137	1.173	1.129	0.341	0.413	0.484	0.518	0.646	0.813	0.903
Kirovohrad	2.197	2.671	2.657	2.050	2.486	2.864	2.397	0.219	0.283	0.336	0.389	0.455	0.517	0.605
Luhansk	2.655	1.935	2.586	1.113	0.930	1.235	1.049	0.388	0.341	0.302	0.195	0.252	0.395	0.335
Lviv	1.767	1.566	1.302	1.389	1.911	2.155	1.964	0.200	0.219	0.219	0.257	0.393	0.486	0.577
Mykolaiv	2.277	2.276	1.759	2.087	0.810	1.138	3.334	0.295	0.329	0.309	0.375	0.515	0.699	0.821
Odesa	1.670	1.182	1.128	1.368	1.942	1.900	1.989	0.290	0.302	0.296	0.373	0.633	0.712	0.788
Poltava	3.539	3.003	2.300	2.489	3.054	3.870	4.348	0.587	0.638	0.584	0.749	1.054	1.451	1.956
Rivne	2.643	1.901	1.862	1.842	2.586	3.088	3.445	0.231	0.186	0.242	0.301	0.415	0.489	0.590
Sumy	3.321	3.405	3.102	3.681	4.751	4.056	4.068	0.274	0.292	0.290	0.349	0.499	0.503	0.607
Ternopil	1.874	2.010	1.524	1.563	3.559	3.640	3.853	0.194	0.184	0.197	0.244	0.379	0.470	0.604
Kharkiv	3.372	3.280	3.123	2.638	4.049	4.701	4.544	0.263	0.309	0.315	0.297	0.497	0.678	0.808
Kherson	2.209	1.796	1.719	2.016	2.536	3.541	3.081	0.240	0.216	0.231	0.273	0.423	0.646	0.714
Khmelnytskyi	2.072	2.032	1.928	1.657	1.756	1.950	2.000	0.216	0.236	0.250	0.239	0.324	0.386	0.506
Cherkasy	3.172	2.925	2.822	3.390	4.236	4.775	5.146	0.353	0.396	0.378	0.494	0.640	0.788	0.933
Chernivtsi	1.403	1.610	1.504	1.794	2.157	2.611	2.665	0.110	0.103	0.104	0.128	0.189	0.255	0.272
Chernihiv	3.992	4.323	3.475	3.415	4.117	4.900	5.300	0.245	0.327	0.318	0.393	0.526	0.716	0.885

Source: elaborated by the authors based on SSSU, 2019.

recorded in Lviv region (6.38%). But in Luhansk, Donetsk, and Dnipropetrovsk regions the employment reduced by 17.27%, 13.78% and 3.42%. respectively. in spite of this, in the two latter regions (along with Kharkiv region) the share of industrial employment was the highest one: 14.58% in Dnipropetrovsk region and 8.58% in Donetsk region. But in Luhansk region this share decreased to 2.91% (against 8.17% in 2011), whereas in Lviv region it grew to 6.77% (against 5,23%). in view of the above, the overall resource efficiency of the Ukrainian industry could be increased given the continuingly growing (from 2014 and on) capital productivity and labor productivity. Yet, if measured by the latter indicator, it was thrice lower than in Poland.

The economic effectiveness of the industry is measured by operating profitability, profitability of turnover, and return on assets. in 2016-2017, the operating profitability in the Ukrainian industry grew, after its considerable decrease in four previous years. in 2017, its average level reached 6.8%, which is 1.45 times higher than in 2011 (Table 1.10). The operational (or main) activity in the industry became profitable in 22 regions (against 10 in 2014).

Profitability of turnover and return on assets in the domestic industry were below zero in 2014 and the following years on account of loss-making result from the normal operations before tax. in 2017, the domestic industry gained the profit worth 87461.7 million UAH (against 7569.6 million UAH in the previous year). This triggered growth in profitability of turnover and return on assets across the industry, which was nearly twice higher than in 2012. Still, the financial result from the normal operations before tax was below zero in 9 regions (against 11 in 2016). in particular, the loss-making of the industry aggravated in Donetsk, Zhytomyr, and Luhansk regions.

In 2017, the highest cost-effectiveness in the industry was recorded for Dnipropetrovsk and Zaporizhzhia regions, which could occur due to the considerable growth in all the three profitability indicators to maximal level among the Ukrainian regions. This growth resulted from the financial result from the normal operations before tax, increased by 3.3 times in Dnipropetrovsk region and 1.7 times in Zaporizhzhia region. A high cost-effectiveness in the industry was also recorded in 2017 for Vinnytsia, Poltava, and Cherkasy regions.

Kharkiv region needs a separate mention because of the continuing profit-making of its industry throughout 2011-2017, in contrast with the other regions. While the financial result from the normal operations in the industry before tax had been falling in 2014-2016, it could be increased by 7.4 times in 2017. It should also be noted that absolute positive values of all the profitability indicators in Kirovohrad regions could be increased after their plummeting in 2015.

The overall industry performance enhanced in Ukraine in 2017 compared with the previous years. However, the following package of organizational-economic and financial arrangements should be implemented, in order to stop the chronic

Table 1.10. Indicators of cost-effectiveness in the industry, by Ukrainian region

Region	Profitability of turnover							Return on assets							Operating profitability						
	2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017
Ukraine	**4.5**	**1.6**	**1.0**	**–11.6**	**–10.2**	**–0.4**	**3.3**	**4.2**	**1.2**	**0.7**	**–8.3**	**–7.7**	**–0.3**	**2.8**	**4.7**	**3.4**	**3.0**	**1.6**	**0.9**	**4.2**	**6.8**
Vinnytsia	1.3	1.7	2.9	–1.0	0.8	2.6	5.7	2.0	2.1	3.4	–1.3	1.0	3.5	6.9	2.8	3.5	4.8	4.6	5.4	5.2	7.0
Volyn	4.1	2.1	2.1	–1.6	1.5	2.6	3.0	3.6	1.9	1.8	–1.6	1.6	2.8	3.2	4.3	3.9	3.9	6.8	6.4	4.5	5.4
Dnipropetrovsk	12.3	4.4	5.8	–0.5	–4.6	3.3	8.7	4.1	3.8	4.9	–0.4	–3.6	2.5	7.0	12.1	6.2	8.0	7.6	2.1	6.4	10.4
Donetsk	0.7	–2.7	–3.2	–12.8	–20.8	–3.3	–7.3	0.7	0.9	–2.6	–8.5	–13.2	–2.1	–5.5	0.8	–0.8	–1.1	–0.7	–6.8	1.9	–2.0
Zhytomyr	1.2	1.2	0.8	–9.5	–6.9	–0.1	–0.5	1.2	1.2	0.7	–8.3	–8.1	–0.2	–0.5	3.1	4.1	3.4	–2.4	0.0	3.4	2.4
Zakarpattia	2.0	1.3	0.8	–10.5	–8.6	0.7	–3.0	2.0	1.2	0.7	–9.6	–7.7	0.7	–3.3	3.0	2.6	2.2	0.0	0.2	3.2	1.0
Zaporizhzhia	5.1	4.1	7.1	–7.2	–3.9	6.1	8.7	5.7	4.0	6.4	–6.2	–3.7	5.6	7.8	4.9	5.9	9.2	11.6	9.5	13.1	12.6
Ivano- Frankivsk	–5.4	–6.2	–2.9	–28.5	–21.4	–7.2	–1.5	–5.9	–6.8	–2.2	–19.1	–14.4	–4.6	–1.1	–2.0	–3.4	–0.4	–0.1	2.0	3.9	3.9
Kyiv	3.0	3.1	3.4	–9.9	–5.3	2.1	3.4	1.9	2.1	2.1	–5.6	–3.2	1.3	2.3	4.6	4.8	3.9	–0.7	2.0	5.3	5.6
Kirovohrad	6.1	0.0	0.0	0.0	–56.9	0.6	2.3	4.7	3.5	0.8	0.0	–64.6	0.8	2.5	7.4	8.5	6.4	–28.1	–32.3	2.0	3.2
Luhansk	–3.3	–8.1	–12.3	–126.6	–204.1	–78.6	–118.3	–4.0	–7.3	–4.2	–60.9	–68.9	–28.5	–34.9	–0.4	–4.7	–13.4	–20.8	–24.2	–16.8	–35.1
Lviv	2.4	0.9	2.6	–8.9	–5.9	1.3	1.6	2.0	0.7	1.8	–5.9	–5.0	1.0	1.3	3.2	1.7	3.8	1.5	1.1	3.9	3.6
Mykolaiv	2.3	2.6	0.5	–22.6	–10.0	–11.9	–0.4	2.3	2.4	0.4	–20.4	–5.1	–8.2	–0.5	3.3	5.4	2.6	–5.7	–0.3	–6.6	4.6
Odesa	–1.5	–4.0	–5.9	–23.3	–7.7	–6.0	–2.8	–1.3	–3.0	–4.2	–16.0	–7.9	–5.7	–2.7	0.9	1.5	–1.3	–10.7	–1.7	–1.5	2.4
Poltava	10.1	6.8	5.5	–3.4	–8.0	–0.9	3.9	14.5	9.5	6.2	–3.9	–9.9	–1.2	6.9	10.4	9.0	7.8	11.7	5.4	6.6	10.3
Rivne	0.9	–8.4	–7.7	–40.3	–24.7	–5.8	–1.2	1.0	–6.3	–5.6	–33.3	–24.0	–6.4	–1.7	2.3	–5.7	–5.0	–22.4	–15.1	–5.0	1.0
Sumy	4.9	7.1	4.4	–3.1	–1.1	2.8	2.2	6.9	9.7	5.6	–4.0	–1.6	3.9	3.0	6.0	8.9	6.7	4.9	6.5	8.1	5.7
Ternopil	–12.5	–0.5	–4.5	–15.9	–1.1	0.7	–21.6	–11.8	–0.5	–3.9	–14.5	–1.7	0.9	–31.3	–7.5	1.4	–1.3	–1.9	3.3	3.1	2.8
Kharkiv	5.7	3.3	3.3	0.9	0.5	0.4	2.5	7.4	4.0	4.0	0.9	0.7	0.6	3.8	6.7	5.6	6.2	3.6	4.7	3.2	4.7
Kherson	–1.5	–0.1	–2.2	–17.0	–8.3	–1.7	0.3	–1.4	–0.1	–2.0	–14.7	–8.4	–2.1	0.4	2.1	2.4	0.4	–5.9	–1.9	1.1	2.8
Khmelnytskyi	3.4	1.3	2.4	–18.4	–14.7	–3.5	0.1	4.0	1.5	2.7	–16.2	–13.3	–3.3	0.1	4.8	6.0	6.9	–6.6	–5.5	1.6	5.6
Cherkasy	–0.6	0.2	–2.7	–18.0	–8.6	0.6	3.8	–0.5	0.2	–2.2	–13.8	–7.1	0.6	4.2	4.4	1.8	–1.2	–6.9	–3.2	3.9	9.1
Chernivtsi	–0.8	4.9	0.6	–1.7	0.6	2.5	2.0	–0.7	4.6	0.6	–1.8	0.8	3.3	2.6	0.8	1.2	2.3	0.4	2.9	3.6	0.6
Chernihiv	1.5	1.5	2.0	–3.3	–5.3	–6.0	1.9	2.4	3.0	3.4	–5.5	–9.4	–3.5	3.2	3.3	3.6	5.4	6.2	1.4	–3.6	4.9

Source: elaborated by the authors based on SSSU, 2019.

negative tendencies in the domestic industry (first of all, the degrading structure of assets and the plummeting innovation activity, in particular the shrinking share of innovative products in the total sales of industrial products, etc.), to assure the continuing increase in capital productivity, labor productivity, profitability of industrial entities, to increase the industry's share in the total exports, to increase the industrial investment:

– enhance the innovation activity in every region (stimulate the development of high tech industries);

– promote FDI (expand the access of domestic industrial entities to FDI and enhance the foreign investor's awareness of potential areas for FDI);

– increase the export capacities if necessary (stimulate export activities of enterprises, diversify the commodity structure of domestic exports, balance the commodity structure of exports by trading partners of Ukraine).

A comprehensive solution for the problems related with operation and development of the Ukrainian industry calls for structural modernization of the industry, intended to increase the share of high tech economic activities in the domestic output and exports, to meet the domestic market demand for home-made products and enhance the efficiency of the domestic production. This study of the author will be followed by search for effective models for structural transformation of the Ukrainian economy (its regional level in particular) within the framework of the European platform for smart specialization of the industry. in particular, it is interesting to utilize panel data and to analyze what the variables studied have the most influence.

1.3. Import dependence of the economy of Ukraine and EU countries by segments of industrial consumption

A geopolitical changes, the processes of reformatting the priorities and the strategic directions of the global economy determine the actualization of import dependence as one of the key factors influencing the socio-economic development of individual countries. The country's high dependence on imports of goods and services causes its economy to be open (and therefore vulnerable) to external economic influences, such as fluctuations in world market prices, unfair economic behavior of exporting countries, and the others. The external economic pressure is increasingly becoming an instrument in international competition and even leads to the deployment of price wars and armed confrontations over control of strategic resources.

As the world experience shows, most countries at certain stages of their development have pursued a policy of import substitution in order to protect cer-

tain sectors of their economies until they reach a sufficient level of competitiveness in the world market. Moreover, countries that have today reached the top of the world economic rankings due to the free market and free trade policy (UK, USA, DEU, JPN), in the past have been the most active in using protectionist measures to support domestic producers.

The need for import substitution for Ukraine is due to the fact that this process is a catalyst for structural changes in the economy, a prerequisite for its innovative development, a stimulus to increase business activity, as well as a basis for developing the export potential of domestic producers. The formation of the basic principles of import substitution policy should be preceded by an objective analysis of the level of import dependence of the national economy and, above all, its industrial sector. The latter is due to the fact that the structure of imports of goods and services in Ukraine is dominated by industrial products. Its share during 2012-2016 decreased to 5.02 pp., in particular, in mining – 10.01 pp. (including extraction of crude oil and natural gas – 8.07 pp.) (Table 1.11).

Table 1.11. Share of industrial products in imports of goods and services in Ukraine, %

Indicator	2012	2013	2014	2015	2016
Industry	**84.92**	**82.80**	**82.00**	**81.46**	**79.90**
Manufacturing	65.02	65.71	68.07	64.25	69.96
Mining and quarrying, including:	19.77	16.95	13.77	15.72	9.76
extraction of crude oil and natural gas	…	13.76	9.71	10.76	5.69

Source: elaborated by the authors based on SSSU, 2019.

Instead, the share of manufacturing products in the structure of imports of goods and services in 2016, compared to the previous year, increased to 5.71 pp. For comparison, the share of industrial products in imports of goods and services of Poland in 2016 was 45.87% (which is 34.03 pp. less than in Ukraine), and the highest value of this indicator among the Member States of the European Union (EU) – in Hungary (55.09%) (Annex A, Table A.1).

The high share of industrial products in imports of goods and services of Ukraine, compared to EU member states, is due to structural features and the level of development of the national economy. Given the dominance of manufacturing products in the structure of imports of goods and services, this study focuses on assessing the level of import dependence of the economy on this type of industrial products.

A generalized indicator of industrial products consumed and used in the country is the indicator of total consumption, which is defined as the sum of outputs and imports minus the volume of exports of these products. To determine the

level of import dependence of the economy, it is proposed to use the indicator of the share of imports in total consumption[1]. The higher the value of this indicator, the higher the country's import dependence and, consequently, the higher the risks to its economic security.

Domestic processing industry has significant production and raw materials and human capital, and hence development potential. However, Ukraine's economy is characterized by a fairly high dependence on imports of industrial goods, in particular, compared to EU member states, similar in key structural parameters of the industrial sector (Fig. 1.4).

Thus, in 2016, in terms of the share of imports in the total consumption of products of the processing industry, Ukraine was ahead of only Hungary and Slovakia, behind, for example, Poland to 18.49 pp. (52.39% vs. 33.90%).

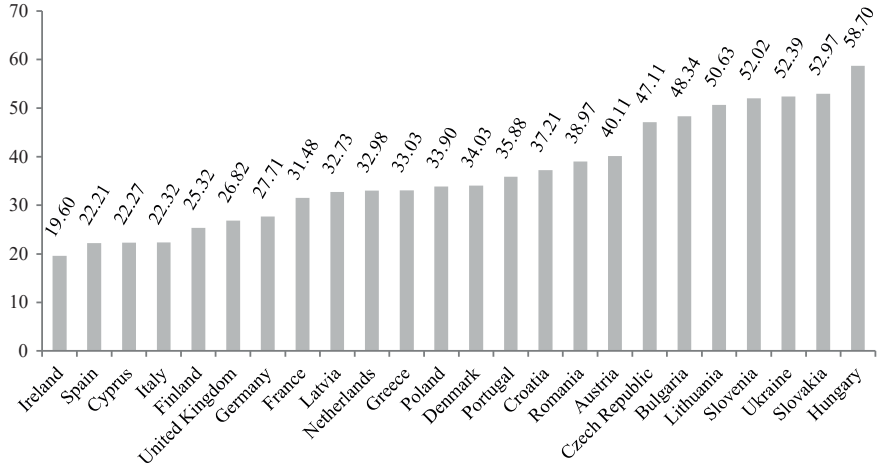


Fig. 1.4. Share of imports in the total consumption of products of the processing industry in Ukraine and the EU in 2016, %

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019.

Ukrainian economy, compared to the Polish, is much more dependent on imports of industrial products of processing industries of all levels of technology (Table 1.12).

The largest gap between countries in terms of the share of imports in total consumption is typical for products of medium-high-tech industries (28.75 pp. in 2016), and the lowest – for low-tech products (13.17 pp.).

[1] The share of imports in total consumption = Imports of goods and services / (Output + Imports of goods and services – Exports of goods and services).

Table 1.12. Share of imports in total consumption of products of processing industry in Ukraine and Poland, %

The group	The production	Ukraine				Poland				Deviation (+/–)			
		2013	2014	2015	2016	2013	2014	2015	2016	2013	2014	2015	2016
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	72.09	71.78	65.45	66.67	42.37	43.09	44.34	42.73	29.73	28.69	21.10	23.94
	Manufacture of computers, electronic and optical products	93.57	91.48	96.96	93.37	64.16	66.19	72.58	71.72	29.42	25.29	24.39	21.64
	Total	**82.41**	**80.09**	**80.04**	**79.75**	**58.48**	**60.38**	**64.60**	**63.00**	**23.93**	**19.71**	**15.45**	**16.75**
The medium-high-tech	Manufacture of chemicals and chemical products	73.62	78.43	75.73	79.53	29.64	30.37	29.32	28.89	43.98	48.06	46.41	50.64
	Production of electric equipment	71.61	66.57	72.26	73.26	50.89	52.49	53.65	55.71	20.72	14.08	18.61	17.55
	Manufacture of machinery and equipment not elsewhere classified	83.18	91.80	96.53	89.78	27.45	27.56	25.62	29.58	55.73	64.24	70.91	60.19
	Production of motor vehicles, trailers and semitrailers	91.84	83.93	89.40	91.98	69.66	67.89	69.75	70.05	22.17	16.05	19.65	21.93
	Manufacture of other transport equipment	13.92	28.17	18.11	20.66	66.31	58.90	54.66	61.13	–52.38	–30.73	–36.55	-40.47
	Total	**71.92**	**76.54**	**78.75**	**81.11**	**50.09**	**49.73**	**50.10**	**52.37**	**21.82**	**26.80**	**28.65**	**28.75**
The moderately-low-tech	Production of coke and coke products of oil refining	56.98	67.43	66.41	62.69	44.58	47.71	43.97	40.14	12.40	19.71	22.44	22.55
	Manufacture of rubber and plastic products	50.75	49.46	47.47	47.61	36.04	35.33	34.27	35.13	14.71	14.13	13.20	12.48
	Manufacture of other non-metallic mineral products	25.28	26.31	23.78	23.57	15.97	16.16	17.09	18.92	9.31	10.15	6.70	4.65
	Metallurgical production	32.37	30.27	29.17	24.85	27.81	29.71	30.63	31.80	4.56	0.56	–1.46	-6.95
	Manufacture of fabricated metal products, except machinery and equipment	48.28	59.80	58.48	55.35	23.76	23.21	21.06	21.36	24.52	36.58	37.43	33.99
	Total	**43.47**	**49.35**	**48.18**	**43.25**	**33.63**	**33.98**	**30.80**	**29.83**	**9.84**	**15.36**	**17.38**	**13.42**
The low-tech	Food production; drinks and tobacco products	20.08	20.38	19.04	23.08	15.75	15.67	15.67	16.95	4.33	4.71	3.38	6.13
	Textile production, clothing, leather and other materials	88.74	81.91	77.98	77.88	32.10	32.46	30.23	31.99	56.64	49.45	47.75	45.89
	Manufacture of wood and paper; printing and duplication	39.54	40.81	38.39	36.90	20.71	20.48	20.03	20.03	18.83	20.34	18.36	16.86
	Furniture production; other products	32.53	30.10	38.76	38.55	21.18	23.45	21.66	21.89	11.35	6.65	17.10	16.65
	Total	**30.06**	**29.91**	**29.58**	**32.31**	**18.28**	**18.47**	**18.20**	**19.14**	**11.79**	**11.43**	**11.38**	**13.17**
Total manufacturing		**48.93**	**51.02**	**51.26**	**52.39**	**33.60**	**34.17**	**33.49**	**33.90**	**15.32**	**16.85**	**17.77**	**18.49**

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019.

In terms of production in 2016, Ukraine was the second largest in Poland in terms of dependence on imports of engineering products (to 60.19 pp.), as well as the chemical (50.64 pp.) and the light (45.89 pp.) industries. At the same time, both countries have the lowest dependence on imports of food products, but in Ukraine the share of imports in total consumption of these products in 2016 was higher to 6.13 pp. (vs. 4.33 pp. in 2013). On the other hand, the existing production potential of the other vehicles in Ukraine determines a much lower (to 40.47 pp.) level of import dependence on this type of product than in Poland. The situation is similar with metallurgical products.

In general, there have been positive trends in Ukraine in the direction of reducing import dependence on total consumption of processing products. Thus, in 2016 there was a decrease in the share of imports in total consumption of products of such industries (Annex A, Table A.2):

– the high-tech – to 0.29 pp., in particular, the production of computers, electronic and optical products to 3.60 pp.;

– the medium-low-tech – to 4.93 pp. (the except for the production of rubber and plastic products).

In addition, there was a decrease in the level of dependence on imports of machinery and equipment (to 6.75 pp.), which are products of medium-high-tech production, as well as products of the following low-tech industries:

– the textile production, production of clothing, leather and the other materials (to 0.10 pp.);

– the production of wood, paper; printing and replication (to 1.49 pp.);

– the furniture production; the other products (to 0.21 pp.).

The decrease in the level of import dependence of the Ukrainian economy is caused by an increase in the rate of total consumption of domestic industrial products (Table 1.13).

Thus, the growth rate of domestic products of the processing industry in 2016 reached 28.82% vs. 1.20% in 2014, in particular, the high-tech industries – 42.16% vs. 23.25%. The growth rate of the total domestic consumption increased in the most (10) manufacturing industries. It is also positive that the growth of total consumption of domestic products by key industries significantly exceeded the growth of imported ones. This applies in particular to the manufacture of computers, electronic and optical products; production of machinery and equipment not elsewhere classified, as well as metallurgical production.

However, the growth rate of total consumption of imported products of the processing industry in Ukraine in 2016 exceeded the same indicator of domestic products to 5.97 pp. (vs. 1.17 pp. in 2015). The imports of pharmaceutical products, electrical equipment, motor vehicles and mechanical engineering, as well as food products grew at the fastest pace. At the same time, the growth rate of imports of the chemical products and refined products decreased significantly.

Table 1.13. Dynamics of total consumption of products of the processing industry in Ukraine, %

The group	The production	Growth rate / decrease in total consumption								
		total			domestic products			imported products		
		2014	2015	2016	2014	2015	2016	2014	2015	2016
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	21.12	14.01	33.08	22.48	39.59	28.38	20.60	3.95	35.56
	Manufacture of computers, electronic and optical products	–4.34	34.72	48.23	26.85	–52.02	224.00	–6.48	42.80	42.73
	Total	**8.89**	**22.75**	**40.10**	**23.25**	**23.04**	**42.16**	**5.83**	**22.68**	**39.58**
The medium-high-tech	Manufacture of chemicals and chemical products	14.80	54.35	18.45	–6.14	73.64	–0.06	22.31	49.04	24.38
	Production of electric equipment	9.10	–1.82	41.27	28.49	–18.55	36.18	1.41	6.58	43.22
	Manufacture of machinery and equipment not elsewhere classified	–11.89	26.58	83.82	–57.04	–46.40	441.08	–2.76	33.10	70.97
	Production of motor vehicles, trailers and semitrailers	–20.47	15.65	73.28	56.57	–23.68	31.06	–27.31	23.17	78.29
	Manufacture of other transport equipment	–31.61	–13.36	25.08	–42.93	–1.22	21.18	38.40	–44.31	42.72
	Total	**–5.36**	**28.67**	**44.22**	**–20.92**	**16.52**	**28.18**	**0.72**	**32.39**	**48.55**
The moderately-low-tech	Production of coke and coke products of oil refining	32.15	13.57	5.32	0.05	17.13	16.97	56.40	11.85	-0.57
	Manufacture of rubber and plastic products	11.02	35.80	29.84	13.92	41.16	29.50	8.21	30.32	30.22
	Manufacture of other non-metallic mineral products	0.16	27.49	37.93	–1.23	31.87	38.31	4.27	15.22	36.69
	Metallurgical production	2.73	4.06	51.89	5.92	5.70	61.15	–3.95	0.28	29.39
	Manufacture of fabricated metal products, except machinery and equipment	–0.82	34.17	29.47	–22.91	38.55	39.24	22.84	31.22	22.53
	Total	**12.17**	**18.10**	**27.21**	**0.50**	**20.83**	**39.31**	**27.33**	**15.29**	**14.20**
The low-tech	Food production; drinks and tobacco products	6.73	22.24	23.46	6.33	24.29	17.31	8.34	14.20	49.59
	Textile production, clothing, leather and other materials	11.70	35.59	28.99	79.49	65.02	29.58	3.10	29.09	28.82
	Manufacture of wood and paper; printing and duplication	13.92	22.35	30.37	11.52	27.36	33.53	17.59	15.08	25.30
	Furniture production; other products	–7.06	32.71	35.44	–3.70	16.27	35.91	–14.01	70.88	34.69
	Total	**6.81**	**24.38**	**26.10**	**7.04**	**24.96**	**21.21**	**6.27**	**23.02**	**37.74**
Total manufacturing		**5.54**	**23.12**	**31.88**	**1.20**	**22.53**	**28.82**	**10.06**	**23.70**	**34.79**

Source: elaborated by the authors based on SSSU, 2019.

Similar trends are characteristic of the dynamics of the total consumption of products of the processing industry in Poland (Annex A, Table A.2).

In the structure of total consumption of products of the processing industry in Ukraine during the analyzed period, the largest share was steadily occupied by goods of low- and medium-low-tech industries (65.63% in 2016), in particular: food production; beverages and tobacco products (22.36%), production of coke and coke products, refined products (9.21%) and metallurgical production (8.48%) (Table 1.14).

Relatively significant in this structure are the shares of production of chemicals and chemical products (10.13%) and production of machinery and equipment (7.77%), which belong to the medium-high-tech.

In turn, among these types of production, domestic products dominate in the consumption of goods only in the food and metallurgical industries. Instead, imported – in the consumption of goods of high- and medium-high-tech industries: a total of 53.01% in 2016 vs. 48.81% in 2015. The structure of total consumption of products of the processing industry in Poland is similar (Annex A, Table A.3).

In summary, we can state a generally high level of import dependence of Ukraine's economy. in order to outline directions and develop specific measures to implement the policy of import substitution, based primarily on the position of national economic security and protection of domestic producers, detailed objective information on the dynamics and volume of changes in imports of manufacturing is needed. Such information is provided by the results of an in-depth analysis of import dependence in the areas of resource use – the final consumption[2], intermediate consumption[3] and gross fixed capital formation[4].

Thus, in particular, in the structure of imports of the goods of processing industry in Ukraine in 2016, 59.80% accounted for intermediate consumption products, 23.46% – for the final consumption products and 16.73% – for a gross capital formation, in which 65.47% occupied fixed capital (Annex A, Table A.4). The dominance of intermediate goods in total imports of industrial products (with a share of ≈60%) of the processing industry indicates a high level of import dependence of the Ukrainian economy in this segment. in other words, 60% of domestic production and other areas depend on imported components and materials. This increases the risks to the stability of the national economy and its individual

[2] The final consumption of goods and services consists of household expenditures for own final consumption, expenditures of public institutions to meet individual and collective needs of society, as well as expenditures for individual final consumption of non-profit organizations serving households.

[3] The intermediate consumption includes expenditures on goods and services used by institutional units for production purposes.

[4] The gross fixed capital formation is the acquisition by resident producers, net of disposal, of fixed assets during the reporting period, including the increase in the value of unproduced assets resulting from the productive activities of entrepreneurs or institutional units. Fixed assets are produced assets that used in production for more than one year.

Table 1.14. Structure of total consumption of products of processing industry in Ukraine, %

The group	The production	Total				Domestic products				Imported products			
		2013	2014	2015	2016	2013	2014	2015	2016	2013	2014	2015	2016
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	3.83	4.39	4.07	4.10	2.09	2.53	2.88	2.87	5.64	6.18	5.19	5.22
	Manufacture of computers, electronic and optical products	3.54	3.21	3.51	3.94	0.45	0.56	0.22	0.55	6.77	5.75	6.64	7.03
	Total	**7.36**	**7.60**	**7.58**	**8.05**	**2.54**	**3.09**	**3.10**	**3.42**	**12.40**	**11.93**	**11.83**	**12.25**
The medium-high-tech	Manufacture of chemicals and chemical products	8.28	9.00	11.28	10.13	4.27	3.96	5.62	4.36	12.45	13.84	16.67	15.38
	Production of electric equipment	2.59	2.68	2.14	2.29	1.44	1.83	1.22	1.28	3.79	3.49	3.01	3.20
	Manufacture of machinery and equipment not elsewhere classified	6.49	5.42	5.57	7.77	2.14	0.91	0.40	1.67	11.04	9.76	10.50	13.31
	Production of motor vehicles, trailers and semitrailers	5.09	3.83	3.60	4.73	0.81	1.26	0.78	0.80	9.55	6.31	6.28	8.31
	Manufacture of other transport equipment	3.24	2.10	1.48	1.40	5.46	3.08	2.48	2.33	0.92	1.16	0.52	0.55
	Total	**25.69**	**23.03**	**24.07**	**26.32**	**14.12**	**11.04**	**10.49**	**10.44**	**37.76**	**34.55**	**36.98**	**40.76**
The moderately-low-tech	Production of coke and coke products of oil refining	9.98	12.50	11.53	9.21	8.41	8.31	7.95	7.22	11.63	16.52	14.94	11.02
	Manufacture of rubber and plastic products	3.96	4.17	4.60	4.53	3.82	4.30	4.96	4.98	4.11	4.04	4.26	4.11
	Manufacture of other non-metallic mineral products	4.65	4.41	4.57	4.78	6.80	6.64	7.15	7.67	2.40	2.28	2.12	2.15
	Metallurgical production	8.95	8.71	7.36	8.48	11.85	12.40	10.70	13.38	5.92	5.17	4.19	4.02
	Manufacture of fabricated metal products, except machinery and equipment	4.21	3.96	4.31	4.23	4.26	3.25	3.67	3.97	4.15	4.64	4.92	4.47
	Total	**31.76**	**33.75**	**32.37**	**31.23**	**35.15**	**34.90**	**34.42**	**37.22**	**28.22**	**32.64**	**30.42**	**25.78**
The low-tech	Food production; drinks and tobacco products	23.79	24.06	23.89	22.36	37.23	39.11	39.67	36.13	9.76	9.61	8.87	9.85
	Textile production, clothing, leather and other materials	3.12	3.30	3.64	3.56	0.69	1.22	1.64	1.65	5.66	5.30	5.53	5.29
	Manufacture of wood and paper; printing and duplication	4.84	5.22	5.19	5.13	5.72	6.31	6.56	6.80	3.91	4.18	3.88	3.61
	Furniture production; other products	3.45	3.04	3.27	3.36	4.55	4.33	4.11	4.34	2.29	1.79	2.47	2.47
	Total	**35.19**	**35.62**	**35.98**	**34.40**	**48.19**	**50.97**	**51.98**	**48.91**	**21.62**	**20.88**	**20.76**	**21.22**
Total manufacturing		**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: elaborated by the authors based on SSSU, 2019.

sectors, especially in a period of global change, accompanied by deteriorating market conditions.

In the structure of imports of the goods of processing industry in the segment of intermediate consumption in 2016 dominated by (with a share of over 80%) the products of such industries (Annex A, Table A.4): wood, paper (91.69%), coke and coke products and products oil refining (87.50%), chemicals and chemical products (93.58%), rubber and plastic products (91.46%), the other non-metallic mineral products (86.98%), metallurgical production (99.83%) and manufacture of fabricated metal products, except machinery and equipment (83.06%).

The share of imported products of the processing industry in the intermediate consumption of the economy of Ukraine in 2016 reached 52.4% vs. 46.2% in 2013 (Table 1.15).

However, the increase in the overall level of import dependence was caused by an increase in the share of imports in the intermediate consumption of only 5 industries, the most of them – production of vehicles (to 8.06 pp.), food products (8.02 pp.) and chemicals (5.95 pp.). As a result, in 2016 there was a decrease in the level of import dependence in the products of high-tech and medium-low-tech industries, but, instead, an increase in the level of import dependence in the products of medium-high-tech and low-tech industries.

In general, the highest level of import dependence in the intermediate consumption segment is characteristic of mechanical engineering and chemical products (over 80%), as well as light industry and coke production (over 60%).

During 2015-2016, the dynamics of intermediate consumption of the domestic processing industry increased significantly, which is due to the increase in business activity in Ukraine (Table 1.16).

There is a positive trend towards accelerated growth of intermediate consumption of domestic industrial products (to 22.26% during the analyzed period), compared to imported (to 13.95%).

Thus, along with the use of imports, in Ukraine the use of domestic products in the segment of intermediate consumption has significantly increased. Intermediate consumption of domestic products of the following industries grew the fastest: computers, electronic and optical products (1.89 in times); machines and equipment not included in other groups (2.51 in times); textile production, production of clothing, leather and the other materials (1.28 in times).

The positive qualitative and quantitative trends in the development of the national economy during the period of significant political and economic transformations, primarily related to the deepening of Ukraine's European integration, are evidenced by structural changes in intermediate consumption. Thus, in 2016, the share of products of low- and medium-low-tech industries in the structure of intermediate consumption decreased to 66.69% (vs. 71.83% in 2013), but instead the share of high-tech and medium-high-tech productions (Table 1.17).

Table 1.15. Share of imports in intermediate consumption of products of processing industry in Ukraine, %

The group	The production	Share				Deviation (+/–)		
		2013	2014	2015	2016	2014-2013	2015-2014	2016-2015
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	71.77	71.78	65.45	60.09	0.00	–6.32	–5.36
	Manufacture of computers, electronic and optical products	87.67	86.72	91.31	88.40	–0.95	4.60	–2.91
	Total	**77.00**	**75.90**	**73.37**	**72.24**	**–1.10**	**–2.54**	**–1.12**
The medium-high-tech	Manufacture of chemicals and chemical products	78.26	80.01	77.36	83.31	1.75	–2.64	5.95
	Production of electric equipment	69.86	69.17	65.94	63.58	–0.69	–3.23	–2.36
	Manufacture of machinery and equipment not elsewhere classified	72.04	85.01	89.21	83.40	12.97	4.20	–5.80
	Production of motor vehicles, trailers and semitrailers	85.27	78.72	75.86	83.92	–6.55	–2.86	8.06
	Manufacture of other transport equipment	6.36	5.94	3.40	3.50	–0.42	–2.54	0.10
	Total	**71.13**	**75.79**	**75.62**	**81.19**	**4.67**	**–0.17**	**5.57**
The moderately-low-tech	Production of coke and coke products of oil refining	54.53	64.84	62.74	61.68	10.31	–2.10	–1.06
	Manufacture of rubber and plastic products	50.55	47.84	47.12	47.23	–2.72	–0.72	0.11
	Manufacture of other non-metallic mineral products	24.58	25.07	24.07	23.86	0.49	–1.00	–0.21
	Metallurgical production	31.71	29.42	29.40	26.38	–2.29	–0.02	–3.01
	Manufacture of fabricated metal products, except machinery and equipment	55.56	66.40	57.78	54.93	10.84	–8.62	–2.85
	Total	**42.70**	**47.27**	**45.77**	**43.07**	**4.57**	**–1.50**	**–2.71**
The low-tech	Food production; drinks and tobacco products	14.99	14.84	14.74	22.75	–0.16	–0.10	8.02
	Textile production, clothing, leather and other materials	66.28	58.01	76.42	60.76	–8.27	18.41	–15.66
	Manufacture of wood and paper; printing and duplication	39.04	42.85	40.08	38.72	3.81	–2.76	–1.36
	Furniture production; other products	5.44	13.50	18.83	14.52	8.06	5.33	–4.32
	Total	**22.73**	**25.56**	**25.85**	**28.99**	**2.84**	**0.29**	**3.15**
Total manufacturing		**46.22**	**50.35**	**50.48**	**52.40**	**4.13**	**0.13**	**1.92**

Source: elaborated by the authors based SSSU, 2019.

Table 1.16. Dynamics of intermediate consumption of products of the processing industry in Ukraine, %

The group	The production	Growth rate / decrease in total consumption								
		total			domestic products			imported products		
		2014	2015	2016	2014	2015	2016	2014	2015	2016
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	7.81	16.96	27.09	7.80	43.16	46.83	7.81	6.66	16.67
	Manufacture of computers, electronic and optical products	–16.01	35.16	116.84	–9.53	–11.60	189.55	–16.92	42.32	109.93
	Total	**–0.03**	**21.99**	**54.56**	**4.75**	**34.83**	**61.07**	**–1.45**	**17.91**	**52.19**
The medium-high-tech	Manufacture of chemicals and chemical products	21.96	54.48	10.58	12.14	74.91	–18.46	24.69	49.38	19.08
	Production of electric equipment	9.30	–6.19	12.83	11.81	3.63	20.65	8.22	–10.56	8.79
	Manufacture of machinery and equipment not elsewhere classified	20.24	0.40	128.52	–35.53	–27.72	251.38	41.89	5.36	113.65
	Production of motor vehicles, trailers and semitrailers	–20.46	49.26	65.57	14.94	69.36	10.27	–26.57	43.83	83.17
	Manufacture of other transport equipment	–22.94	–11.97	–41.38	–22.60	–9.59	–41.43	–28.03	–49.65	-39.72
	Total	**11.94**	**34.71**	**31.73**	**–6.15**	**35.66**	**1.61**	**19.29**	**34.41**	**41.44**
The moderately-low-tech	Production of coke and coke products of oil refining	27.06	6.13	19.12	–1.75	12.48	22.50	51.09	2.69	17.11
	Manufacture of rubber and plastic products	16.10	25.81	30.47	22.48	27.54	30.20	9.86	23.92	30.78
	Manufacture of other non-metallic mineral products	2.77	13.49	41.42	2.10	15.01	41.81	4.82	8.96	40.18
	Metallurgical production	3.59	–0.02	44.13	7.07	0.01	50.29	–3.89	–0.10	29.35
	Manufacture of fabricated metal products, except machinery and equipment	2.81	29.23	30.38	–22.26	62.38	39.17	22.86	12.45	23.96
	Total	**11.95**	**10.47**	**31.84**	**3.03**	**13.60**	**38.42**	**23.92**	**6.98**	**24.04**
The low-tech	Food production; drinks and tobacco products	1.42	18.57	–12.15	1.61	18.71	–20.41	0.36	17.77	35.64
	Textile production, clothing, leather and other materials	20.54	–10.21	37.03	50.09	–49.58	128.05	5.50	18.29	8.95
	Manufacture of wood and paper; printing and duplication	11.45	23.25	28.71	4.49	29.21	31.64	22.31	15.30	24.34
	Furniture production; other products	–6.45	21.12	44.15	–14.43	13.66	51.82	132.06	68.95	11.10
	Total	**3.95**	**18.97**	**10.95**	**0.13**	**18.52**	**6.24**	**16.92**	**20.30**	**24.47**
Total manufacturing		**9.35**	**18.62**	**28.19**	**0.95**	**18.30**	**23.21**	**19.13**	**18.92**	**33.08**

Source: elaborated by the authors based on SSSU, 2019.

Table 1.17. Structure of intermediate consumption of products of processing industry in Ukraine, %

The group	The production	Total				Domestic products				Imported products			
		2013	2014	2015	2016	2013	2014	2015	2016	2013	2014	2015	2016
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	3.72	3.67	3.62	3.59	1.95	2.09	2.52	3.01	5.78	5.23	4.69	4.11
	Manufacture of computers, electronic and optical products	1.82	1.40	1.60	2.70	0.42	0.37	0.28	0.66	3.46	2.41	2.89	4.55
	Total	**5.55**	**5.07**	**5.21**	**6.29**	**2.37**	**2.46**	**2.80**	**3.67**	**9.24**	**7.64**	**7.58**	**8.67**
The medium-high-tech	Manufacture of chemicals and chemical products	12.08	13.48	17.55	15.14	4.89	5.43	8.02	5.31	20.46	21.42	26.90	24.07
	Production of electric equipment	1.66	1.66	1.31	1.16	0.93	1.03	0.90	0.89	2.51	2.28	1.72	1.40
	Manufacture of machinery and equipment not elsewhere classified	4.31	4.74	4.01	7.16	2.24	1.43	0.88	2.50	6.72	8.01	7.09	11.39
	Production of motor vehicles, trailers and semitrailers	2.63	1.91	2.40	3.10	0.72	0.82	1.17	1.05	4.85	2.99	3.61	4.97
	Manufacture of other transport equipment	1.93	1.36	1.01	0.46	3.36	2.58	1.97	0.94	0.27	0.16	0.07	0.03
	Total	**22.62**	**23.16**	**26.30**	**27.02**	**12.14**	**11.29**	**12.95**	**10.68**	**34.81**	**34.85**	**39.39**	**41.87**
The moderately-low-tech	Production of coke and coke products of oil refining	14.18	16.48	14.74	13.70	11.99	11.67	11.09	11.03	16.73	21.22	18.32	16.12
	Manufacture of rubber and plastic products	6.09	6.47	6.86	6.98	5.60	6.79	7.32	7.74	6.66	6.14	6.40	6.29
	Manufacture of other non-metallic mineral products	6.92	6.51	6.23	6.87	9.71	9.82	9.55	10.99	3.68	3.24	2.97	3.13
	Metallurgical production	14.85	14.07	11.86	13.33	18.86	20.00	16.91	20.62	10.19	8.22	6.90	6.71
	Manufacture of fabricated metal products, except machinery and equipment	5.69	5.35	5.83	5.92	4.70	3.62	4.97	5.61	6.84	7.05	6.67	6.21
	Total	**47.73**	**48.86**	**45.51**	**46.80**	**50.85**	**51.90**	**49.84**	**55.99**	**44.10**	**45.87**	**41.26**	**38.46**
The low-tech	Food production; drinks and tobacco products	12.29	11.40	11.40	7.81	19.43	19.56	19.62	12.68	3.99	3.36	3.33	3.39
	Textile production, clothing, leather and other materials	1.03	1.13	0.86	0.92	0.64	0.96	0.41	0.75	1.47	1.30	1.30	1.06
	Manufacture of wood and paper; printing and duplication	7.05	7.18	7.46	7.49	7.99	8.27	9.03	9.65	5.95	6.11	5.93	5.54
	Furniture production; other products	3.74	3.20	3.26	3.67	6.57	5.57	5.35	6.59	0.44	0.86	1.22	1.02
	Total	**24.10**	**22.91**	**22.98**	**19.89**	**34.63**	**34.35**	**34.41**	**29.67**	**11.85**	**11.63**	**11.77**	**11.00**
Total manufacturing		**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: elaborated by the authors based on SSSU, 2019.

This was a consequence of a significant decrease in the share of food industry products in this structure and, at the same time, an increase in the chemical industry and mechanical engineering.

Such changes are signs of a gradual transition of the national economy from raw materials to innovation. This was confirmed by the growth during 2014-2016 of the share of high-tech production and, at the same time, the decrease of the share of low-tech in the intermediate consumption of domestic products.

The structure of intermediate consumption of imported products, in contrast to domestic, in 2016 was dominated by high- and medium-high-tech production (a total of 50.54% vs. 40.05% in 2013).

The growth of the share of imports in the intermediate consumption of high-tech products in general contributed to the acceleration of the national economy and intensified the processes of realization, in particular, of domestic industrial potential. However, in the medium and long term, without additional incentives to increase the use of domestic products in intermediate consumption, the level of import dependence on the products of these industries can reach a critical level. This, in turn, will pose a threat not only to the competitiveness of the industrial sector of the national economy, but also to the economic security of the state.

The dependence of production on imports of fixed assets reflects the share of imports in gross fixed capital formation. The high value of this indicator is evidence of many economic problems, in particular: insufficient investment in fixed assets, high level of depreciation of fixed assets, inefficient policy of renewal of fixed capital, low investment and innovation activity, and the others.

In 2016, the gross accumulation of fixed capital in Ukraine to 84.98% was provided by imports, while in 2013 the value of this indicator was 71.49% (Table 1.18).

However, it should be noted that during this period the degree of depreciation of fixed assets decreased significantly – to 58.1% vs. 77.3%. At the same time, the tendency to increase this indicator in the domestic industry to 69.4% (vs. 56.9% in 2013), in particular, in the processing industry – to 76.4% (vs. 50.1%) is negative.

The significant increase in import dependence on fixed capital in Ukraine was due to the urgent need to modernize fixed assets, which has not been carried out for many years. Therefore, increasing dependence on imports of fixed assets is, on the one hand, a sign of growing business activity, and on the other – unsatisfactory dynamics of investment and innovation processes in the domestic processing industry and incomplete and irrational use of machine-building potential of Ukraine.

The largest increase in import dependence in the segment of gross fixed capital formation occurred in the production of finished metal products, except machinery and equipment in 2015 – to 59.04 pp., compared to 2013. At the same time, dependence on imports of electrical equipment in 2016 decreased to 7.17 pp., compared to 2013, and on the other products – to 7.81 pp.

Table 1.18. Share of imports in gross fixed capital formation in Ukraine, %

The production	Share				Deviation (+/–)		
	2013	2014	2015	2016	2014-2013	2015-2014	2016-2015
Manufacture of fabricated metal products, except machinery and equipment	8.82	10.4	67.86	62.57	1.58	57.46	–5.31
Manufacture of computer, electronic and optical products	96.66	98.29	97.95	98.00	1.63	–0.34	0.05
Manufacture of electrical equipment	90.45	84.18	87.65	83.28	–6.28	3.47	–4.37
Manufacture of machinery and equipment n.e.c.	91.55	99.64	99.63	98.84	8.09	–0.01	–0.79
Manufacture of motor vehicles, trailers and semi-trailers	88.85	96.64	98.05	98.27	7.79	1.41	0.22
Manufacture of other transport equipment	16.23	40.93	22.99	23.18	24.7	–17.95	0.21
Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	76.45	62.02	64.86	68.64	–14.44	2.85	3.78
Total manufacturing	**71.49**	**79.82**	**86.3**	**84.98**	**8.33**	**6.48**	**–1.31**

Source: elaborated by the authors based on SSSU, 2019.

The highest level of import dependence of the Ukrainian economy in the segment of gross fixed capital formation (over 90%) is characteristic of the products of the following industries: computers, electronic and optical products; machines and equipment not included in other groups; vehicles, trailers and semi-trailers. At the same time, the share of imports of the other vehicles was the lowest (23.18% in 2016) in the gross fixed capital formation.

The intensification of the processes of modernization of means of production in Ukraine (however, with a significant import component) is evidenced by the dynamics of gross fixed capital formation (Table 1.19).

Thus, the growth rate of gross fixed capital formation in 2016 reached 55.04% (vs. –26.89% in 2014), including capital of domestic origin 52.68% (vs. –18.37%), and imported – 69.92% (vs. 52.68%).

The structure of gross fixed capital formation in Ukraine (in terms of production and sources of origin) during 2013-2016 remained relatively stable (Table 1.20).

The highest share in this structure was occupied by the production of machinery and equipment not included in the other groups (with a tendency to decrease) and the production of motor vehicles, trailers and semi-trailers (with a tendency to increase). Among the fixed assets dominated by the products of domestic origin with shares, respectively, 39.33% and 24.76%. Instead, among the products of other vehicles, as well as the production of finished metal products, in addition to machinery and equipment – the main means of imported origin.

Table 1.19. Dynamics of gross fixed capital formation in Ukraine, %

The production	Growth rate / decrease in total consumption								
	Total			domestic products			imported products		
	2014	2015	2016	2014	2015	2016	2014	2015	2016
Manufacture of fabricated metal products, except machinery and equipment	–11.58	22.21	21.49	4.26	697.52	12.01	–13.12	–56.17	41.52
Manufacture of computer, electronic and optical products	–23.55	41.19	48.75	–22.26	40.71	48.83	–60.79	69.10	44.85
Manufacture of electrical equipment	1.49	10.35	90.04	–5.56	14.90	80.56	68.21	–13.85	157.28
Manufacture of machinery and equipment n.e.c.	–33.50	34.14	48.22	–27.62	34.13	47.05	–97.17	36.84	366.92
Manufacture of motor vehicles, trailers and semi-trailers	–24.06	42.06	63.70	–17.41	44.13	64.07	–77.10	–17.46	45.34
Manufacture of other transport equipment	–36.66	–14.28	67.90	59.70	–51.87	69.34	–55.34	11.77	67.46
Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	–4.71	14.73	23.90	–22.71	20.00	31.12	53.73	6.12	10.58
Total manufacturing	**–26.89**	**24.77**	**55.04**	**–18.37**	**34.90**	**52.68**	**–48.25**	**–15.27**	**69.92**

Source: elaborated by the authors based on SSSU, 2019.

In summary, it can be argued that in general the high level of import dependence (≈85%) in the segment of gross fixed capital formation in Ukraine is an indicator and, at the same time, a factor (in the short term) of the development of manufacturing. However, in the strategic dimension, high dependence on imports of fixed assets, and especially key high-tech industries (in particular, mechanical engineering), can lead to the preservation of the low level of manufacturability of the domestic processing industry in general.

The level of import dependence in the segment of final consumption of industrial products shows the share of imports in consumer goods sold in the country and, at the same time, is a reflection of the conditions and capabilities of the domestic processing industry to meet demand for such goods. According to the calculations, in Ukraine in 2016, the final consumer goods accounted for the largest share in food imports; beverages and tobacco products (79.41%), textile production, production of clothing, leather and the other materials (85.25%) and furniture production (70.55%) (Annex A, Table A.4).

In general, in 2016, the consumption of industrial goods in Ukraine was provided by imports to 45.59% (vs. 43.72% in 2015) (Table 1.21).

Table 1.20. Structure of gross fixed capital formation in Ukraine, %

The production	Total				Domestic products				Imported products			
	2013	2014	2015	2016	2013	2014	2015	2016	2013	2014	2015	2016
Manufacture of fabricated metal products, except machinery and equipment	6.78	8.20	8.03	6.30	0.84	1.07	6.32	4.63	21.69	36.42	18.84	15.69
Manufacture of computer, electronic and optical products	12.39	12.96	14.66	14.07	16.75	15.96	16.64	16.22	1.45	1.10	2.19	1.87
Manufacture of electrical equipment	7.41	10.29	9.10	11.15	9.38	10.85	9.24	10.93	2.48	8.06	8.20	12.42
Manufacture of machinery and equipment n.e.c.	36.17	32.90	35.37	33.82	46.32	41.08	40.84	39.33	10.72	0.59	0.95	2.60
Manufacture of motor vehicles, trailers and semi-trailers	17.15	17.81	20.28	21.41	21.32	21.57	23.04	24.76	6.71	2.97	2.89	2.47
Manufacture of other transport equipment	19.11	16.55	11.37	12.31	4.34	8.49	3.03	3.36	56.13	48.45	63.90	62.98
Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	0.99	1.29	1.18	0.94	1.05	1.00	0.89	0.76	0.81	2.42	3.03	1.97
Total manufacturing	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: elaborated by the authors based on SSSU, 2019.

Table 1.21. Share of imports in final consumption of products of processing industry in Ukraine, %

The group	The production	Share				Deviation (+/–)		
		2013	2014	2015	2016	2014-2013	2015-2014	2016-2015
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	72.30	71.78	65.44	75.80	–0.51	–6.34	10.36
	Manufacture of computers, electronic and optical products	91.02	98.58	99.62	93.77	7.56	1.04	–5.85
	Total	**80.01**	**81.24**	**76.44**	**81.08**	**1.23**	**–4.80**	**4.64**
The medium-high-tech	Manufacture of chemicals and chemical products	39.52	41.95	37.35	50.44	2.44	–4.60	13.09
	Production of electric equipment	53.10	49.14	66.76	72.32	–3.95	17.61	5.56
	Manufacture of machinery and equipment not elsewhere classified	19.07	44.70	98.70	28.45	25.63	54.00	–70.25
	Production of motor vehicles, trailers and semitrailers	95.33	94.90	92.73	95.16	–0.43	–2.17	2.43
	Manufacture of other transport equipment	96.60	94.61	99.18	85.80	–1.99	4.57	–13.38
	Total	**74.08**	**65.98**	**64.58**	**73.62**	**–8.10**	**–1.40**	**9.04**
The moderately-low-tech	Production of coke and coke products of oil refining	73.19	80.91	79.67	70.59	7.72	–1.23	-9.08
	Manufacture of rubber and plastic products	96.30	88.33	93.92	93.53	–7.97	5.59	-0.40
	Manufacture of other non-metallic mineral products	38.43	33.24	30.55	31.00	–5.19	–2.69	0.45
	Metallurgical production	4.00	2.08	3.66	2.25	–1.92	1.58	-1.41
	Manufacture of fabricated metal products, except machinery and equipment	25.62	49.58	45.59	61.84	23.96	–3.99	16.25
	Total	**65.18**	**72.96**	**71.24**	**61.03**	**7.78**	**–1.72**	**-10.21**
The low-tech	Food production; drinks and tobacco products	22.12	22.75	21.20	25.38	0.63	–1.54	4.18
	Textile production, clothing, leather and other materials	89.97	86.83	80.10	83.07	–3.14	–6.73	2.97
	Manufacture of wood and paper; printing and duplication	42.67	31.90	29.48	30.39	–10.77	–2.42	0.91
	Furniture production; other products	82.13	52.82	75.09	90.68	–29.32	22.27	15.59
	Total	**34.68**	**32.64**	**32.60**	**36.72**	**–2.04**	**–0.04**	**4.12**
Total manufacturing		**45.66**	**44.23**	**43.72**	**45.59**	**–1.43**	**–0.51**	**1.87**

Source: elaborated by the authors based on SSSU, 2019.

A slight decrease in the values of this indicator during 2014-2015 was primarily due to a decrease in the purchasing power of the population due to the devaluation of the national currency.

The highest share of imports in final consumption is typical for products of high- and medium-high-tech industries – 81.08% and 73.62%, respectively. in particular, more than 90% of the demand for consumer goods of the two industries (the computers and vehicles) belonging to these groups was met by imports.

At the same time, it is worth noting the decrease in 2016 in the level of dependence of the Ukrainian consumer market on imports of products of some high- and medium-high-tech industries, namely: machinery and equipment not included in the other groups (to 70.25 pp.); the other vehicles (13.38 pp.); computers, electronic and optical equipment (5.85 pp.). This was facilitated primarily by an increase in the share of domestic products in the intermediate consumption of these industries, and thus – a decrease in cost and cheaper final products, which became more competitive in price compared to imported counterparts.

In 2016, compared to 2015, the share of imports in the final consumption of products of medium-low-tech industries decreased to 10.21 pp. (up to 61.03%). However, somewhat paradoxically, there is a significant increase (to 16.25 pp.) in the share of imports in final consumption of finished metal products, except machinery and equipment, especially given the existing domestic potential of this industry, and the fact that the import component in intermediate consumption of products of this production in 2016 decreased to 2.85 pp.

The share of imports in the final consumption of low-tech products, including textiles and furniture, as well as the production of rubber and plastic products, which belongs to the medium-low technology, remains too high (over 80%). The capacity of the consumer market in the segments of light, furniture and chemical industries, as well as the availability of necessary the raw materials and production facilities for further development of these processing industries increase the need to intensify incentives (including state) and support domestic producers by market methods.

The need for regulation in this area is evidenced by the dynamics of final consumption of processing products in Ukraine, which in 2016 was generally negative. Thus, the growth rate of final consumption of these products decreased to 5.09 pp. (after an increase in 2015 to 17.42 pp.), including a domestic – to 10.19 pp., while imported, on the contrary, increased to 1.43 pp. (Table 1.22).

The growth rates of final consumption of imported products of medium-high-tech industries increased the most: vehicles, trailers and semi-trailers; chemicals and chemical products; electrical equipment. Extremely negative sign, given the available domestic potential, is a significant increase in the growth rate of imports of consumer goods of food (to 40.57 pp.) and woodworking (to 8.97 pp.) industry. The consequence of such dynamics was an even greater increase in the import

Table 1.22. Dynamics of final consumption of products of the processing industry in Ukraine, %

The group	The production	Growth rate / decrease in total consumption								
		total			domestic products			imported products		
		2014	2015	2016	2014	2015	2016	2014	2015	2016
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	14.50	42.67	7.65	16.63	74.72	–24.62	13.69	30.07	24.69
	Manufacture of computers, electronic and optical products	–10.74	24.10	–5.73	–85.89	–66.88	1450.94	–3.33	25.40	–11.27
	Total	**4.11**	**36.11**	**3.34**	**–2.31**	**70.94**	**–16.99**	**5.72**	**28.07**	**9.61**
The medium-high-tech	Manufacture of chemicals and chemical products	40.93	66.28	14.73	35.26	79.47	–9.24	49.62	48.04	54.94
	Production of electric equipment	0.45	–9.52	22.28	8.92	–40.86	1.82	–7.03	22.91	32.46
	Manufacture of machinery and equipment not elsewhere classified	47.59	16.41	10.00	0.85	–97.26	5953.85	245.95	157.03	–68.29
	Production of motor vehicles, trailers and semitrailers	–37.33	–20.36	92.99	–31.52	13.49	28.53	–37.61	–22.18	98.04
	Manufacture of other transport equipment	1.51	35.87	–8.48	61.11	–79.31	1483.33	–0.59	42.44	–20.83
	Total	**–13.01**	**6.90**	**38.89**	**14.19**	**11.29**	**3.44**	**–22.52**	**4.63**	**58.34**
The moderately-low-tech	Production of coke and coke products of oil refining	63.02	34.61	–46.50	16.11	43.30	–22.61	80.21	32.55	–52.60
	Manufacture of rubber and plastic products	132.90	13.65	26.19	635.00	–40.82	34.48	113.63	20.84	25.65
	Manufacture of other non-metallic mineral products	35.79	39.37	13.62	47.24	44.98	12.88	17.45	28.09	15.31
	Metallurgical production	284.00	70.83	8.54	291.67	68.09	10.13	100.00	200.00	–33.33
	Manufacture of fabricated metal products, except machinery and equipment	–11.66	45.01	4.44	–40.12	56.49	–26.75	70.97	33.33	41.67
	Total	**56.45**	**34.88**	**–32.85**	**21.47**	**43.46**	**–9.00**	**75.13**	**31.70**	**–42.48**
The low-tech	Food production; drinks and tobacco products	7.28	21.36	28.40	6.41	23.79	21.60	10.32	13.12	53.69
	Textile production, clothing, leather and other materials	3.44	39.51	23.95	35.88	110.78	5.43	–0.17	28.69	28.55
	Manufacture of wood and paper; printing and duplication	–0.38	27.38	22.88	18.34	31.91	21.29	–25.54	17.72	26.69
	Furniture production; other products	3.68	23.88	20.13	173.83	–34.60	–55.06	–33.33	76.12	45.08
	Total	**6.40**	**23.93**	**27.20**	**9.72**	**24.00**	**19.43**	**0.14**	**23.79**	**43.27**
Total processing industry		**7.17**	**24.59**	**19.50**	**9.99**	**25.73**	**15.54**	**3.82**	**23.17**	**24.60**

Source: elaborated by the authors based on SSSU, 2019.

dependence of the Ukrainian consumer market on products not only of medium-high-tech industries, but also low-tech, as can be seen from Table. 1.21.

At the same time, in the structure of final consumption of products of the processing industry in Ukraine there were positive trends in the direction of reducing the share of low-tech industries (to 4.21 pp. during 2013-2016) and, instead, increasing the share of high- and medium-high-tech industries (Table. 1.23). However, the share of these two industries in the structure of consumption of the domestic products in 2016 totaled only 14.35%, while imported – 50.54%.

The structure of final consumption of domestic processing industry is dominated by products of medium-low-tech industries, whose share in 2016 was 55.99% (vs. 49.84% in 2015), including metallurgical – 20.62% (16.91%). On the other hand, the structure of final consumption of imported products is invariably dominated by chemical products – 24.07% in 2016.

Thus, the results of comparing the structure of final consumption of domestic and imported products of the processing industry indicate the presence of significant reserves for Ukrainian producers in the direction of expanding their range, and thus filling new niches in the domestic market. This applies primarily to the manufacture of machinery and equipment, the other vehicles, computers, electronic and the optical products, as well as chemical industries.

Summarizing this block of research, it can be argued that the economy of Ukraine is characterized by a generally high level of import dependence. Thus, the share of imports in total consumption of processing products in 2016 reached 52.4%, while in the EU member states the value of this indicator averaged 37.4%. The greatest dependence is on imports of engineering and chemical products, that is the key system-forming high-tech industries.

In terms of segments of consumption of manufacturing products in Ukraine, the share of imports in the gross accumulation of fixed capital is the highest (≈85%). This level of import dependence poses a threat to the economic security of the state. This threat is exacerbated by a critically high degree of physical depreciation of fixed capital of domestic industry (≈70%), in particular, processing (≈80%). Hence, there is an urgent need to update and modernize fixed assets. The implementation of these import-based processes, especially in the public sector, requires significant investment and, therefore, carries risks to the stability of the national currency and socio-economic development in general.

The alternative is to create import-substituting industries in Ukraine that will be able to produce fixed assets for the needs of the national economy. However, the organization and further operation of such enterprises mostly involves the use of imported components. At present, imported industrial products dominate in the segment of intermediate consumption – in 2016 its share was over 52%. The economy of Ukraine mostly depends on materials and components of the following industries: computers, electronic and optical products (≈90%); chemicals and

Table 1.23. Structure of final consumption of products of the processing industry in Ukraine, %

The group	The production	Total				Domestic products				Imported products			
		2013	2014	2015	2016	2013	2014	2015	2016	2013	2014	2015	2016
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	3.72	3.67	3.62	3.59	1.95	2.09	2.52	3.01	5.78	5.23	4.69	4.11
	Manufacture of computers, electronic and optical products	1.82	1.40	1.60	2.70	0.42	0.37	0.28	0.66	3.46	2.41	2.89	4.55
	Total	**5.55**	**5.07**	**5.21**	**6.29**	**2.37**	**2.46**	**2.80**	**3.67**	**9.24**	**7.64**	**7.58**	**8.67**
The medium-high-tech	Manufacture of chemicals and chemical products	12.08	13.48	17.55	15.14	4.89	5.43	8.02	5.31	20.46	21.42	26.90	24.07
	Production of electric equipment	1.66	1.66	1.31	1.16	0.93	1.03	0.90	0.89	2.51	2.28	1.72	1.40
	Manufacture of machinery and equipment not elsewhere classified	4.31	4.74	4.01	7.16	2.24	1.43	0.88	2.50	6.72	8.01	7.09	11.39
	Production of motor vehicles, trailers and semitrailers	2.63	1.91	2.40	3.10	0.72	0.82	1.17	1.05	4.85	2.99	3.61	4.97
	Manufacture of other transport equipment	1.93	1.36	1.01	0.46	3.36	2.58	1.97	0.94	0.27	0.16	0.07	0.03
	Total	**22.62**	**23.16**	**26.30**	**27.02**	**12.14**	**11.29**	**12.95**	**10.68**	**34.81**	**34.85**	**39.39**	**41.87**
The moderately-low-tech	Production of coke and coke products of oil refining	14.18	16.48	14.74	13.70	11.99	11.67	11.09	11.03	16.73	21.22	18.32	16.12
	Manufacture of rubber and plastic products	6.09	6.47	6.86	6.98	5.60	6.79	7.32	7.74	6.66	6.14	6.40	6.29
	Manufacture of other non-metallic mineral products	6.92	6.51	6.23	6.87	9.71	9.82	9.55	10.99	3.68	3.24	2.97	3.13
	Metallurgical production	14.85	14.07	11.86	13.33	18.86	20.00	16.91	20.62	10.19	8.22	6.90	6.71
	Manufacture of fabricated metal products, except machinery and equipment	5.69	5.35	5.83	5.92	4.70	3.62	4.97	5.61	6.84	7.05	6.67	6.21
	Total	**47.73**	**48.86**	**45.51**	**46.80**	**50.85**	**51.90**	**49.84**	**55.99**	**44.10**	**45.87**	**41.26**	**38.46**
The low-tech	Food production; drinks and tobacco products	12.29	11.40	11.40	7.81	19.43	19.56	19.62	12.68	3.99	3.36	3.33	3.39
	Textile production, clothing, leather and other materials	1.03	1.13	0.86	0.92	0.64	0.96	0.41	0.75	1.47	1.30	1.30	1.06
	Manufacture of wood and paper; printing and duplication	7.05	7.18	7.46	7.49	7.99	8.27	9.03	9.65	5.95	6.11	5.93	5.54
	Furniture production; other products	3.74	3.20	3.26	3.67	6.57	5.57	5.35	6.59	0.44	0.86	1.22	1.02
	Total	**24.10**	**22.91**	**22.98**	**19.89**	**34.63**	**34.35**	**34.41**	**29.67**	**11.85**	**11.63**	**11.77**	**11.00**
Total manufacturing		**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: elaborated by the authors based on SSSU, 2019.

chemical products (> 80%); mechanical engineering (> 80%); coke and refined products (> 60%); textile production, clothing, leather and the other materials (> 60%). in fact, this means that domestic enterprises and organizations of production, but also the other areas (financial, social) can not function not only without imported goods of mechanical engineering and chemical industry, but also without the products of oil refining and light industry.

Hence, the directions of import substitution in Ukraine are obvious, which relate primarily to these industries. Another argument for the need to reduce the import dependence of the domestic economy on engineering, chemical and light industry products is that these industries have become priorities for the development of Polish industry since the signing of the Association Agreement and accession to the EU.

Thus, the high level of import dependence of Ukraine's economy should be considered not only as a source of threat to sustainable economic development (especially in conditions of global instability), but also as an opportunity for more efficient use and capacity building of domestic processing industry. The latter's products will be able to fill free niches in the domestic market, successfully competing with imports primarily in terms of price parameters. An effective import substitution policy will have a significant multiplier effect: create new jobs in the industrial sector of the economy and additional effective demand within the country, and thus significantly expand the domestic market, increase gross domestic product (GDP) and tax revenues to budgets at various levels. As a result, it will create conditions for the creation of additional jobs in the field of service and improve the level and quality of life of the population.

Chapter 2

Features of the functioning of certain types of the processing industry in Ukraine and the EU countries

2.1. Chemical industry

2.1.1. Role of Ukraine in the global and European chemical industry

The chemical industry is one of the leading global industry segment. For example, in the US and EU, chemical production accumulates the highest share of value added (16%) created in industry. in 2018, the share of chemicals production in the US reached 13.6% of the total industrial production in the country. in EU, the chemical sector, which involved 12% of the employed in industry and mastered the largest volume of investment in industrial production (18%), accounted for 7.6% of sold industrial products.

Producing intermediate consumption products (raw materials and semi-finished products) for all sectors of the economy, modern chemical industry determines largely the level of their competitiveness, as well as the development dynamics and the innovation processes direction. On the other hand, the wide assortment of household chemical products confirms its weight on the consumer market. The level of "chemistry" is a universally accepted criterion for the socio-economic development of any country. Thus, in industrialized countries, chemicals production shares from 5-8% to 13-16% in industry, while in Ukraine – less than 3%. Ukrainian chemical production is export oriented (the share of exports in the volume of sold chemical products in 2017 was 60%) and, at the same time, import-dependent (the share of imports in the intermediate consumption of chemicals and chemical products is less than 95%), and, consequently, dynamics and results their functioning depends directly on the situation on the world market of chemical products.

Today Ukrainian chemical industry is directly influenced by the consequences of the chemical products world market competitive environment transformation, which has intensified since 2015. Among the world chemical industry development key trends over the past 4 years, can distinguish the following:

1. Mergers and acquisitions. in 2015, the merger of Dow and DuPont took place, and in 2016 it was purchased by the Chinese national company ChemChina of Syngenta Corporation (the world's largest producer of plant and seed and plant protection products), as well as the conclusion of an agreement between the German Concern Bayer and the American producer of genetically modified seeds and herbicide Monsanto. These megaliths are caused by a number of factors, namely:

– falling prices for grain and slow growth of the agricultural segment of the world economy;

– the need to increase the resource base in the most promising agro-sectors;

– the desire to increase the efficiency of chemical production, in particular, by using opportunities to attract low-cost financing.

2. New regulatory environment formation. in particular, the Lauthenberg Act was passed, which sets out a single standard (plus the requirements of existing state and local regulations) regarding the safety of chemical production in the world.

3. The investment activation. First of all, it concerns North America, where a large wave of multibillion-dollar investments in new production facilities of chemical production took place.

4. The introduction of innovative technologies designed to reduce costs for producers, as well as create new business models that would help to establish relationships between chemical manufacturers with suppliers, their direct customers and end users. Thus, due to the automation and use of IIoT (Industrial Internet of Things), the operational and business environment in the chemical industry undergoes radical changes, in particular: the practice of embedding intelligent sensors in production capacities that control performance or transmit data to object managers is introduced to identify optimal operating conditions and the need for preventive maintenance; automation has been applied to improve the safety of workers of chemical plants, etc.

According to experts from the international corporation General Electric, today the world chemical industry is undergoing more radical changes than at any given time in the last 40-50 years, and the pace of these changes continues to grow.

In 2017, the world chemicals production grew to 3.5% compared with the previous year, in particular: in EU-28 to 3.8% (vs. 0.4%), in the US – 2.9% (vs. 1.0%), in Japan – 7.2% (vs. 1.7%), in Asia – 3.8% (vs. 5.8%). As a result, EU-28 remained the world leader in the chemical industry, primarily due to the chemicals export, which grew to 6.2% in 2017 compared to the previous year, with a positive trade balance of EUR 138.35 bill. (vs. 128.41 in addition to EU-28, in 2017, the USA and China) were among the top three exporters on the world market for chemical products in 2017.

The share of Ukraine in chemicals export to the top 10 participants in the world chemical market was the highest in 2011, however, since 2012 there is an annual decrease in the values of this indicator (Table 2.1).

Table 2.1. Share of Ukraine in the export of chemical products of the top 10 participants in the world chemical market, %

Country	2010	2011	2012	2013	2014	2015	2016	2017
EU-28	**1.08**	**1.47**	**1.36**	**1.15**	**0.84**	**0.63**	**0.45**	**0.40**
USA	1.70	2.42	2.28	1.93	1.45	1.04	0.80	0.74
China	3.68	4.40	4.16	3.36	2.27	1.64	1.27	0.76
Japan	4.22	6.12	6.16	5.41	4.31	3.47	2.48	2.15
South Korea	6.53	8.22	7.67	6.07	4.50	3.63	2.63	2.18
Canada	9.71	12.79	12.78	10.68	8.08	5.84	4.58	4.40
Singapore	8.07	9.75	8.71	8.03	5.77	4.55	3.39	3.31
India	12.29	14.62	11.24	9.06	7.62	5.72	4.13	3.73
Mexico	27.44	35.99	31.18	26.28	19.86	15.13	11.80	12.01

Source: elaborated by the authors based on SSSU, 2019; Trends in the chemical industry, 2017.

The share of Ukraine in compare to EU-28 chemicals export in 2017 was only 0.4% (compared to 1.47% in 2011). Ukrainian chemicals export in compare to the leading EU chemical producers is also minor, in particular: 1.7% of German chemicals export in 2016-2017 and less than 5% in France, Belgium and Ireland (Table 2.2). in addition, during this period, Ukraine exported substantially less chemical products than such post-socialist countries as Poland, Slovenia, Hungary and the Czech Republic.

EU chemical industry leader is Germany, which produces 1/4 of world chemical products, and also takes 2-nd place – in terms of its exports. The share of Germany in EU-28 chemicals export was 27% in 2017. The next countries were also included to the Top 10 EU-28 by the share of chemicals export: France – 11.2%, Belgium – 10.5%, Ireland – 10.3%, United Kingdom – 8.6%, the Netherlands – 7.2%, Italy – 6.9%, Spain – 4.6%, Denmark – 3.1%, Sweden – 2.5.

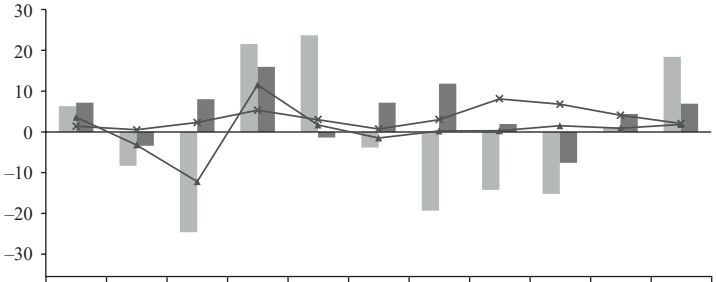
The largest volumes of chemical production (in value terms) in the EU-28 were achieved in 2015, which in turn caused an increase in exports with virtually the same level of chemicals import. in 2017, there was a slight increase in chemicals production (to 1.5%, as compared to the previous year), as well as by a substantial increase (to 6.2%) in export.

In 2013, the trends of chemical industry in Ukraine and in EU-28 were the same: the decline in chemicals production in 2007-2009, growth in 2010 and the decline in 2012 (Fig. 2.1).

Table 2.2. Ukrainian chemicals export in compare to the EU countries, %

Country	2010	2011	2012	2013	2014	2015	2016	2017
Austria	45.4	61.0	59.2	48.9	35.9	29.5	20.2	21.7
Belgium	8.2	12.3	10.7	9.4	7.3	5.6	4.1	4.2
Bulgaria	334.1	427.5	412.0	347.0	246.4	201.6	172.3	157.6
United Kingdom	8.9	13.5	12.9	11.9	9.1	5.3	4.7	5.2
Greece	333.1	532.2	528.6	405.1	306.4	250.0	187.5	178.1
Denmark	44.1	60.5	49.4	38.1	28.4	20.1	13.7	14.3
Estonia	1157.8	1107.3	935.8	875.8	753.8	755.6	526.4	484.6
Ireland	10.6	14.1	15.8	13.0	9.2	5.9	4.1	4.3
Spain	24.0	33.0	30.7	23.5	17.1	13.3	9.9	9.7
Italy	16.3	22.1	21.3	16.9	13.4	10.5	7.2	6.4
Cyprus	1981.1	3103.6	2509.8	2053.7	1590.9	1165.1	850.4	834.5
Latvia	919.4	1187.5	1062.7	874.8	623.3	545.4	347.4	313.1
Lithuania	370.8	435.4	390.2	321.7	238.0	182.8	120.1	109.4
Lithuania	813.4	1088.6	1243.0	1078.8	865.8	683.2	497.1	464.5
Luxembourg	3907.5	5479.4	6758.8	5053.3	2972.0	1332.7	882.5	829.4
Malta	2677.4	4015.4	3846.0	2689.3	2041.4	1468.4	194.9	1617.0
Netherlands	16.7	19.3	17.8	15.2	11.6	8.8	6.8	6.2
Germany	4.3	5.9	5.4	4.3	3.2	2.4	1.7	1.7
Poland	80.1	108.5	94.3	74.1	59.5	49.7	34.0	30.7
Portugal	344.5	369.9	366.1	299.6	206.6	169.0	124.8	127.1
Romania	286.6	296.5	292.6	280.3	223.1	217.2	166.1	155.4
Slovenia	195.4	250.3	228.5	169.9	126.6	110.8	84.4	82.9
Hungary	125.4	173.0	149.5	111.8	97.2	80.4	60.4	51.3
Finland	126.6	164.6	164.7	143.2	116.6	75.4	59.7	57.9
France	8.6	11.9	11.3	9.3	7.2	5.5	4.1	4.0
Croatia	447.1	574.7	570.3	495.3	404.1	320.7	181.9	161.1
Czech Republic	174.6	235.3	219.7	186.2	145.0	122.0	93.5	91.9
Sweden	42.6	58.9	55.1	43.9	34.8	24.9	18.8	18.1

Source: elaborated by the authors based on SSSU, 2019; Annual detailed enterprise statistics for industry Eurostat, 2018.



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Manufacture of chemicals and chemical products in Ukraine	6.3	–8.3	–24.6	21.5	23.7	–3.8	–19.3	–14.2	–15.2	1.1	18.4
Manufacture of basic pharmaceutical products and pharmaceutical preparations in Ukraine	7.2	–3.4	8.0	15.9	–1.4	7.2	11.8	1.9	–7.6	4.4	6.9
Manufacture of chemicals and chemical products in Ukrainein the EU-28	3.6	–3.2	–12.2	11.5	1.7	–1.5	0.2	0.3	1.5	0.9	1.8
Manufacture of basic pharmaceutical products and pharmaceutical preparations in Ukraine in the EU-28	1.4	0.5	2.3	5.3	3	0.7	3.0	8.1	6.8	4.1	2.1

Fig. 2.1. Growth (decrease) of chemicals and pharmaceuticals manufacture in Ukraine and EU-28, % to the previous year

Source: elaborated by the authors based on SSSU, 2019; Annual detailed enterprise statistics for industry Eurostat, 2018.

During 2013-2015, the chemical industry development trends had been changed. So, when there was a slight increase in the chemicals production (from 0.2% in 2013 to 1.5% in 2015) in EU-28, in Ukraine there was a significant decrease (from –19.3% in 2013 to –15.2% in 2015). Instead, in 2017, the chemicals production in Ukraine grew to 18.4%, while the production of the basic pharmaceuticals increased to 6.9%, whereas in EU-28 the growth of these indicators was only 1.8% and 2.1% respectively. This has been evidence of a higher (compared with the EU chemical industry) domestic chemical industry vulnerability to the external and the internal environment changes.

Against the backdrop of accelerating growth in the chemicals production in EU-28 in 2017, the slowdown in growth rate of high-tech basic pharmaceuticals and pharmaceuticals manufacturing began in 2015 and dropped to 2.1% (vs. 8.1% in 2014). However, despite the negative trends in production, pharmaceutical products are dominant in foreign trade compared to the other chemical products. Thus, in 2017, this commodity sub-group accounted for 47% of exports and 39% of EU-28 chemical imports, while demonstrating the highest average annual growth rates of exports and imports for 2007-2017 – 8.8% and 8.7% respectively (Table 2.3).

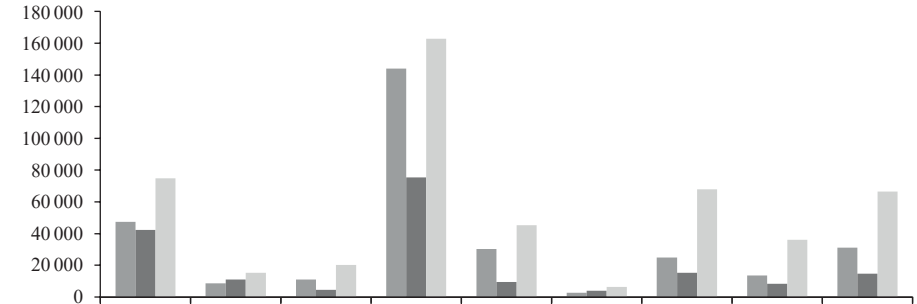
Table 2.3. Commodity structure of foreign trade in chemical products in Ukraine and EU-28, %

Commodity subgroup	EU				Ukraine			
	2014	2015	2016	2017	2014	2015	2016	2017
Structure of export of chemical products								
Organic chemicals	15.59	15.63	15.09	13.31	5.05	3.12	4.40	8.50
Inorganic chemicals	3.17	3.01	2.78	2.87	38.58	45.40	40.50	47.00
Pharmaceutical products	42.43	45.26	45.92	46.95	8.37	7.29	11.82	11.57
Essential oils, resinoids and perfume materials	9.76	9.34	9.66	9.71	5.73	5.00	5.99	6.58
Fertilizers	0.97	1.01	0.85	0.86	22.74	25.06	21.06	7.78
Structure of import of chemical products								
Organic chemical compounds	24.24	24.31	22.82	23.12	10.46	11.36	9.69	9.32
Inorganic Chemistry Products	7.78	7.08	5.96	5.94	4.51	5.67	5.44	5.79
Pharmaceutical products	38.06	38.98	40.74	39.40	36.47	27.29	28.60	27.00
Essential oils, resinoids and perfume materials	4.53	4.78	5.11	5.11	10.46	9.81	9.29	9.16
Fertilizers	2.53	2.52	2.15	2.20	8.74	14.14	14.64	17.21

Source: elaborated by the authors based on SSSU, 2019; Annual detailed enterprise statistics for industry Eurostat, 2018.

The largest pharmaceutical manufacturers in Europe are Switzerland (25.9% of the total EU-28 pharmaceutical production in 2016), Germany (16.8%), France (13.4%), Italy (9.5%), Belgium (8.6%), Denmark (5.1%), Spain (4.7%). The highest rate of growth was in Greece (17.9%), Romania (15.2%), Norway (13.7%), Denmark (12.1%), the Czech Republic (10.6%), Switzerland (10.5%), while in Germany, France, Italy, Spain and Belgium, the value of this indicator was significantly lower (5.5%, 5.3%, 6.3%, 2.8%, and 3.4% respectively). High rates of foreign trade are also typical for organic chemicals, which occupied 13.3% of exports and 23.1% of EU chemicals import in 2017.

The volume of chemical products domestic exports in EU-28 exceeds the volume of external exports, which means a greater orientation of producers to the domestic market of EU than to foreign markets. The largest gap between the volumes of domestic and foreign exports is observed in such commodity subgroups as fertilizers (in 2017 the volume of domestic exports exceeded the volume of external exports to 2.3 in times) and plastics in primary forms (to 2.8 in times) (Fig. 2.2). At the same time, the volume of domestic exports of the largest commodity subgroup, – organic chemistry – was only 9% higher than the volume of external exports, indicating the manufactures orientation to the same extent both on the domestic EU market and on the external market.



	51	52	53	54	55	56	57	58	59
Extra exports	47324	8728	11019	143974	30291	2668	24975	13505	31070
Extra imports	42245	11037	4550	75431	9463	3974	15334	8354	14754
Intra imports	74762	15389	20147	162766	45230	6371	67822	36142	66468

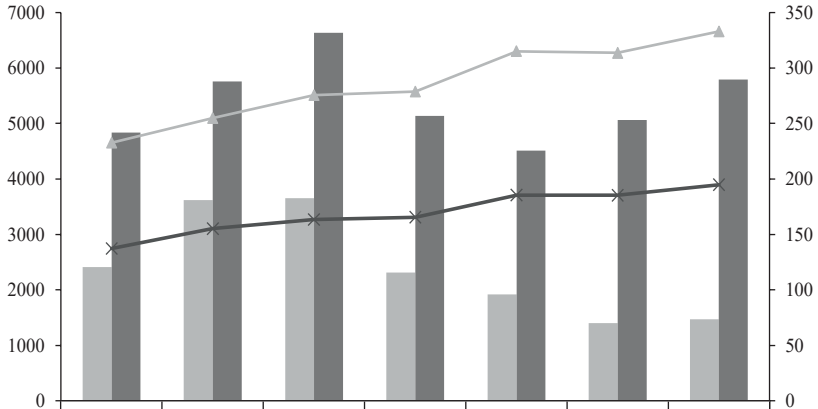
Explanations:
51 – Organic chemicals
52 – Inorganic chemicals
53 – Dyeing, tanning&colouring materials
54 – Medical and pharmaceutical products
55 – Essential oils, resinoids and perfume materials
56 – Fertilizers (other than those of group 272)
57 – Plastics in primary forms
58 – Plastics in non-primary forms
59 – Chemical materials and products

Fig. 2.2. Foreign chemical products trade in EU-28 in 2017, EUR bill

Source: elaborated by the authors based on Annual detailed enterprise statistics for industry Eurostat, 2018.

The structure of chemical products foreign trade in Ukraine differs from the similar EU-28 structure. So, when in the EU the priority is export of pharmaceuticals (46.95% in 2017) and organic chemical compounds (13.31%), in Ukraine the main part of exports is taken by products of inorganic chemistry (47.0%). Fertilizers, which are the second largest pharmaceutical importer in Ukraine (17.2% in 2017), in the similar structure of EU-28 imports, occupy the smallest share (2.2%) among all product subgroups. At the same time, the commodity structure of chemical products export in Ukraine is being transformed in the direction of approaching to structure of EU-28: it increases the pharmaceuticals and organic chemicals export share. The common feature of chemical products import structure in Ukraine and EU-28 is the dominance of pharmaceuticals share, which value in 2017 accounted for 27.0% and 39.4%, respectively.

For the indicators of the chemical products foreign trade dynamics EU-28 is characterized by higher stability, compared with Ukraine. Thus, if EU-28 is undergoing an annual increase in the volume of chemicals export, the tendency for



	2011	2012	2013	2014	2015	2016	2017
Ukraine exports, millions euro	2413.0	3619.0	3654.2	2313.7	1919.7	1403.8	1469.6
Ukraine imports millions euro	4838.7	5754.8	6636.6	5138.0	4512.8	5062.6	5792.8
EU imports, billions euro	232.7	254.9	275.5	278.8	315.2	313.6	333.1
EU exports, billions euro	137.3	155.3	163.4	165.5	185.5	185.2	194.8

Fig. 2.3. Dynamics of chemical products export and import in Ukraine and EU-28

Source: elaborated by the authors based on SSSU, 2019; Annual detailed enterprise statistics for industry Eurostat, 2018.

export growth was observed in Ukraine until 2012 and recovered only in 2016-2017 years (Fig. 2.3). As a result, the volume of chemical products Ukrainian exports of in 2017 amounted to only 40.2% of its volume in 2012, while the EU-28 exports increased to 20.9% over this period.

According to the results of author's calculations carried out on the basis of the data of the State Statistics Service of Ukraine (author's calculations by SSSU, 2019 and Eurostat 2019), the chemicals import trends in EU countries (which are characterized by stable insignificant growth), correlate with the trends of export performance. While in Ukraine, after a tangible decrease in chemical products import (to 32% during 2014-2015), since 2016, its intensive growth is taking place.

Low values of performance indicators are typical for Ukrainian chemical industry (in particular, in the production of chemicals) (Table 2.4).

According to the number of chemical enterprises, Ukraine is second only to the UK, Spain, Italy, Germany, France and Poland, which are the leaders of the chemical industry development in EU. Instead, the volume of chemical products sales (VCPS) per chemical enterprise in Ukraine (0.97 bill. EUR in 2016) is significantly lower than in EU countries. Thus, in particular, this indicator in Belgium was higher than in Ukraine, almost in 62 times, and in Poland – 6.3 in times.

Table 2.4. Indicators of the functioning of the chemical industry (production of chemicals and chemical products) in Ukraine and EU countries in 2016

Country	Number of chemical enterprises	VCPS, million euros	VCPS per chemical enterprise, thousand euros	VCPS per employee, thousand euros	Share of chemical products in volume of industrial products sold, %	Share of employees in the product chemical and chemical products, %
Ukraine	2046	1987.7	971.5	28.4	2.6	2.9
Austria	360	13377.2	37158.9	742.7	7.4	2.9
Belgium	562	33732.6	60022.4	784.3	13.7	8.7
Bulgaria	606	1455.4	2401.7	102.0	4.9	2.6
UK	2826	36386.9	12875.8	411.7	5.2	3.4
Greece	979	2150.6	2196.7	207.3	4.6	3.3
Denmark	263	5362.0	20387.8	459.7	4.8	3.8
Estonia	110	452.4	4112.7	191.7	3.8	2.2
Spain	3409	37132.2	10892.4	422.9	8.0	4.7
Italy	4312	49570.7	11496.0	459.1	5.6	2.9
Cyprus	57	86.4	1515.8	138.5	2.8	2.1
Latvia	231	218.3	945.0	76.7	2.8	2.4
Lithuania	144	1774.8	12325.0	334.8	9.8	2.5
Luxembourg	16	332.4	20775.0	296.8	2.5	3.3
Malta	40	32.8	820.0	114.8	1.3	1.3
Netherlands	893	43760.7	49004.1	989.5	13.6	6.4
Germany	3121	160450.4	51409.9	472.1	7.7	4.6
Norway	222	5585.2	25158.6	541.1	6.7	4.6
Poland	2444	14960.5	6121.3	184.6	5.2	3.1
Portugal	791	4319.4	5460.7	345.4	5.3	1.8
Romania	851	2283.7	2683.5	101.6	3.0	1.9
Slovakia	446	1657.1	3715.5	186.5	2.3	1.9
Slovenia	206	1270.5	6167.5	198.0	4.8	3.3
Hungary	663	5638.5	8504.5	373.1	5.5	2.0
Finland	288	7686.3	26688.5	601.9	6.3	3.8
France	3042	66628.6	21902.9	457.8	7.3	5.0
Croatia	358	730.1	2039.4	124.4	3.6	2.2
Czech Republic	1815	6142.6	3384.4	202.4	3.8	2.3
Sweden	821	9438.9	11496.8	448.8	4.8	3.5

Source: elaborated by the authors based on SSSU, 2019; Annual detailed enterprise statistics for industry Eurostat, 2018.

The VCPS per worker in Ukraine is 2.7 in times lower than in Latvia (the lowest value of this indicator among EU countries) and almost 35 in times – than in the Netherlands. By the share of chemical products in the volume of industrial products sold in 2016, Ukraine predominated only Luxembourg, Malta and Slovakia, and by the indicator of the share of workers engaged in the chemicals production – Bulgaria, Estonia, Malta and Slovakia.

Ukrainian chemical industry remains raw-oriented, determines the territorial concentration of basic chemical production, and, at the same time, determines the need for structural transformation of this sector in the direction of high-tech industries increasing. However, such a transformation should foresee the need to preserve existing competitive advantages (raw material deposits and production capacities) that can be used to develop the chemical industry in the long term. Therefore, the priority for development in Ukraine should be those chemicals which are considered as raw materials and semi-finished products not only for the chemical but also for other sectors (light, food, etc.) industry, as well as other types of economic activity.

Summing up the results of the conducted research, low efficiency of Ukrainian chemical industry functioning, in particular, compared with EU countries can be noted. Thus, the volumes of domestic chemical products production and export are 10 in times smaller than in EU-leading chemical manufacturing countries, and the turnover per one chemical company in Ukraine is significantly lower than in European countries. in addition, the dynamics of chemical production in EU are characterized by much more stable tendencies, while the chemical industry of Ukraine, being export-oriented and, at the same time, import-dependent, directly depends on the state of the chemical products world market. On the other hand, the fact of active chemical production growth in Ukraine in 2016-2018, which in several times exceeded the figures in EU countries, gives grounds for the statement about the domestic chemical industry prospects.

In the context of the global chemical industry new architecture formation, a key guideline for the chemical companies development is the innovation, which confirms the need to intensify innovation activities in Ukraine. The main motivation to innovate is the demands of the market, that is, consumers of chemical products (sectors of the economy and the population) and pressure against competitors. The realization of such a task, for its part, requires:

– the high-tech chemical production development stimulation through selective subsidization (increase of target state subsidies) on the example of EU member states, preferential crediting and taxation, with increasing the knowledge of the products, giving preferences (additional points) in conducting tenders for the receipt of a state order, provided the values of the coefficient localization of internal potential at a certain level, involvement in the implementation of state target programs, etc.;

– the creation of effective technological chemical industry development forecasting system (primarily with the participation of the institutes of the National Academy of Sciences of Ukraine) on the basis of constant monitoring of the technical re-equipment level.

In order to increase the competitiveness of the chemical industry in Ukraine, institutional reforms are called for, in particular, to promote:

– the formation of vertically and horizontally integrated institutional structures for the production of chemical products with a full technological cycle (from raw materials to final products);

– the creation of clusters, industrial (chemical) parks and the other associations of industrial, scientific and commercial enterprises of various types of economic activity for the implementation of priority investment and innovation projects;

– the stimulating the chemical enterprises participation in the formation of stable cooperative ties, ensuring inter-sectoral and interregional cooperation.

2.1.2. Cross-sectoral links of the chemical productions

The chemical industry belongs to the main segments of the world industry. This is a poly element system of production, which includes the synthesis of substances with certain properties on the basis of mineral, organic and other raw materials by its chemical processing. Producing products of intermediate consumption (raw materials and semi-finished products) for all sectors of the economy, modern chemical industry largely determines the level of their competitiveness, as well as the dynamics of development, the nature and direction of innovation processes. On the other hand, the wide assortment of household chemical products confirms its weight on the consumer market. The level of "chemistry" is a universally accepted criterion for the socio-economic development of any country. Thus, in industrialized countries, the share of chemical products in industrial production ranges from 5-8% to 13-16%, while in Ukraine – less than 3%.

The structure of chemical and chemical production in Ukraine over the past 5 years has not changed its raw material orientation, since it continues to dominate (with a share less than 60%) and, at the same time, import-dependent (the share of imports in the intermediate consumption of chemicals and chemical products is near 65%) the main chemical products, fertilizers and nitrogen compounds, plastics and synthetic rubbers in primary forms. Insignificant changes in this structure were the result of increased production of paint and varnish and other chemical products, primarily for consumer purposes. The latter is evidence of a non-systematic structural reform of the domestic chemical industry, which was carried out at the level of individual enterprises in response to the growth of local (sectoral) demand for certain types of chemical products. Thus, Ukrainian chemical

production is export-oriented (the share of exports in the volume of sold chemical products in 2017 was less than 95%), and therefore, the dynamics and the results of their functioning are directly dependent on the situation on the world market of chemical products.

In 2016, the Ukrainian economy used chemical products worth 162,141 bill. UAH, which is 10.6% more than in 2015 and 108.3% more than in the year 2013. Chemical products, which in varying degrees are used by all types of economic activity, in 2016 amounted to 5.5% of the total volume of intermediate consumption of the Ukrainian economy. The largest consumers of chemical products were agriculture and the chemical industry (production of chemicals and chemical products). Thus, agriculture, forestry and fisheries accounted for almost 40% (or 64.780 bill. UAH) of intermediate consumption chemicals, compared to 30% (23.312 bill. UAH) in 2013 (Table 2.5).

Table 2.5. Share of the largest consumers of chemical products in Ukraine (in the segment of intermediate consumption), %

NACE activities	2013	2014	2015	2016	Deviation (+/–)			
					2014--2013	2015--2014	2016--2015	2016--2013
Agriculture, forestry and fishing	30.00	28.74	36.78	39.95	–1.26	8.04	3.17	9.95
Manufacture of chemicals and chemical products	16.80	15.65	13.96	12.59	–1.15	–1.69	–1.37	–4.21
Manufacture of rubber and plastic products and other non-metallic mineral products	8.70	7.57	7.86	8.50	–1.13	0.29	0.64	–0.20
Manufacture of wood, paper, printing and reproduction	8.10	7.48	6.65	6.92	–0.62	–0.83	0.27	–1.18
Manufacture of food products; beverages and tobacco products	6.00	6.76	6.24	6.03	0.76	–0.52	–0.21	0.03

Source: elaborated by the authors based on SSSU, 2019.

During 2013-2016, the use of these types of economic activity of the chemical intermediate consumption increased to 177.9%. The main commodities of the chemical industry used in agriculture in Ukraine are mineral fertilizers, insecticides and fuel and lubricants. For comparison, in Poland (a country close to Ukraine in terms of economic parameters), agriculture accounts for about 10% of intermediate consumption of chemical products (Table 2.6). Significantly higher level of use in domestic agriculture of chemical products is due to the increased "agrarization" of the national economy.

The 2-nd largest consumer of chemical products in Ukraine is the production of chemicals and chemical products (chemical industry) with a share of 12.59%

Table 2.6. Share of the largest consumers of chemical products in Poland and Germany (in the segment of intermediate consumption) in 2016, %

NACE activities	Poland	Germany
Agriculture, forestry and fishing	10.85	2.50
Manufacture of chemicals and chemical products	24.19	58.46
Manufacture of rubber and plastic products and other non-metallic mineral products	18.25	14.88
Manufacture of wood, paper, printing and reproduction	5.36	2.52
Manufacture of food products; beverages and tobacco products	2.48	0.86

Source: elaborated by the authors based on CSOP, 2018; Eurostat, 2019.

in 2016 vs. 16.80% in 2013. The decline in the level of use by the chemical industry of its own products of intermediate consumption correlated with the decrease of the index of chemical products, the value of which for 2013-2015 ranged from 80.7% to 84.8%. For example, in Poland the share of production of chemicals and chemical products in the structure of intermediate consumption of chemical industry products is twice as high 25% than in Ukraine, and in Germany – even higher 60%.

The share of production of chemicals and chemical products in the structure of intermediate consumption of products of the chemical industry reflects not only the level of development of the latter, but also the optimality of the structure, efficiency of functioning and the level of technological efficiency of the industrial sector of the economy as a whole. According to the results of the analysis, in Ukraine the value of this indicator is significantly lower than in the industrialized countries of EU. And hence, the level of productivity of the domestic industry is lower: in 2016, the share of high and medium-high-tech manufacturing in the production of processing industry in Ukraine was 16.67%, while in Poland – 32.17%, and in Germany – 57.33%. Thus, the development of the chemical industry of Ukraine should be seen not as an intra-industry but as a national economic vector and priority.

The 3-rd largest consumer of chemical products in Ukraine is the production of rubber and plastic products, technologically close to the chemical industry. The share of this production in the structure of intermediate consumption of chemical products during the analyzed period was characterized by a changing trend: a decrease in 2013-2014, but growth in 2016 to 8.50% (vs. 8.70% in 2013). A similar trend was observed in the dynamics of products of the named production, whose index dropped from 97.4% to 92.8% over 2013-2015, and in 2016 it increased to 108.5%. Polish rubber and plastic products use about 20% of the volume of intermediate consumption chemicals in this country.

In addition to the three types of economic activity, the main consumers of chemical products in Ukraine include wood, paper, printing and duplication, the share of which in the structure of intermediate consumption of chemical products in 2014 and 2015 tended to decrease, which was caused primarily by a decrease in indices of this production up to 96.0% and 88.9% respectively, as well as a decrease in its technological capacity. Thus, during this period raw material exports of woodworking industry increased. in 2016, the share of wood, paper, printing and replicating in the intermediate consumption of chemical industry products (based on paint and varnish products) slightly increased to 6.95% (vs. 8.10% in 2013).

The production of food, beverages and tobacco products in its activity uses the broadest range of products of the chemical industry, in particular: edible salt and soda, spices, various food additives (dyes, preservatives, antioxidants, stabilizers, emulsifiers, flavor enhancers, glazing agents) and many other chemicals and food ingredients. The weight of chemical products in ensuring the functioning of food production confirms the relatively constant importance of the latter share in the structure of intermediate consumption of products of the chemical industry in Ukraine, which remained at the level of 6.0% for 2013-2016. For comparison, in Poland, the value of this indicator in 2014 was 2.48% (vs. 3.52% in 2005), and in Germany – only 0.86%. These differences are due to the varying weight of the food industry in the economies of these countries. Thus, the share of the food industry in the output of the processing industry of Ukraine in 2016 amounted to 33.88%, while Poland – 19.90%, and Germany – 9.88%.

In addition to the low level of technological efficiency of the industrial sector, one of the most acute problems in Ukraine is the high level of import dependence, in particular, in the segment of intermediate consumption of chemical products. Thus, in 2016, the share of imports consumed by all sectors of the national economy of manufactured goods of chemical substances and chemical products amounted to 83.31% (vs. 77.36% in 2015) (author's calculations by SSSU, 2019). Among the main consumers of chemical products, the largest amount of imported goods (less than 95% in 2016) used in its activity: agriculture, chemical and food industry (Table 2.7).

During 2013-2016, the share of imports in the intermediate consumption of chemical products increased significantly in the production of food products, beverages and tobacco products (to 27.78 pp.) and agriculture (12.93 pp.) with the increase in production volumes in sectors of the economy. Instead, in the production of wood, paper, printing and replicating, as well as in the manufacture of rubber and plastic products, the share of imported chemical products during this period decreased, respectively, to 33.38 pp. and 18.46 pp. in the structure of intermediate consumption of the domestic chemical industry (the production of chemicals and chemical products), imports of chemical products with a share > 95% were dominant in the average for the analyzed period.

Table 2.7. Share of imports in the intermediate consumption of chemical products in Ukraine (by main consumers), %

NACE activities	2013	2014	2015	2016	Deviation (+/–)			
					2014--2013	2015--2014	2016--2015	2016--2013
Agriculture, forestry and fishing	86.70	98.67	96.34	99.63	11.97	–2.33	3.29	12.93
Manufacture of chemicals and chemical products	97.28	92.16	97.02	96.16	–5.12	4.86	–0.86	–1.12
Manufacture of rubber and plastic products and other non-metallic mineral products	93.68	77.67	64.89	75.22	–16.01	–12.78	10.33	–18.46
Manufacture of wood, paper, printing and reproduction	80.72	50.84	47.7	47.34	–29.88	–3.14	–0.36	–33.38
Manufacture of food products; beverages and tobacco products	68.06	97.49	55.82	95.84	29.43	–41.67	40.02	27.78

Source: elaborated by the authors based on SSSU, 2019.

The main exporters of chemical products to Ukraine are European countries (with a share less than 50%) (Table 2.8). During 2013-2017, the geographical structure of the import of chemical products was relatively stable, however, there was a slight decrease (to 2.3 pp.) of the shares of European countries, and, on the contrary, the growth of the Asian countries (1.7 pp.) and the CIS (0.6 pp.).

Table 2.8. Geographical structure of import of chemical products in Ukraine, %

The region of the world	2013	2014	2015	2016	2017	Deviation (+/–)				
						2014--2013	2015--2014	2016--2015	2017--2016	2017--2013
Europe	54.8	53.6	51.4	52.6	52.5	–1.2	–2.2	1.2	–0.1	–2.3
Asia	18.3	20.2	20.1	21.2	20.0	1.9	–0.1	1.1	–1.2	1.7
Africa	0.3	0.4	0.4	0.3	0.3	0.2	0.0	–0.1	0.0	0.0
America	4.1	4.4	4.1	4.3	4.1	0.2	–0.3	0.2	–0.2	0.0
CIS	22.4	21.3	24.0	21.6	23.0	–1.1	2.7	–2.4	1.4	0.6

Source: elaborated by the authors based on NBU, 2018.

At the same time, two opposite trends were observed in the geographic structure of Ukrainian imports of basic chemicals (codes 28, 29, 31):

1) the full or partial reorientation of imports from the Russian Federation to the countries of Europe, China, etc.;

2) the growth of the Russian Federation share in the structure of imports of certain commodity items of basic chemistry.

Thus, in 2013, Russian Federation was the key exporter of nitric acid and sulphoisic acid (HS Code: 2808), while in 2017 Poland and the Czech Republic (Table 2.9). A similar reorientation of import flows occurred in the context of other commodity positions, namely: 2850; 2904; 2942; 2849 (HS Code).

Table 2.9. Geographic structure of Ukrainian imports by individual commodity positions of basic chemistry in 2013 and 2017

HS Code	Commodity position	Country	2013		Country	2017	
			Thousand dollars USA	%		Thousand dollars USA	%
2808	Nitric acid; sulphonitric acids	Russian Federation	5458	98.77	Poland	2309	77.90
		Spain	43	0.78	Czech Republic	583	19.67
		Germany	17	0.31	Germany	57	1.92
		Other countries	8	0.14	Other countries	15	0.51
		Total	**5526**	**100.00**	**Total**	**2964**	**100.00**
2850	Hydrides. nitrides. azides. silicides and borides. whether or not chemically defined. other than compounds which are also carbides of heading no. 2849	Russian Federation	154	54.8	China	232.0	81.69
		China	54	19.22	India	39.0	13.73
		Japan	41	14.59	Japan	10.0	3.52
		Other countries	32	11.39	Other countries	3.0	1.06
		Total	**281**	**100.00**	**Total**	**284**	**100.00**
2904	Sulphonated. nitrated or nitrosated derivatives of hydrocarbons; whether or not halogenated	Russian Federation	1329	53.05	Czech Republic	105.00	27.34
		Germany	421	16.81	China	102.00	26.56
		Czech Republic	292	11.66	USA	53.00	13.80
		Other countries	463	18.48	Other countries	124.00	32.29
		Total	**2505**	**100.00**	**Total**	**384.00**	**100.00**
2942	Organic compounds; n.e.c. in chapter 29	Russian Federation	516	72.98	India	25	46.30
		France	100	14.14	China	9	16.67
		USA	36	5.09	Italy	8	14.81
		Other countries	55	7.78	Other countries	12	22.22
		Total	**707**	**100.00**	**Total**	**54.00**	**100.00**
2849	Carbides. whether or not chemically defined	Kazakhstan	2316	27.23	Slovakia	3190	82.39
		Slovakia	2177	25.59	China	254	6.56
		Russian Federation	2034	23.91	South Africa	132	3.41
		Other countries	1979	23.27	Other countries	296	7.64
		Total	**8506**	**100.00**	**Total**	**3872**	**100.00**

Source: elaborated by the authors based on NBU, 2018.

In addition to deepening import dependence in the segment of intermediate consumption of basic chemicals products, the problem of the cost of chemical production is acute in Ukraine. Indicator of expenditure is the indicator of the share of intermediate consumption (goods and services) in the issue. in Ukraine, there has been a tendency towards a gradual (but very slow) decrease in the values of this indicator. Thus, in 2016, the share of expenditures in the production of domestic chemical and chemical products was 88.78% (compared to 89.55% in 2013) and was 17.47 pp. higher than in Poland and to 25.77 pp. – rather than in Germany (Fig. 2.4).

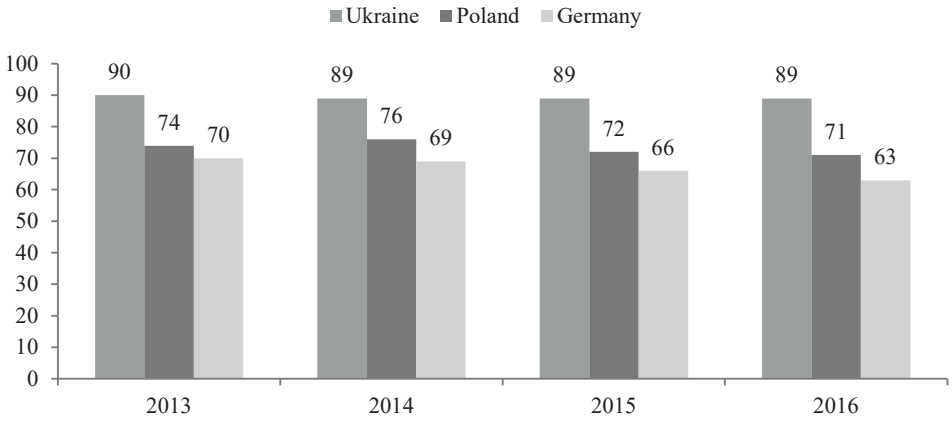


Fig. 2.4. Share of expenses (intermediate consumption) in the production of chemicals and chemical products, %

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019.

The level of consumption of Ukrainian chemical industry is the highest among EU countries, in which in 2016 its value ranged from 47.2% in Greece to 76.0% in Italy (author's calculations by SSSU, 2019; Eurostat 2019). At the same time, in Ukraine, the tendency towards an increase in the share of domestic products and services in the structure of expenses for the production of chemicals and chemical products is positive. Thus, the value of this indicator in 2017 reached 46.76% vs. 36.33% in 2013 (Table 2.10).

In the production activities of the domestic chemical industry used products of all types of economic activity. in 2016, 76.38% of products were produced in four of them (chemical and chemical production; crude oil and natural gas production; electricity, gas, steam and air conditioning, wholesale and retail trade, repair of motor vehicles and motorcycles) services used in the production of chemicals and chemical products.

The production of chemicals and chemical products during 2013-2016 has increased its weight in the structure of expenses of the chemical industry of Ukraine

Table 2.10. Indicators of cost of the chemical industry of Ukraine, %

Indicator	2013	2014	2015	2016	Deviation (+/–)			
					2014--2013	2015--2014	2016--2015	2016--2013
Share input in the output of them:	89.55	89.05	89.08	88.78	–0.49	0.03	–0.30	–0.77
− domestic products and services	36.33	41.31	39.82	46.76	4.97	–1.48	6.94	10.43
− imported products and services	53.22	47.75	49.26	42.03	–5.47	1.52	–7.24	–11.19

Source: elaborated by the authors based on SSSU, 2019.

to 3.89 pp. (Table 2.11). Such a tendency is a sign of an increase in the level of technology of domestic chemical production. This indicator can also be considered a general indicator of the functioning of the chemical industry. For example, in Poland in 2014, its value was 52.52%, and in Germany – 58.46% (Table 2.12).

Table 2.11. Types of economic activity, the products of which occupy the largest share in the structure of expenses (intermediate consumption) of the chemical industry of Ukraine, %

NACE activities	2013	2014	2015	2016	Deviation (+/–)			
					2014--2013	2015--2014	2016--2015	2016--2013
Manufacture of chemicals and chemical products	29.69	31.73	31.27	33.58	2.04	–0.46	2.31	3.89
Mining of crude oil and natural gas	38.90	27.79	32.99	22.31	–11.12	5.20	–10.68	–16.59
Electricity, gas, steam and air conditioning supply	9.14	9.60	7.83	10.78	0.47	–1.77	2.94	1.64
Wholesale and retail trade; repair of motor vehicles and motorcycles	0.22	8.38	7.76	9.71	8.17	–0.63	1.95	9.49

Source: elaborated by the authors based on SSSU, 2019.

Table 2.12. Types of economic activity, the products of which occupy the largest share in the structure of expenses (intermediate consumption) of the chemical industry of Poland and Germany in 2016, %

NACE activities	Poland	Germany
Manufacture of chemicals and chemical products	52.52	58.46
Mining of metal ores, other minerals and quarries; provision of auxiliary services in the extractive industry and the development of quarries	7.65	3.40
Extraction of crude oil and natural gas	0.00	0.60
Electricity, gas, steam and air conditioning supply	3.86	2.46
Wholesale and retail trade; repair of motor vehicles and motorcycles	0.11	2.74

Source: elaborated by the authors based on CSOP, 2018; Eurostat, 2019.

To ensure the activity of chemical production in Ukraine, the second most important is the production of such kind of economic activity as the extraction of crude oil and natural gas. This is due to the fact that oil, coal and natural gas are the main elements of the raw material base of the domestic chemical industry. Accordingly, the change in prices for this raw material is one of the decisive factors influencing the cost price of chemical products. During 2013-2016, the share of crude oil and natural gas production in the structure of expenses of the chemical industry decreased to 16.59 pp. and in 2016 it was 22.31%. For comparison, the share of crude oil and natural gas (along with metal ore mining, mining and quarrying) products in the structure of the costs of the chemical industry in Poland in 2014 was 7.65% and Germany – 4.0% (in particular, the share of crude oil and natural gas production is only 0.60%). Thus, in the Polish and German chemical industries, the use of metal ores and other minerals predominates, and in Ukrainian – the use of oil, coal and natural gas. Instead, the share of production of metal ores, other minerals and quarries in the structure of expenditures of domestic chemical industry decreased to 2.66 pp. over 2013-2016 and in 2016 it was only 0.52% (author's calculations by SSSU, 2019).

The electricity, gas, steam and air conditioning supply is the third type of economic activity in terms of the share of its products in the structure of expenses of the chemical industry. The value of this indicator in Ukraine in 2016 amounted to 10.78% (vs. 9.14% in 2013), while in Poland in 2014 – 3.86%, and in Germany – 2.94%. More and more energy consumption in Ukraine is due to the structure of domestic chemical production, in which the products of inorganic chemistry and mineral fertilizers prevail, whose production processes are more energy--intensive.

Share of products and services of wholesale and retail trade; repair of motor vehicles and motorcycles in the structure of expenses of the chemical industry of Ukraine during 2013-2016 increased to 9.49 pp. This tendency is caused by a significant rapid increase in the cost of fuel and lubricants and energy, and hence of transport services in 2014, which, in turn, resulted from the devaluation of the national currency and the negative impact of other macroeconomic factors. For example, in the structure of the costs of the chemical industry in Poland, the share of products and services of the type of economic activity in 2014 was only 0.11% and Germany – 2.74%. Therefore, in order to reduce the cost of chemical industry in Ukraine, it is necessary to improve the activity of transport and logistics sphere in general, and in particular, raw material supply systems for chemical production and distribution of chemical products.

In Ukraine, there was a positive trend towards a decrease in the import dependence of the chemical industry. Thus, the share of imports in the cost of production of chemicals and chemical products in 2013-2016 decreased to 17.62 pp. and

in 2016 amounted to 47.78% (author's calculations by SSSU, 2019). The most important is the significant decrease in the dependence of the domestic chemical industry on imported products for the extraction of crude oil and natural gas – to 35.25 pp., as compared to 2013 (Table 2.13).

Table 2.13. Share of imports in the costs of the chemical industry of Ukraine (in the category of key types of economic activity), %

NACE activities	2013	2014	2015	2016	Deviation (+/–)			
					2014--2013	2015--2014	2016--2015	2016--2013
Manufacture of chemicals and chemical products	97.28	92.16	97.02	96.16	–5.13	4.86	–0.85	–1.12
Extraction of crude oil and natural gas	81.27	71.29	66.79	46.02	–9.97	–4.50	–20.78	–35.25
Electricity, gas, steam and air conditioning supply	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wholesale and retail trade; repair of motor vehicles and motorcycles	6.32	0.38	0.33	0.51	–5.93	–0.05	0.17	–5.81

Source: elaborated by the authors based on SSSU, 2019.

The share of import services of this type of economic activity, such as wholesale and retail trade, repair of motor vehicles and motorcycles in the expenses of the chemical industry since 2014, is negligible and import energy is not used at all. At the same time, the level of dependence on imports of chemical products in 2016 remained critically high – 96.16%.

Summarizing the results of the conducted assessments, one can state the relatively low level of technological ability of the chemical industry of Ukraine, whose production and export structure is dominated by the production of energy-intensive raw materials for inorganic chemistry and mineral fertilizers. in addition, these production are completely import-dependent and, at the same time, export-oriented – the share of exports in the volume of sales of basic chemicals in 2017 amounted to 69.82%. Therefore, due to specialization in raw materials, export-oriented and significant import dependence (in the intermediate consumption segment), the domestic chemical industry in 2013-2016 only partially (with a decreasing trend) provided demand for chemical products on the domestic market of Ukraine (Fig. 2.5).

In the future, the observance of these guidelines for the development of chemical production in Ukraine is irrational and economically dangerous, especially during the period of the dynamic transformation of the world market of chemical products. Thus, the problem of reforming the domestic chemical industry, especially in the direction of optimization of the structure of production and export according to criteria of increasing economic efficiency and technological efficiency,

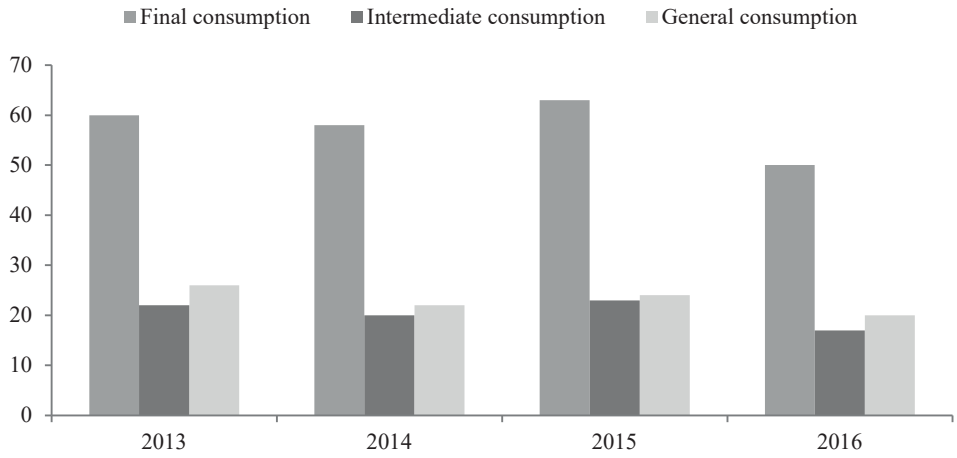


Fig. 2.5. Level of satisfaction of the Ukrainian chemical industry with demand for chemical products on the domestic market (by type of consumption), %

Source: elaborated by the authors based on SSSU, 2019.

is actualized. Hence, the prospects for the development of the chemical industry in Ukraine should be considered through the prism:

– the activation of activity of basic production of inorganic and organic chemistry;

– the reducing the import dependence of the national economy on certain types of chemical products;

– the changes in the structure of exports of chemical products in accordance with the standards of the industrialized countries of EU.

The outline directions will be the subject of further authors' research on the chemical industry.

2.2. Woodworking industry

2.2.1. Trends in timber harvesting and foreign trade of the timber products in Ukraine and EU countries

The woodworking industry is one of the promising links of the Ukrainian economy, which can ensure the growth of jobs, budget revenues and industrial products for related industries (furniture industry and construction). A sufficient supply of woodworking manufactures with raw materials while maintaining a sus-

tainable environment and the rational use of wood is a necessary condition for the functioning of this economic sector. These issues become especially relevant in the conditions and period of strengthening economic integration processes and the introduction of a moratorium on timber exports from Ukraine. All this highlights the studying importance of the raw material potential of Ukrainian woodworking manufacturers, especially in comparison with EU countries, in order to develop economic and legal instruments for the forestry and woodworking industry development.

Ukraine ranks sixth place among EU countries in terms of forest area (9698 thousand hectares in 2017) and timber reserves (2102 bill. m^3), competing with Poland, Italy and Romania. in 2017, 18 913.9 thousand m^3 of roundwood was harvested in Ukraine, which is to 3.5% less than in 2016, but to 8.0% more than in 2012. The dynamics of roundwood harvesting in terms of its main types (industrial roundwood and fuelwood) is different. Thus, in 2017 the volume of industrial roundwood harvest was 7296.6 thousand m^3, while in 2016 it was to 12.2% more (8311.3 thousand m^3), although the harvest of fuel timber increased to 2.9 % in 2017 vs. 7.8% in 2015 (Table 2.14).

Table 2.14. Dynamics of harvested wood volume in Ukraine

Wood type	Volume, thousand m^3						Growth/decrease rate, %				
	2012	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Roundwood	17 506.7	18 021.9	18 333.2	19 267.7	19 605.7	18 913.9	2.9	1.7	5.1	1.8	–3.5
Industrial roundwood	7850.8	8102.1	8158.8	8302.6	8311.3	7296.6	3.2	0.7	1.8	0.1	–12.2
Fuelwood, incl. charcoal	9 655.9	9 919.8	10 174.4	10 965.1	11 294.4	11 617.3	2.7	2.6	7.8	3.0	2.9

Source: elaborated by the authors based on SSSU, 2019.

In terms of harvested round wood, Ukraine ranked the 7-th place among EU countries in 2017, ahead of its closest neighbors in the ranking (Austria and Spain) to 7.1% and Romania (to 23.4%), but behind the Czech Republic (2.4%), Poland (58.3%) and France (63.1%) (Fig. 2.6).

Instead, in terms of the volume of harvested fuel wood, Ukraine ranked the 2-nd place in 2017 (vs. the 3-rd place in 2011) among EU countries, giving first place only to France (Fig. 2.7). The latter is the undisputed leader in EU in terms of harvested fuelwood. According to indicator, France outperforms the nearest followers more than 2.5 in times. However, its importance tends to decrease, while in Ukraine, on the contrary, it increases.

In terms of industrial roundwood production, Ukraine ranked the 14-th place during 2012-2017, ahead of Estonia to 6.6% (in 2017), Lithuania to 56.5% and Slovenia – 2.1 in times ahead, but behind Slovakia (to 20.2%), Great Britain (21.1%),

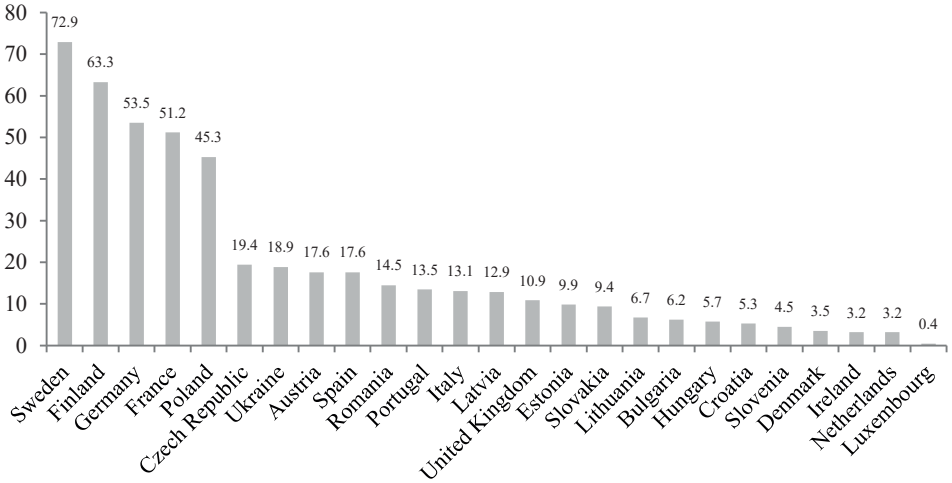


Fig. 2.6. Volume of roundwood harvested in 2017 in Ukraine and EU countries, bill. m^3
Source: elaborated by the authors based on SSSU, 2019; FAO Forestry, 2019.

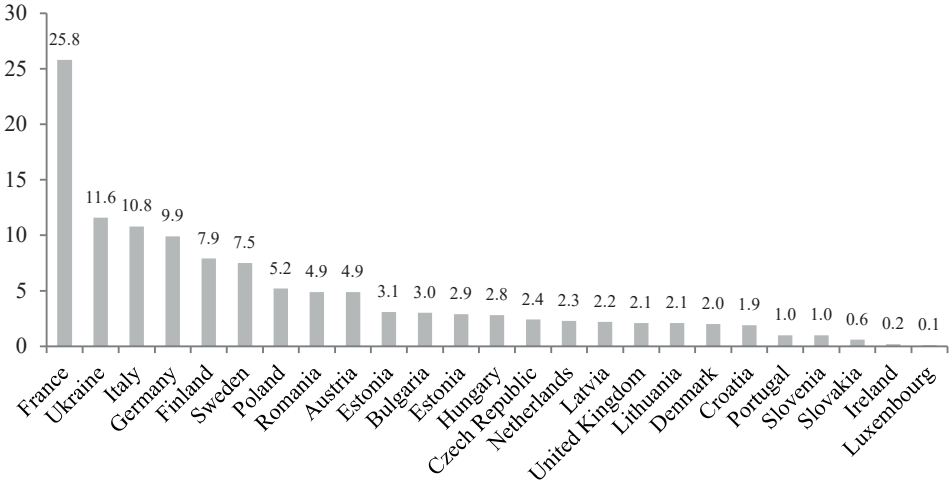


Fig. 2.7. Volume of fuelwood harvested in 2017 in Ukraine and EU countries, bill. m^3
Source: elaborated by the authors based on SSSU, 2019; FAO Forestry, 2019.

and Romania (31.3%) (Fig. 2.8). It should be noted that Poland differs insignificantly from Ukraine in terms of forest area, timber reserves and roundwood production, but it ranks the 4-th place among EU countries in terms of industrial oundwood production, beating Ukraine 5.5 in times (40.1 vs. 7.3 bill. m^3 in 2017).

The fuel wood has invariably been the major part of roundwood harvested in Ukraine: its share increased to 4.3 pp. during 2011-2016, and to 3.8 pp. in 2017 compared to 2016 (Fig. 2.9).

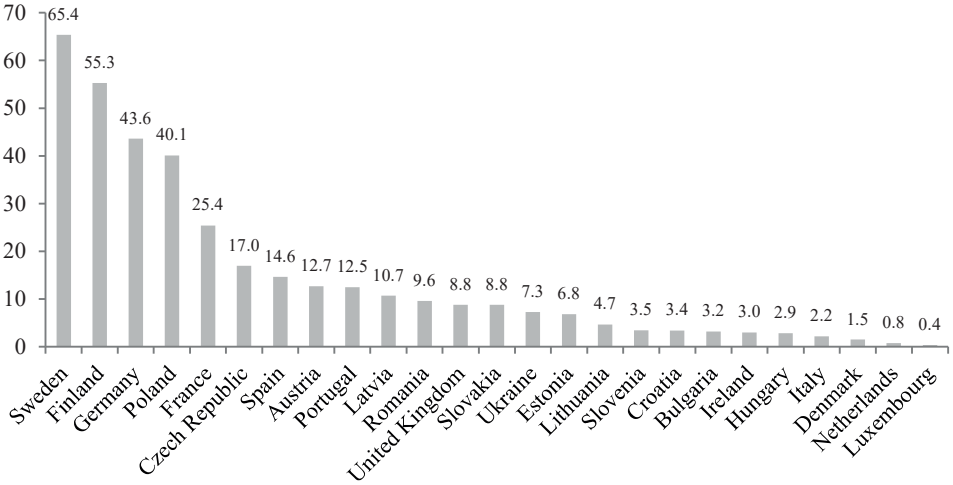


Fig. 2.8. Volume of harvested industrial roundwood in 2017 in Ukraine and EU countries, million m^3

Source: elaborated by the authors based on SSSU, 2019; FAO Forestry, 2019.

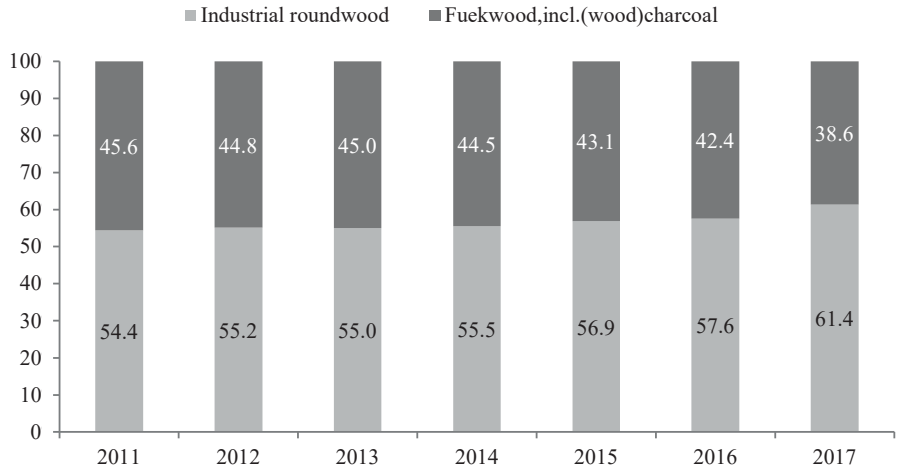


Fig. 2.9. Structure of roundwood harvested in Ukraine (by main types), %

Source: elaborated by the authors based on SSSU, 2019.

In contrast to Ukraine, the most round wood harvested in the vast majority of EU countries is classified as industrial roundwood, with a much smaller share of fuelwood. For example, the share of fuelwood in 2017 was 11.6% and 12.3% in the neighboring countries with a similar forest landscape – Poland and the Czech Republic respectively, Slovakia – only 6.3%, and in EU as a whole – 23.2% (author's calculations by SSSU, 2019; FAO Forestry, 2019). Hence, the sharp

deterioration in the round wood harvested structure in Ukraine can be interpreted as a threat to environmental and, consequently, national security as well as the prospects of woodworking industries.

The structure of industrial round wood harvested in Ukraine during the analyzed period was steadily dominated by lumber and billets, glued plywood and veneer, the share of which in 2017 was 81.0% vs. 86.5% in 2014, and 78.9% in 2011 (Fig. 2.10). The decrease in the share of this type of round wood in the structure of industrial round wood in Ukraine was a consequence of its harvesting reduction.

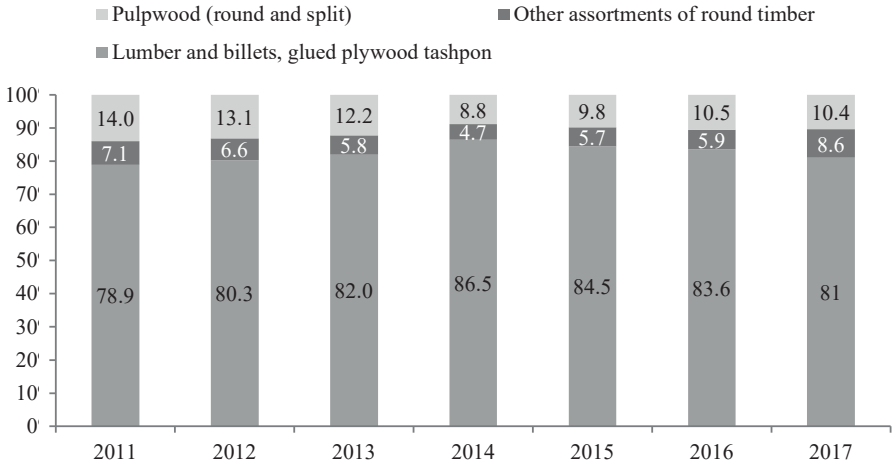


Fig. 2.10. Structure of industrial round wood harvested in Ukraine, %

Source: elaborated by the authors based on SSSU, 2019.

Thus, the harvested volume of timber and billets, glued plywood and veneer decreased to 16.2% during 2015-2017 (from 7053.7 thousand m^3 in 2014 to 5909.2 thousand m^3 in 2017), including to 14.9% in 2017. As a result, Ukraine ranked the 11-th place in terms of the harvested volume of timber and billets, glued plywood and veneer in 2016 (vs. the 10-th place in 2015) among EU countries, while Poland ranked the 4-th place, the Czech Republic – the 6-th place, and Romania – the 8-th place.

The tendency of the structure deteoration of not only harvested industrial roundwood, but also fuelwood is depening in Ukraine. Thus, the structure of fuelwood was dominated by firewood for heating during 2014-2017, the share of which increased to 6.9 pp. during the mentioned period. (Fig. 2.11). This, in turn, became a consequence of an increase in the volume of firewood for heating to 28.7%, in particular, to 12.9% in 2015.

In conclusion, it can be stated that Ukraine has sufficient raw material potential to ensure the dynamic development of the woodworking industry. The 6-th place of Ukraine among EU countries in terms of timber reserves and the 7-th –

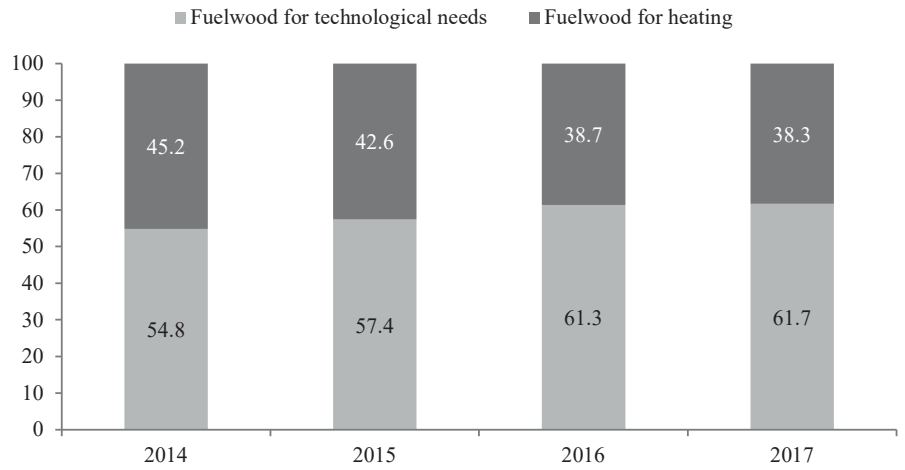


Fig. 2.11. Structure of fuelwood harvested in Ukraine (by main types), %
Source: elaborated by the authors based on SSSU, 2019.

in terms of roundwood harvesting are the proof of this. However, in contrast to the vast majority of EU countries, the structure of harvested domestic roundwood is dominated by fuelwood – 61.4% (the 4-th place after Cyprus, Italy and the Netherlands). Ukraine ranked the 2-nd place in 2017 among EU countries after France in terms of harvesting this type of wood.

The identification of structural and dynamic features of timber that is harvested in Ukraine may be the result of increasing loss of forest stands, changes in world markets, domestic demand for certain types of wood, capacity of woodworking enterprises, regulatory mechanisms and many other multifaceted factors. Detailing, explanation and substantiation of the reasons for the deterioration of the structure of roundwood that is harvested in Ukraine requires separate special scientific and analytical studies.

A high level of the woodworking industry export orientation is inherent for the European countries with a high forest land percentage. Thus, in terms of the share of exports in the production of woodworking industries in 2016, Ukraine ranked the 3-rd among EU countries after Latvia and Estonia (Fig. 2.12). The high level of the woodworking industry export-orientedness (> 20%) is also present in such "woodland" countries as Romania, Croatia, Slovenia and Austria, which is explained by the availability of resource potential for the relevant industries development. in contrast, the economic leaders of EU (Germany, France, Spain and Italy) account for < 6% of exports in the wood production.

In the one thirds of EU countries (including "post-soviet" Bulgaria, Estonia, Poland, the Czech Republic and Romania) the level of woodworking industry export orientation tends to decrease, and in the vast majority of other countries it

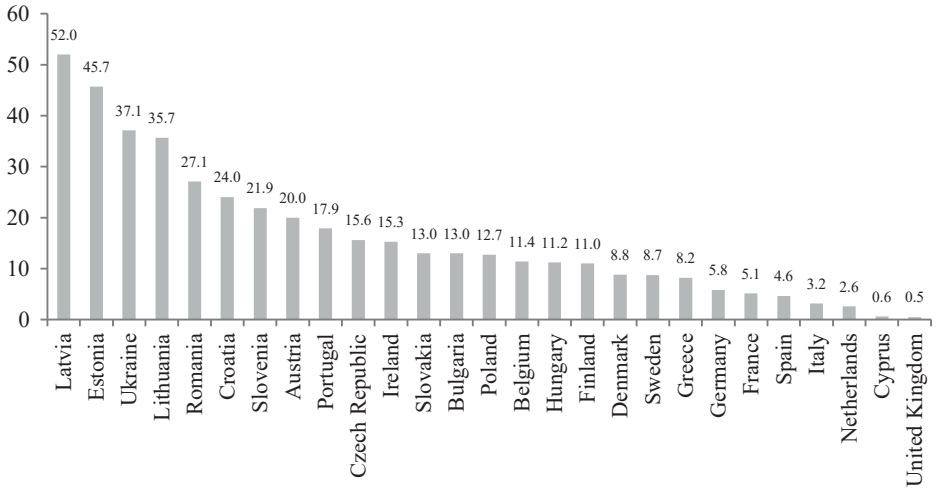


Fig. 2.12. Share of exports in the woodworking outputs in Ukraine and EU countries in 2016,%
Source: elaborated by the authors based on SSSU, 2019; FAO Forestry, 2019.

remains relatively stable (fluctuations do not exceed 1 pp.). The exception is Latvia, where the share of exports in wood production increased to 6.25 pp. during 2014-2016. At the same time, in Ukraine it increased to 5.19 pp. for that period, and by another 1.27 pp. in 2017 (Fig. 2.13).

In terms of wood products exports in 2016, Ukraine ranked the 16-th among EU countries (vs. the 17-th in 2014-2015 and the 13-th in 2012-2013), competing with Estonia, Hungary, Latvia and Romania, but conceding the leader by this

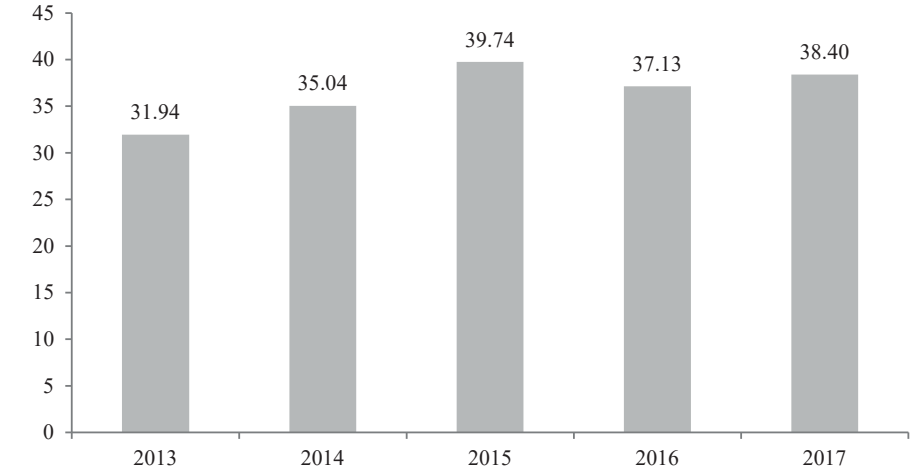


Fig. 2.13. Share of exports in the woodworking outputs in Ukraine, %
Source: elaborated by the authors based on SSSU, 2019.

indicator – Germany – in more than 16 in times. It should be noted that the leading manufactures of woodworking products in EU (Germany, Finland, Italy) have a significantly lower level of woodworking industry export-orientedness than Ukraine.

Based on the assumptions provided, we can conclude that growth of Ukrainian woodworking industry export-orientedness, especially in the context of increasing woodworking products with a low degree of raw materials processing exports, is more negative than positive sign of economic development, in particular, from the standpoint of environmental safety. This thesis is confirmed by the results of the analysis of structural changes in domestic wood products exports.

A woodworking products exports from Ukraine increased to 15.41% in 2017 comparing to 2016 and amounted to 1434.8 bill. EUR. However, the value of this indicator was 4.75 in times lower than in Poland, which has about the same stock of wood as Ukraine. Significantly lower domestic wood products exports (in USD terms) can be explained by its structure, which is dominated by cheap products with a low level of manufacturability.

Thus, in Ukraine, the structure of woodworking products exports (by main product groups) changed significantly in 2018, comparing to 2013 (to 25.22 pp.). The share of commodity group 44 "Wood and wood products, charcoal" increased, reaching 73.05% (Table 2.15). Instead, the shares of 2 product groups decreased, the products with a high manufacturability degree, namely: 48 "Paper and cardboard; articles thereof" (to 21.55 pp.) and 49 "Printed products" (3.80 pp.). For comparison, in Germany, the share of the 48-th product group consistently occupies more than 58% in the structure of wood products exports.

These structural changes in domestic wood products exports took place as a consequence of a decrease in exports of goods of the 48-th (to 55.32%) and the

Table 2.15. Structure of wood products exports in terms of product groups, %

Code	Commodity group	Ukraine		Poland		Germany	
		2013	2018	2013	2018	2013	2018
44	Wood and wood products, charcoal	47.83	73.05	42.57	42.12	22.99	25.29
45	Cork and cork products	0.00	0.05	0.08	0.04	0.09	0.09
46	straw products and the products of other plaiting materials	0.03	0.05	0.37	0.26	0.13	0.13
47	Mass of wood or cellulose; paper or cardboard from waste paper	0.05	0.12	1.82	2.53	4.04	3.67
48	Paper and cardboard products	45.16	23.61	45.48	39.40	58.28	58.13
49	Printed products	6.92	3.12	9.69	15.65	14.47	12.70
Total		**100.0**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019.

49-th (61.44%) commodity groups and, at the same time, an increase in exports of goods of the 44-th group to 30.50%.

The basis of exports of the 44-th commodity group "Wood and wood products, charcoal" in Ukraine is formed by types of products whit a low degree of raw materials processing and, at the same time, high resource consumption. These are, in particular, "processed timber", the share of which reached 39.3% in the 44-th commodity group in 2018 (+15.43 pp., compared to 2013). However, it is worth noting the following positive fact: in 2018, Ukraine almost did not export products of the least technological commodity item 4403 "Unprocessed timber", which accounted for 20.77% of the 44-th commodity group exports in 2013.

Thus, given the significant increase in the share of the 44-th commodity group in domestic wood products exports, the deterioration of its technological (or qualitative) structure was detected, in particular, compared to a similar structure of exports of Polish woodworking products, which was close to Ukrainian for the vast majority of product items in 2013.

Important indicators of the woodworking industry functioning are the level of import dependence of the country's economy on corresponding products types and vectors of imports structure changes. in Ukraine, there is a positive trend towards reducing the economy dependence on wood products imports. Thus, in 2017, compared to 2013, the share of imports in total wood products consumption decreased to 3.34 pp., intermediate – 2.00 pp. (Fig. 2.14). On the other hand, the same indicator in final consumption increased to 3.03 pp. in 2013 and to 15.31 pp. in 2017.

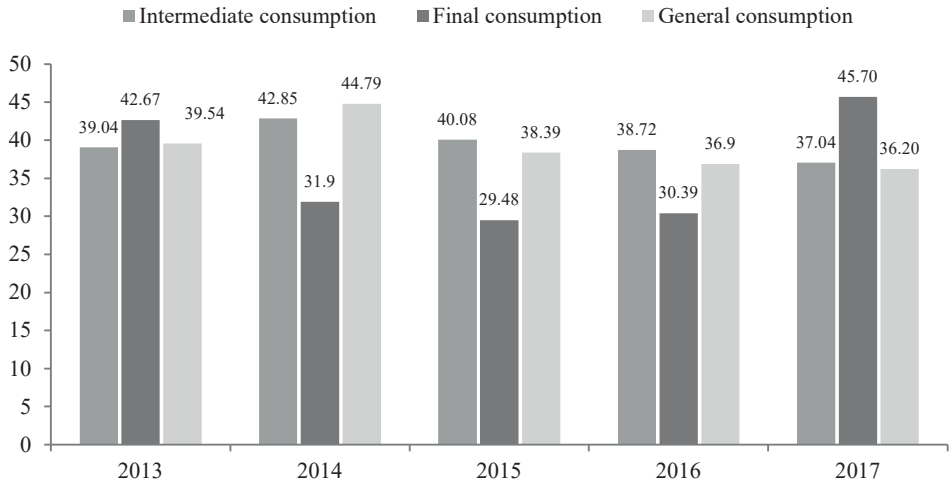


Fig. 2.14. Dependence of Ukraine's economy on woodworking products imports (by type of consumption), %

Source: elaborated by the authors based on SSSU, 2019.

The dependence on wood products imports in Ukraine is much higher than, for example, in Poland, namely: in the intermediate consumption – to 14.47 pp., final consumption – 23.28 pp., and in general consumption – 13.24 pp. in addition, since 2016, Ukraine has been the growing wood products imports, in particular, the rate of increasing reached 15.23% in 2018 (Table 2.16).

Table 2.16. Increase / decrease in wood products imports in Ukraine (by product groups), %

Code	Commodity group	2014	2015	2016	2017	2018	2018 to 2013
44	Wood and wood products, charcoal	–28.77	–50.55	33.99	28.82	21.94	–25,86
45	Cork and cork products	–26.37	–28.72	10.34	–3.37	3.32	-42,19
46	straw products and the products of other plaiting materials	–26.21	–59.85	1.75	–3.38	11.28	-67,58
47	Mass of wood or cellulose; paper or cardboard from waste paper	–3.75	–19.18	–11.74	33.22	14.62	4,84
48	Paper and cardboard products	–34.39	–31.91	6.14	1.88	13.47	-45,18
49	Printed products	–27.49	–55.18	5.21	–10.51	14.39	-65,00
Total		**-31,46**	**–35.34**	**8.26**	**8.39**	**15.23**	**–40.07**

Source: elaborated by the authors based on SSSU, 2019.

Imports of the 44-th (the wood and wood products, charcoal) and the 46-th (the pulp of wood or cellulose; paper or cardboard from waste paper) codes products increased at the most. At the same time, the positive thing was a decreasing in imports of wood products with a higher raw materials level of processing (product groups 48 and 49) in 2018 compared to 2013, which may be considered as sign of the products import substitution. However, the growth of imports by all product groups, which was observed in 2018, in the long run may increase the national economy dependence on wood products imports, and ultimately – change intersectoral relations structure of the wood industry.

In contrast to exports, in the structure of Ukrainian wood products imports is occupied in the most important share by products with a high level of raw materials processing. in particular, the products of product group 48 “Paper and cardboard products” accounted for 66.48% of wood products imports in 2018 (vs. 72.68% in 2013) (Table 2.17). This product group is the most important in the wood products imports structure in Poland and Germany, but its share is much smaller – to 7.84 pp. and 20.64 pp. in 2018 respectively.

The woodworking products imports basis in Ukraine includes four commodity items: 4802 “Paper and cardboard not coated; hand-cast paper”, 4810 “Paper and paperboard coated on one or the both sides with kaolin”, 4811 “Paper, paperboard, wadding, coated cloths impregnated, the other than 4803, 4809, 4810” and

Table 2.17. Structure of wood products imports in terms of product groups, %

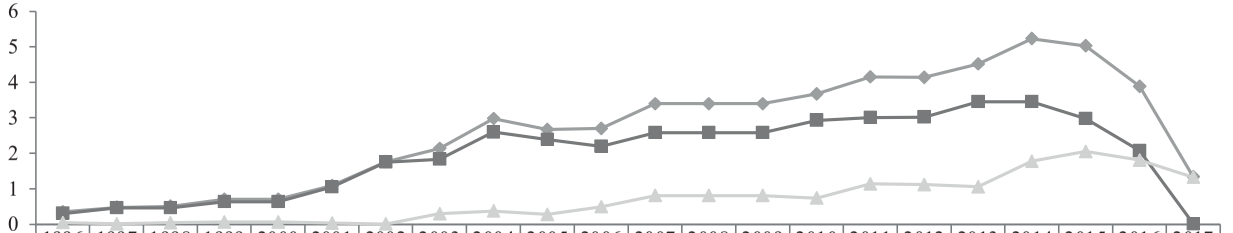
Code	Commodity group	Ukraine		Poland		Germany	
		2013	2018	2013	2018	2013	2018
44	Wood and wood products, charcoal	17.14	21.20	20.05	22.71	27.58	28.53
45	Cork and cork products	0.56	0.54	0.17	0.16	0.38	0.35
46	straw products and the products of other plaiting materials	0.25	0.13	0.36	0.34	0.46	0.41
47	Mass of wood or cellulose; paper or cardboard from waste paper	5.29	9.26	9.54	9.76	15.40	15.20
48	Paper and cardboard products	72.68	66.48	65.59	58.64	48.87	45.84
49	Printed products	4.08	2.38	4.29	8.39	7.30	9.67
Total		**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019.

4819 "Boxes, cases, bags and cases other containers made of paper, cardboard, cellulose wadding". in 2018, their total share in the imports structure of the 48-th product group counted 64.04% (vs. 52.07% in 2013). These items also formed the basis of wood products imports of the 48-th commodity group in Poland and Germany (with shares of 49.42% and 55.33% in 2018, respectively).

Summarizing, it is possible to state the deterioration (according to the criterion of manufacturability) of the wood products production and export structures in Ukraine, as well as the high level of domestic wood industries consumption. The latter causes by the manufacture of products with a low processing raw materials level and high resource consumption. Despite the export-orientedness growth, the Ukrainian woodworking industry almost does not provide the necessary production products for the furniture industry and the construction sector. Thus, the demand for final consumption products of the furniture industry in the domestic market is provided by more than 90% of imports. On the other hand, the needs of the woodworking industry in intermediate consumption (consumptive use) products produced (or supplied) by other national economy sectors are met insufficiently.

According to FAO Forestry (2019) during 1996-2014 Ukraine rapidly increased exports of roundwood in general and its main types (industrial roundwood and fuelwood) in particular. Thus, the export of roundwood in 1996 amounted to 0.36 bill. m^3, and increased 14.7 in times over 18 years, reaching the highest value for this period – 5.23 bill. m^3 in 2014. in 2017, compared to 2014, exports of roundwood from Ukraine decreased sharply (to 99.6%), in particular, industrial roundwood – to 74.4%, and fuelwood – 25.3% (Fig. 2.15). The key factor was the moratorium on the export of timber (industrial roundwood), the main purpose of which was to preserve the raw material potential for the Ukrainian woodworking industry.



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Roundwood	0.36	0.48	0.51	0.70	0.70	1.09	1.76	2.14	2.98	2.67	2.70	3.40	3.40	3.40	3.67	4.15	4.14	4.52	5.23	5.03	3.89	1.34
Industrial roundwood	0.31	0.47	0.47	0.64	0.64	1.06	1.75	1.84	2.60	2.39	2.20	2.58	2.58	2.58	2.93	3.01	3.02	3.45	3.45	2.98	2.07	0.01
Fuelwood	0.05	0.01	0.04	0.07	0.07	0.03	0.01	0.30	0.38	0.28	0.50	0.81	0.81	0.81	0.74	1.14	1.12	1.06	1.78	2.05	1.81	1.33

Fig. 2.15. Merchantable wood and its main types export from Ukraine, bill. m^3

Source: elaborated by the authors based on SSSU, 2019; FAO Forestry, 2019.

A significant decrease in exports of roundwood and, in particular, industrial roundwood in 2015-2017 occurred in the vast majority of EU. For example, the growth rate of roundwood exports from Germany counted 0.3% in 2017 only vs. 10.7% in 2015. This is despite the fact that this country harvests 3 in times more roundwood than Ukraine. At the same time, Germany has the largest timber resources in EU, and forest cover of its territory is almost twice as high, compared to Ukraine – 30.1% vs. 15.9%. Nevertheless, in 2015, Ukraine exported 28.2% more roundwood than Germany.

The growth rate of roundwood exports from France was 1.9% in 2017, vs. –9.4% in 2016. France outperforms Ukraine in terms of timber resources to 38.1%, in terms of forest cover – to 11.7 pp., and in terms of roundwood – to 2.7 in times. However, compared to France, in 2014 Ukraine exported 3.4% more roundwood.

In terms of roundwood exports in 2014-2015, Ukraine was the leader among EU countries, and in 2016 and 2017 it ranked the 4-th and the 11-th, respectively (Table 2.18). At the same time, in terms of timber resources, Ukraine ranked the 6-th among EU countries, and in terms of roundwood – 6-7-th place in 2011-2017.

Until 2017, the main export of roundwood from Ukraine (as well as the vast majority of EU countries) was industrial roundwood, the share of which in the corresponding structure was 53.3% in 2016, while 99.3% – in 2002. A direct consequence of the on the raw timber (roundwood) export moratorium was a decrease in the share of industrial roundwood in the export of roundwood from Ukraine to 1.1% (in 2017). A similar trend is typical for Croatia, where the value of this indicator decreased to 28.1% in 2017 (vs. 82.4% in 2002).

An important characteristic of the wood raw materials usage is the level of its export-orientedness, which is determined by the share of cut timber exports. However, we believe that in conditions of natural resources shortage and growing environmental and climatic challenges, high export-orientedness in the segment of unprocessed wood is a manifestation of risky (from the standpoint of preserving environmental balances and rational use of raw materials) government policy.

Therefore, we perceive as a positive reduction in 2017 the share of exports in the volume of harvested merchantable wood to 7.3% (vs. 28.5% in 2014), in particular, industrial roundwood – to 0.2% (vs. 42.3%) and fuelwood – up to 13.0% (vs. 17.5%) (Fig. 2.16). As a result, the level of export orientation of roundwood in Ukraine approached the level of EU-28 (8.8%). Whereas in 2015 the share of exports in the volume of harvested roundwood in Ukraine (27.4%) was in three times higher than EU level (9.1%). in 2017, Austria, Poland, Bulgaria, Germany and Spain were close to Ukraine in terms of this indicator, and Croatia, Lithuania, Denmark and Latvia in 2014.

Table 2.18. Exports of roundwood from Ukraine and EU countries, bill. m^3

2012			2013			2014		
Range	Country	Turnover	Range	Country	Turnover	Range	Country	Turnover
1	France	5.3	1	France	5.5	**1**	**Ukraine**	**5.2**
2	Latvia	4.4	**2**	**Ukraine**	**4.5**	2	Czech Republic	5.1
3	**Ukraine**	**4.1**	3	Czech Republic	4.5	3	France	5.1
4	Czech Republic	4.0	4	Latvia	4.0	4	Latvia	4.0
5	Germany	3.5	5	Germany	3.4	5	Germany	3.5
6	Estonia	2.6	6	Slovakia	3.1	6	Slovakia	3.4
7	Slovakia	2.4	7	Estonia	3.1	7	Estonia	3.0
8	Poland	2.0	8	Poland	3.1	8	Poland	2.9
9	Spain	1.7	9	Spain	2.6	9	Spain	2.8
10	Lithuania	1.6	10	Lithuania	2.0	10	Slovenia	2.4
11	Slovenia	1.3	11	Slovenia	1.6	11	Lithuania	1.9
12	Hungary	1.2	12	Hungary	1.3	12	Croatia	1.3
13	Belgium	1.1	13	Belgium	1.3	13	Belgium	1.3
14	Bulgaria	1.0	14	Portugal	1.3	14	Bulgaria	1.2
15	United Kingdom	1.0	15	Croatia	1.2	15	Hungary	1.1
16	Portugal	1.0	16	United Kingdom	1.0	16	Portugal	1.0
17	Croatia	1.0	17	Finland	0.9	17	Denmark	1.0
18	Austria	0.9	18	Austria	0.9	18	Finland	0.9
19	Sweden	0.8	19	Sweden	0.8	19	Austria	0.8
20	Finland	0.7	20	Romania	0.8	20	United Kingdom	0.7
21	Denmark	0.6	21	Bulgaria	0.7	21	Sweden	0.6
22	Romania	0.6	22	Denmark	0.6	22	Romania	0.5
23	Netherlands	0.5	23	Luxembourg	0.4	23	Netherlands	0.5
24	Luxembourg	0.4	24	Ireland	0.4	24	Ireland	0.3
25	Ireland	0.2	25	Italy	0.2	25	Italy	0.2
26	Italy	0.2	26	Greece	0.1	26	Greece	…
27	Cyprus	…	27	Malta	…	27	Malta	…
28	Malta	…	28	Cyprus	…	28	Cyprus	…
29	Greece	…	29	Netherlands	…	29	Luxembourg	…

Source: elaborated by the authors based on SSSU, 2019; FAO Forestry, 2019.

	2015			2016			2017		
	Range	Country	Turnover	Range	Country	Turnover	Range	Country	Turnover
	1	**Ukraine**	**5.0**	1	Czech Republic	5.4	1	Czech Republic	6.8
	2	France	5.0	2	France	4.6	2	France	4.6
	3	Czech Republic	4.7	3	Germany	4.1	3	Germany	4.1
	4	Germany	3.9	**4**	**Ukraine**	**3.9**	4	Latvia	3.0
	5	Latvia	3.2	5	Latvia	3.1	5	Poland	3.0
	6	Estonia	2.7	6	Slovenia	3.1	6	Estonia	2.8
	7	Slovenia	2.7	7	Estonia	2.8	7	Slovenia	2.7
	8	Poland	2.7	8	Poland	2.7	8	Slovakia	2.0
	9	Slovakia	2.6	9	Slovakia	2.4	9	Lithuania	1.6
	10	Spain	2.1	10	Spain	2.1	10	Spain	1.4
	11	Lithuania	1.6	11	Lithuania	1.6	**11**	Ukraine	**1.3**
	12	Belgium	1.4	12	Croatia	1.2	12	Croatia	1.0
	13	Croatia	1.0	13	Hungary	1.0	13	Finland	1.0
	14	Hungary	0.9	14	Finland	0.9	14	Austria	0.9
	15	United Kingdom	0.9	15	Austria	0.9	15	Denmark	0.8
	16	Denmark	0.9	16	Denmark	0.8	16	Hungary	0.8
	17	Austria	0.8	17	United Kingdom	0.7	17	Sweden	0.8
	18	Finland	0.8	18	Sweden	0.6	18	Portugal	0.5
	19	Sweden	0.6	19	Bulgaria	0.5	19	Netherlands	0.5
	20	Netherlands	0.6	20	Netherlands	0.4	20	Bulgaria	0.5
	21	Bulgaria	0.5	21	Ireland	0.4	21	United Kingdom	0.4
	22	Romania	0.3	22	Portugal	0.3	22	Italy	0.2
	23	Ireland	0.3	23	Italy	0.2	23	Romania	0.2
	24	Portugal	0.3	24	Romania	0.2	24	Ireland	0.1
	25	Italy	0.2	25	Cyprus	…	25	Cyprus	…
	26	Greece	…	26	Malta	…	26	Malta	…
	27	Malta	…	27	Belgium	…	27	Belgium	…
	28	Cyprus	…	28	Greece	…	28	Greece	…
	29	Luxembourg	…	29	Luxembourg	…	29	Luxembourg	…

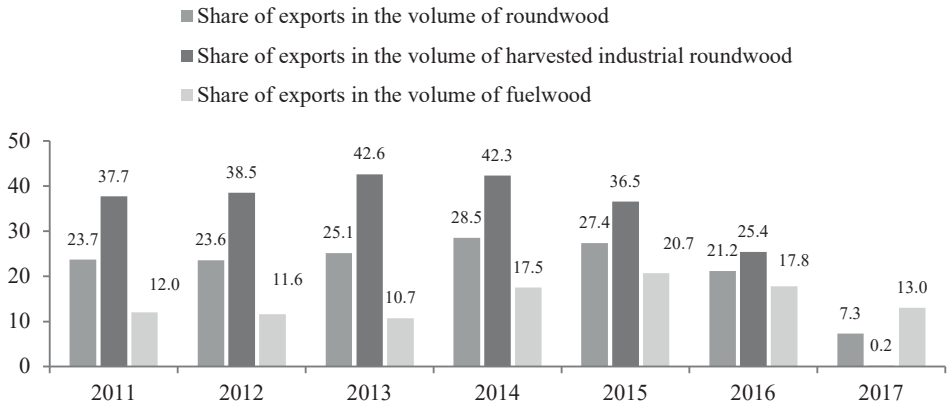


Fig. 2.16. Shares of harvested merchantable, industrial and low-grade wood exports from Ukraine, %

Source: elaborated by the authors based on SSSU, 2019.

The share of exports in the volume of harvested industrial roundwood in Ukraine was 0.2% only in 2017, while in 2013 – 42.6% (vs. 7.9% in Germany and 8.4% in Poland). At the same time, in terms of the harvested fuelwood wood exports share (13.03%) Ukraine ranked the 4-th among EU countries (vs. the 6-th in 2014), behind Slovenia, Croatia and Latvia.

Finally, we can state that Ukraine has sufficient raw material potential to provide the dynamic development of the woodworking industry. Proof of this is the 6th place of Ukraine among the EU countries in terms of timber resources and the 7-th – in terms of merchantable wood harvesting. However, in contrast to the vast majority of EU, the structure of harvested domestic merchantable wood is dominated by low-grade wood – 61.4% (the 4-th place after Cyprus, Italy and the Netherlands). in terms of the volume of harvesting of this type of wood, Ukraine ranked the 2-nd among EU countries after France in 2017.

In terms of export-orientedness the Ukrainian woodworking industry prevails in the most EU countries, which have a higher level of forest cover and much larger forest resources. in addition, the level of Ukrainian export-orientedness maintains a steady growing trend. The basis of the domestic woodworking industry exports counts the products with a low level raw materials processing of and high resource consumption of product group 44 “Wood and wood products, charcoal”. in 2018, the share of this product group in the wood products export counted 73.05% that was to 25.22 pp. higher than in 2013. At the same time, in 2018, exports of commodity item 4403 “Unprocessed timber” rapidly decreased, which shows the trend of improving the structure (in terms of technology) of the domestic woodworking industry exports. With the growth of export-orientedness, the level of import dependence of the Ukrainian economy on the final consump-

tion products of the woodworking industry also increased significantly, reaching 45.07% in 2017. The basis woodworking products imports includes products with a high level raw materials processing of product group 48 “Paper and cardboard; products from them”, the share of which decreased to 6.20 pp. in 2018 compared to 2013. This trend is facilitated by the introduction of the raw wood export moratorium. As a result, the share of roundwood in the structure of Ukrainian timber exports has rapidly decreased, but the share of fuelwood has increased, and the export-orientedness of all wood types has generally decreased. However, the high and growing share of fuelwood in harvested and exported wood is being the problem of the raw material woodworking industry potential development. in this regard, the prospects for further exploration are finding the ways to increase the level of wood industry manufacturability exports, reduce the economy’s import dependence on these products and improve the quality of raw materials in this sector.

2.2.2. Cross-sectoral links of the woodworking productions

Today, the woodworking industry is a strategically promising export-oriented segment of the world economy, as well as an important link in the formation of global value chains. The objective basis for the further dynamic development of woodworking industries in Ukraine is created by the presence of a significant raw material base and prospects for expanding markets (both domestic and foreign). Proof of this is the 6-th place of Ukraine among EU countries in terms of timber reserves and the 7-th – in terms of liquid wood harvesting. Ukraine is also ranked the 27-th among the world’s largest exporters of wood products. However, the available potential is far from being fully used, primarily due to the lack of a strategic vision for the development of the Ukrainian woodworking industry.

The efficiency and prospects of woodworking industries depend on the processes of forestry development, the level of technology and conditions of the furniture industry, as well as the demand for wood products from other economic activities (especially construction), the closeness of intersectoral links of the woodworking industry. The assessment of intersectoral relations is carried out according to the tables “cost-output”, which are also called matrices of the intersectoral balance of Leontief. The relevance and importance of such an assessment for Ukraine is due to the need to determine the degree of correspondence between supply and demand for wood products in the domestic market.

In 2017, Ukraine produced woodworking products worth 128.689 bill. UAH (in consumer prices) or 42.890 bill. EUR, which is 5.1 in times less than in Poland in this period (SSSU, 2019; Eurostat, 2019). in terms of wood production, Ukraine is 21.3 in times behind the leader among the countries of the European Union

(EU) – Germany, and the nearest geographical neighbors, in particular, Romania 1.4 in times, the Czech Republic – 2.0, Poland – 5.

The structure of woodworking products in Ukraine in terms of its use is steadily dominated by products for production purposes or intermediate consumption (Fig. 2.17). However, in 2017 the share of these products in this structure decreased significantly (to 7.08 pp.) compared to 2016, while the share of final consumption products (4.34 pp.) and the gross accumulation increased capital (2.74 pp.).

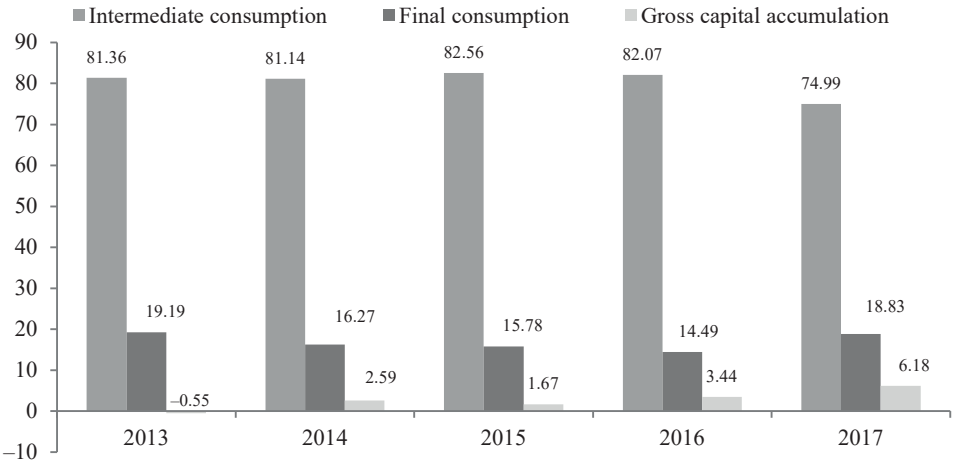


Fig. 2.17. Structure of wood products of Ukraine by areas of its use, %

Source: elaborated by the authors based on SSSU, 2019.

In 2017, the economy of Ukraine consumed the production resources of the woodworking industry to 92.814 bill. UAH, which is 4.71% more than in 2016 and 85.34% more than in 2013 (SSSU, 2019). However, this increase is due to the devaluation of the national currency, as in USD terms, this figure increased only to 0.6% in 2017 (vs. 7.1% in 2016) (Fig. 2.18) wood products by the Ukrainian economy in 2017.

Compared to those EU countries where the woodworking industry is well developed, the Ukrainian economy consumes much less woodworking products for industrial purposes. Thus, in terms of the use of intermediate wood products in 2015, the Ukrainian economy was 5.8 in times inferior to the Polish economy, and the German economy was 21.2 in times inferior (SSSU, 2019; Eurostat, 2019).

In the structure of intermediate consumption of all types of economic activity of Ukraine, woodworking products in 2017 accounted for 2.1%. The largest consumers of these products are the woodworking industry (production of wood, paper; printing and replication), as well as food (food production, beverages and tobacco products) industry. Thus, in 2017, the woodworking industry account-

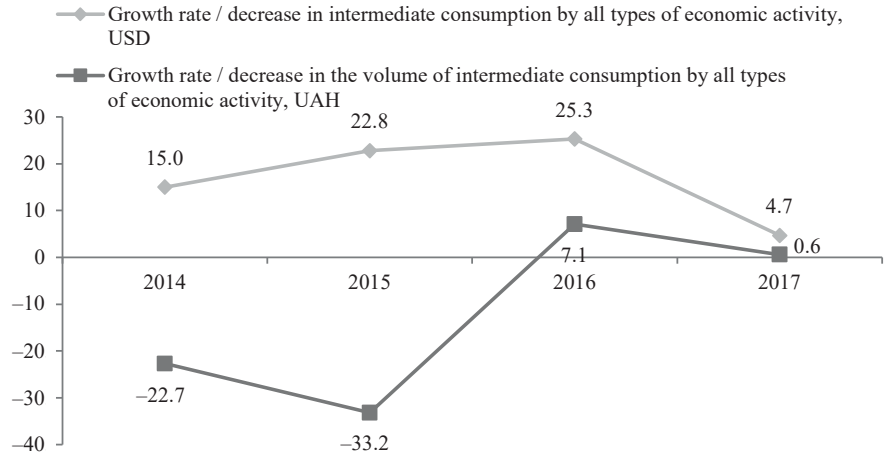


Fig. 2.18. Dynamics of the use of woodworking products of intermediate consumption in Ukraine, %

Source: elaborated by the authors based on SSSU, 2019.

ed for 30.52% (or 28.331 bill. UAH) of intermediate wood processing products against 33.19% (29.422 bill. UAH) in 2016 (Table 2.19). in terms of this indicator, Ukraine is close to Poland (> 32%) and Germany (> 29%).

However, in terms of consumption by the woodworking industry of its own production products, Ukraine is 5.9 in times inferior to Poland and more than 19 in times inferior to Germany. Given the approximately equal supply of wood in Ukraine and Poland, such a discrepancy is a sign of incomplete use of raw material potential by the domestic woodworking industry.

The second largest consumer of intermediate wood products in Ukraine is the food industry (or food production; beverages and tobacco products). The share of the food industry in the volume of intermediate wood products consumed by the economy in 2017 was 25.17% (vs. 26.24% in 2013). The importance of this foreign trade in the structure of wood processing products of intermediate consumption in Ukraine is very high. For example, in Poland, the food industry accounts for about 6% of intermediate wood products, and in Germany – about 2.5%. At the same time, in terms of consumption of woodworking products, the Ukrainian food industry is 1.3 in times inferior to the Polish one, and almost twice in times lower than the German one. The main products of woodworking industries used in the food industry are a wide range of cardboard and paper products. in particular, in 2017, the domestic food industry used wood products to 23 360 bill. UAH, which is 3.35% more than in 2016 and 77.78% more than in 2013.

The third largest consumer of wood products in Ukraine is wholesale and retail trade. The share of this foreign trade in the structure of intermediate con-

Table 2.19. Shares of the largest consumers of wood products in Ukraine (in the segment of intermediate consumption), %

NACE activities	2013	2014	2015	2016	2017	Deviation (+/–)			
						2014--2013	2015--2014	2016--2015	2017--2016
Manufacture of wood, paper, printing and reproduction	30.65	30.06	31.86	33.19	30.52	–0.59	1.81	1.33	–2.67
Manufacture of food products; beverages and tobacco products	26.24	27.89	27.15	25.50	25.17	1.65	–0.74	–1.65	–0.33
Wholesale and retail trade; repair of motor vehicles and motorcycles	9.84	7.79	5.83	6.75	10.04	–2.05	–1.96	0.91	3.30
Public administration and defense; compulsory social insurance	2.64	6.00	8.35	7.28	5.89	3.35	2.35	–1.07	–1.39
Construction	2.80	2.56	2.06	1.97	4.47	–0.24	–0.50	–0.09	2.50
Manufacture of wood, paper, printing and reproduction	3.69	3.00	2.05	2.71	3.15	–0.69	–0.95	0.66	0.44
Manufacture of furniture; other products; repair and installation of machines and equipment	3.55	2.77	2.78	2.92	2.27	–0.78	0.01	0.14	–0.65

Source: elaborated by the authors based on SSSU, 2019.

sumption of wood products was variable: it decreased in 2014-2015 to 5.83%, but increased in 2016-2017 to 10.04%. The weight of the trade sector of the economy in the structure of intermediate consumption of wood products in Poland and Germany is lower – 7.37% and 5.25%, but consumption is significantly higher: 7.38 in times and 19.04 in times, respectively.

In 2017, the trade sector in Ukraine consumed wood products worth 9.319 bill. UAH or 0.39038 bill. USD. The growth rate of consumption of wood products by this foreign economic activity in the UAH equivalent in 2017 reached 55.86% vs. (–8.95% in 2014), and in the USD – 49.74% vs. 38.77%, respectively. Vertical relationship between woodworking industry and wholesale and retail trade is manifested mainly in the sale through the retail network of wood products for consumer purposes. Therefore, the growth of consumption of wood products by the trade sector is a sign of increased sales of wood products of final consumption in Ukraine, which confirmed the changes (increase in the share of final consumption to 4.34 pp.) in the structure of wood products in Ukraine by use in 2017.

In addition to the woodworking and food industries, the main consumers of woodworking products in Ukraine include public administration and defense; compulsory social insurance, the share of which in the structure of intermediate

consumption of wood products in 2015 reached 8.35%, but in 2017 decreased to 5.89%. in Poland and Germany, the value of this indicator was significantly lower – 1.0% and 2.98%, respectively.

In 2017, the state administration and defense in Ukraine consumed woodworking products worth 5.465 bill. UAH, which is 4.1 in times more than in 2013, but 15.3 in times less than in 2016. At the same time, the volume of consumption of wood processing products in Ukraine in 2015 in Ukraine was 1.4 in times higher than in Poland. One of the key reasons for the increase in the consumption of wood products for industrial use by public administration and defense in 2015-2016 was the growing needs of the Ukrainian army for such products, although this volume was 7.6 in times lower than in Germany.

Construction is one of the largest consumers of the wood products in EU, but not in Ukraine. Thus, in 2015, construction in Poland consumed 10.81% of woodworking production, and in Germany – 8.55%. in Ukraine, from the other hand, in 2017 the construction sector of the economy accounted for 4.47% of woodworking products, while in 2015 – only 2.06%. The volume of consumption by domestic construction of woodworking products in 2017 amounted to 4.149 bill. UAH, which is 138.04% more than in 2016 and 195.11% more than in 2013 (in UAH equivalent). in USD terms, this difference was (+128.68%) and (–11.19%), respectively. Consumption of wood products by the construction sector of the Polish economy was more than 30 in times higher (data for 2015), and Germany – almost 88 in times.

One of the largest consumers of woodworking products in countries with developed woodworking industries is also the production of furniture; other products; repair and installation of machines and equipment. in particular, in Poland this foreign trade accounts for about 8%, and in Germany – about 6% of intermediate wood products, while in Ukraine – only 2.3% (in 2017). During 2013-2017, the share of the domestic furniture industry in the structure of consumption of woodworking products decreased to 1.28 pp. in addition, in terms of consumption of these products, the Ukrainian furniture industry in 2015 was 14.7 in times lower than the Polish and 41.9 in times lower than German.

A significant consumer (with a share of ≈8% in the structure of intermediate consumption) of wood products for industrial purposes in Germany (but much smaller in Poland and Ukraine) is publishing; production of movies and videos, television programs, publication of sound recordings; activity of radio broadcasting (and television broadcasting (hereinafter – publishing activity). in 2017, this figure in Ukraine was 3.15% (vs. 3.69% in 2013). The volume of consumption of wood products in publishing activities in 2017, compared to 2015, it increased to 7.43% (or 146 bill. UAH), however, according to this indicator, the Ukrainian publishing activity is inferior to the Polish one more than 7 in times, and German one – almost 60 in times.

In addition to deepening the level of untapped potential of woodworking industries in the segment of providing woodworking products of intermediate consumption of the furniture industry and the construction sector, in Ukraine there is an acute problem of cost of these industries. An indicator of the cost of a particular industrial production is an indicator of the share of intermediate consumption (goods and services) in output. in Ukraine during 2013-2017, the level of consumption of woodworking industries was consistently high (≈78%) (Fig. 2.19).

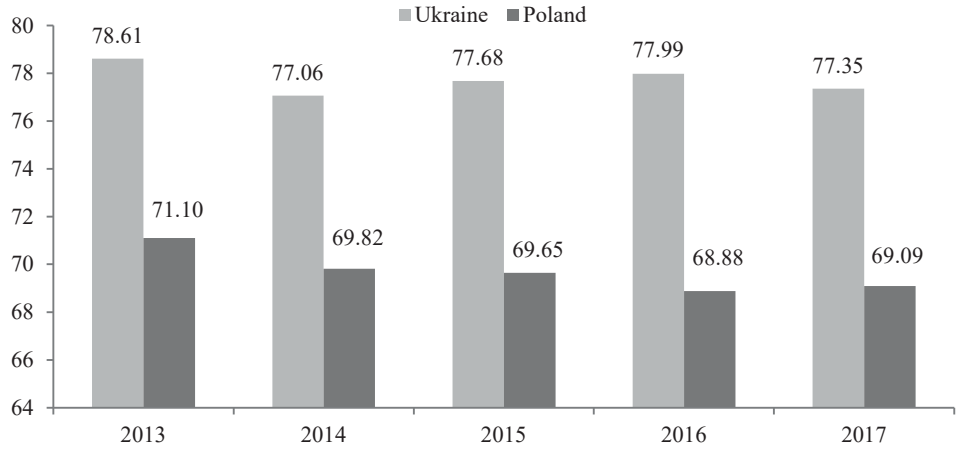


Fig. 2.19. Share of costs (intermediate consumption) in the production of wood products, %
Source: elaborated by the authors based on SSSU, 2019; CSOP, 2018.

The share of costs in the production of wood products in Ukraine in 2017 was 8.25 pp. higher than in Poland, while in 2012 – to 7.51 pp. The level of consumption of domestic wood products is almost the highest among the EU countries (after Greece). in particular, in Germany it is lower to 10 pp., and in Lithuania – 20 pp.

Expenditures (intermediate consumption) of the Ukrainian woodworking industry in 2017 amounted to 97.989 bill. UAH, which is 16.8% more than in the previous year and 121.2% more than in 2013. For example, in Poland, the volume of intermediate consumption of woodworking industries exceeds the value of the same indicator in Ukraine 5 in times, and in Germany – almost 20 in times. This comparison is a confirmation of insufficient use of resource opportunities of the domestic woodworking industry.

The production activities of the woodworking industry in Ukraine use the products of all foreign trade. in 2017, four of them ("production of wood, paper; printing and replication"; "production of chemicals and chemical products", "agriculture, forestry and fisheries", "wholesale and retail trade; repair of motor vehicles and motorcycles") accounted for 67.17% of products and services used by woodworking industries in their operating activities.

During 2014-2017, the woodworking industry of Ukraine reduced the share of its own products in the cost structure (intermediate consumption) to 5.74 pp. (Table 2.20). This trend is a sign of declining levels of manufacturability of domestic woodworking industries. This is explained as follows: the higher the share of woodworking products in the costs of the woodworking industry, the longer the chains of airborne forces and the fuller the operating cycle of this industrial production. Therefore, the indicator of the share of own products in intermediate consumption can also be considered a general indicator of the level of manufacturability and efficiency of any processing production.

Table 2.20. Types of economic activity, the products of which occupy the largest share in the cost structure of the woodworking industry of Ukraine, %

NACE activities	2013	2014	2015	2016	2017	Deviation (+/–)				
						2014--2013	2015--2014	2016--2015	2017--2016	2017--2013
Manufacture of wood, paper, printing and reproduction	34.65	33.69	33.33	35.06	28.91	–0.96	–0.36	1.72	–6.14	–5.74
Manufacture of chemicals and chemical products	16.65	16.65	17.25	15.99	16.38	0.01	0.60	–1.26	0.39	–0.27
Agriculture, forestry and fishing	6.53	6.73	8.60	8.65	10.97	0.20	1.88	0.05	2.32	4.44
Wholesale and retail trade; repair of motor vehicles and motorcycles	16.65	17.85	14.24	11.36	10.91	1.20	–3.61	–2.88	–0.45	–5.75

Source: elaborated by the authors based on SSSU, 2019.

For example, in Poland the share of wood products in the costs of the wood industry is over 36% at a level of consumption < 70%, and in Lithua (a country with one of the highest levels of forest cover in Europe) the ratio between these indicators is even better < 15 pp.) – 43.44% compared to 58.30%, respectively. in contrast, in Ukraine the difference between the share of own products in intermediate consumption of woodworking industries and the level of consumption of the latter in 2017 amounted to 48.44 pp. (vs. 43.96 pp. in 2013).

Deepening the processing of raw materials in woodworking industries ensures the use of chemical products, whose share in the cost structure of the domestic woodworking industry in 2017 was 16.38% vs. 17.25% in 2015 and 16.65% in 2013. The importance of this foreign trade in the structure of intermediate consumption of the woodworking industry in Ukraine is significantly higher than, for example, in Poland (4.76%), Germany (5.65%) and Lithua (4.37%). However, in terms of chemical consumption in woodworking, Ukraine is 1.5 in times inferior to Poland and 6.5 in times lower than Germany.

Agricultural and forestry products in the cost structure of the Ukrainian woodworking industry occupy the third position with a share of 10.97% in 2017 vs. 6.53% in 2013. During the analyzed period, the volume of consumption by woodworking industries of products of the named foreign trade, primarily wood, increased 3.7 in times. The most significant increase in the values of this indicator occurred in 2015 (to 68.39%) and in 2017 (48.04%). The growth of the share of agricultural and forestry products in the cost structure (intermediate consumption) of the domestic woodworking industry can be considered a sign of a decrease in the level of processing of raw materials, and hence the level of manufacturability of woodworking and resource efficiency. For comparison, in Poland this foreign trade accounts for ≈8%, and in Germany – about 5% of the costs of the woodworking industry.

Wholesale and retail trade; repair of motor vehicles and motorcycles is the fourth most important foreign trade in the structure of costs of the woodworking industry of Ukraine with a share of 10.91% in 2017 (vs. 16.65% in 2013). During the analyzed period, the volume of consumption of products and services of this foreign trade by woodworking industries decreased from 24.4% in 2014 to –1.0% in 2016, but in 2017 increased to 12.1%. The decrease in the share of the trade sector of the economy in the costs of the domestic woodworking industry may be a consequence of shortening operating cycles, as well as reducing the level of processing of wood raw materials that require a number of components and parts sold through the trade network. For example, in Poland, Germany and Lithua, products and services of the trade network in the cost structure of the woodworking industry occupy the second position with shares, respectively, 13.22%, 11.30% and 13.93%.

Summarizing the results of the analysis of intersectoral relations of the woodworking industry, it can be stated that the structure of consumption of woodworking products for industrial purposes in Ukraine differs significantly from the similar structure of Poland and Germany – it has a relatively small share of construction and furniture industry. The revealed structural differences in the intersectoral relations of the woodworking industry are one of the key reasons why the economy of Ukraine consumes woodworking products almost six times less than the economy of Poland and more than twenty times less than the economy of Germany. Thus, the provision of production resources for furniture production and the construction sector of the national economy is still an unrealized but promising niche for the domestic woodworking industry.

According to the results of the analysis of the structure and dynamics of consumption of the woodworking industry of Ukraine, it can be argued that the level of consumption of domestic woodworking industries is the highest among EU countries. This is largely due to the presence of significant differences in the cost structures (intermediate consumption) of the woodworking industry of Ukraine

and the EU. The latter is dominated by the share of woodworking products, while in Ukraine it tends to decrease. Also during 2014-2017, the share of agricultural and forestry products in the cost structure of the domestic woodworking industry increased, and, instead, the share of products and services of retail chains decreased. As a result, the degree of processing of wood raw materials decreased and the manufacturability of production deteriorated.

Hence the need to improve the structure of production of the woodworking industry in the direction of increasing production for the construction and furniture industries. It is also important to create in Ukraine such organizational, economic and institutional and legal conditions that would contribute to the growth of demand for wood products in domestic and foreign markets. Thus, promising research in this direction will relate to the construction of appropriate optimization models (conceptual and economic-mathematical) of the structural transformation of Ukrainian industry.

2.3. Textile industry

2.3.1. Problems of Ukrainian textile industry

Today, the textile industry is one of the basic strategic segments of the Ukrainian economy, which provides 5% of budget revenues and 2.6% of merchandise exports, and therefore has significant potential for further development. in Ukraine, there are more than 2.3 thousand enterprises (small and medium) of the textile industry, which employ about 85 thousand workers, and the volume of their products reaches 22 bill. UAH. A production is mainly concentrated in medium-sized enterprises (accounting for 14% of the total number of textile enterprises) – they sell ≈80% of products, while in 2014 small enterprises (or 86%) account for only ≈20% of products.

Since Ukraine's independence, textile output has declined significantly, accounting for only about 22% of 1990 output in 2001. This drop in output was, in particular, caused by a significant reduction in household incomes and a sharp decline in government orders for professional clothing. in 2008, the output of the textile industry of Ukraine reached almost 60% of the level of 1990, but in the following years again fell sharply, primarily under the influence of the global financial crisis (Fig. 2.20).

Further dynamics of production in this segment of the national economy was unstable: a decline in 2014-2016 (to the level of 2004) and stable growth in the next two years. in 2018, the volume of sold products of the textile industry of Ukraine to 93% reached the level of 2006.

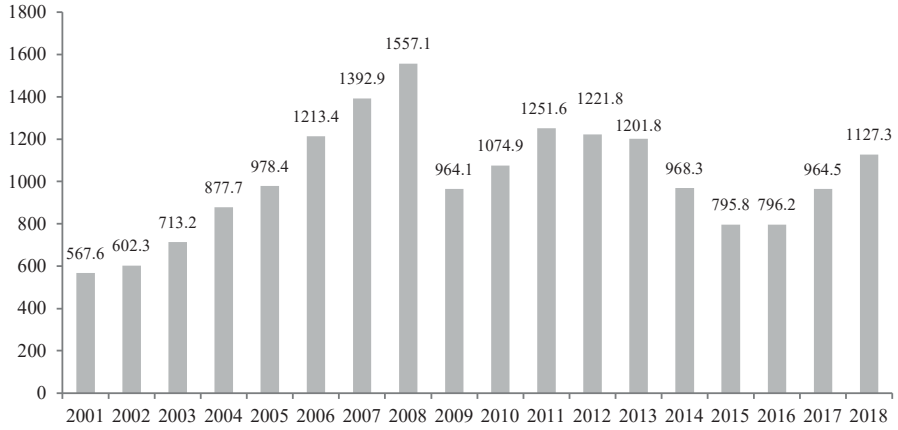


Fig. 2.20. Volume of sold products of textile industry of Ukraine, bill. USD
Source: elaborated by the authors based on SSSU, 2019.

As a result of the negative dynamics of textile industry production, Ukraine lagged behind this indicator, in particular, from Poland 6 in times, from Germany – 21 in times, and from Italy (the leader among EU countries in this segment of the processing industry) – 73 in times. in 2017, Ukraine ranked the 21-st among EU countries in terms of textile output (Annex B, Fig. B.1).

The textile industry of Ukraine (both ITA and DEU) specializes in the manufacture of final consumption goods, the share of which in the structure of output (by consumption segments) in 2017 was 60.76%, and in 2015 even reached 82.90% (Fig. 2.21). However, despite this specialization, the domestic market demand for textile products was covered to 87.22% of imports.

One of the main reasons for the high dependence of the national economy on imports of textile products everywhere to replace the textile industry is the low level of provision of domestic industries with their own intermediate products. At the same time, it is necessary to state the tendency to a certain decrease in the import dependence of the national economy on all segments of consumption of textile products. Thus, in 2017, compared to 2013, the share of imports in general consumption of textile products decreased to 11.87 pp., in particular in the final – 2.75 pp., and in the intermediate – 6.80 pp. (Fig. 2.22).

The dynamics of import operations is also positive: compared to 2013, the volume of imports to Ukraine of intermediate goods manufactured by textile industries decreased to 51.0% in USD, and final consumption – 39.7%. Over the past five years, the total volume of Ukrainian imports of textile products (commodity groups 61-65) decreased to 42.0% (Annex B, Table B.1). This mostly concerned the import of textile clothing (–52.55%) and footwear (–55.55%).

Despite the tendency to reduce the level of import dependence of the Ukrainian economy by segments of consumption of textile products (intermediate and

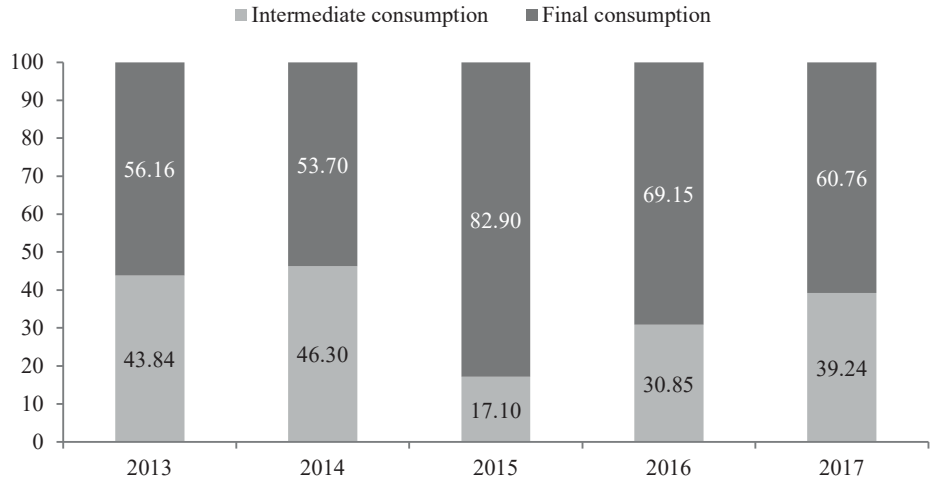


Fig. 2.21. Structure of textile industry output in Ukraine (by consumption segments), %
Source: elaborated by the authors based on SSSU, 2019.

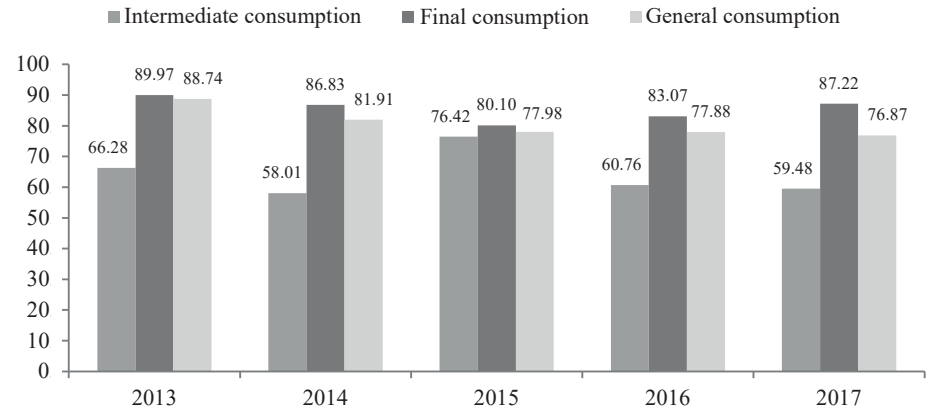


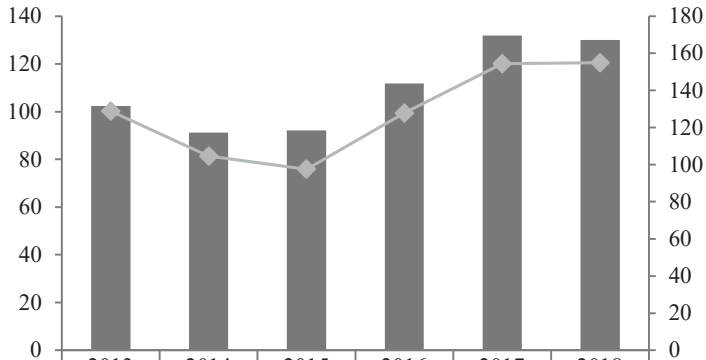
Fig. 2.22. Share of imports in the consumption of textile products in Ukraine, %
Source: elaborated by the authors based on SSSU, 2019.

final), as well as despite a significant decrease in such imports, the absolute values of these indicators remained relatively high. At the same time, it should be noted that dependence on imports of textile products is inherent in the economies of most EU countries. For example, in Poland the share of imports in intermediate consumption of textile products is 63.45%, and in the final – 69.24%. in Germany, the values of these indicators are at the level of 68.39% and 65.77%, while in Italy – 32.11% and 27.04% (Annex B, Fig. B.2).

Almost 80% of the EU textile industry's output is produced in 6 countries: Italy, Germany, Spain, France, the United Kingdom and Portugal (Annex B, Table

B.2). It follows that not all countries have the potential (or priority) for the active development of the textile industry. This situation is due to both the problems of resource provision of specialized industries, and the existing structure of the world market of textile industry. However, despite the relatively (with EU countries) low output of domestic textile industry and its high dependence on imports of production resources (the fixed assets, raw materials and supplies), Ukraine has significant experience, qualified personnel, traditions and potential to increase the necessary raw materials, and hence – the finished products of these processing plants. This statement is argued by the gradual decrease in the level of import dependence of the national economy by segments of consumption of textile products.

At the same time, one of the main factors weakening the competitiveness of Ukrainian textile industry products in the domestic consumer market is the favorable conditions for the import of used clothing and other products. in particular, in 2018, 130.000 tons of second-hand clothes worth 154.98 bill. USD were imported to Ukraine, which is 38.87 thousand tons (or 57.47 bill. USD) more than in 2015 (Fig. 2.23).



	2013	2014	2015	2016	2017	2018
Net, thousand tons, right scale	102.43	91.15	92.15	111.8	131.86	130.03
Million dollars USA, left scale	128.81	104.66	97.51	127.72	154.4	154.98

Fig. 2.23. Volume of imports to Ukraine of second-hand clothes and the other products

Source: elaborated by the authors based on Clothing; worn and other worn articles (HScode: 630900), 2019.

Thus, in terms of imports of second-hand clothes and footwear, Ukraine ranked the 4-th (after Pakistan, Malaysia and Kenya) among 112 countries, while in 2013 – the 5-th (128.8 bill. USD) among 157 countries after Russia, Pakistan, Malaysia and Poland (Annex B, Fig. B.3).

In the structure of Ukrainian imports of ready-made clothing and footwear in 2018, the share of second-hand goods was 13.3% (vs. 17.1% in 2017 and 6.5%

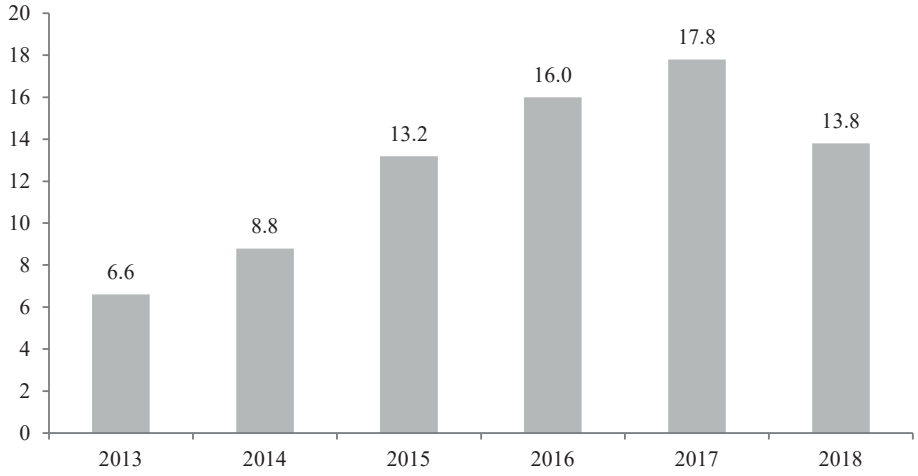


Fig. 2.24. Share of second-hand goods in Ukrainian imports of finished clothes and footwear, %
Source: elaborated by the authors based on Clothing; worn and other worn articles (HScode: 630900), 2019.

in 2013) (Fig. 2.24). For comparison, in Poland this figure was 3.29%, and in Pakistan (the world leader in the import of used clothing) – 51.12%.

Thus, despite the relative proximity of Ukraine and Poland in the world ranking of importers of second-hand clothes and the other products in 2018, the share of such goods in the structure of Ukrainian imports of textile products was 10.01 pp. higher than in the Polish structure. of course, the decrease in 2018 (compared to 2017) in the share of second-hand goods in the volume of imports of ready-made clothing and footwear in Ukraine to 3.8 pp. is positive, but in general the trend of this indicator is clearly negative.

At the same time, it should be recognized that in developing economies or transition economies (with relatively low incomes), the import of second-hand clothes can be useful because it provides access to cheap clothing and footwear for the poor. However, on the other hand, such imports significantly reduce the competitiveness (primarily in terms of price parameters) of domestic textile products in the domestic consumer market, and thus cause a decline in production.

Despite the high import dependence, Ukrainian textile industry is export-oriented – in 2017, 46.21% of manufactured textile and other products were sold on foreign markets (Fig. 2.25).

That is, the domestic market of Ukraine consumed only 53.79% of domestic products, while import dependence in the segment of final consumption of textile goods amounted to 87.22%. At the same time, compared to 2013, the share of domestic products sold on the domestic market increased 1.85 in times, and import dependence in the segment of final consumption of the textile products in Ukraine during this period decreased only to 2.75 pp.

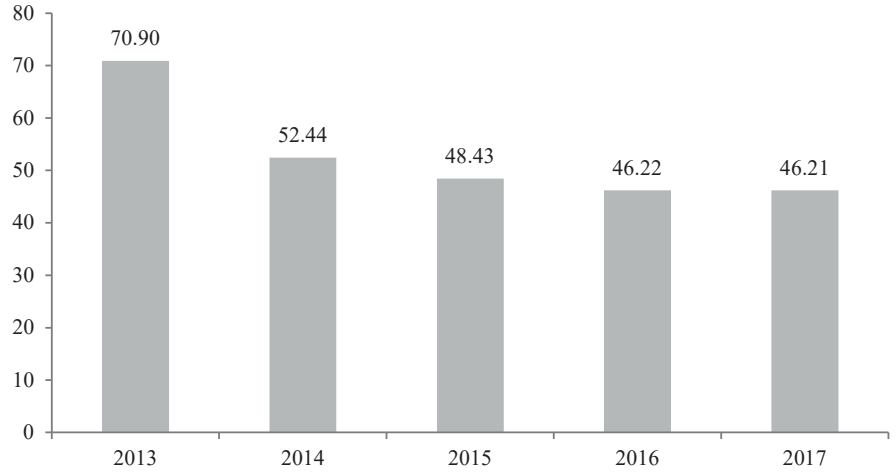


Fig. 2.25. Share of exports in the production of textiles, clothing, leather and the other materials in Ukraine, %

Source: elaborated by the authors based on SSSU, 2019.

Significant export orientation of textile and other textile industries with a high level of import dependence of the national economy in all segments of consumption of products of these industries indicates the presence of a high share of tolling operations in Ukrainian exports.

Thus, in 2018, the export of commodity group VIII. Raw hides and skins, leather made up to 56.11% consisted of products made from toll raw materials, and compared to 2013, the value of this indicator increased to 21.89 pp. (Table 2.21).

During the analyzed period, the share of such products in group XII exports also increased (to 8.28 pp.) shoes, hats, umbrellas. At the same time, in the export of textile materials and textile products (commodity group XI), the share of products made from toll raw materials, after growing in 2016 to 5.06 pp. returned to the level of 2013.

In general, it can be stated that there is an almost complete absence in the Ukrainian export of textile products of leather products, knitted fabrics and clothing (knitted and textile), as well as domestic shoes.

Thus, garment, textile and footwear enterprises located in Ukraine, but operating on a tolling basis, provide products not to Ukrainian consumers, but fill the foreign market and serve the economic interests of certain countries and business groups. The socio-economic effect for the national economy from the operation of such enterprises is only in the presence of a relatively small number of low-paying jobs (compared to neighboring countries, in particular, EU), budget revenues from contributions to the payroll, as well as consumption energy resources. At the same time, this situation indicates that the output of the domestic textile industry (in terms of both intermediate (or production) and final consumption), and

Table 2.21. Share of finished products made from toll raw materials in the export of textile industry of Ukraine, %

UKTZED code	Cargo group	2013	2014	2015	2016	2017	2018
VIII.	**The skins are raw, the skin is tanned**	**34.32**	**36.2**	**47.94**	**55.5**	**57.0**	**56.11**
41	skins	20.48	22.5	36.75	48.3	51.1	52.80
42	leather goods	66.03	79.3	74.68	81.9	83.9	84.03
43	natural and artificial fur	34.18	20.3	29.59	19.9	24.8	13.61
XI.	Textile materials and textile products	**74.14**	**76.3**	**76.45**	**79.20**	**76.0**	**74.60**
51	wool	30.49	16.9	15.24	51.9	48.1	49.42
52	cotton	20.63	17.7	52.96	37.0	36.7	41.82
53	other textile fibers	2.44	3.5	2.16	1.3	2.3	1.01
54	threads, synthetic or artificial	13.96	35.6	67.38	78.7	56.2	67.36
55	synthetic or artificial staple fibers	12.62	12.1	47.76	47.7	36.1	45.45
56	cotton	16.14	11.7	6.81	9.3	7.1	5.05
58	special fabrics	64.12	67.4	61.24	64.9	69.1	62.22
59	textile materials	1.20	2.1	3.89	6.9	9.2	10.21
60	knitted fabrics	76.59	75.1	74.53	78.8	87.0	88.60
61	clothing and clothing accessories, knitted	76.66	77.7	76.85	80.0	77.9	78.13
62	clothing and clothing accessories, textile	95.90	96.4	96.62	96.6	95.5	93.88
63	other finished textile products	61.71	69.2	68.90	75.9	73.7	76.02
XII.	Shoes, hats, umbrellas	**72.58**	**77.8**	**80.72**	**79.1**	**77.7**	**80.86**
64	shoes	74.46	79.8	82.97	82.4	80.3	84.84
65	hats	55.09	69.2	58.46	63.1	77.2	49.33
67	treated feathers and down	30.90	9.5	48.93	61.5	35.5	65.92

Source: elaborated by the authors based on SSSU, 2019.

thus the labor market and budget revenues can potentially increase significantly due to import substitution in the domestic market and qualitative improvement structure of exports, primarily by reducing the share of finished products made from toll raw materials.

2.3.2. Cross-sectoral links of the textile productions

The high level of import dependence and, at the same time, the export orientation of Ukrainian textile industry was reflected in the structure of its intersectional relations, in particular, in the use of textile and other products (in the intermediate consumption segment) by enterprises of other economic activities.

During 2013-2017, the largest consumers of the textile products in Ukraine were industries that belong to this type of industrial activity (textile, clothing, leather and the other materials), as well as the trade sector, furniture industry, public administration and defense (Table 2.22).

Thus, in 2017 in Ukraine 44.42% or 5.330 bill. UAH products of textile industry for industrial purposes were consumed by enterprises engaged in the manufacture of textiles, clothing, leather and the other materials. At the same time, it

Table 2.22. Share of the largest consumers of textile products in Ukraine (in the segment of intermediate consumption), %

NACE activities	2013	2014	2015	2016	2017
Manufacture of wood, paper, printing and reproduction	32.21	34.08	48.05	45.30	44.42
Wholesale and retail trade; repair of motor vehicles and motorcycles	14.51	7.79	9.29	10.66	8.87
Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	8.16	9.92	8.28	7.25	8.61
Public administration and defence; compulsory social security	4.60	9.33	7.38	5.68	6.77
Manufacture of wood, paper, printing and reproduction	1.39	1.96	0.83	4.45	3.96
Manufacture of food products; beverages and tobacco products	4.57	4.03	3.44	3.13	3.67
Transportation and storage	4.62	3.44	3.10	3.09	1.93
Accommodation and food service activities	2.09	1.26	0.71	1.21	1.73
Agriculture, forestry and fishing	1.06	1.39	1.30	1.18	1.62
Manufacture of rubber and plastic products	1.65	0.45	0.36	0.33	1.53
Other service activities	1.35	1.27	0.80	0.92	1.42
Electricity, gas, steam and air conditioning supply	1.73	2.57	1.44	2.16	1.34
Manufacture of basic metals	2.92	3.75	1.90	1.66	1.27
Construction	2.22	1.96	1.54	1.12	1.23
Mining of metal ores, other minerals and quarrying; provision of ancillary services in the field of mining and quarrying	1.57	1.70	1.16	1.44	1.17
Manufacture of chemicals and chemical products	1.65	0.77	0.63	0.41	1.09

Source: elaborated by the authors based on SSSU, 2019.

Table 2.23. Share of imports in the structure of intermediate consumption of textile products in Ukraine, %

NACE activities	2013	2014	2015	2016	2017
Manufacture of textiles, wearing apparel, leather and related products	99.91	99.08	87.98	94.64	95.65
Wholesale and retail trade; repair of motor vehicles and motorcycles	42.86	35.97	43.07	30.62	34.96
Manufacture of furniture; other manufacturing	47.68	40.25	69.59	36.90	28.94
Public administration and defence; compulsory social security	42.76	35.94	65.15	35.73	28.82
Manufacture of wood, paper, printing and reproduction	81.52	39.10	52.54	30.05	32.21
Manufacture of food products; beverages and tobacco products	93.05	35.83	60.57	30.94	25.23
Transportation and storage	42.62	35.40	59.01	31.02	47.41
Accommodation and food service activities	42.75	36.00	92.16	31.93	20.77
Agriculture, forestry and fishing	45.71	37.84	59.14	36.21	24.23
Manufacture of rubber and plastic products	92.66	41.67	96.15	40.63	8.20
Other service activities	42.70	36.63	70.18	35.56	21.76
Electricity, gas, steam and air conditioning supply	42.98	35.61	92.23	30.19	45.96
Manufacture of basic metals	42.49	35.79	94.85	31.29	40.13
Construction	42.86	35.90	65.45	30.91	27.21
Mining of metal ores, other minerals and quarrying; provision of ancillary services in the field of mining and quarrying	42.31	35.56	74.70	30.50	35.71
Manufacture of chemicals and chemical products	43.12	36.07	93.33	35.00	12.21
Total	**66.28**	**58.01**	**76.42**	**60.76**	**59.48**

Source: elaborated by the authors based on SSSU, 2019.

should be noted that 95.65% (5098 bill. UAH) of the volume of these products was covered by imports (Table 2.23).

For comparison, in Poland the textile industry used 28.61% of textile products and the others industries, of which imports covered 54.35%, and in Italy the values of these indicators were, respectively, 70.59% and 32.57% (Annex B, Table B.3).

The second largest consumer of textile products in Ukraine is the trade sector, which in 2017 accounted for 8.87% or to 1.064 bill. UAH, of which 34.96% (372 bill. UAH) was covered by imports. in Poland, on the other hand, the second place in this structure belonged to the production of furniture with a share of 12.75%, of which 58.11% was provided by imports. in Italy, furniture production was also the second largest consumer of textile products, but with a share of 5.54%, of which 31.03% was covered by imports.

In Ukraine, in the structure of consumption of textile products for industrial purposes, the furniture industry ranked third with a share of 8.61% or 1.033 bill. UAH, of which imports accounted for 28.94% (299 bill. UAH). The relatively low share of imports in the consumption of furniture products of the textile industry is a sign of the potential of domestic textile and other industries in providing this segment. However, the realization and further increase of this potential requires appropriate conditions for the growth of demand for such products in the domestic market by furniture companies.

In general, the analysis of intersectional relations of the domestic textile industry and the level of import dependence of the national economy by segments of consumption of its products can be said that this type of industrial activity in Ukraine has significant potential to increase output not only for furniture. The expansion of the range of relevant specialized textile products and the other textile industries for: the production of rubber and plastic products; the production of vehicles, trailers and semi-trailers; the production of other vehicles; a public administration and defense, compulsory social insurance; a health care and social assistance.

An important argument in favor of this statement is a significant reduction in the level of dependence of these foreign economic activity on imports of textile products, and especially the production of rubber and plastic products (to 88.0 pp. compared to 2015). in the other words, over the last 3 years there has been a significant increase in the share of products manufactured by domestic textile industries in the intermediate consumption of these type of economic activities (TEA) that we can see in the Table 2.23.

One of the most important characteristics of the functioning of any type of processing industry is the structure of its intermediate consumption (or the structure of production and non-production costs) in the terms of products and services of the other foreign trade. The production activities of the textile industry in Ukraine use the products of many foreign trade, but the main suppliers of raw materials and components are: textile production, production of clothing, leather and other materials; production of chemicals and chemical products; wholesale and retail trade; supply of electricity, gas, steam and air conditioning. in 2017, these 4 foreign economic activity accounted for a total of 70.74% (compared to 66.42% in 2013) of expenditures of the Ukrainian textile industry (Table 2.24).

During 2014-2017, significant changes took place in the sectorial structure of expenditures of the domestic textile industry. in particular, the share of textile, clothing, leather and other materials decreased to 8.54 pp., while the share of trade increased to 9.02 pp. Such structural changes are evidence of increasing the level of manufacturability (achieving a higher degree of processing of raw materials) of textile industries in Ukraine, and thus bringing them closer to EU standards. For example, in the sectorial structure of costs (intermediate consumption) of the Ital-

Table 2.24. TEA, the products of which occupy the largest share in the cost structure of textile industry in Ukraine, %

NACE activities	2013	2014	2015	2016	2017
Manufacture of textiles, wearing apparel, leather and related products	41.07	43.83	33.90	34.60	32.53
Manufacture of chemicals and chemical products	18.65	16.55	17.31	19.16	21.77
Wholesale and retail trade; repair of motor vehicles and motorcycles	0.37	8.77	8.43	9.06	9.39
Electricity, gas, steam and air conditioning supply	6.33	5.36	5.48	6.97	7.05
Transportation and storage	2.12	3.29	3.32	3.98	4.03
Agriculture, forestry and fishing	5.25	3.13	4.20	3.61	2.87
Manufacture of rubber and plastic products	6.37	4.02	4.66	2.96	2.41

Source: elaborated by the authors based on SSSU, 2019.

ian textile industry, the share of textile products, clothing, leather and other materials was 32.47%, and the trade sector accounted for 20.34%. in Germany, the values of these indicators were, respectively, 22.29% and 24.01%, and in Poland – 37.04% and 25.87% (Annex B, Table B.4). At the same time, the reduction in the cost structure of the Ukrainian textile industry of the share of agricultural products (to 2.38 pp. during 2014-2017) and, at the same time, the increase in the share of chemical products (3.12 pp.) indicates a decrease in production natural products, and instead – an increase in synthetic.

Despite the gradual approximation of the sectorial structure of expenditures of the textile industry of Ukraine to the level of the leading EU producers, the import dependence of domestic industries in the segment of intermediate consumption remains relatively high. Thus, in 2017, 95.65% (vs. 99.91% in 2013) of the textile products used in the production activities of Ukrainian textile and the other enterprises were covered by imports (Table 2.25). For comparison, in ITA the value of this indicator was 32.57%, DEU – 62.34% and POL – 54.35%.

An unconditional positive is the reduction of the level of the import dependence of Ukrainian textile industries in the segment of intermediate consumption of agricultural products to 30.21% (vs. 98.97% in 2014) and rubber and plastic products to 34.43% (vs. 90% in 2013). Instead, the share of imports in the chemical industry used by textiles and the other domestic industries reached 45.53% (vs. 23.08% in 2013), which, in turn, indicates the problems of development of the chemical industry in Ukraine. in general, in 2017, the Ukrainian textile industry used 48.88% of imported resources in its activities (vs. 60.49% in 2013). For comparison, the import dependence of the textile industry in Italy was 21%, Germany – 31% and Poland – 37%.

Table 2.25. Share of imports in the costs of the textile industry in Ukraine (in terms of major suppliers (TEA) of intermediate goods), %

NACE activities	2013	2014	2015	2016	2017
Manufacture of textiles, wearing apparel, leather and related products	99.91	99.08	87.98	94.64	95.65
Manufacture of chemicals and chemical products	23.08	42.34	37.95	36.56	45.53
Wholesale and retail trade; repair of motor vehicles and motorcycles	5.26	0.55	0.47	0.52	0.39
Electricity, gas, steam and air conditioning supply	0.00	0.00	0.00	0.00	0.00
Transportation and storage	35.45	15.20	15.43	41.29	46.52
Agriculture, forestry and fishing	78.68	98.97	58.92	32.61	30.21
Manufacture of rubber and plastic products	90.00	32.13	31.78	31.84	34.43
Total	**60.49**	**58.87**	**46.09**	**47.81**	**48.88**

Source: elaborated by the authors based on SSSU, 2019.

Summarizing this block of research, we can state the tendency to reduce the level of import dependence of textile industries in Ukraine and the gradual approximation of the structure of its intersectional ties to the standards of EU countries, in particular Italy and Germany, which are leaders in the textiles, leather, clothing and footwear in Europe. At the same time, further development and raising the level of manufacturability of Ukrainian textile industry products requires strengthening the latter's integration with the trade sector. This is due to the fact that through the trade network, companies, on the one hand, purchase the necessary materials for production processes and components manufactured by the other foreign trade, and on the other – sell their products (wholesale and retail). However, the trade sector (and especially the retail sector) in Ukraine requires a radical "de-shadowing", legalization of all the operations. in addition, increasing the competitiveness of the domestic textile industry in the both domestic and foreign markets is impossible without import substitution in the segment of intermediate goods, raw materials, materials and components, especially fabrics.

Chapter 3

Industry of Ukraine and EU member states: Comparative evaluation

3.1. Comparative analysis of structural parameters of industry in Ukraine and EU countries

The competitiveness of the industrial sector of the economy is its permanent ability to withstand competition due to the availability of appropriate potential (especially the formed structural characteristics) provided that a high level of efficiency is achieved. The proposed methodological approach allows to systematically assess the competitiveness of industry at the macro and meso levels, as it covers a number of structural characteristics, including: the level of industrial economy, industry specialization (by the types of industrial activity and processing), its the internal and external efficiency. So, to implement this approach, an appropriate economic and mathematical apparatus has been developed.

The overall level of competitiveness of the industrial sector of the economy reflects the coefficient of structural advantages (K) – a complex indicator that combines primary determinants:

$$K = K_E \frac{K_D}{K_V}, \tag{3.1}$$

where

K_E – the indicator of the share of industry in the export of GVA of all TEA((reflects external efficiency);

K_D – the indicator of the share of industry in the GVA of all foreign trade;

K_V – the indicator of the industrial level of the economy (reflects the share of industry in the output of all TEA).

$$K_V = \frac{V_{prom}}{V}, \tag{3.2}$$

where

V_{prom} – the industrial output, V – the production of all TEA;

$$K_D = \frac{D_{prom}}{D}, \tag{3.3}$$

where

D_{prom} – the GVA of the industry, D – the GVA of all TEA;

$$K_E = \frac{E_{prom}}{V_{prom}} \cdot \frac{D_{prom}}{ED}, \tag{3.4}$$

where

E_{prom} – the export of industrial products, E – the export of goods and services.

Taking into account (4.2)-(4.4), equation (4.1) can be written as a model:

$$K = \frac{E_{prom} D_{prom}}{V_{prom}} \times \frac{V}{ED} \times \frac{D_{prom}}{D} \times \frac{V}{V_{prom}} = \frac{E_{prom}}{E} \times \frac{D_{prom}^2}{V_{prom}^2} \div \frac{D^2}{V^2}. \tag{3.5}$$

The share of GVA in industrial output is singled out $\left(K_D^V\right)$:

$$K_D^V = \frac{D_{prom}}{V_{prom}}. \tag{3.6}$$

This indicator characterizes the socio-economic efficiency of the industrial sector of the economy. Its high value (> 0.5) is a necessary condition for the realization of competitive potential.

The coefficient of structural advantages of industrial activities K^i is determined by the formula:

$$K^i = K_E^i \frac{K_D^i}{K_V^i}, \tag{3.7}$$

where

K_E^i – the indicator of the share of the GVA of industrial activities in industrial exports;

K_D^i – the indicator of the share of industrial activities in the GVA;

K_V^i – the indicator of industry specialization (reflects the structure of industry in terms of industrial activities).

$$K_V^i = \frac{V_i}{V_{prom}}, \tag{3.8}$$

where

V_i – the issue of the *i*-th type of industrial activity;

$$K_D^i = \frac{D_i}{D_{prom}}, \tag{3.9}$$

where

D_i – the GVA of the *i*-th type of industrial activity;

$$K_E^i = \frac{E_i D_i}{V_i} : \frac{E_{prom} D_{prom}}{V_{prom}}, \tag{3.10}$$

where

E_i – the export of products of the *i*-th type of industrial activity.

A similar tools are used to assess the competitiveness of the processing industry (by the type of production).

As we can see, the level of industrial economy of the country characterizes the size of its industrial sector in the release of all TEA. The national economy of Ukraine belongs to the industrial type. Thus, in spite of a decrease in the share of industry in the release of all TEA, in 2015, Ukraine's 7.65 pp. Prevailed in the EU-28 for this indicator (Table 3.1), reaching of the 5-th – this place among EU member states and the 2-nd only to Ireland, Slovakia, Czech Republic and Hungary, respectively, at 10.77 and 6.69, 6.44 and 5.87 pp. (Annex C, Table C.1).

Table 3.1. The share of industry (by the types of industrial activity) in the production of all TEA in industry

Type of industrial activity	Ukraine				EU-28			
	2012	2013	2014	2015	2012	2013	2014	2015
Industry	**41.15**	**38.34**	**38.87**	**38.10**	**30.96**	**30.66**	**30.35**	**30.45**
Extractive industry and career development	11.80	12.75	11.98	11.67	2.24	2.12	1.92	1.66
Manufacturing	75.19	73.93	74.84	75.57	84.50	84.42	84.92	85.29
Supply of electricity, gas, steam and air condition	11.15	11.49	11.38	11.08	9.68	9.85	9.51	9.45
Water supply; sewage, waste management	1.86	1.83	1.80	1.69	3.58	3.61	3.65	3.60

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

The 6-th place was occupied by Poland, whose share of industry in the issue of all in 2015 was 37.79% (vs. 38.1% in Ukraine). At the same time, in terms of industrial output, the country was the 7-th among the EU member states in 2015, while Ukraine occupied only the 19-th place (compared to the 13-th in 2013). The

volume of domestic industry output is 30.7 in times smaller than that of the German industry leader (Annex D, Table D.1).

Among the industrial activities, the largest share in the structure of industrial production (with a tendency to increase) is the processing industry. The value of this indicator in Ukraine during the analyzed period was more than 9.0%, below, than in the EU-28, which indicates the national economy's belonging to the raw material type. Thus, in 2015, the domestic processing industry by the share of the industrial sector of the economy ranked the 25-th among the EU member states, but in terms of volume – the 20-th (compared to the 15-th in 2013), yielding to German processing industry in more than 36 in times.

The highest share of manufacturing in the industry in 2015 was in the Ireland (96.71%), Hungary (92.86%) and Belgium (90.78%). At the same time, these countries occupied the 8-th, 16-th and 9-th places according to the volume of production of the processing industry. in four EU countries, the share of processing industry in the issue was less than in Ukraine. in addition to Malta, Croatia and Cyprus, the UK also owns these countries, which in terms of output of the processing industry prevails over Ukraine more than 13 in times, ranked the 4-th among the EU.

In the structure of Ukraine's industrial sector, relatively high (> 11%) is a share of extractive industry and the development of quarries. By this indicator, Ukraine during 2012-2015 consistently exceeded the EU-28 by more than 10.0% and was ranked the 1-st number among the countries in question, but the 6-th – by volume (compared to the 3-rd in 2013), which is almost 6.5 in times lower than the leader of the UK. Among the EU member states, the mining and quarrying are the most specialized in Croatia (with a share of 10.60% in 2015), GB (5.42%) and Netherlands (5.07%). in the other of the analyzed countries, the share of this type of industrial activity in the production of the industrial sector of the economy was less than 5% in 2015, in particular in Poland – 3.74% (the 7-th place), which, however, in the 2015, took the 3-rd place in the volume of extraction industry and development of quarries.

By the share of electricity, gas, steam and air-conditioned air supply in the industry over the analyzed period of time, Ukraine steadily surpassed the EU-28 by more than 1.5 pp., in 2015, the 13-th place among the EU member states. Despite the decreasing trend in the value of this indicator since 2014, Ukraine has a significant potential for developing of this type of the industrial activity, primarily electricity (nuclear, hydro- and renewable), but it was only the 16-th in 2015 in terms of its output (vs. the 14-th in 2013), lagging behind GB more than 20 in times.

In EU, the share of electricity, gas, steam and the air conditioning in industrial production in 2015 was the highest in Cyprus (18.35% vs. 21.91% in 2014) and in Latvia (18.19% vs. 20.34%), that is, in countries with very low volumes of this kind of the industrial activity (the 28-th and 23-rd places respectively). Instead,

the Poland, which ranked the 17-th among the countries under consideration for the share of electricity, gas, steam and air conditioning in the structure of the industrial sector of the economy (8.82%), was the 6-th in terms of volume output.

The share of such industrial activities as the water supply, sewage, waste management in the structure of industrial output Ukraine during the analyzed period fell to the EU-28 almost at twice, having achieved the 27-th place in 2015 among the EU member states after Slovakia and Ireland. At the same time, in terms of the release of this type of industrial activity, these countries occupied, respectively, the 19-th and the18-th places, while Ukraine is the 20-th.

The socio-economic result of functioning of the industrial sector of economy is characterized by the amount of GVA that created by it. By the share of industry in the GVA of all TEA, Ukraine prevailed in the EU-28 in all years of the analyzed period of time (Table 3.2).

Table 3.2. The share of industry (by the types of industrial activity) in the GVA of all TEA in industry

Type of industrial activity	Ukraine				EU-28			
	2012	2013	2014	2015	2012	2013	2014	2015
Industry	**24.84**	**22.68**	**23.52**	**23.27**	**19.36**	**19.31**	**19.02**	**19.39**
Extractive industry and career development	26.32	27.15	24.33	24.20	4.51	4.17	3.62	2.80
Manufacturing	56.91	55.97	59.66	60.21	80.08	80.39	81.39	82.46
Supply of electricity. gas. steam and air condition	14.53	14.59	13.79	13.58	10.29	10.31	10.00	9.91
Water supply; sewage. waste management	2.24	2.29	2.22	2.02	4.97	4.95	5.00	4.83

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

In 2015, Ukraine ranked the 10-th among the EU member states by the value of this indicator (vs. the 5-th by share), with Ireland, CR, Hungary, Romania, Slovenia, Slovakia, Poland, Germany and Bulgaria (Annex C, Table C.2). However, in terms of the production of airborne vehicles, domestic industry was only the 20-th, behind the leader – the industry of Germany – 43.8 in times (Annex D, Table D.2).

The share of extractive industry and the development of quarries in the industry in Ukraine during 2012-2015 surpassed the similar figure of the EU-28 by more than 20.0%. Therefore, being the 1-st among EU member states for this indicator, Ukraine occupied only the 6-th place in 2015 in volume of extractive industry and quarrying, yielding to the leader of the UK at 7.2 in times. At the same time, Germany's share of this kind of industrial activity in the aviation industry is only 0.59%, but in terms of the volume of GVA it dominates Ukraine 1.2 in times,

ranked the 5-th among the EU member states. It follows that the domestic extractive industry has a great potential, which, on the one hand, is one of the key competitive advantages of Ukraine on the world market of resources, and, on the other, requires significant investment for the further development of this kind of industrial activity on an intensive basis.

Instead, the domestic processing industry is characterized as a completely opposite situation. Thus, for the part of the processing industry in GVA of industry, Ukraine during 2012-2015 lagged behind the EU-28 by more than 20.0% and ranked last among of all the countries analyzed. However, in terms of the volume of GVA produced, the domestic processing industry was the 20-th in 2015, giving the way to the leader of German processing industry – 64.7 in times. Ireland (94.42% in 2015 compared with 88.43% in 2014), which ranked the 6-th in terms of processing industry, has the highest share of the industrial processing in the GVA of the industry from EU member states.

The share of electricity, gas, steam and air-conditioned air supply in industry Ukraine during the analyzed period to more than in 3.5%. The EU-28 exceeded, having achieved the 9-th place among EU member states in 2015. However, despite the high significance of the structural index, Ukrainian energy sector was only the 18-th in terms of the volume of airborne vehicles, lagging behind the leader – the energy of Germany – more than 20 in times.

Ukraine is an outsider among the EU-28 in terms of the performance of such industrial activities as water supply, sewage, waste management, the share of which in the domestic GVA in 2012-2015 was less than in the EU-28, by more than 2.5 pp. But in 2015 by the value of this indicator Ukraine ranked the 28-th among the EU member states (ahead of only Ireland) and at the same time the 24-th – by the volume of GVA created by named type of industrial activity. The problematic situation is due to organizational and economic factors that affect this type of industrial activity in water supply, sewage, waste management in Ukraine. This is the unsatisfactory condition of fixed assets, unjustified price policy, and the lack of competition in this segment of the market.

The socio-economic efficiency of industry reflects the share of GVA in the output of this sector of the economy. The higher the value of the indicator, the more efficient the industry functions, as a result of which the social and economic effects are reflected, which are reflected in components of GVA – the wages of employees, gross profit, mixed income. By the indicator of the share of GVA emissions in the industry during the analyzed period of time, Ukraine was more than in 5.0 pp. by EU-28 was inferior (Table 3.3).

As a result of reducing the level of the efficiency to 0.32 pp. in 2015, compared to previous domestic industry, it became an outsider in EU, dominated only by Slovakian at 2.21 pp. (Annex C, Table C.3).

Table 3.3. Share of GVA in industrial output (by the types of industrial activity)

Type of industrial activity	Ukraine				EU-28			
	2012	2013	2014	2015	2012	2013	2014	2015
Industry	**24.18**	**24.78**	**24.95**	**24.63**	**29.89**	**30.24**	**29.88**	**30.23**
Extractive industry and career development	53.93	52.79	50.66	51.10	60.23	59.44	56.26	50.79
Manufacturing	18.30	18.76	19.89	19.63	28.32	28.80	28.63	29.23
Supply of electricity, gas, steam and air condition	31.52	31.47	30.21	30.20	31.78	31.67	31.43	31.72
Water supply; sewage, waste management	29.21	30.99	30.84	29.37	41.43	41.38	40.96	40.54

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

The Denmark (40.39% in 2015 vs. 38.66% in 2014) is the leader among the list of analyzed countries, which is ahead of Sweden and the Germany, respectively, to 4.64 and 5.14 pp. The high efficiency of industry (more than 34% in 2015) was also demonstrated by Lithua, Croatia and the UK.

The smallest level of socio-economic efficiency is characteristic for processing industry. in Ukraine during 2012-2015, the share of GVA in the production of this type of industrial activity was more over 9.0 pp. below, than in EU-28. Thus, in 2015, Ukraine by value of indicator lags behind the outsiders among the analyzed countries – Slovakia and Bulgaria – to 1.99 and 3.0 pp. Instead, Romania (34.69%) became the 2-nd after Denmark (38.07%) for the share of GVA emissions in the production of manufacturing.

The share of GVA emissions in the extraction industry and development of quarries in Ukraine at first time exceeded EU-28. However, given the preponderance of Ukraine (with a large margin) among the EU countries in terms of the share of extractive industry in the production and in the GTS-industry, it's the 13-th place in terms of value of the share of GVA emissions in the release of this type of industrial activity is a sign of inefficient use existing production potential. Among EU, Danish extractive industry (80.18% in 2015 vs. 84.72% in 2014) and Netherlands (74.57% vs. 78.21%) have the highest efficiency, although with a downward trend. in 2015, the high value (> 60%) of the share of GVA emissions in production of the processing industry reached Bulgaria and Slovakia. At the same time, it is precisely in these countries that the lowest among EU member states is the efficiency of the processing industry.

During the analyzed period of time, the lag between the values of the indicator of the share of GVA volumes in supply of electricity, gas, steam and air-conditioned air in Ukraine and the EU-28 constantly increased in favor of the latter

and in 2015 reached to 1.52. pp. Ukraine has fallen the 23-rd among the analyzed countries on the effectiveness of this type of the industrial activity, while ranking the 13-th in the share of the latter in the issue and the 9-th in the share of the GVA assets. It is worth noting the presence of a very significant lag (more than 3 in times) between the values of the share of GVA emissions in the production of electricity, gas, steam and the air conditioning in various EU member states. Thus, the highest value of this indicator was in Sweden in 2015 (60.62% vs. 65.79% in 2014), and the lowest in Austria (19.66%), Slovakia (21.62%), Italy (25.49%) and Great Britain (25.61%). The latter was among the top 3 in terms of electricity, gas, steam and air conditioning in industrial production (16.5% vs. 11.08% in Ukraine), but inferior to Ukraine by the efficiency of this kind of industrial activity to 4.59 pp.

The value of the indicator of the share of GVA emissions from the supply of water, sanitation, and waste management during 2012-2015 years in Ukraine was lower than in the EU-28, at more than in 10.0 pp., which made it an outsider among EU member states on effectiveness of this type of industrial activity. This situation necessitates a revision of the state industrial policy on water supply, sanitation, waste management in order to increase its capacity (taking into account water resources in Ukraine) and increase productivity. For example, in the post-socialist countries, such as the Croatia, Slovakia, Poland, Bulgaria, Lithua and Latvia in 2015, the share of the GVA in the production of this type of industrial activity was more than 50%. This implies a need to deregulate this type of industrial activity in Ukraine in liberalization of tariff policy.

The importance of the industrial sector of the economy in foreign trade (from the standpoint of its socio-economic efficiency) characterizes the indicator of share of industry in exports of GVA of all TEA. The greater value of this indicator, greater the presence of high-quality industrial products in foreign markets, and hence the higher competitiveness of the country's industry. in 2012 and 2014, Ukraine surpassed the EU-28, which is evidence of the high export orientation of the industrial sector of the national economy (Table 3.4).

However, in 2015, due to a decrease in the share of domestic industry in the export of GVA of all TEA in industry (and opposite processes in the EU-28), Ukraine yielded the latter to 4.06 pp., having the 21-st place (vs. the 13-th in 2014) among the EU member states for this indicator (Annex C, Table C.4). At the same time, Ukrainian industry was the 19-th in terms of exports of GVA (Annex D, Table D.3) and in terms of exports of industrial products (Annex D, Table D.4).

The leaders in the EU-28 in terms of the share of industry in the export of GVA of all foreign trade in 2015 was Romania (57.22%), which at the same time ranked the 15-th in terms of industrial GVA exports and the 17-th in terms of industrial exports. in Belgium and Netherlands, on the other hand, the share

Table 3.4. Share of industry (by the types of industrial activity) in the export of GVA of all TEA (in industry)

Types of industrial activity	Ukraine				EU-28			
	2012	2013	2014	2015	2012	2013	2014	2015
Industry	**41.59**	**39.51**	**40.54**	**37.21**	**40.48**	**40.40**	**40.51**	**41.27**
Extractive industry and career development	18.13	22.14	22.46	19.91	3.92	3.62	3.47	2.83
Manufacturing	68.42	66.68	69.71	70.92	91.65	92.45	92.89	93.89
Supply of electricity, gas, steam and air condition	1.71	1.71	1.61	1.49	0.23	0.18	0.20	0.20
Water supply; sewage, waste management	0.19	0.23	0.20	0.21	1.56	1.24	1.43	1.38

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

of industry in GVA exports was less than 20 per cent. These are countries with a post-industrial type of economy – in the structure of output, GVA and exports, they are dominated by the service sector. However, they are in the Top-10 among EU member states in terms of both industrial exports exports.

Among the types of industrial activity, the most export-oriented is processing industry. However, the share of the domestic processing industry in the export of GVA to the industry in general (despite an increase to 4.24 pp. during 2014-2015) remains significantly lower than in EU-28. in particular, in 2015 this gap amounted to almost 23.0 pp. Thus, having dropped to the 2-nd positions, Ukraine has become an outsider among EU member states in this indicator, being at the same time the 21-st in terms of the exports of GVA of the processing industry and the 19-th in terms of exports of the latter's products.

Instead mining and quarrying in Ukraine is the most export-oriented country compared with the EU countries – its share in the export of the GVA assets of the industrial sector of the national economy during the analyzed period averaged almost 6 in times (over to 17 pp.), which was the same as in the EU-28. However, being the leader among EU member states in terms of this structural indicator, Ukraine in 2015 occupied only the 4-th place in the volume of export of the GVA assets extractive industry and the development of quarries and the 3-rd – by the volume of export of products of this type of industrial activity. in the E-28, the highest volumes of exports of products and mining industries and the development of quarries were demonstrated by Poland – it surpassed Ukraine by these absolute figures to 1.42 and 1.55 in times respectively.

The export-oriented in Ukraine is a kind of industrial activity such as supply of electricity, gas, steam and air-conditioned air. Despite the tendentious decline in its

share in the exports of industry, Ukraine in this indicator in the EU-28 was dominated to 1.29 pp. in 2015, being the 8-th among the list of analyzed countries. At the same time, the domestic industry ranks the 7-th in terms of exports of electricity, gas, steam and air-conditioned air, giving way to the leader of the German industry almost 38 and 45 in times the volume of the GVA exports by this type of industrial activity.

The water supply, the sewage, waste management has the smallest share in the export of GVA industry, during 2012-2015, Ukraine was inferior to EU-28 for this structural indicator to much more than 1 pp. and ranked the 26-th among in EU. The position of Ukraine and the volume of export of the GVA of this type of industrial activity is similar: it lags behind the leader, – Germany, – more than 122 in times, while by volume of exports of water supply, sewage, waste management – almost 76 in times.

The overall level of competitiveness of the industrial sector of the economy reflects a comprehensive indicator of structural advantages. It aggregates the values of primary structural indicators, in particular, such as the share of industry in the production of all foreign trade, the share of industry in the GVA of all foreign trade, the share of industry in the export of GVA troops.

The value of the coefficient of structural advantages of industry in EU-28 during the analyzed period was almost unchanged, but in 2015, compared to the previous year, increased to 0.009 points (Table 3.5).

Table 3.5. Coefficient of structural advantages of industry (the types of industrial activity), share of unit

Type of industrial activity	Ukraine				EU-28			
	2012	2013	2014	2015	2012	2013	2014	2015
Industry	**0.251**	**0.234**	**0.245**	**0.227**	**0.253**	**0.254**	**0.254**	**0.263**
Mining and quarrying	0.404	0.472	0.456	0.413	0.079	0.071	0.065	0.047
Processing industry	0.518	0.505	0.556	0.565	0.869	0.880	0.890	0.908
Supply of electricity, gas, steam and air conditioning	0.022	0.022	0.020	0.018	0.002	0.002	0.002	0.002
Water supply; sewerage, waste management	0.002	0.003	0.002	0.003	0.022	0.017	0.020	0.019

Source: elaborated by the authors' calculations according to Tables 2.1-2.4.

In Ukraine, on the other hand, this indicator fluctuated annually, and in 2015 it decreased to 0.018 points. So, the gap between the levels of industrial competitiveness increased to 0.036 points in favor of EU-28. As a result, Ukraine in 2015 dropped to the 20-th place (vs. the 14-th in 2014) among EU member states in terms

of the structural advantages of industry (Annex C, Table C.5). This decline in position of the industrial sector of the national economy is explained primarily by the reduction of the latter's share in the export of GVA of all foreign trade.

The leaders in EU-28 in terms of industrial indicators are Romania and Ireland, which outnumber Ukraine almost in twice. This is largely due to the high efficiency of foreign economic activity of these countries, the highest values of their industry shares in GVA exports. However, in terms of exports of industrial GVA, Ireland and Romania rank, respectively, only the 11-th and the 15-th among EU member states.

The domestic extractive industry is out of competition in EU. Thus, despite the decrease in Ukraine during 2014-2015, the indicator of structural advantages of this type of the industrial activity, its value consistently exceeded EU-28, in 2015 to 0.366 points.

The leading position of the domestic extractive industry among EU member states is due to its absolute predominance in terms of primary structural indicators, although the efficiency of this type of industrial activity in Ukraine is 1.58 in times lower than in Denmark – the closest pursuer 2015 vs. 0.227 points in 2014. in the latter, the share of mining and quarrying in industrial output in 2015 was only 4.07%, while in Ukraine the value of this indicator was almost 3 in times higher.

The domestic electric power engineering also remains highly competitive in the EU. Thus, despite the downward trend, in 2015 the value of the indicator of structural advantages of this type of industrial activity in Ukraine was 9 in times higher than EU-28. Thus, Ukraine ranked the 6-th among the analyzed countries in terms of key structural indicators in the supply of electricity, the gas, steam and air conditioning, behind such recent members of EU as Estonia, Bulgaria, Slovenia, CR and Croatia. These countries, on the other hand, have a much higher efficiency of this type of the TEA.

In terms of the coefficient of structural advantages in water supply, sewerage, waste management during 2012-2015, Ukraine was inferior to the EU-28 in more than 6 in times, ranking the 26-th among the analyzed countries. This situation is due to low values of primary structural and absolute indicators, as well as indicators of efficiency of this type of industrial activity in Ukraine.

The least competitive among the types of industrial activity in EU in terms of the structural indicators and socio-economic efficiency is the domestic processing industry. Thus, inferior to EU-28 in 1.6 in times the value of the coefficient of structural advantages, Ukraine in 2015 in this indicator took the penultimate (before Malta) place among EU member states. However, according to the values of absolute performance indicators, Ukrainian processing industry was on the 19-th-21st places, which testifies to significant productivity and the availability of reserves to increase its production potential.

Thus, having industrial potential and at the same time significant natural raw materials and human resources, in 2015 Ukraine ranked only the 19-th among EU member states in terms of the industrial output (the 13-th in 2013) and the 20-th on volume of GVA of the last, conceding to the leader – Germany – in more than 30 and almost 44 in times accordingly.

The specialization of domestic industry is typical for countries with a raw material type of economy. Thus, in particular, the share of mining and quarrying in the structure of GVA in the industrial sector of the national economy is over 24% (the highest figure among EU member states – 13.35% in Netherlands), and the share of manufacturing – only 60.21% (the lowest value in the EU-28 – 64.46% in Cyprus).

Ukrainian extractive industry is fully export-oriented – its share in the export of GVA of industrial sector of the national economy is approaching 20% (the highest rate among EU member states – 8.15% in Croatia). But in terms of GVA exports of this type of industrial activity and, and the volume of production – the 3-rd. Ukraine's competitors in this segment of merchandise exports are Poland, GB, Denmark and Germany.

The key problem of Ukrainian industry is its low efficiency – 28-th place among EU member states in terms of the share of GVA in output. The least efficient are processing plants, in which the share of GVA in output is 19.63% (the lowest value in the EU-28 – 21.62% in Slovakia). The above indicates the dominance in the cost structure of industrial products of the material and energy components and, thus, confirms the raw material orientation of domestic industry, in particular, processing.

The price of the raw materials directly depends on the situation on the world markets of energy and material resources. As the main export goods in Ukraine are products of the food industry and metallurgy, the decline in prices for agricultural products and metal has led to a reduction in foreign exchange earnings, and hence a decline in the national currency. As a result, the volumes of output, GVA, exports of domestic industry in value terms decreased significantly. The latter, in turn, caused Ukraine to lose its positions in the relevant rankings among EU member states.

For the domestic industry, not only is the low share of GVA emissions in the production, but also the irrational structure of GVA, despite the tendency to improve it. Thus, in Ukraine, the share of gross profit, mixed income in the structure of the GVA industrial sector of the industry in 2015 was less than 50%, while in Poland it was close to 60% (Table 3.6). According to this indicator, Ukraine occupied the 18-th place (compared to the 28-th in 2013) among EU member states (Annex E, Table E.1).

Table 3.6. Structure of the GVA in industry, %

Indicator	Ukraine			Poland		
	2013	2014	2015	2013	2014	2015
Industry	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Wages of employees	66.50	59.85	52.87	41.90	44.30	41.40
Other taxes related to production	3.16	2.90	2.46	1.70	1.70	1.60
Other subsidies related to production	–5.85	–6.08	–2.04	–0.90	–1.40	–1.30
Gross profit, mixed income	36.19	43.32	46.71	57.30	55.40	58.30
Mining and quarrying	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Wages of employees	59.78	43.89	35.97	56.90	65.80	56.50
Other taxes related to production	1.73	1.92	2.11	4.00	4.50	3.50
Other subsidies related to production	–17.58	–11.52	–2.52	–1.00	–1.80	–0.30
Gross profit, mixed income	56.07	65.71	64.44	40.10	31.50	40.30
Extraction of stone and brown coal	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Wages of employees	148.40	143.30	147.06	76.50	96.80	72.20
Other taxes related to production	2.00	2.40	2.40	0.60	2.30	1.50
Other subsidies related to production	–64.50	–75.70	–15.41	–0.10	–1.40	0.00
Gross profit, mixed income	14.10	30.00	–34.05	23.00	2.30	26.30
Manufacturing	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Wages of employees	69.75	63.71	56.18	43.00	45.40	43.30
Other taxes related to production	3.78	3.22	2.90	1.10	1.10	0.90
Other subsidies related to production	–0.41	–0.11	–0.13	–0.90	–1.50	–1.50
Gross profit, mixed income	26.89	33.17	41.05	56.80	55.00	57.30
Electricity, gas, steam and air conditioning supply	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Wages of employees	59.60	66.00	61.14	26.60	26.80	23.30
Other taxes related to production	3.60	3.40	4.83	1.80	2.40	2.80
Other subsidies related to production	–4.70	–20.20	–11.66	–0.20	–0.40	–0.30
Gross profit, mixed income	41.50	50.80	45.69	71.80	71.20	74.20
Water supply; sewerage, waste management and remediation activities	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Wages of employees	110.60	92.70	101.31	42.80	42.70	41.20
Other taxes related to production	2.50	1.90	5.26	5.30	6.40	5.50
Other subsidies related to production	–7.10	–19.10	–16.23	–2.00	–2.60	–2.50
Gross profit, mixed income	–6.00	24.50	9.65	53.90	53.50	55.80

Source: elaborated by the authors based on SSSU, 2019; CSOP, 2017.

Despite the reduction in production-related subsidies in 2015, 2.87 in times (compared with 2013), the Ukrainian mining industry remains more subsidized than Polish. This is mostly true for the extraction of brown coal, reducing subsidies to which 4.2 in times resulted in its loss-making. At the same time, subsidies to this kind of extractive industry were stopped in Poland, but the share of profits in its was more than 26%. in parallel with the reduction of subsidies for the mining and processing industry, in 2014-2015, opposite processes in the supply of electricity, gas, steam and air-conditioned air, water supply, sewage, waste management occurred in Ukraine.

The latter's of structure of GVA shows its direct dependence on government subsidies, while in Poland and the other EU member states (with the exception of the Slovenia and Hungary, where the share of income in GVA of water supply, sewage and the waste management was less than 27%), this the type of industrial activity is highly profitable.

In 2015, Ukraine was an outsider among EU member states in terms of share of gross profits, mixed income in the structure of airborne transmission of gas, steam, and air conditioning (45.69%), although the subsidy of this type of industrial activity remained high (11,66% vs. 0.3% in Poland). Instead, the domestic mining industry is the most profitable. Despite the decrease in state subsidies in 2015 to 4,57 in times, the share of profits in GVA of this type of industrial activity declined only 1,27 pp. – up to 64.44% (vs. 40.3 in Poland). Thus, Ukraine ranks the 7-th among the countries under consideration.

The domestic processing industry accelerates the growth of profitability (to 14.2 pp. during 2013-2015) with a parallel decrease in subsidization (to 0.28 pp.). As a result, Ukraine, in terms of the share of gross profit, mixed income in the structure of processing industries, in 2015, took the 21-st place (compared to the 27-th in 2013) among EU member states. It should be emphasized that in Poland, which prevailed over Ukraine by this structural indicator to 16.25 pp., the share of subsidies in the processing industry increased to 0.6 pp.

Consequently, the results of the analysis provide grounds for asserting a need for further restructuring of Ukraine's industrial sector. The gradual optimization of the structure of domestic industry should simultaneously cover all types of industrial activities. A key criterion for such an optimization is the increase in socio-economic efficiency, which, in turn, is to increase the GVA security and improve its structure, in particular the increase in the share of gross operating profit, mixed income. The structure of the industrial sector of the national economy should be dominated by those types of industrial activity that create the largest amount of value added, but at the same time are not raw materials. That is, the development of the processing industry should be a priority of the new industrial policy in Ukraine.

3.2. Rating assessment of the structure and efficiency of the processing industry of Ukraine and the EU countries

The structure of the processing industry, hence its specialization, is characterized by the share of individual industries in the total output of this type of industrial activity. Higher the value of the indicator, more the country's processing industry specializes in a particular production.

The structure of the domestic processing industry (by output) during 2013-2015 has undergone some changes. Thus, the share of the food industry increased the most (to 4.12 pp.), while the share of production of the other vehicles decreased to 3.22 pp. (Table 3.7).

In the contrast to Ukraine, in the EU-28 the values of the share of individual refineries in relevant structure varied within 1.0 pp., and only the share of produc-

Table 3.7. Share of production in the manufacturing industry of Ukraine and the EU-28, %

Manufacturing	Ukraine			EU-28		
	2013	2014	2015	2013	2014	2015
Manufacture of food products; beverages and tobacco products	29.59	31.30	33.71	16.07	15.94	15.59
Manufacture of textiles, wearing apparel, leather and related products	1.40	1.42	1.75	3.10	3.16	3.10
Manufacture of wood, paper, printing and reproduction	4.97	5.38	5.97	5.72	5.68	5.61
Manufacture of coke and refined petroleum products	6.29	5.60	5.01	6.91	5.52	5.26
Manufacture of chemicals and chemical products	6.00	5.47	6.25	7.84	7.84	7.92
Manufacture of basic pharmaceutical products and pharmaceutical preparations	1.52	1.75	1.90	3.49	3.40	3.46
Manufacture of rubber and plastic products	2.79	2.95	3.27	4.07	4.14	4.10
Manufacture of other non-metallic mineral products	4.60	4.30	4.59	2.96	2.98	2.93
Manufacture of basic metals	21.01	23.99	21.58	5.58	5.78	5.65
Manufacture of fabricated metal products, except machinery and equipment	3.38	2.71	2.88	6.94	7.04	6.96
Manufacture of computer, electronic and optical products	0.85	0.86	0.70	4.15	4.18	5.12
Manufacture of electrical equipment	2.49	2.47	2.11	4.05	4.15	4.14
Manufacture of machinery and equipment n.e.c.	4.45	3.81	3.44	9.13	9.33	9.22
Manufacture of motor vehicles, trailers and semi-trailers	1.38	1.39	1.12	10.99	11.91	11.96
Manufacture of other transport equipment	5.42	2.96	2.20	3.04	2.92	2.97
Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	3.87	3.62	3.52	5.96	6.03	6.00

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

tion of coke and coke products, refined products decreased to 1.63 pp. (in Ukraine – to 1.28 pp.).

According to the results of the analysis, the basis of the processing industry of both Ukraine and the vast majority of EU member states is food production; beverages and tobacco products (Annex F, Table F.1). The share of this production in the output of the domestic processing industry in 2015 exceeded the EU-28 to 2.16 in times (in 2013 – to 1.84 in times). According to this structural indicator, Ukraine outperforms all analyzed countries, except Cyprus (46.15%). However, in terms of output, the domestic food industry in 2015 took only 13-th place, behind the leader, – German, – 10.6 in times (Annex G, Table G.1).

The high share of food production in the structure of the processing industry is typical for Greece (30.08%), Croatia (28.38%) and Spain (25.54%). The latter is among the top three EU member states in terms of food industry output. The least developed food production; beverages and tobacco products in Slovenia and Slovakia. These countries rank last in both structural and absolute terms in EU.

The second place in the structure of output of the domestic processing industry stably belongs to metallurgical production, the share of which in 2015 amounted to 21.58%, while in the EU-28 – only 5.65% (7-th place in the structure). Ukraine is the undisputed leader among the analyzed countries in this structural indicator, as its value in the closest pursuer, – Bulgaria, – was 13.98%. However, in terms of output, domestic metallurgy is only 9-th among EU member states, lagging behind German by more than 9 in times.

Production of vehicles, trailers and semi-trailers, which in the EU-28 ranks 2-nd among manufacturing industries with a share of 11.96%, in Ukraine in 2015 was in the penultimate (15-th) place with a share of 1.12%. Domestic motor transport production was on the 23-rd place among the analyzed countries by the value of the structural indicator (share in the output of the processing industry), but on the 20-th – by the value of the absolute (volume of output).

In 2015, the production of chemicals and chemical products rose to the 3 place in the structure of the domestic processing industry. However, if in Ukraine the share of this type of production in the total output of processing was 6.25% (10-th place among the analyzed countries), in the EU-28 – 7.92%, and in countries such as the Netherlands and Belgium – more than 14%. in terms of output, the domestic chemical industry in 2015 was in 15-th place, 44.3 in times lower than the German one.

Manufacture of wood and paper; Printing and replication in the structure of the processing industry of Ukraine in 2015 ranked 4-th with a share of 5.97% in output, outperforming the EU-28 by 0.36 pp. (8-th place in the relevant structure). However, according to this structural indicator, Ukraine is significantly inferior not only to northern EU countries with high forest cover, in the particular Latvia (to 25.01 pp.), Estonia (15.0 pp.), Finland (13.42 pp.) and Sweden (8.02 pp.),

but also in Balkan countries such as Croatia (4.27 pp.) and Slovenia (2.25 pp.). As a result, in terms of output, domestic woodworking and printing industries in 2015 were ranked 19-th among EU member states.

Domestic production of coke and coke products and refined products in 2015 dropped to 5-th place (vs. 3-rd in 2013-2014) among the processing industry. in the EU-28, the share of this production in output is 0.25 pp. higher than in Ukraine, but it ranks only 9-th in the structure of the processing industry. Among EU member states, the production of coke and coke products and refined petroleum products in 2015 was the largest in Greece (25.12% vs. 30.3% in 2014), Belgium (11.32% vs. 15.3%) and Bulgaria (10.60%). These countries ranked 9-th, 6-th and 20-th respectively in terms of coke production, while Ukraine ranked 21-st.

The 6-th place in terms of share in the output of the processing industry of Ukraine in 2015 was taken by the production of other non-metallic mineral products (4.59%). Instead, in the EU-28, this production took the last (16-th) place with a share of 2.93% in the corresponding structure. Among the analyzed countries, the largest share (higher than in Ukraine) of production of other non-metallic mineral products in the output of processing industry in 2015 was achieved in Cyprus (9.72%), Latvia (6.40%), Croatia (5.66%) and Bulgaria (5.13%). However, these countries are inferior to Ukraine in terms of production: from 1.6 in times (Bulgaria) – to 9.6 in times (Cyprus). At the same time, the volume of domestic production of other non-metallic mineral products is more than 19 in times smaller than the German one.

Manufacture of furniture; the other products; repair and installation of machinery and equipment, despite the decrease in its share in the structure of output of the domestic processing industry during the analyzed period to 0.36 pp., in 2015 rose to 7-th place (vs. 9-th in 2013). in the EU-28, the share of production in the corresponding structure decreased to 0.91 pp., but it remained in 6-th place. in terms of production of furniture, the other products, repair and installation of machinery and equipment, Ukraine in 2015 was 21-st among EU member states, 52.4 in times behind Germany.

Production of machinery and equipment in 2015 took only 8-th place in Ukraine with a share of 3.52% (vs. 4.45% in 2013) in the output of the processing industry, while in the EU-28 – third with a share higher in more than 2.6 in times (9.22%). The leaders in the EU in this structural indicator are such highly developed countries as Denmark (18.06%), Germany (13.48%), Finland (13.43%), Italy (12.68%) and Austria (12.27%). in terms of production of machinery and equipment, Ukraine lags behind by Germany to 143 in times, and by Poland – 6.3 in times.

Thus, based on the results of the analysis, it can be concluded that the processing industry of Ukraine is narrowly specialized, as its structure is dominated by 2 types of production: the food (33.71% in 2015) and metallurgy (21.58%). The

remaining 14 industries accounted for 44.71%, of which, in particular, the production of computers, electronic and optical products – only 0.7% (in the EU-28 – 5.12%). in contrast, in the EU-28, the structure of the manufacturing industry is more balanced – the shares of key industries (the food and transport) total less than a third (27.55%), and the gap between the largest and smallest shares is declining, 11% in 2013), while in Ukraine, on the contrary, – increases (33.01% vs. 28.74%).

The effectiveness of processing industries characterizes the share of these industries in the structure of gross value added of the processing industry. During 2013-2015, the structure of the domestic processing industry underwent certain changes, in particular, in the direction of increasing the share of metallurgical (to 6.15 pp.) and the food (4.22 pp.) production (Table. 3.8).

Table 3.8. Share of production in the GVA of the processing industry of Ukraine and the EU-28, %

Manufacturing	Ukraine			EU-28		
	2013	2014	2015	2013	2014	2015
Manufacture of food products; beverages and tobacco products	27.16	29.36	31.38	13.37	13.25	12.76
Manufacture of textiles, wearing apparel, leather and related products	4.09	3.90	4.53	3.50	3.46	3.32
Manufacture of wood, paper, printing and reproduction	5.66	6.20	6.79	6.00	5.85	5.69
Manufacture of coke and refined petroleum products	3.36	3.23	3.07	1.19	0.98	0.94
Manufacture of chemicals and chemical products	3.34	3.01	3.48	6.72	6.76	6.82
Manufacture of basic pharmaceutical products and pharmaceutical preparations	1.90	2.66	2.96	5.60	5.54	5.67
Manufacture of rubber and plastic products	2.65	2.15	2.44	4.64	4.65	4.52
Manufacture of other non-metallic mineral products	4.72	3.56	3.88	3.41	3.41	3.32
Manufacture of basic metals	10.00	17.76	16.15	3.43	3.45	3.32
Manufacture of fabricated metal products, except machinery and equipment	3.76	2.98	3.23	9.31	9.26	9.01
Manufacture of computer, electronic and optical products	1.31	1.23	1.04	5.29	5.19	7.22
Manufacture of electrical equipment	3.84	3.60	3.14	4.95	4.88	4.73
Manufacture of machinery and equipment n.e.c.	7.37	5.99	5.47	11.14	11.21	10.78
Manufacture of motor vehicles, trailers and semi-trailers	1.68	1.61	1.32	9.63	10.41	10.36
Manufacture of other transport equipment	11.93	6.14	4.61	3.15	3.00	3.04
Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	7.25	6.60	6.54	8.68	8.70	8.48

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

Instead, the share of production of other vehicles (to 7.32 pp.) and mechanical engineering (1.9 pp.) decreased significantly. in the EU-28, the structure of GVA manufacturing remained relatively stable (fluctuations in the share of individual industries did not exceed 1.0 pp.), only the share of computer production increased to 1.93 pp.

The highest share in the GVA of the processing industry in Ukraine (31.38%) and in the EU-28 (12.76%) is occupied by food production; beverages and tobacco products. in 2015, the domestic food industry ranked 3-rd among EU member states in terms of this structural indicator, second only to Greece (to 4.66 pp.) and Cyprus (4.28 pp.), and the closest whose persecutor – the Croatian – prevailed to 4.64 pp. (Annex F, Table F.2). However, in terms of the amount of GVA created by this production, Ukraine was 16-th, lagging behind the leader – France – more than 15 in times (Annex G, Table G.2).

The second place in the share of GVA processing industry in Ukraine traditionally belongs to metallurgical production (16.15%), while in the EU-28 the share of the latter in the relevant structure is only 3.32% (14-th place). According to this structural indicator, Ukraine is the undisputed leader among the analyzed countries, but in absolute terms (the volume of GVA of metallurgy) – only 12-th, behind Germany by more than 13 in times.

In EU, in particular Denmark, Germany, Italy, Finland, Austria, Hungary, the Netherlands and Sweden, the mechanical engineering plays an important role in the formation of GVA in the processing industry (with a share of more than 11.0%), and in Hungary and the Czech Republic, Germany and Slovakia – production of motor vehicles, trailers and semi-trailers (with a share in the structure of more than 18.0%). in Ukraine, the share of these industries in the GVA of the processing industry in 2015 was, respectively, only 5.47% (5-th place) and 1.32% (15-th place).

Instead, a significant contribution to the formation of GVA processing industry of Ukraine is made by the production of wood and paper; printing and replication – 6.79% in 2015 (vs. 5.66% in 2013) and furniture production; the other products; repair and installation of machines and equipment. However, the share of the latter in the GVA of the domestic processing industry during 2013-2015 decreased by 0.71 pp. As a result, in 2015 Ukraine lost to the EU-28 on this structural indicator by 1.94 pp. and was 21-st among the analyzed countries, while the share of wood, paper, printing and replication – 14-th. At the same time, according to the volume of GVA created by these industries, it is the 21-st.

Production of other vehicles in 2015 dropped to 6-th place (compared to 2-nd in 2013) in the structure of GVA troops of the domestic processing industry, while in the EU-28 it is consistently in the penultimate (15-th) place. Despite the decrease in the share of this production in the GVA of the processing industry, Ukraine remains one of the leaders among the EU member states, second only to France (7.17%), Great Britain (6.30%) and Spain (5.02%). in 2015, these coun-

tries ranked 1-st, 3-rd and 4-th, respectively, in terms of the amount of GVA created by the production of the other vehicles, while Ukraine – only 13-th behind the leader – France – 36 in times.

In Ukraine, relatively high efficiency is typical for textile production, production of clothing, leather and the other materials – with a share of 4.53% in the GVA of the domestic processing industry during 2014-2015 it ranked 7-th in the relevant structure. in the EU-28, this production with a share of 3.32% in 2015 dropped to 13-th place in the structure of the processing industry against 14-th in terms of share in output (as in Ukraine). in terms of the share of textile production, production of clothing, leather and the other materials in the structure of GVA of the processing industry in 2015, Ukraine was on the 10-th place among EU member states, but on the volume of created GVA – on the 18-th, lagging behind the leader – Italy – 53 in times.

Production of chemicals and chemical products with a share of 3.48% in the structure of GVA of the domestic processing industry in 2015 rose to 9-th place (vs. 12-th in 2013), while in the EU-28 it took 7-th place in the corresponding structure with a share of 6.82%. According to this structural indicator, Ukraine is only 22-nd among the EU member states, and according to the volume of GVA chemical industry – 21-st.

In summary, it can be stated that in Ukraine the structure of GVA (as well as the structure of output) of the processing industry is narrowly specialized. It is dominated by the food industry and metallurgy, which together generate more than 47.5% of GVA (vs. 55.3% of output) of the domestic processing industry. Instead, the smallest shares in the structure of GVA of the domestic processing industry are steadily occupied by pharmaceutical, motor transport and computer production, as well as the production of rubber and plastic products – a total of 7.76% in 2015 (compared to 7.54% in 2013). in the EU-28, these industries generated a total of 27.77% of GVA in the processing industry (compared to 25.16%).

Socio-economic efficiency of the processing industry is characterized by the share of gross value added in output. The more value added created by a particular processing industry accounts for volume of its output, the more gross profit companies receive and the greater the wage bill of their employees.

According to the results of the analysis, during 2013-2015 in Ukraine the efficiency of the pharmaceutical and metallurgical industries increased the most – the share of GVA in the output of industries increased to 7.13 and 5.75 pp. respectively (Table 3.9).

Instead, the efficiency of textile production (to 4.11 pp.), production of rubber and plastic products (3.16 pp.) and the production of the other non-metallic mineral products (2.69 pp.) decreased significantly. in the EU-28, changes in the values of this indicator were insignificant. The only exception was the production of computers, electronic and optical products, the share of GVA in the production of which in 2015, compared to the previous year, increased to 5.37 pp.

Table 3.9. Share of GVA in the output of processing industries of Ukraine and the EU-28, %

Manufacturing	Ukraine			EU-28		
	2013	2014	2015	2013	2014	2015
Manufacture of food products; beverages and tobacco products	17.22	18.66	18.27	23.91	23.98	23.95
Manufacture of textiles, wearing apparel, leather and related products	54.93	54.62	50.82	32.40	31.66	31.38
Manufacture of wood, paper, printing and reproduction	21.39	22.94	22.32	30.11	29.74	29.72
Manufacture of coke and refined petroleum products	10.03	11.48	12.05	4.92	5.12	5.22
Manufacture of chemicals and chemical products	10.45	10.95	10.92	24.62	24.87	25.17
Manufacture of basic pharmaceutical products and pharmaceutical preparations	23.38	30.25	30.51	46.10	46.96	47.91
Manufacture of rubber and plastic products	17.82	14.50	14.66	32.75	32.42	32.27
Manufacture of other non-metallic mineral products	19.25	16.46	16.57	33.13	33.00	33.18
Manufacture of basic metals	8.93	14.72	14.68	17.65	17.22	17.18
Manufacture of fabricated metal products, except machinery and equipment	20.92	21.85	22.01	38.54	37.93	37.89
Manufacture of computer, electronic and optical products	28.72	28.44	29.18	36.65	35.88	41.25
Manufacture of electrical equipment	28.93	29.05	29.24	35.07	33.88	33.40
Manufacture of machinery and equipment n.e.c.	31.02	31.22	31.17	35.02	34.70	34.20
Manufacture of motor vehicles, trailers and semi-trailers	22.76	23.04	22.98	25.17	25.23	25.35
Manufacture of other transport equipment	41.29	41.22	41.11	29.83	29.66	29.91
Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	35.13	36.21	36.49	41.84	41.62	41.37

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

In general, in Ukraine, compared to the EU-28, only 3 processing plants operate more efficiently:

1) the textile production, production of clothing, leather and the other materials – the share of GVA in its output is 50.82% (vs. 31.38% in the EU-28);

2) the production of the other vehicles (41.11% vs. 29.91%);

3) the production of coke and the coke products; refined products (12.05% vs. 5.22%).

In terms of the share of GVA in the output of textile production, production of clothing, leather and other materials, Ukraine ranked 2-nd among the EU-28 member states in 2015, after Lithuania (54.83%); in terms of the share of GVA

in the output of the other vehicles – 4-th place, behind Greece (61.34%), Lithuania (58.20%) and Sweden (51.66%); by the share of GVA troops in the production of coke and coke products; of refined products – 8-th place after Romania (36.88%), Latvia (32.0%) Estonia (29.72%), Cyprus (28.57%), Slovenia (21.74%), Hungary (18,98%), Slovakia (16.13%) (Annex F, Table F.3).

At the same time, the share of GVA in the production of one of the flagships of the Ukrainian industry – metallurgical production – in 2015 was 14.68% (vs. 17.18% in the EU-28). Thus, in terms of the efficiency of this type of processing industry, Ukraine outperformed only four of the analyzed countries, namely: Belgium (13.78%), Bulgaria (8.15%), Latvia (14.46%) and Portugal (13.14%).

Ukraine ranks middle among EU member states in the level of efficiency of such types of processing industries as the production of computers, electronic and optical products – the share of GVA in its output was 29.18% (vs. 41.25% in the EU-28), manufacture of electrical equipment (29.24% vs. 33.40%), manufacture of motor vehicles, trailers and semi-trailers (22.98% vs. 25.35%), manufacture of furniture; the other products; repair and installation of machinery and the equipment (36.49% vs. 41.37%).

In terms of the efficiency of production of machinery and equipment, not included in the other groups (31.17%), Ukraine in 2015 was dominated by Bulgaria (30.50%), Estonia (30.26%), Italy (30.71%), Poland (30.52%) and Slovakia (25.25%), and the production of basic pharmaceutical products and pharmaceuticals (30.51%) – Belgium (25.21%), Bulgaria (30.24%), Estonia 22.43%) and Slovakia (30.49%). By the efficiency of food production; beverages and the tobacco products (18.27%) and production of wood and paper; printing and replication (22.32%) Ukraine was the penultimate, ahead, respectively, Denmark (16.04%) and Greece (21.31%).

Four productions of the Ukrainian processing industry are outsiders among the EU-28 member states in terms of the share of GVA in output. These include:

– the production of chemicals and chemical products – 10.92% vs. 25.17% in the EU-28 (from 20.17% in Portugal to 47.95% in Greece);

– the production of rubber and plastic products – 14.66% vs. 32.27% in the EU-28 (from 18.32% in Greece to 40.07% in Lithua);

– the production of the other non-metallic mineral products – 16.57% vs. 33.18% in the EU-28 (from 21.62% in Ireland to 44.01% in Lithua);

– the production of finished metal products, except machinery and equipment – 22.01% vs. 37.89% in the EU-28 (from 29.85% in Estonia to 50.55% in Ireland).

In summary, it can be argued that Ukraine's manufacturing industry (with the exception of light industry and the production of the other vehicles) is inefficient. The biggest negative is the relatively small amount of value added produced by the food industry – the leader (by a wide margin) among domestic processing

industries both in terms of share in the structure of output and in terms of share in the structure of GVA.

On the other hand, Lithua, a former Soviet Union country, maintains its leading position among EU member states in the share of GVA in the production of 7 types of processing industry and at the same time holds leading positions in this production in other industries except coke, for which no data are available.

The effectiveness of a particular processing production in foreign markets characterizes the share of this production in the export of GVA of countrys processing industry. By the way, during 2013-2015, certain changes took place in the structure of GVA exports of the domestic processing industry. Thus, in particular, the shares of metallurgical production (to 9.74 pp.) and food production (to 7.51 pp.) increased significantly, but, instead, the share of production of the other vehicles decreased (to 7.91 pp.) (Table 3.10). in the EU-28, the structure of GVA exports of the processing industry has not changed significantly, only the share of computer production increased to 3.29%.

Thus, in Ukraine, the priority in terms of the exports of value added belongs to metallurgical production – its share in the export of GVA of the domestic processing industry in 2015 was 26.08%, which is 23.11 pp. higher than in the EU-28. According to this structural indicator, Ukraine is the undisputed leader among the analyzed countries, as the nearest pursuer – Greece – prevailed to 8.85 pp. (Annex F, Table F.4). However, in terms of the volume of GVA exports, domestic metallurgical production took only the 10-th place, and in terms of the volume of exports of metallurgical products – the 9-th, lagging behind the German, respectively, 8.1 and 5.4 un times (Annex G, Table G.3 and G.4).

In the EU-28, the largest share in the export of GVA of the processing industry (with a gap of more than 6.0 pp. from the other industries) is the production of machinery and equipment not included in the other groups (20.63%). According to this structural indicator (11.57%), Ukraine was the 10-th among EU member states in 2015, but the 18-th in terms of exports of both GVA and mechanical engineering products.

The second place in the share of GVA exports of the Ukrainian processing industry belongs to the production of food products; beverages and tobacco products – 24.33% vs. 5.07% in the EU-28. in 2015, Ukraine ranked the 2-nd among the analyzed countries in this structural indicator, behind Cyprus to 2.37 pp., but in terms of exports of both products and GVA food industry was only the 12-th.

The production of wood and paper occupies a relatively significant share in the export of GVA troops of the domestic processing industry; printing and replication (5.93% vs. 2.57% in the EU-28). According to this structural indicator, Ukraine ranked the 11-th among EU member states in 2015, but the 18-th in terms of exports of woodworking and printing industries and 22-nd in terms of exports of the latter's GVA, which indicates a low degree of processing. exported wood.

Table 3.10. Share of production in the export of GVA processing industry of Ukraine and the EU-28, %

Manufacturing	Ukraine			EU-28		
	2013	2014	2015	2013	2014	2015
Manufacture of food products; beverages and tobacco products	16.82	20.06	24.33	5.05	5.25	5.07
Manufacture of textiles, wearing apparel, leather and related products	7.20	4.70	4.98	4.12	4.17	3.98
Manufacture of wood, paper, printing and reproduction	4.38	4.83	5.93	2.72	2.64	2.57
Manufacture of coke and refined petroleum products	1.77	1.34	0.90	1.13	0.89	0.85
Manufacture of chemicals and chemical products	4.72	4.03	3.94	8.01	8.30	8.22
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.88	1.18	1.11	10.10	9.97	10.13
Manufacture of rubber and plastic products	1.22	0.93	0.91	3.02	3.05	2.94
Manufacture of other non-metallic mineral products	1.44	1.15	1.24	1.62	1.58	1.54
Manufacture of basic metals	16.34	28.50	26.08	3.25	3.09	2.97
Manufacture of fabricated metal products, except machinery and equipment	2.39	2.31	2.22	4.21	4.12	3.99
Manufacture of computer, electronic and optical products	2.22	1.78	1.94	9.52	9.52	12.81
Manufacture of electrical equipment	6.16	4.75	4.77	6.32	6.12	5.84
Manufacture of machinery and equipment n.e.c.	12.99	11.75	11.57	19.39	20.13	19.10
Manufacture of motor vehicles, trailers and semi-trailers	2.64	1.78	1.80	11.69	12.29	12.09
Manufacture of other transport equipment	11.80	5.84	3.89	7.08	6.70	6.65
Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	5.42	4.91	5.10	6.25	5.73	5.53

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

By share in the export of GVA furniture processing industry; the other products; repair and installation of machinery and equipment (5.1% vs. 5.53% in the EU-28) in 2015, Ukraine was the 16-th among the analyzed countries and at the same time the 18-th in terms of exports and GVA of this production.

The export items in Ukraine include light industry products. Thus, in 2015, Ukraine ranked the 10-th among EU member states in terms of the share of GVA exports in the textile industry, clothing, leather and the other materials (4.98% vs. 3.98% in the EU-28), however, in terms of exports of GVA of this production – the 19-th, and in terms of exports of its products – the 20-th.

The share of the remaining 12 refineries in Ukraine totals only 22% of the exported GVA of the refining industry, in particular: from 0.9% (production of coke and coke products; refined products) to 4.77% (manufacture of electrical equipment).

In the EU-28, the leading value-added exporters (excluding machine-building) include the following processing industries:

– the manufacture of computers, electronic and optical products – with a share of 12.81% in the export of GVA of the processing industry (vs. 1.94% in Ukraine);

– the production of motor vehicles, trailers and semi-trailers – 12.09% (vs. 1.8% in Ukraine);

– the production of basic pharmaceutical products and pharmaceuticals – 10.13% (vs. 1.11% in Ukraine).

Thus, the basis of merchandise exports from Ukraine is formed by the production of such low-efficiency (in terms of the share of GVA in output) types of processing industry, such as metallurgy and production of food, beverages and tobacco products. in total, the share of these industries in the export of GVA of the domestic processing industry in 2015 was over 50% (in 2014 – 48.56%). At the same time, in the EU-28 the commodity structure of exports of the processing industry is generally more uniform, and is based on high-tech production.

The complex characteristic of the structure of the processing industry is given by the value of the aggregate coefficient of structural advantages (*K*) by types of processing industries. As evidenced by the results of the calculations, a half of the production of processing industry in Ukraine (highlighted in italics in Table 3.11) outperformed the EU-28 on this indicator.

During 2013-2015, the value of the coefficient of structural advantages increased the most in the domestic metallurgy (2.5 in times) and food industry (1.47 in times), while in the EU-28 – in the manufacture of computers, electronic and optical products (1.48 in times). At the same time, in Ukraine the value of this coefficient in the production of other vehicles has deteriorated more than 3 in times.

As a result, Ukraine in 2015 was the first among EU member states in terms of a comprehensive indicator of the structural advantages of metallurgical production and the second – the production of food, beverages and tobacco products (Annex F, Table F.5). However, these domestic industries are outsiders in terms of efficiency, the share of GVA in their output. Instead, the most efficient (compared to the analyzed countries) among the processing industries in Ukraine are the textile production, production of clothing, leather and the other materials (2-nd place), production of other vehicles (4-th place) and coke production (9-th place).

Analysis of the structure of GVA of domestic processing industries revealed that in 2015 the most efficient (in terms of the share of gross profit, mixed income in GVA) were: production of food, beverages and tobacco products (52.6% vs.

Table 3.11. Coefficient of structural advantages of processing industries of Ukraine and the EU-28, the share of the unit

Manufacturing	Ukraine			EU-28		
	2013	2014	2015	2013	2014	2015
Manufacture of food products; beverages and tobacco products	0.154	0.188	0.226	0.042	0.044	0.041
Manufacture of textiles, wearing apparel, leather and related products	0.211	0.129	0.129	0.046	0.046	0.043
Manufacture of wood, paper, printing and reproduction	0.050	0.056	0.067	0.029	0.027	0.026
Manufacture of coke and refined petroleum products	0.009	0.008	0.006	0.002	0.002	0.002
Manufacture of chemicals and chemical products	0.026	0.022	0.022	0.069	0.072	0.071
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.011	0.018	0.017	0.162	0.162	0.166
Manufacture of rubber and plastic products	0.012	0.007	0.007	0.034	0.034	0.032
Manufacture of other non-metallic mineral products	0.015	0.010	0.010	0.019	0.018	0.017
Manufacture of basic metals	0.078	0.211	0.195	0.020	0.018	0.017
Manufacture of fabricated metal products, except machinery and equipment	0.027	0.025	0.025	0.056	0.054	0.052
Manufacture of computer, electronic and optical products	0.034	0.025	0.029	0.122	0.118	0.181
Manufacture of electrical equipment	0.095	0.069	0.071	0.077	0.072	0.067
Manufacture of machinery and equipment n.e.c.	0.215	0.184	0.184	0.236	0.242	0.223
Manufacture of motor vehicles, trailers and semi-trailers	0.032	0.021	0.021	0.102	0.107	0.105
Manufacture of other transport equipment	0.260	0.121	0.082	0.074	0.069	0.068
Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	0.101	0.089	0.095	0.091	0.083	0.078

Source: elaborated by the authors' calculations according to tables 2.1-2.4.

45.7% in 2014), the production of wood, paper; printing and reproduction (49.5% vs. 35.0%) and the production of basic pharmaceutical products and pharmaceuticals (49% vs. 40.3%) (Table 3.12).

However, among the EU member states, Ukraine ranked only the 11-th, 9-th and 23-rd respectively in terms of the values of this structural indicator (Annex E, Table E.2).

The smallest share of gross profit, mixed income in GVA in Ukraine in 2015 was in the production of chemicals and chemical products (14.8% vs. 4.8% in 2014) and the production of computers, electronic and optical products (13,5% vs. 19.2%), and the production of vehicles, trailers and semi-trailers in general became unprofitable (–11.4% vs. 11.2%). At the same time, in the EU, these productions are quite profitable. Thus, in particular, in 2015 the share of gross profit in GVA was: in the production of chemicals and chemical products – from 25.13% in Cyprus to 76.28% in Lithua; in the manufacture of computers, electronic and optical products – from 23.8% in Estonia to 90.23% in Cyprus; in the manufacture of motor vehicles, trailers and semi-trailers – from 20.97% in Croatia to 64.5% in Hungary.

In general, the low profitability of the domestic processing industry compared to the EU-28 is to some extent explained by the lack of state support. For example, in Poland, without exception, all processing industries are subsidized by the state, while in Ukraine only the food, light and metallurgical industries receive subsidies. in addition, the share of these subsidies in the structure of GVA of these processing plants is much smaller than in Poland.

At the same time, the share of other taxes related to production in the structure of GVA of the processing industry in Ukraine is on average 2.6 in times higher (despite their reduction during 2013-2015 bto 1.3 in times) than in Poland. These taxes include payments of enterprises and organizations to state and local budgets, state trust funds in connection with the use of resources and obtaining permits for specific activities. That is, taxes related to the use of factors of production, as well as payments for licenses to engage in any production activity or the other mandatory payments, the payment of which is necessary for the activities of the resident production unit. They do not include taxes on income or the other income received by the enterprise and are payable regardless of the profitability of production.

Such macroeconomic conditions (primarily fiscal) make Ukrainian processing a priori uncompetitive compared to similar productions of EU member states. Hence the need for both a critical review of other taxes related to production in Ukraine, in order to reasonably reduce their number, and reduce the rates of these taxes. It is also advisable to selectively subsidize high-tech industries.

On the other hand, it is necessary to increase the share of GVA in the production of inefficient industries (especially chemical and metallurgical industries), as well as reduce the cost of their products and improve its structure in order to reduce its raw materials and fuel and energy costs in favor of wages. To solve this problem, further modernization of fixed capital is needed, which we propose to carry out on the basis of intersectoral and interregional cooperation and at the same time optimization of operational and financial management systems.

Table 3.12. Structure of GVA processing industries of Ukraine and Poland, %

Year	Country	Indicator	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	
2015	Ukraine	OP	44.8	63.3	47.5	69.1	80.2	49.3	57.7	
		SP	2.9	1.5	3.0	4.3	4.9	1.7	4.0	
		IP	–0.3	–0.1	0.0	0.0	0.0	0.0	0.0	
		VP	52.6	35.3	49.5	26.6	14.8	49.0	38.3	
		GVA	**100**	**100**	**100**	**100**	**100**	**100**	**100**	
	Poland	OP	43.2	49.8	38.9	15.2	33.4	40.3	43.6	
		SP	0.8	0.9	1.1	3.6	1.3	0.9	0.6	
		IP	–1.5	–2.3	–3.3	–0.5	–0.6	–0.2	–1.4	
		VP	57.5	51.6	63.3	81.7	65.9	59.0	57.2	
		GVA	**100**	**100**	**100**	**100**	**100**	**100**	**100**	
2014	Ukraine	OP	51.3	82.3	61.8	87.4	99.2	57.6	66.1	
		SP	3.4	1.7	3.2	4.7	5.6	2.1	4.6	
		IP	–0.4	–0.1	0.0	0.0	0.0	0.0	0.0	
		VP	45.7	16.1	35.0	7.9	–4.8	40.3	29.3	
		GVA	**100**	**100**	**100**	**100**	**100**	**100**	**100**	
	Poland	OP	49.1	48.3	39.6	23.0	38.3	38.1	44.5	
		SP	1.2	0.9	1.2	6.8	1.5	1.0	0.7	
		IP	–1.6	–2.4	–2.9	–0.7	–0.8	–0.4	–1.5	
		VP	51.3	53.2	62.1	70.9	61.0	61.3	56.3	
		GVA	**100**	**100**	**100**	**100**	**100**	**100**	**100**	
2013	Ukraine	OP	58.6	88.4	69.0	88.7	112.8	63.9	55.3	
		SP	4.1	1.8	3.7	5.9	6.6	2.9	4.1	
		IP	–1.3	–0.4	0.0	0.0	–0.2	0.0	0.0	
		VP	38.6	10.2	27.3	5.3	–19.2	33.2	40.6	
		GVA	**100**	**100**	**100**	**100**	**100**	**100**	**100**	
	Poland	OP	46.8	46.4	37.4	8.0	37.1	35.4	42.9	
		SP	1.3	1.5	1.6	1.9	1.7	0.8	0.8	
		IP	–1.4	–1.2	–1.4	–0.1	–0.8	–0.3	–1.0	
		VP	53.3	53.3	62.4	90.2	62.0	64.1	57.3	
		GVA	**100**	**100**	**100**	**100**	**100**	**100**	**100**	

Note. OP – the wages of employees; SP – the other taxes related to production; IP – the other subsidies related

Source: elaborated by the authors based on SSSU, 2019; CSOP, 2017.

	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
	72.2	50.9	70.8	84.5	57.0	71.6	108.9	59.1	64.6
	3.7	3.7	2.9	2.0	1.9	2.0	2.5	1.4	2.1
	0.0	0.0	0.0	0.0	0.0	–0.4	0.0	0.0	0.0
	24.1	45.4	26.3	13.5	41.2	26.8	–11.4	39.5	33.3
	100	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
	39.7	45.3	47.3	52.7	49.4	60.7	43.8	52.0	51.2
	1.3	1.4	0.7	0.6	0.7	0.9	0.9	0.7	0.7
	–1.3	–0.5	–2.3	–1.3	–0.6	–1.3	–0.3	–1.2	–2.1
	60.3	53.8	54.3	48.0	50.5	39.7	55.6	48.5	50.2
	100	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
	76.5	53.8	78.7	78.4	76.1	75.0	86.2	62.8	72.4
	4.3	4.1	3.4	2.4	1.9	2.0	2.6	1.5	2.4
	0.0	0.0	0.0	0.0	0.0	–0.2	0.0	0.0	0.0
	19.2	42.1	17.9	19.2	22.0	23.2	11.2	35.7	25.2
	100	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
	42.2	47.4	49.3	49.4	50.6	57.3	47.0	44.4	51.1
	1.5	1.7	0.8	0.5	0.8	0.9	1.0	0.7	0.7
	–1.3	–0.5	–2.1	–1.4	–0.8	–1.3	–0.3	–0.8	–1.8
	57.6	51.4	52.0	51.5	49.4	43.1	52.3	55.7	50.0
	100	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
	64.6	82.4	81.6	81.3	76.0	72.6	83.7	53.2	75.1
	3.9	7.7	3.7	2.7	2.6	2.2	2.9	1.4	2.8
	0.0	0.0	0.0	0.0	0.0	–0.7	0.0	0.0	0.0
	31.5	9.9	14.7	16.0	21.4	25.9	13.4	45.4	22.1
	100	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
	45.8	53.5	47.3	48.2	50.6	56.7	46.4	47.5	49.8
	1.8	1.8	1.0	0.6	0.7	1.0	0.7	1.0	0.9
	–0.8	–0.7	–1.2	–1.2	–0.7	–0.9	–0.2	–0.4	–0.8
	53.2	45.4	52.9	52.4	49.4	43.2	53.1	51.9	50.1
	100	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

to production; VP – a gross profit, mixed income; GVA – the gross value added.

3.3. Models of optimization of the structure of the industrial sector of Ukrainian economy according to Polish standards

One of the key priorities of the Ukrainian government is to create conditions for the transition from raw materials to high-tech economy models. High-tech full-cycle industrial production, focused on import substitution and expanding commodity exports, can contribute not only to reducing unemployment and labor migration, but also to increase social standards, the development of science and education, and the strengthening of the national financial system.

Ukrainian industry in terms of key performance indicators is significantly inferior to the EU industry, in particular, countries with similar industrial potential and economic type. Thus, in 2015, the domestic industry fell by 4.9 in times in terms of output and by 6.2 in times in terms of gross value added. in pre-crisis 2013, such a predominance of Polish industry was smaller and still substantial and amounted to 2.7 and 3.2 in times, respectively. At the same time, in 2013, the number of people employed in industry in Ukraine was higher than in Poland by 1.1 in times (3170 vs. 2843 thousand people), and in 2015 it was 0.88 in times less (2573.9 against 2926.6 thousand people). The above determines the need to find ways to improve the efficiency of the functioning of the industrial sector of the national economy.

The key indicator that characterizes the growth of efficiency is ratio between the growth rates of gross value added and output. The higher the value of this indicator, the more intense is the increase in efficiency, in the prevalence of gross value added over the issue. in Ukraine, the growth rate of the gross value added of industry in 2014 exceeded the growth rate of output by only 11%, and in 2015 this ratio in general became negative (Fig. 3.1). Similarly, the situation with increasing efficiency of the domestic processing industry is critical, with the growth rate of its production in 2015 exceeding the growth rate of gross value added by 7% (Fig. 3.2).

At the same time, in Poland, the ratio between the growth rate of gross value added and the rate of increase in industrial output exceeds twice, in the processing industry it increased in 2015 to 3.86 (vs. 2.12 pp. in 2014). One of the most important reasons for low socio-economic efficiency of domestic industry is the inefficient economic structure of sector. Such conclusion was the result of comparison of structural indicators of Ukraine and Poland – the neighboring countries, models of the national economy which are similar in socio-economic parameters. It is therefore advisable to take into account the experience of structural adjustment of the industrial sector of the Polish economy.

In the period of time since the signing of the Association Agreement with the EU prior to its accession (by the way, 1994-2004), Poland succeeded in trans-

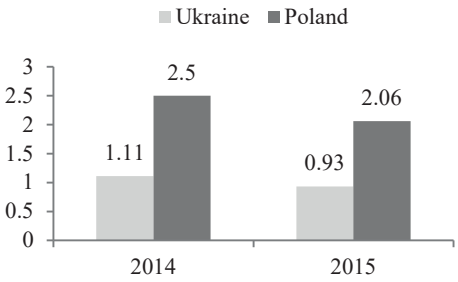


Fig. 3.1. The relationship between the growth rate of GVA and the production of Ukraine and Poland. in times

Source: elaborated by the authors based on SSSU, 2019; CSOP, 2017.

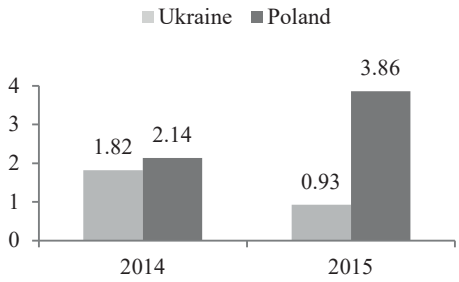


Fig. 3.2. The ratio between the growth rate of GVA and the output of the processing industry of Ukraine and Poland, in times

Source: elaborated by the authors based on SSSU, 2019; CSOP, 2017.

forming the industry to improve its efficiency. The output of the Polish industry reduced the share of extractive industry and the development of quarries: from 7.83 in 1995 to 4.85 in 2004, and in 2015 it was 3.74% (Table 3.13). Conversely, the share of the processing industry increased from 82.28% to 83.68 per cent, and in 2015 it reached 84.47%.

Table 3.13. The structural indices of Ukraine and Poland industry, %

The indicator	Ukraine			Poland			
	2004	2011	2015	1995	2004	2011	2015
Industry (the share in the issue of types of economic activity**)**	**48.08**	**43.78**	**38.10**	**41.48**	**37.43**	**37.83**	**37.79**
Extractive industry and career development (the share in industry output)	8.15	12.22	11.67	7.83	4.85	5.09	3.74
Manufacturing (the share in industry output**)**	**83.64**	**77.12**	**75.57**	**82.28**	**83.68**	**83.40**	**84.47**
Supply of electricity, gas, steam and air condition (the share in industry output)	8.20	10.65	11.08	9.05	9.06	8.80	8.82
Water supply; sewage, waste management (the share in industry output)	–	–	1.69	0.84	2.41	2.70	2.96

Source: elaborated by the authors based on SSSU 2019; CSOP, 2017.

In Ukraine, during 2005-2014, the share of industry in the production of the economy declined by almost 10.0 pp., but the structure of the production industry has been the opposite of changes in Poland than in Ukraine. Thus, the share of extractive industry and the development of quarries in the domestic industry increased from 8.15 to 11.67%, while the share of processing industry, – on

the contrary, – decreased from 83.64 to 75.57%. Such a transformation intensified the raw material orientation of national economy and impacted negatively on the efficiency of its industrial sector.

Thus, initially (in 2005-2007), due to the dynamic growth of the value of the share of gross value added in the industry, Ukraine almost equalized with Poland – in 2007 the difference was only 0.49 pp. in favor of the latter (Fig. 3.3).

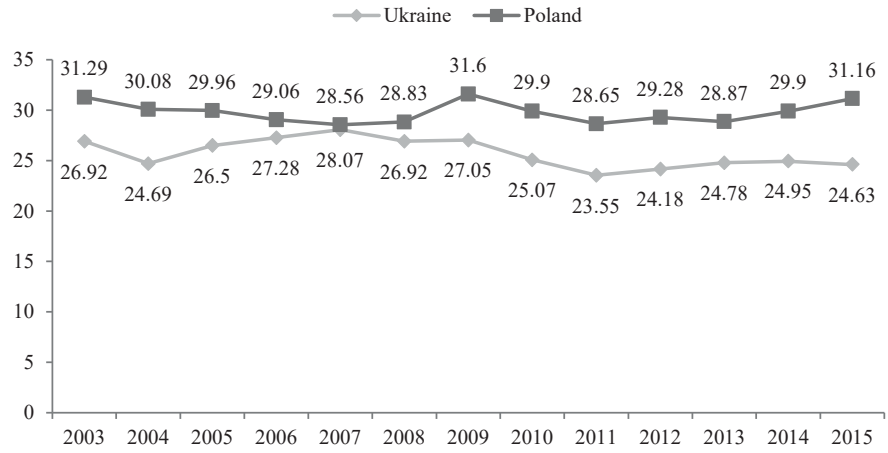


Fig. 3.3. The share of GVA in the Ukraine and Poland industry output during 2003-2015, %
Source: elaborated by the authors based on SSSU, 2019; CSOP, 2017.

However, since 2008, the decline in the efficiency of the domestic industry, due to the deterioration of the situation on commodity markets under the influence of the global financial crisis. The fall in prices for metal and other industrial products complicated the situation, and in 2011 the share of gross value added in the Ukrainian industry dropped to 23.55% (or near 1.0 pp.).

At the same time, the industry in Poland, in spite of crisis, which covered the economy of the European zone, was able to keep the value of the gross value added share in the output in 2011 at 28.65% (+5.1 pp., in comparison to Ukraine) and to increase it is up to 31.16% in 2015 (+6.53 pp., in comparison with Ukraine). Such efficiency is explained by the rational structure of the industrial sector of the Polish economy, where, as a result of the restructuring, the production with a high degree of processing dominates.

From the above it follows that the Ukrainian industry has the potential opportunities to achieve the level of efficiency in Poland. One of the key directions of such an achievement is the optimization of the economic structure of this sector of the economy, in the course of which it is necessary to take in account the strategic benchmark of socio-economic development of Ukraine – the transition from raw material to innovation-investment model of the national economy.

According to the experience of the developed countries, the industry, whose gross value added structure is at least 75 per cent, is promising. Under these conditions, three other types of industrial activities should become integral components, (to a certain extent) a resource base for the development of the latter.

The functional link between the share of gross value added in industry output and gross value added structures, industry output (by type of industrial activity) can be represented using an optimization economic and mathematical model (3.11):

$$\frac{Q}{P}=\frac{q_\alpha+q_\beta+q_\chi+q_\delta}{p_\alpha+p_\beta+p_\chi+p_\delta}=\frac{Q\left(\frac{Q}{Q}\right)\left(\frac{q_\alpha}{Q}+\frac{q_\beta}{Q}+\frac{q_\chi}{Q}+\frac{q_\delta}{Q}\right)}{P\left(\frac{P}{P}\right)\left(\frac{p_\alpha}{P}+\frac{p_\beta}{P}+\frac{p_\chi}{P}+\frac{p_\delta}{P}\right)}\to\max, \qquad (3.11)$$

where

Q – the gross added value of the industry;

P – the industry release;

q_α – the gross added value of the extractive industry and the development of quarries;

q_β – the gross value added of the processing industry;

q_χ – the gross added value of electricity, gas, steam and air conditioning supply;

q_δ – the gross added value of water supply; sewage, waste management;

p_α – the extraction industry mining quarry development;

p_β – the output of manufacturing industry;

p_χ – the release of electricity, gas, steam and air conditioning;

p_δ – the release of water supply, sewage, waste management;

$\frac{q_\alpha}{Q}$ – the share of extractive industries and the development of quarries in the gross added value of industry;

$\frac{q_\beta}{Q}$ – the share of the processing industry in gross value added of industry;

$\frac{q_\chi}{Q}$ – the share of electricity, gas, steam and air conditioning in gross value added of industry;

$\frac{q_\delta}{Q}$ – the share of water supply; sewage, waste management in gross added value of industry;

$\frac{p_\alpha}{P}$ – the share of extractive industries and the development of quarries in the production industry;

$\frac{p_\beta}{P}$ – the share of the manufacturing industry in the production of industry;

$\frac{p_\chi}{P}$ – the share of electricity, gas, steam and air conditioning in the industry;

$\frac{p_\delta}{P}$ – the share of water supply; sewage, waste management in industry. The target function of optimizing the structure of the industrial sector of the national economy is the value of the share of gross value added in the output at the level of 31.16% (as in Poland in 2015).

The variables of the target function (1) determine absolute indicators, that is, the volumes of gross value added (Q) and production of industry (P) and types of industrial activity ($q_\alpha, q_\beta, q_\chi, q_\delta$) and ($p_\alpha, p_\beta, p_\chi, p_\delta$), respectively, as well as structural indicators of output and gross value added of industry $\left(\frac{p_\alpha}{P}+\frac{p_\beta}{P}+\frac{p_\chi}{P}+\frac{p_\delta}{P}\right)$.

In order to achieve the target function and construct such output structures and gross value added that take into account both the desired performance benchmarks and the actual state and capabilities of the Ukrainian industry, the relevant conditions (the system of constraints and criteria) are determined to the optimization function.

1. The sum of the shares of certain types of industrial activity in the output structures and the gross value added of industry is 1:

$$\frac{p_\alpha}{P}+\frac{p_\beta}{P}+\frac{p_\chi}{P}+\frac{p_\delta}{P}=1; \quad \frac{q_\alpha}{Q}+\frac{q_\beta}{Q}+\frac{q_\chi}{Q}+\frac{q_\delta}{Q}=1. \tag{3.12}$$

2. It is rational to reduce the share of extractive industry and develop quarries in the output of domestic industry, while simultaneously increasing the share of gross value added in this type of industrial activity from 51.1% (actual data in Ukraine in 2015) to the level of Poland (55.69% in 2015), that is (3.13)-(3.14):

$$\frac{p_\alpha}{P} \le 0.1167, \tag{3.13}$$

$$0.511 \le \frac{q_\alpha}{p_\alpha} \le 0.5569. \tag{3.14}$$

3. The share of gross value added in the output of the processing industry should increase from 19.63% (actual data for Ukraine in 2015) to the level of Poland (27.62%), that is (3.15):

$$0.1963 \le \frac{q_\beta}{p_\beta} \le 0.2762. \tag{3.15}$$

4. The share of gross value added in electricity, the gas, steam and air conditioning in Ukraine should increase from 30.2% (actual for Ukraine in 2015) to the level of Poland (47.4%), that is (3.16):

$$0.302 \le \frac{q_\chi}{p_\chi} \le 0.474. \tag{3.16}$$

5. The water supply, sewage, waste management requires systemic modernization, which, in turn, is a long-term capital-intensive process. Therefore, for the growth of the indicator of gross value added in the release of this type of industrial activity in Ukraine to the level of Poland (52.78%) in the medium term, there is no economic basis. Nevertheless, the necessary condition for increasing the efficiency of the water supply, sewage, waste management is its deregulation, in particular, the liberalization of tariffs. The use of this tool will increase the share of gross value added in the issue compared to the actual value, that is, will make the following optimization constraint real (3.17):

$$\frac{q_\delta}{p_\delta} \ge 0.2937. \tag{3.17}$$

6. It is important to ensure the intensive growth of the efficiency of both the industrial sector of the national economy as a whole and its key segment – the processing industry. A prerequisite for this is the excess of the growth rate of gross value added over the growth rate of output at least twice (for example of Poland and the other countries in EU that have undergone a transformation path), that is (3.18):

$$\frac{\Delta Q}{\Delta P} \ge 2; \quad \frac{\Delta q_\beta}{\Delta p_\beta} \ge 2. \tag{3.18}$$

The proposed optimization model (3.11)-(3.18) is solved by the linear programming method using the MS Excel "Decision Search" option.

Based on results of calculations, the following output and gross value added structures were constructed, which ensured the competitiveness (according to the criterion of efficiency, that is, the share of gross value added in the output) of the Ukrainian industry, compared with the Polish one. in particular, achieving the share of gross value added in the output for domestic industry at 31.16%; the extractive industry and career development – 55.69%; the processing industry – 27,62%; the electricity, gas, steam and air conditioning supply – 47.44% (Table 3.14).

At the same time:

– an increase in the volume of industrial output of Ukraine by 33.5%, and gross value added – to 68.66%, which is a sign of the intensive growth of the efficiency of this sector of the national economy (the ratio between the growth rate of gross value added and the growth rate of industry output will be twice in time);

Table 3.14. The results of structure optimization of the Ukrainian Economy industrial sector, %

The type of industrial activity	The actual data			The optimized data			The absolute deviations of optimized data from actual		
	the share in GVA structure	the share in output structure	the share of GVA in issue	the share in GVA structure	the share in output structure	the share of GVA in issue	the share in GVA structure	the share in output structure	the share of GVA in issue
Extractive industry and career development (the share in industry output)	24.20	11.67	51.10	11.65	6.52	55.69	–12.55	–5.15	4.59
Manufacturing (the share in industry output)	60.21	75.57	19.63	73.88	83.35	27.62	13.67	7.78	7.99
Supply of electricity, gas, steam and air condition (the share in industry output)	13.58	11.08	30.20	12.82	8.42	47.44	–0.76	–2.65	17.24
Water supply; sewage, waste management (the share in industry output)	2.02	1.69	29.37	1.65	1.71	30.00	–0.37	0.02	0.63
Industry	**100.0**	**100.0**	**24.63**	**100.00**	**100.00**	**31.16**	**x**	**x**	**6.53**

Reed: x – data missing

Source: authors' calculation.

– the reduction of the share of extractive industry and the development of quarries in the structure of industry by 5.15 pp., while the share of gross value added in the corresponding structure – to 12.55 pp., which will facilitate the withdrawal of the national economy from the raw material type;

– an increase in the share of processing industry in the structure of industrial output by 7.78 pp., while the share of gross value added in the corresponding structure – to 13.67 pp.;

– the reduction of the share of electricity, the gas, steam and conditioned air supply in the structure of industry output by 2.65 pp., and the share of gross value added in the corresponding structure – to 0.76 pp.

The share of water supply, sewage, waste management in optimized output patterns and gross value added of the industry will remain unchanged.

The Ukrainian processing industry in general yielded to the 1.4 in time fold decrease in efficiency in Poland, although the share of gross value added in the production of seven domestic productions was higher than in Poland (Table 3.15).

But, instead, the share of gross profit, mixed income in the structure of the gross value added of these productions (as well as the rest of the processing industry) in Ukraine was significantly lower. This is due to the specifics of the functioning of light, furniture, automobile and other types of domestic processing industry. in general, it is an incomplete production and a high import dependence.

Table 3.15. Indicators of the functioning of Ukraine and Poland processing industry of in 2015, %

The production	The share of GVA in issue		The share of gross profit, mixed income in gross value added	
	Ukraine	Poland	Ukraine	Poland
Manufacturing	19.63	27.62	41.0	57.3
Food production; drinks and tobacco products	18.27	22.44	52.6	57.5
Textile production, clothing, leather and other materials	50.82	31.29	35.31	51.60
Manufacture of wood and paper; printing and duplication	22.32	30.07	49.5	63.3
Production of coke and coke products, oil refining products	12.05	15.45	26.6	81.7
Manufacture of chemicals and chemical products	10.92	26.98	14.8	65.9
Manufacture of basic pharmaceutical products and pharmaceuticals	30.51	33.49	49.0	59.0
Manufacture of rubber and plastic products	14.66	30.38	38.3	57.2
Manufacture of other non-metallic mineral products	16.57	35.24	24.1	60.3
Metallurgical production	14.68	21.05	45.4	53.8
Manufacture of fabricated metal products, except machinery and equipment	22.01	36.56	26.3	54.3
Manufacture of computers, electronic and optical products	29.18	19.02	13.5	48.0
Production of electric equipment	29.24	24.21	41.2	50.5
Manufacture of machinery and equipment not elsewhere classified	31.17	30.52	26.8	39.7
Production of motor vehicles, trailers and semitrailers	22.98	21.28	–11.4	55.6
Manufacture of other transport equipment	41.11	27.68	39.5	48.5
Furniture production; other products; repair and installation of machinery and equipment	36.49	32.97	33.3	50.2

Source: elaborated by the authors based on SSSU, 2019; CSOP, 2017.

In Ukraine, the structure of the processing industry is inefficient (from a technological standpoint). Thus, in 2015, the share of high-tech and medium-high-tech industries in this structure was 1.8 in times lower than in Poland (Table 3.16).

On the other hand, the shares of medium-low-tech and low-tech – higher at 1.13 and 1.3 in times, respectively. These was the result of a decline in 2015, compared to 2013, the share of the medium-high tech and the medium-low-tech manufacturing in the structure of the domestic processing industry, while a significant increase (to 5.12 pp.) of the share of the low-tech and the insignificant (to 0.22 pp.) – high-tech (Table 3.17).

Table 3.16. The structure of production of processing industry on the level of technological efficiency of production at Ukraine and Poland in 2015, %

The group	The production	Ukraine		Poland	
		The share in the release of the group	The share of the group in the production of manufacturing	The share in the release of the group	The share of the group in the production of manufacturing
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	73.16	**2.60**	30.69	**4.67**
	Manufacture of computers, electronic and optical products	26.84		69.31	
	Total	**100.00**		**100.00**	
The medium-high-tech	Manufacture of chemicals and chemical products	41.34	**15.12**	19.80	**27.48**
	Production of electric equipment	13.92		17.72	
	Manufacture of machinery and equipment not elsewhere classified	22.76		14.44	
	Production of motor vehicles, trailers and semitrailers	7.43		41.10	
	Manufacture of other transport equipment	14.56		6.94	
	Total	**100.00**		**100.00**	
The moderately-low-tech	Production of coke and coke products of oil refining	13.41	**37.33**	17.01	**33.09**
	Manufacture of rubber and plastic products	8.75		21.06	
	Manufacture of other non-metallic mineral products	12.30		13.34	
	Metallurgical production	57.82		11.89	
	Manufacture of fabricated metal products, except machinery and equipment	7.71		25.50	
	Repair and installation of machinery and equipment	…		11.20	
	Total	**100.00**		**100.00**	
The low-tech	Food production; drinks and tobacco products	75.00	**44.94**	56.25	**34.76**
	Textile production, clothing, leather and other materials	3.89		7.16	
	Manufacture of wood and paper; printing and duplication	13.29		22.97	
	Furniture production; other products	7.83		13.62	
	Total	**100.00**	**100.00**	**100.00**	**100.00**

Source: elaborated by the authors based on SSSU, 2019; CSOP, 2017.

In Poland, in 1995-2004, the transformation of the structure of the processing industry took place, resulting in an increase in its share of almost two-thirds of high-tech manufacturing. in the future, the tendency to increase this share and, at the same time, reduce the share of low-tech industries.

Table 3.17. The technological structure of production of Ukraine and Poland processing industry of, %

The group	Ukraine		Poland		
	2013	2015	1995	2004	2015
The high-tech	2.38	2.60	2.28	4.44	4.67
The medium-high-tech	19.75	15.12	27.13	25.67	27.48
The moderately-low-tech	38.05	37.33	26.58	32.49	33.09
The low-tech	39.82	44.94	45.01	37.39	34.76

Source: elaborated by the authors based on SSSU, 2019; CSOP, 2017.

Hence the need to optimize the structure of the Ukrainian processing industry is evident. The main task of optimizing the output structures and the gross value added of the Ukrainian processing industry is to determine the ratio of their share of production, which will achieve an increase in the share of gross value added in the release of this type of industrial activity (3.19):

$$\frac{q_\beta}{p_\beta} = \frac{q_{\beta_1} + q_{\beta_2} + \ldots + q_{\beta_{16}}}{p_{\beta_1} + p_{\beta_2} + \ldots + p_{\beta_{16}}} = \frac{q_\beta \left(\frac{q_\beta}{q_\beta} \right) \left(\frac{q_{\beta_1}}{q_\beta} + \frac{q_{\beta_2}}{q_\beta} + \ldots + \frac{q_{\beta_{16}}}{q_\beta} \right)}{p_\beta \left(\frac{p_\beta}{p_\beta} \right) \left(\frac{p_{\beta_1}}{p_\beta} + \frac{p_{\beta_2}}{p_\beta} + \ldots + \frac{p_{\beta_{16}}}{p_\beta} \right)} \to \max, \quad (3.19)$$

where

$q_{\beta_1} + q_{\beta_2} + \ldots + q_{\beta_{16}}$ – the gross value added of 16-th manufacturing industries;

$p_{\beta_1} + p_{\beta_2} + \ldots + p_{\beta_{16}}$ – the issue of 16-th manufacturing industries;

$\frac{q_{\beta_1}}{q_\beta} + \frac{q_{\beta_2}}{q_\beta} + \ldots + \frac{q_{\beta_{16}}}{q_\beta}$ – the shares of 16-th manufacturing industries in gross value added of the processing industry;

$\frac{p_{\beta_1}}{p_\beta} + \frac{p_{\beta_2}}{p_\beta} + \ldots + \frac{p_{\beta_{16}}}{p_\beta}$ – the shares of 16-th manufacturing industries in the manufacturing industry.

For the constructed optimization function (3.19), the following restrictions and criteria are defined:

1. The objective function (the criterion) of optimization is the increase in the actual value of the share of gross value added in the output of the processing industry to 27.62% (as in Poland in 2015).

2. By analogy with the condition (3.12), the sum of the shares of individual production in the output structures and the gross value added of the processing industry is 1 (3.20):

$$\frac{q_{\beta_1}}{q_\beta}+\frac{q_{\beta_2}}{q_\beta}+\ldots+\frac{q_{\beta_{16}}}{q_\beta}=1; \quad \frac{p_{\beta_1}}{p_\beta}+\frac{p_{\beta_2}}{p_\beta}+\ldots+\frac{p_{\beta_{16}}}{p_\beta}=1. \tag{3.20}$$

3. The value of the indicators of the gross value added share in the production of each of the 16-th industries of Ukrainian processing industry is equal to the value of similar indicators of Poland in 2015. All 16-th enterprises (including those for which the share of gross value added in the issue is higher than in Poland) is due to a relatively lower share of gross profit, mixed income in gross value added.

4. The share of the high-tech and medium-high-tech manufacturing in the manufacturing industry will increase from 2.60% and 15.12% (actual data for Ukraine in 2015) to the level of Poland (4.67% and 27.48% in 2015).

The optimization model (3.19), similar to (3.11), is solved by the linear programming method using the MS Excel option "Search Solutions".

According to the results of the calculations, the following output structures and gross value added have been obtained, which ensure competitiveness (in terms of gross value added in the output) of the Ukrainian processing industry, as compared to Polish (Table 3.18).

In addition, the resulting optimized structures have a significantly higher (compared to actual in 2015) diversification (in terms of productivity). Thus, in 2015, 55.3% of the output and 47.52% of gross value added of the processing industry provided two the low-tech production – the food production; drinks and tobacco products (33.71% and 31.38% respectively) and metallurgical production (21.58% and 16.15%). Instead, in optimized structures, as a result of the fulfillment of conditions (3.12) and (3.20), the share of these productions in production and the gross value added of the processing industry decreased to 29.26% and 23.26% respectively. Thus, the proposed optimization models (3.11), (3.19) and the corresponding conditions, a criteria for them, as well as the obtained optimization structures can serve as methodological and informational tools in the processes of development of industrial development strategies in Ukraine.

The results of the analysis provide grounds for asserting the need for further restructuring of the Ukraine's industrial sector. The gradual optimization of the structure of domestic industry should take place simultaneously in 4 directions, that is, to cover all types of industrial activities and their subspecies. A key criterion for such an optimization is the increase in a socio-economic efficiency, which consists in increasing the gross value added and the improving its structure, the share of gross operating profit, mixed income.

On the other hand, in the structure of the industrial sector of the national economy, those types of industrial activity that create the largest amount of value added, but at the same time are not raw materials, should dominate. That is, the development of the processing industry should be the priority of the new industrial policy in Ukraine.

Table 3.18. The results of structure optimization of the Ukraine manufacturing, %

Manufacturing	Manufacture	Actual data (2015)			Optimized data		
		Share in GVA	Share in output	Share of GVA in output	Share in GVA	Share in output	Share of GVA in output
High-technology	Manufacture of basic pharmaceutical products and pharmaceutical preparations	2.96	1.90	30.51	2.79	2.30	33.49
	Manufacture of computer, electronic and optical product	1.04	0.70	29.18	1.63	2.37	19.02
	Total	**4.00**	**2.60**	**x**	**4.42**	**4.67**	**x**
Medium-high technology	Manufacture of chemicals and chemical products	3.48	6.25	10.92	10.41	10.65	26.98
	Manufacture of electrical equipment	3.14	2.11	29.24	3.72	4.24	24.21
	Manufacture of machinery and equipment n.e.c.	5.47	3.44	31.17	6.24	5.64	30.52
	Manufacture of motor vehicles, trailers and semi-trailers	1.32	1.12	22.98	2.55	3.31	21.28
	Manufacture of other transport equipment	4.61	2.20	41.11	3.64	3.63	27.68
	Total	**18.01**	**15.12**	**x**	**26.55**	**27.48**	**x**
Medium-low technology	Manufacture of coke and refined petroleum products	3.07	5.01	12.05	1.63	2.92	15.45
	Manufacture of rubber and plastic products	2.44	3.27	14.66	5.61	5.10	30.38
	Manufacture of other non-metallic mineral products	3.88	4.59	16.57	10.77	8.44	35.24
	Manufacture of basic metals	16.15	21.58	14.68	7.72	10.13	21.05
	Manufacture of fabricated metals products, excepts machinery and equipment	3.23	2.88	22.01	18.23	13.77	36.56
	Total	**28.77**	**37.33**	**x**	**43.96**	**40.36**	**x**
Medium-low technology	Manufacture of food products; beverages and tobacco products	31.38	33.71	18.27	15.54	19.13	22.44
	Manufacture of textiles, wearing apparel, leather and related products	4.53	1.75	50.82	2.26	2.00	31.29
	Manufacture of wood, paper, printing and reproduction	6.79	5.97	22.32	3.44	3.16	30.07
	Manufacture of furniture; other manufacturing	6.54	3.52	36.49	3.82	3.20	32.97
Manufacturing, total		**49.23**	**44.94**	**x**	**25.07**	**27.49**	**x**

Reed: x – data missing

Source: authors' calculation.

The implementation of this priority, as well as calculated optimization structures, requires the use of appropriate public policy measures:

1. The increasing the share of state capital in industries that are the center of inter-branch technological chains (the high-tech and medium-high tech) through the creation of state-owned, state-owned or nationalized strategic but inefficient pri-

vatized enterprises. of course, such measures should be carried out under the close supervision of the public and the relevant institutions, as an example of how it was done in the banking sector.

The need to increase the presence of the state in the high-tech and the medium-high-tech industries is due to:

– a critical degree of wear (on average, more than 80% in these groups), consequently the same level of the import dependence and the need to modernize the fixed assets of these productions, as well as the passive position of private domestic and foreign capital on medium and long-term investment in these sectors of the processing industry;

– the need to create conditions for the development and implementation of domestic scientific and educational potential and implementation and improvement of successful domestic inventions, production systems and training programs;

– the strategic significance of these industries in the development of the economy and the social sphere of the country as a whole.

The restoration of the share of state capital in medium-low-tech industries is explained by the necessity:

– the state control over the rational use of natural resources and increase the efficiency of raw materials production, as is the case in many countries with significant mineral resources;

– increase of non-tax revenues for fulfilling tasks of the state and funds for modernization of the fixed capital of medium-high-tech manufacturing enterprises;

– a decrease in the high level of dependence of domestic production on imported the raw materials and other means of intermediate consumption, resulting in a decrease in the price competitiveness of goods of these industries in the domestic consumer market. Thus, the share of imports in the intermediate consumption for the traditional Ukrainian production in 2015 was: 64.42% in the production of vehicles, trailers, semitrailers; 60.99% in the manufacture of rubber and plastic products; 49.02% in the manufacture of the machinery and equipment not included in other groups and 46.09% in textile production, clothing, leather and other materials.

The importance of strengthening the role of the state in manufacturing industry is due to a decline in the manufacturing sector of the public sector from 5.1% in 2011 to 4% in 2016. in part, such a change was the result of a decrease in the share of the public sector in the volume of sales of this type of industrial activity from 4.2% to 3.1%. The similar trends are observed in the processing industry in Poland, in particular, the share of the public sector in the volume of sales of this type of industrial activity decreased from 4.8% in 2011 to 2.7% in 2016. However, it is worth noting that the structural the transformation of the processing industry (according to the technological criterion) of country took place in 1995-2004, while in Ukraine these processes are only beginning. Thus, the reduction

of the role of the state in the processing industry without the pre-existing modernization of fixed capital, restoration of partially lost production, establishment of effective inter-sectoral and interregional cooperation at this stage of functioning, especially in the conditions of an unstable investment climate in the country, is not feasible.

2. The application of the levers of state orders for raw materials for the operation of the textile production, production of clothing, the leather and other materials, separate parts of food production; drinks and tobacco products, in particular meat and dairy products.

3. The introduction of selective subsidization (increased targeted state subsidies), based on Poland's example, the tax incentives, information and consulting support for industries that do not use tolling raw materials and invest in the creation and modernization of fixed assets, are developing or introducing innovations.

4. The creation and organization of the activity of educational-research-and-production centers of branch direction with the purpose of raising the level of skills of workers and technological capacity of manufacturing industries of the processing industry in accordance with the needs of the market.

The state policy measures to change the output structure and the gross value added of the processing industry should be based on the principles of complexity, sectoral development, inter-sectoral and interregional and public-private cooperation, and address the fundamental task of the increasing the level of innovation and technological efficiency of productions of this type of industrial activity. The prospective directions of further research are the search of organizational, economic and regulatory mechanisms for the structural adjustment of the processing industry according to criteria of increasing technological efficiency and efficiency.

3.4. Optimization of relations between structural parameters of the processing industry of individual EU countries

The deepening globalisation has had a generally positive impact on economic development, and in particular, foreign trade; however, it also intensified competition in the world market. Under such conditions, the industrial sector plays a key role in ensuring the competitiveness of EU countries, as it accounts for about 60% of commodity exports on average in the EU-28, with over 58% resulting from the processing industry. The processing industry is the manufacturing sector, in which enterprises use physical or chemical processes to transform materials, substances or components into new products. According to the European Classification of Economic Activities NACE Rev.2, processing covers 33 industries, which can

be classed into the following groups: food, woodworking, textile, chemical, oil refining, metallurgy, engineering, furniture, repair, and installation of machinery and equipment.

Since industrial enterprises produce about 50% of intermediate consumption products, their results determine the external trade balance of EU countries as well as the state of their economy in general. Industry – and primarily its processing sector – remains the leading economic activity, which can be evidenced by intensified reshoring processes in developed EU countries. However, a high level of efficiency must be achieved to maintain competitiveness or the enduring ability to withstand competition with the help of the available potential. This largely depends on the existing structural parameters, by which this study understands the relationship between the shares of different types of industry (based on the level of manufacturability – high-tech, medium-high-tech, moderately-low-tech and low-tech) in output of the processing industry.

The question of structural transformations of the economy and, in particular, its industrial sector, as well as the expediency of applying the optimization models is the subject of many scientific studies. For example, Wlodarczyk (2013) presented an overview of structural changes in the Polish food industry over the period 2000-2012 and the optimization of the structure of production factors using nonlinear programming methods. The optimization of the sectoral structure of economic resources to maximise Turkey's income using linear programming methods was described in detail by Can (2012) and Altan, Doğan, & İloğlu (2016). Čapek (2016) used the dynamic stochastic general equilibrium (DSGE) model and Bayesian methods to present an estimation of structural changes in the Czech economy over the period 1996-2002. Taušer, Arltová, & Žamberský (2015) used the autoregressive distributed lag (ADL) model to demonstrate a high correlation between the Czech exports and the German GDP as well as the significant integration of the Czech and German economies. Olczyk and Kordalska (2017) applied the sectorial approach and the error correction model to assess the international competitiveness of the Czech industry. This facilitated conclusions regarding the significant dependence of Czech exports on imported components.

Vogstad (2009) offered a broad overview of the possibilities and examples to apply linear programming methods as well as input-output data tables in resource optimization processes. Tan et al. (2019) presented models for optimising interconnections between industry sectors to improve export and import tactics. And Sharify (2018) discussed the theoretical and methodological principles for the application of the nonlinear supply-driven input-output model.

However, the available studies paid insufficient attention to modelling the impact made by structural parameters of the processing industry on the industry's efficiency, and especially to the comparison of different countries. Research on this topic rarely includes a comprehensive scientific approach that covers the entire

spectrum from problem argumentation and the proposal as well as confirmation of hypotheses to their justification and testing by models, formulation of scientific and analytical conclusions and recommendations that could be potentially applied in the realm of the real economy. Also, researchers rarely use the information capabilities of input-output tables, specifically in the assessment of the degree of import dependence particular to economic sectors.

The authors of the article used the results of thorough analytical studies into the industrial sector of the economy of three selected countries (Poland, Germany and the Czech Republic) to hypothesise that a higher share of high-tech and medium-high-tech industries in the structure of processing industry's output results in a higher share of GVA in output for this type of industrial activity. However, this hypothesis was fully empirically confirmed only for Poland and Germany as the results of correlation-regression analysis established the existence of a stochastic and linear relationship, which was very close to deterministic, and a direct relationship between changes in the studied parameters. This hypothesis was not fully confirmed for the Czech processing industry due to a relatively low closeness of the relationship between the change in the selected parameters. These conclusions resulted in further detailed studies of the Czech processing industry, which served as the basis for the second hypothesis, stating that a lower share of imports in the intermediate consumption of high-tech and medium-high-tech industries results in a higher share of GVA in the processing industry's output. This hypothesis was empirically confirmed by the results of the correlation-regression analysis, which showed the presence of a close stochastic relationship and the inverse relationship between changes in the studied parameters.

The formulated and confirmed hypotheses became the methodological basis for optimising the structure of the processing industry in Poland and the Czech Republic according to the criteria of an increasing level of manufacturability and reducing import dependence. The target function of the optimization was the efficiency index of the German processing industry, which is the industry leader in the EU. Determinative multiplicative models were used for optimization because of a functional relationship between the share of GVA in output and the selected structural parameters. Actual data (structural indicators of the industry of the studied countries) was used to test the mathematical adequacy of the models. As linear programming methods allow the most accurate solutions for optimization tasks, they were used to solve the models. As discussed in the literature overview, these arguments have been confirmed by modelling results of the economic processes of different countries.

Data for analytical assessments were sourced from the Eurostat (2019). the United Nations Industrial Development Organization (UNIDO 2019) and the OECD (2019). including input-output tables and national accounts. The methodological basis of the research included general scientific, economic-logical and eco-

nomic-mathematical methods of economic analysis, in particular such methods as cognition theory, deterministic factor and general analysis, correlation-regression analysis, and linear programming.

The following text presents the algorithm for solving the tasks, as well as the most important results of the authors' in-depth analytical research on the formation and confirmation of hypotheses, the elaboration and solution of optimization models.

Having similar industrial potential parameters, Poland and Germany are among the most industrialised countries of the EU. in 2017, Poland exceeded Germany by 9.18 pp. (45.53% vs 36.35%) in terms of the level of industrialisation (the share contributed by industry to gross domestic product (GDP)); whereas in 2014, Poland was in the lead only by 1.1 pp. (37.74% vs 36.64%). in absolute numbers of output and GVA, the Polish industry was inferior to the German in 2017, respectively by 6.41 and 5.80 times, while in 2014, the differences between the values amounted to 6.64 and 7.26 times. At the same time, by share of GVA in output (which is one of the main indicators of the economic efficiency), the German industry has had a constant advantage (≈4 pp.) over the Polish industry with 34.57% vs 30.49% in 2017 (33.69% vs 29.90% in 2014).

One of the main reasons for such differences is the relatively lower efficiency of the Polish processing industry. Thus, by share of GVA in the processing industry's output in 2017, Poland was inferior to Germany by 7.05 pp. The German processing industry exceeded the Polish in all high-tech and medium-high-tech industries without exception, and so it did in 2017, in the vast majority of other industries, based on this indicator of efficiency (Table 3.19). The Polish processing industry had insignificant advantages in two low-tech (manufacture of textiles, wearing apparel, leather and related products; and manufacture of wood, paper, printing and reproduction) and two medium-low-tech industries (manufacture of coke and refined petroleum products; and repair and installation of machinery and equipment).

Hence it follows, that a higher economic efficiency of the German processing industry (as compared to the Polish) can be explained by its greater orientation towards high-tech industries and industries with a higher degree of raw material processing. This thesis was confirmed by the comparison of GVA and output structures of processing industries in these two countries (Table 3.20).

Thus, the share of high-tech and medium-high-tech industries in the output structure of the German processing industry is 1.8 times larger than in Poland. The German processing industry is founded on medium-high-tech industries that comprise 51.04%, of which 21.14% is the production of motor vehicles, trailers and semitrailers. Meanwhile, the Polish processing industry is supported on low-tech industries that amount to 35.21%, of which 19.89% is the manufacture of food products, drinks and tobacco products.

Table 3.19. Share of gross value added in the processing industry's output in 2017, %

The group	The manufacturing	Classification code of economic activities NACE Rev. 2	Poland	Germany
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	C21	32.40	53.64
	Manufacture of computers, electronic and optical products	C26	17.51	45.96
The medium-high-tech	Manufacture of chemicals and chemical products	C20	26.17	32.90
	Manufacture of electrical equipment	C27	22.08	41.01
	Manufacture of machinery and equipment not elsewhere classified	C28	32.30	37.94
	Manufacture of motor vehicles, trailers and semi-trailers	C29	20.26	33.41
	Manufacture of other transport equipment	C30	31.42	32.70
The moderately-low-tech	Manufacture of coke and refined petroleum products	C19	16.03	10.37
	Manufacture of rubber and plastic products	C22	28.84	35.19
	Manufacture of other non-metallic mineral products	C23	34.90	36.77
	Manufacture of basic metals	C24	17.77	19.96
	Manufacture of fabricated metal products, except machinery and equipment	C25	34.99	41.15
	Repair and installation of machinery and equipment	C33	48.11	36.06
The low-tech	Manufacture of food products; beverages and tobacco products	C10-12	23.67	23.75
	Manufacture of textiles, wearing apparel, leather and related products	C13-15	35.62	32.88
	Manufacture of wood, paper, printing and reproduction	C16-18	30.91	30.07
	Manufacture of furniture; other manufacturing	C31-32	32.66	45.09
Total processing industry			**27.01**	**34.06**

Source: elaborated by the authors based on Eurostat 2016.

Table 3.20. Structures of gross value added and output of the processing industries in Poland and Germany in 2017, %

The group	The manufacturing	Classification code of economic activities NACE Rev.2	The structure of gross value added		The output structure	
			Poland	Germany	Poland	Germany
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	C21	1.58	3.33	1.32	2.12
	Manufacture of computers, electronic and optical products	C26	2.09	6.08	3.22	4.50
	Total		**3.67**	**9.41**	**4.54**	**6.62**
The medium-high-tech	Manufacture of chemicals and chemical products	C20	4.93	7.47	5.09	7.73
	Production of electric equipment	C27	3.69	6.72	4.52	5.58
	Manufacture of machinery and equipment not elsewhere classified	C28	4.64	15.41	3.88	13.84
	Production of motor vehicles, trailers and semitrailers	C29	8.77	20.74	11.69	21.14
	Manufacture of other transport equipment	C30	2.08	2.64	1.79	2.75
	Total		**24.11**	**52.98**	**26.96**	**51.04**
The moderately-low-tech	Production of coke and coke products of oil refining	C19	3.16	0.82	5.32	2.71
	Manufacture of rubber and plastic products	C22	7.76	4.47	7.27	4.32
	Manufacture of other non-metallic mineral products	C23	5.70	2.65	4.41	2.46
	Metallurgical production	C24	2.82	3.09	4.29	5.27
	Manufacture of fabricated metal products, except machinery and equipment	C25	11.56	8.45	8.92	6.99
	Repair and installation of machinery and equipment	C33	5.48	2.30	3.07	2.18
	Total		**36.48**	**21.78**	**33.29**	**23.93**
The low-tech	Manufacture of food products; beverages and tobacco products	C10-12	17.43	6.93	19.89	9.94
	Manufacture of textiles, wearing apparel, leather and related products	C13-15	3.42	1.15	2.59	1.19
	Manufacture of wood, paper, printing and reproduction	C16-18	8.94	3.79	7.81	4.29
	Manufacture of furniture; other manufacturing	C31-32	5.95	3.96	4.92	2.99
	Total		**35.73**	**15.83**	**35.21**	**18.41**
Total processing industry			**100.00**	**100.00**	**100.00**	**100.00**

Source: elaborated by the authors based on Eurostat, 2019.

In the case of Poland and Germany, a close relationship exists between the dynamics particular to the share of high-tech and medium-high-tech industries in the structure of the processing industry's output on the one hand, and the share of GVA in the processing industry's output on the other. During the studied period, both Poland and Germany saw the increase in the share of medium-high-tech industries in the structure of the processing industry's output, which concurred with the increase in the share of GVA in the processing industry's output (Figs. 3.4 and 3.5). The exception was the post-crisis year 2010 in Poland.

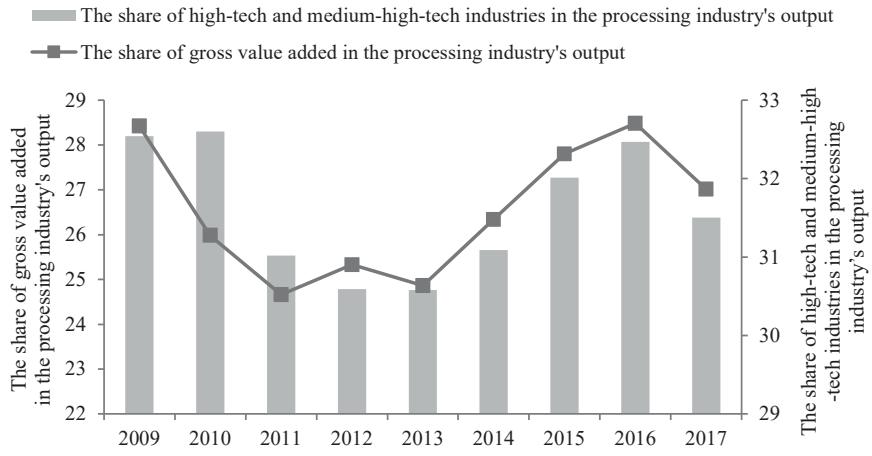


Fig. 3.4. Dynamics of structural indicators of the processing industry of Poland, %

Source: elaborated by the authors based on Eurostat, 2019.

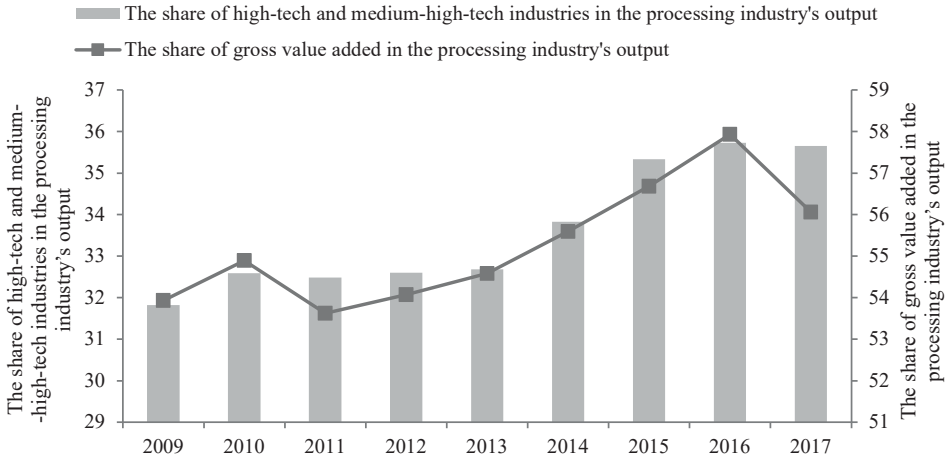
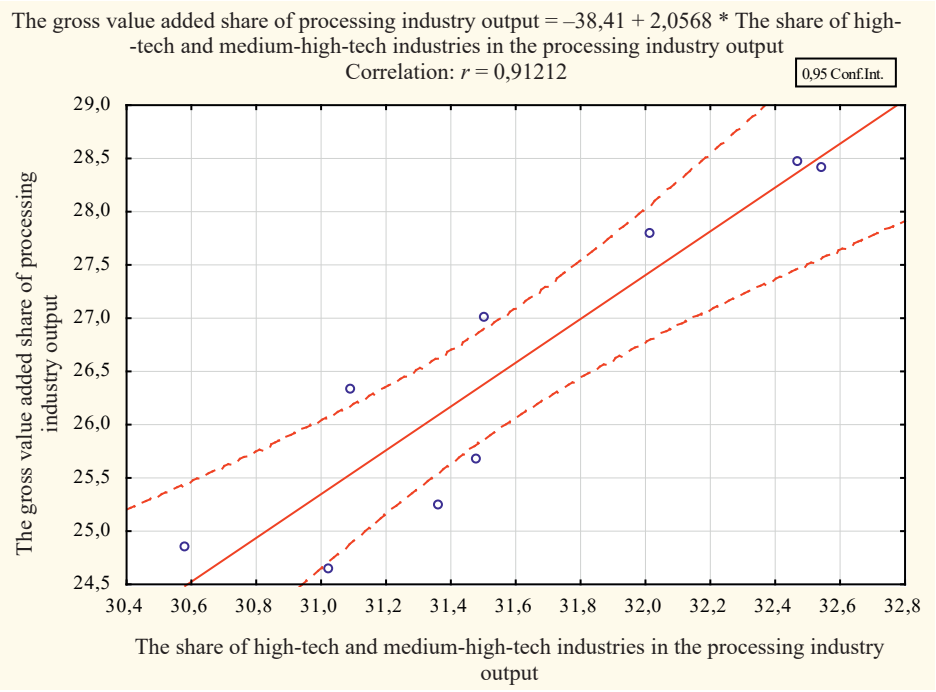


Fig. 3.5. Dynamics of structural indicators of the processing industry of Germany, %

Source: elaborated by the authors based on Eurostat, 2019.

The correlation and regression analysis established a stochastic and linear correlation, which was very close to functional (deterministic), since the correlation coefficients between the studied indicators for Poland and Germany were very high, respectively, 0.91 and 0.92 (Figs. 3.6 and 3.7). The values for the coefficient of determination (R) show that in the analysed period, share of GVA in the Polish and German processing industry's output depended on the share (total) of high-tech and medium-high-tech industries in the structure of the processing industry's output by 83.20% and 84.64%, respectively.

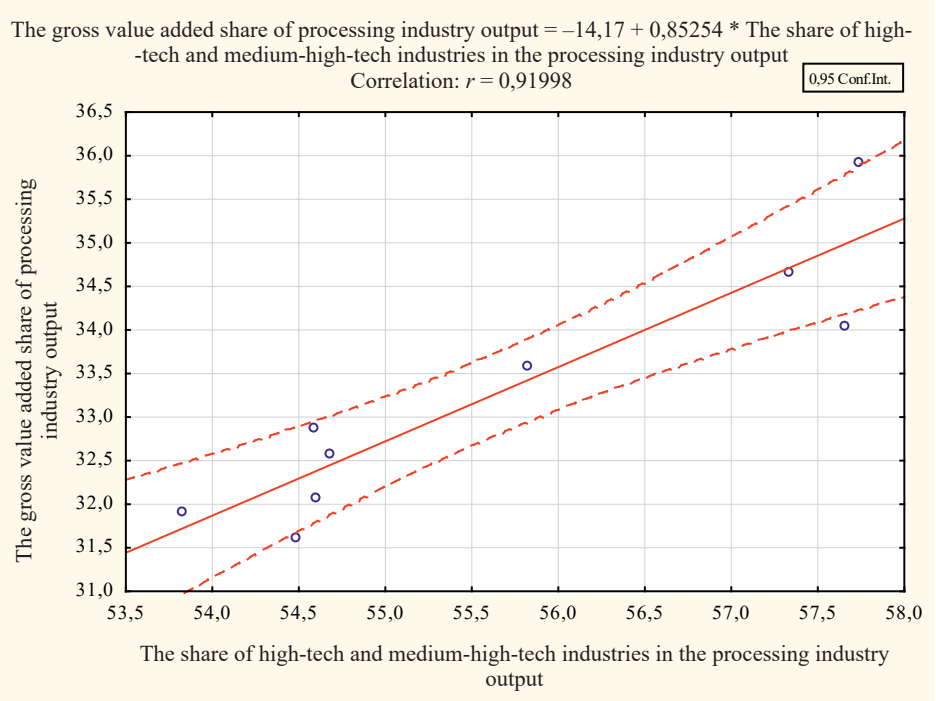


Multiple R = 0.91212261; R^2 = 0.83196765; Adjusted R^2 = 0.80796303; Standard error of estimate: 0.654909995; F = 34.65865; df = 1.7; p = 0.000607; Intercept: –38.41398182; Std. Error: 11.02872; $t(7)$ = –3.483; p = 0.0102

Fig. 3.6. Relationship between the share of high-tech and medium-high-tech industries in the processing industry's output and share of GVA in the processing industry's output in Poland

Source: elaborated by the authors based on Eurostat, 2019.

Thus, an analytical review and results of the correlation and regression analysis of Poland and Germany confirmed the hypothesis stating that *a higher share of high-tech and medium-high-tech industries in the structure of the processing industry's output results in a higher share of GVA in output generated by this type of industrial activity*. It follows that the optimization of the processing industry structure (in terms of particular industries) is a way to increase the industry's efficiency.



Multiple $R = 0.91998061$; $R^2 = 0.84636433$; Adjusted $R^2 = 0.82441638$; Standard error of estimate: 0.599371375; $F = 38.56234$; $df = 1.7$; $p = 0.000441$; Intercept: –14.16868929; Std. Error: 7.640436; $t(7) = -1.854$; $p = 0.1061$

Fig. 3.7. Relationship between the share of high-tech and medium-high-tech industries in the processing industry's output and share of GVA in the processing industry's output in Germany

Source: elaborated by the authors based on Eurostat, 2019.

The authors developed an economic and mathematical model to optimise the structure of processing industry's output using the criterion for increasing efficiency (i.e., achieving the desired GVA). The optimization model (1) is deterministic and reflects a functional relationship (i.e., the changing value of one indicator inevitably results in the changing value of another) that exists between the dynamics particular to shares of output held by individual industries and characteristic to the processing industry's GVA on the one hand, and the change in share of GVA in the processing industry's output on the other:

$$\frac{q}{p} = \frac{q_1 + q_2 + \ldots + q_{17}}{p_1 + p_2 + \ldots + p_{17}} = \frac{q\left(\frac{q}{q}\right)\left(\frac{q_1}{q} + \frac{q_2}{q} + \ldots + \frac{q_{17}}{q}\right)}{p\left(\frac{p}{p}\right)\left(\frac{p_1}{p} + \frac{p_2}{p} + \ldots + \frac{p_{17}}{p}\right)} \rightarrow opt, \qquad (3.21)$$

where:

q – the gross value added of the processing industry;

p – the output of the processing industry;

$q_1 + q_2 + \ldots + q_{17}$ – the gross value added of 17 industries of the processing industry;

$p_1 + p_2 + \ldots + p_{17}$ – the output of 17 industries of the processing industry;

$\frac{q_1}{q} + \frac{q_2}{q} + \ldots + \frac{q_{17}}{q}$ – the shares of 17 industries in GVA of the processing industry;

$\frac{p_1}{p} + \frac{p_2}{p} + \ldots + \frac{p_{17}}{p}$ – the shares of 17 industries in the output of the processing industry.

The target function of the optimization is the increase in the actual value of share of GVA in the processing industry's output up to the desired level.

For an elaborated optimization model (3.21), a set of criteria and constraints was defined as follows:

1. The sum of the shares of individual 17 industries comprising the output and GVA structures of the processing industry is 1:

$$\frac{q_1}{q} + \frac{q_2}{q} + \ldots + \frac{q_{17}}{q} = 1; \quad \frac{p_1}{p} + \frac{p_2}{p} + \ldots + \frac{p_{17}}{p} = 1.$$

2. The values of share of GVA in output for each of the 17 industries of the processing industry should grow.

3. The shares of high-tech and the medium-high-tech industries in the processing industry's output and GVA should grow.

In some EU countries, high-tech industries are not sufficiently effective. These are, in particular, the Czech Republic, Hungary, Slovenia and Slovakia – countries with a high level of import dependence characteristic to the processing industry. in the Czech Republic, despite a high share of high-tech and medium-tech industries within the structure of the processing industry (56.30% in 2017), their share of GVA in output was only 26.82%. in this country, in-depth studies found a relatively high (43.37%) share of imports in intermediate consumption of the processing industry, including high-tech and medium-high-tech industries, which amounted to 46.97% in 2015 (this being the last year, for which the shares of imports in the intermediate consumption of processing industries of EU countries were available). in Poland, these indicators were, respectively, 30.82% and 38.81%, and in Germany, 27.22% and 27.43 % (Table 3.21)[5].

[5] The names, codes and groups of industries within the processing industry listed in Table 3.21 correspond to the ISIC Rev.4 economic activity classification system. This decision was made because the fullest body of information, which was required to calculate the share of imports in intermediate

Table 3.21. Share of GVA in the processing industry's output and the share of imports in the ntermediate consumption of the processing industry in Poland, the Czech Republic and Germany, %

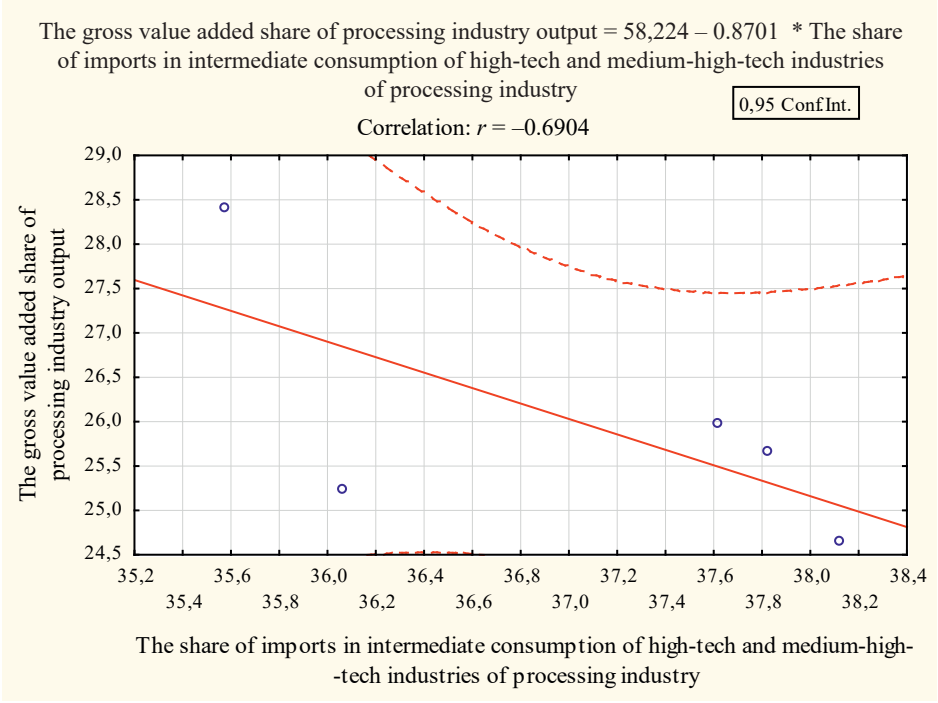
The group	Manufacturing	Code classification of economic activities ISIC Rev.4	Poland		Czech Republic		Germany	
			The share of gross value added in output	The share of imports in intermediate consumption	The share of gross value added in output	The share of imports in intermediate consumption	The share of gross value added in output	The share of imports in intermediate consumption
Medium-high and high technology	Computer, electronic and optical products	D26	18.57	46.74	18.94	53.13	47.07	35.89
	Chemicals and pharmaceutical products	D20T21	29.20	34.49	29.28	38.94	38.07	30.00
	Electrical equipment	D27	25.11	44.00	30.63	50.90	41.39	29.72
	Machinery and equipment, n.e.c.	D28	32.13	40.11	31.77	39.05	39.18	24.98
	Motor vehicles, trailers and semi-trailers	D29	20.95	34.73	19.43	47.95	32.35	24.83
	Other transport equipment	D30	30.40	49.04	36.38	38.86	34.21	35.45
	Total		**25.06**	**38.81**	**23.85**	**46.97**	**37.10**	**27.43**
Medium technology	Rubber and plastic products	D22	29.97	35.49	32.33	50.50	36.68	30.52
	Other non-metallic mineral products	D23	35.71	19.52	37.06	30.64	38.04	20.33
	Basic metals	D24	20.80	27.56	22.38	36.70	21.92	28.32
	Other manufacturing; repair and installation of machinery and equipment	D31T33	38.10	27.43	37.31	35.43	44.14	22.37
	Total		**32.40**	**28.53**	**32.12**	**40.09**	**34.43**	**26.30**
Low technology	Food products, beverages and tobacco	D10T12	24.41	15.32	26.17	24.95	25.16	21.13
	Textiles, wearing apparel, leather and related products	D13T15	36.58	33.57	33.66	46.29	32.92	29.01
	Wood and products of wood and cork	D16	29.35	15.24	27.78	20.10	28.36	17.87
	Paper products and printing	D17T18	31.08	25.75	28.48	36.28	33.31	23.39
	Coke and refined petroleum products	D19	14.37	53.3	5.27	77.86	10.61	55.77
	Fabricated metal products	D25	36.99	33.47	35.72	39.27	43.17	23.79
	Total		**27.33**	**25.99**	**28.44**	**37.38**	**29.86**	**27.39**
Total processing industry			**27.81**	**30.82**	**26.60**	**43.37**	**34.79**	**27.22**

Source: elaborated by the authors based on OECD, 2019.

consumption of industries within the processing industry, was available from OECD (2019), where it was given according to the named system. The manufacturability groups were formed according to the levels of the technological intensity of ISIC Rev.4 UNIDO (2019). It should also be noted that Furniture production (Division 31) was classified as Medium rather than Low technology, as required by UNIDO (2019). This decision was made because the OECD (2019) information concerning the imports of intermediate consumption of Furniture (Division 31) was presented in D31T33: Other manufacturing; repair and installation of machinery and equipment.

According to Table 3.21, the smaller is the share of imports in the intermediate consumption (primarily of high-tech and medium-high-tech industries), the higher is share of GVA in the processing industry's output.

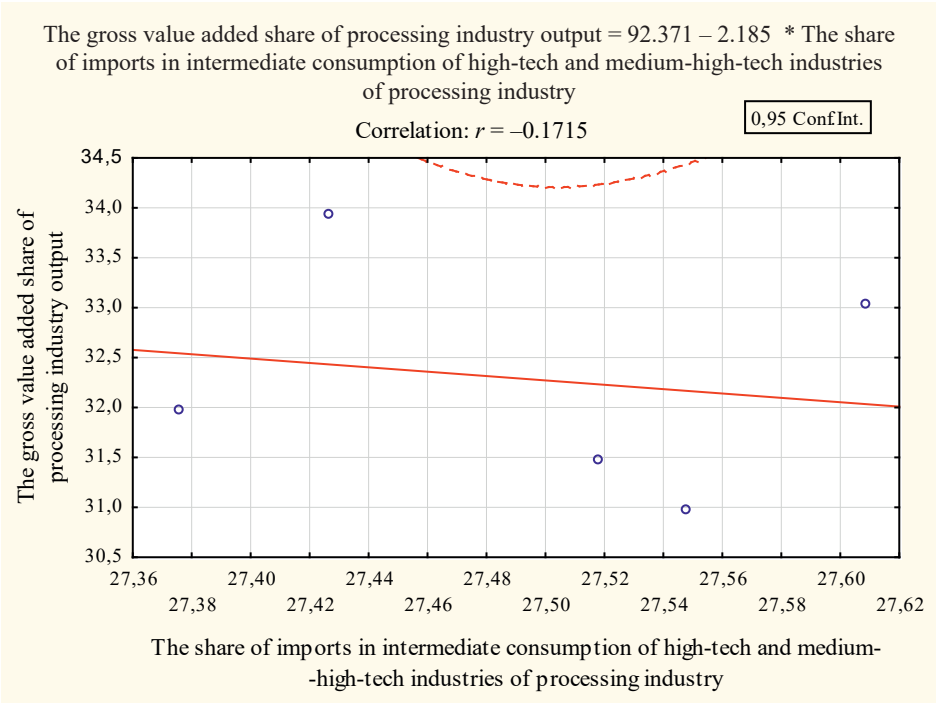
Results of the correlation and regression analysis confirmed the presence of a stochastic connection and inverse relationship between the change in share of GVA in the processing industry's output and the share of high-tech and medium-high-tech industries in all three studied countries. However, the degree of dependency between these indicators varied from country to country. This relationship was very high in the Czech Republic (the correlation coefficient was –0.92), high in Poland (–0.69), and low in Germany (–0.17) (Figs. 3.8-3.10). Determination coefficients show that the dependence of share of GVA in the processing industry's output on the share of imports in the intermediate consumption of high-tech and medium-high-tech industries amounts to 84.04% in the Czech Republic, 47.67% in Poland, and as little as 2.94% in Germany.



Multiple $R = 0.69041263$; $R^2 = 0.47666960$; adjusted $R^2 = 0.30222614$; Standard error of estimate: 1.203776159; Intercept: 58.224202892; Std. Error: 19.50324; $t(3) = 2.9854$; $p = 0.196895$; $p < 0.0583$; $df = 1.3$

Fig. 3.8. Relationship between share of GVA in the processing industry's output and the share of imports in the intermediate consumption of high-tech and medium-high-tech industries in Poland

Source: elaborated by the authors based on OECD, 2019.



Multiple $R = 0.17154493$; $R^2 = 0.02942766$; adjusted $R^2 = -0.29409645$; Standard error of estimate: 1.360032654; Intercept: 92.370829663; Std. Error: 199.2361; $F = 0.0909597$; $t(3) = 0.46363$; $p = 0.782658$; $p < 0.6745$; $df = 1.3$

Fig. 3.9. Relationship between share of GVA in the processing industry's output and the share of imports in the intermediate consumption of high-tech and medium-high-tech industries in Germany

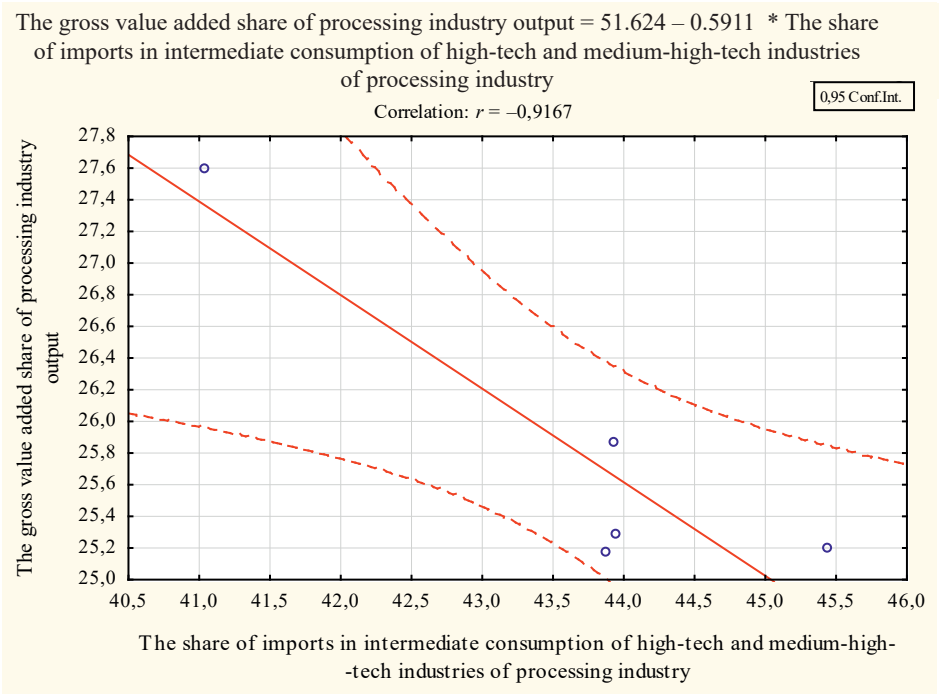
Source: elaborated by the authors based on OECD, 2019.

Thus, the results of the analysis confirmed the second hypothesis: *the lower is the share of imports in the intermediate consumption of high-tech and medium-high-tech industries, the higher is share of GVA in the processing industry's output.*

Consequently, the optimised structure of the intermediate consumption of the processing industry in favour of the domestic components of high-tech and medium-high-tech industries increases the efficiency of the processing industry.

The functional relationship between share of GVA in the processing industry's output and the structure (in terms of domestic and imported components) of the intermediate consumption is represented by the optimization model:

$$\frac{q}{p} = \frac{q_1 + q_2 + \ldots + q_{16}}{q_1 + c_1\left(\frac{d_1}{c_1} + \frac{i_1}{c_1}\right) + q_2 + c_2\left(\frac{d_2}{c_2} + \frac{i_2}{c_2}\right) + \ldots + q_{16} + c_{16}\left(\frac{d_{16}}{c_{16}} + \frac{i_{16}}{c_{16}}\right)} \rightarrow opt, \quad (3.22)$$



Multiple $R = 0.91671400$; $R^2 = 0.84036455$; adjusted $R^2 = 0.78715273$; Standard error of estimate: 0.475927705; Intercept: 51.624065020; Std. Error: 6.494768; $F = 15.79282$; $p = 0.028490$; $p < 0.0042$; $t(3) = 7.9486$; $df = 1.3$

Fig. 3.10. Relationship between share of GVA in the processing industry's output and the share of imports in the intermediate consumption of high-tech and medium-high-tech industries in the Czech Republic

Source: elaborated by the authors based on OECD, 2019.

where:

q – the gross value added of the processing industry;

p – the output of the processing industry;

$q_1, q_2, \ldots, q_{16}$ – the gross value added of 16 industries of the processing industry;

$c_1, c_2, \ldots, c_{16}$ – intermediate consumption of the 16 industries;

$\frac{d_1}{c_1}, \frac{d_2}{c_2}, \ldots, \frac{d_{16}}{c_{16}}$ – the shares of domestic components in the intermediate consumption of each of the 16 industries;

$\frac{i_1}{c_1}, \frac{i_2}{c_2}, \ldots, \frac{i_{16}}{c_{16}}$ – the shares of imported components in the intermediate consumption of each of the 16 industries. The target function of the optimization was to increase the actual share of GVA in the processing industry's output to the desired level.

The following limitations and criteria were defined for the optimization function (3.22):

1. The total sum of the shares of domestic and imported components of the intermediate consumption for each of the 16 industries is 1:

$$\left(\frac{d_1}{c_1}+\frac{i_1}{c_1}\right)=1,\ \left(\frac{d_2}{c_2}+\frac{i_2}{c_2}\right)=1,\ \ldots\ ,\ \left(\frac{d_{16}}{c_{16}}+\frac{i_{16}}{c_{16}}\right)=1.$$

2. The volumes of GVA and the output of the processing industry are equal to the sums of the GVAs and outputs of the 16 industries.

3. The share of domestic components in the intermediate consumption of high-tech and medium-high-tech industries is inclined to grow, while the share of imported components – to decline.

4. Shares of GVA in output for each of high-tech and medium-high-tech industries should increase.

The optimization model (1) was solved using the linear programming method. The input data for calculations were the values of structural indices of the processing industry in Poland. The target function was to achieve 34.06% (Germany's value) in terms of share of GVA in the processing industry's output in Poland. As a result of the calculations, the optimised structures of output and GVA for the processing industry in Poland were obtained (Table 3.22).

According to the results, the processing industry in Poland will be able to reach the German level of efficiency (the share of GVA in output at the level of 34.06%) on the condition that the share of high-tech and medium-high-tech industries in the output structure will increase by 4.69 pp. At the same time, share of GVA of high-tech and medium-high-tech industries in the processing industry's GVA should increase by 11.02 pp. in Poland.

The optimization model (2) was solved using the linear programming method. The initial data for the calculations were the values of structural indicators of the Czech processing industry. The target function was to achieve 34.79% for share of GVA in the processing industry's output in the Czech Republic (which is the indicator for Germany in 2015). According to the simulation results, an optimised structure of the intermediate consumption of the Czech processing industry was constructed (Table 3.23).

Thus, ratios were determined between the share of domestic and imported components of the intermediate consumption for all 16 industries, at which the level of efficiency of the Czech processing industry would reach the level of Germany in 2015 (share of GVA in output amounting to 34.79%). Such an efficiency indicator can be achieved under the condition that the import share in the intermediate consumption of high-tech and medium-high industries of the Czech processing industry is decreased by 18.49 pp.

Table 3.22. Optimised structures of GVA and output for the processing industry in Poland, %

The group	The manufacturing	Classification code of economic activities NACE Rev.2	The gross value added structure	The output structure	The share of gross value added in output
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	C21	2.22	1.54	49.01
	Manufacture of computers, electronic and optical products	C26	4.02	3.42	40.00
	Total		**6.23**	**4.96**	**42.80**
The medium-high-tech	Manufacture of chemicals and chemical products	C20	6.13	5.50	37.96
	Production of electric equipment	C27	5.83	4.97	39.98
	Manufacture of machinery and equipment not elsewhere classified	C28	4.91	4.51	37.05
	Production of motor vehicles, trailers and semitrailers	C29	13.27	13.74	32.89
	Manufacture of other transport equipment	C30	2.43	2.52	32.87
	Total		**32.57**	**31.24**	**35.51**
The moderately-low-tech	Production of coke and coke products of oil refining	C19	2.99	5.29	19.25
	Manufacture of rubber and plastic products	C22	7.43	7.24	34.96
	Manufacture of other non-metallic mineral products	C23	4.64	4.37	36.17
	Metallurgical production	C24	2.37	4.22	19.13
	Manufacture of fabricated metal products, except machinery and equipment	C25	8.86	7.40	40.78
	Repair and installation of machinery and equipment	C33	4.77	3.00	54.21
	Total		**31.07**	**31.52**	**36.46**
The low-tech	Manufacture of food products; beverages and tobacco products	C10-12	15.08	19.01	27.01
	Manufacture of textiles, wearing apparel, leather and related products	C13-15	2.31	2.20	35.78
	Manufacture of wood, paper, printing and reproduction	C16-18	7.64	7.20	36.12
	Manufacture of furniture; other manufacturing	C31-32	5.11	3.87	44.97
	Total		**30.13**	**32.28**	**31.79**
Total processing industry			**100.00**	**100.00**	**34.06**

Source: elaborated by the authors based on Eurostat, 2019.

Table 3.23. Optimised structure (in terms of domestic and imported components) of the intermediate consumption of the processing industry in the Czech Republic, %

The group	The manufacturing	Code classification of economic activities ISIC Rev.4	Actual data (2015)			Optimised data		
			the share of gross value added in output	the share of domestic component in intermediate consumption	the share of imported component in intermediate consumption	the share of gross value added in output	the share of domestic component in intermediate consumption	the share of imported component in intermediate consumption
Medium-high and high technology	Computer, electronic and optical products	D26	18.94	46.87	53.13	20.12	64.64	35.36
	Chemicals and pharmaceutical products	D20T21	29.28	61.06	38.94	32.21	65.92	34.08
	Electrical equipment	D27	30.63	49.10	50.90	31.21	65.44	34.56
	Machinery and equipment, n.e.c.	D28	31.77	60.95	39.05	33.21	66.60	33.40
	Motor vehicles, trailers and semi-trailers	D29	19.43	52.05	47.95	22.21	77.56	22.44
	Other transport equipment	D30	36.38	61.14	38.86	38.21	64.17	35.83
	Total		**23.85**	**53.03**	**46.97**	**26.06**	**71.52**	**28.48**
The moderately-low-tech	Rubber and plastic products	D22	5.27	22.14	77.86	7.39	23.79	76.21
	Other non-metallic mineral products	D23	32.33	49.50	50.50	35.51	64.35	35.65
	Basic metals	D24	37.06	69.36	30.64	52.38	71.80	28.20
	Other manufacturing; repair and installation of machinery and equipment	D31T33	22.38	63.30	36.70	42.07	64.50	35.50
	Total		**35.72**	**60.73**	**39.27**	**37.41**	**76.40**	**23.60**
The low-tech	Food products, beverages and tobacco	D10T12	29.95	54.85	45.15	36.84	64.14	35.86
	Textiles, wearing apparel, leather and related products	D13T15	26.17	75.05	24.95	42.71	77.67	22.33
	Wood and products of wood and cork	D16	33.66	53.71	46.29	36.55	56.04	43.96
	Paper products and printing	D17T18	27.78	79.90	20.10	29.89	80.44	19.56
	Coke and refined petroleum products	D19	28.48	63.72	36.28	31.64	64.37	35.63
	Fabricated metal products	D25	37.31	64.57	35.43	38.20	67.43	32.57
	Total		**30.11**	**69.83**	**30.17**	**37.85**	**71.15**	**28.85**
Total processing industry			**26.60**	**56.63**	**43.37**	**34.79**	**74.97**	**25.03**

Source: elaborated by the authors based on OECD, 2019.

The study into the industrial sector of the EU economy, in particular Poland and Germany, suggested a relationship between the efficiency of the processing industry and its structure. The results of the correlation and regression analysis proved the adequacy of the hypothesis stating that the higher was the share of high-tech and medium-high-tech industries of the processing industry's output, the higher was share of GVA in output of these types of industrial activity. This led to the conclusion that the optimization of the processing industry output structure was a way to increase the efficiency of this industry. Based on this statement, an optimization model was constructed, in which the target function was to increase share of GVA in the processing industry's output to the desired level, and the main optimization criterion was increasing the share of high-tech and medium-high-tech industries in the output structure.

Further research found that the high-tech processing industry was not always effective. This particularly applies to such countries as the Czech Republic, Hungary, Slovenia and Slovakia, i.e. countries with a high level of import dependence in the processing industry. The results of the correlation and regression analysis, conducted on the example of the Czech Republic, proved the adequacy of the second hypothesis stating that the lower was the share of imports in the intermediate consumption of high-tech and medium-tech industries, the higher was the share of GVA in the processing industry's output. Hence, another way for increasing the efficiency of the processing industry was defined as the optimization of the structure pertaining to the intermediate consumption of high-tech and medium-high-tech industries. According to this hypothesis, an optimization model was developed, which allowed determining ratios between domestic and imported components in the structure of the intermediate consumption of the industries within the processing industry, that would allow achieving the desired level of efficiency.

The developed economic and mathematical models were solved using the method of linear programming. in both models, the share of GVA in the German processing industry's output as a benchmark was chosen as the target function. The first model was tested on the example of Poland, in particular, the optimised structure of the output, and GVA of the processing industry of this country was built according to the criterion of increasing the technological level. The second model was tested on the example of the Czech Republic, in particular, the optimised structure of the intermediate consumption of the industries was built according to the criterion of reducing import dependence.

Further research in this direction will focus on modelling the impact of other factors on the level of processing industry's efficiency, in particular, the specificities of the high-tech industries from the perspective of the creation of value-added chains.

Summary

The Polish and Ukrainian economies are on the way to an innovative model of development. However, today, the level of innovation in the economies of these countries is still very low. The Polish economy, in particular industry, is significantly superior to Ukraine in terms of innovation, but at the same time it is inferior to many EU countries. One of the common problems of innovative development of Ukraine and Poland is the relatively high import dependence of the economy on the intermediate consumption of high-tech industries. The economy of Ukraine and Poland mostly depends on materials and components of the following industries: computers, electronic and optical products; chemicals and chemical products; mechanical engineering; coke and refined products; textile production, clothing, leather and the other materials. in fact, this means that domestic enterprises and organizations of production, but also the other areas (financial, social) can not function not only without imported goods of mechanical engineering and chemical industry, but also without the products of oil refining and light industry.

Thus, one of the ways to increase the innovation of the economies of these countries is the import substitution of industrial products in the domestic market. An effective import substitution policy will have a significant multiplier effect: create new jobs in the industrial sector of the economy and additional effective demand within the country, and thus significantly expand the domestic market, increase gross domestic product (GDP) and tax revenues to budgets at various levels. As a result, it will create conditions for the creation of additional jobs in the field of service and improve the level and quality of life of the population.

Another important problem of restraining the innovative development of these countries is that the structure of industrial output of these countries is dominated by low-tech and medium-tech production with a low degree of processing of raw materials and value added. A significant part of exported products is carried out by tolling operations. Due to these and other factors, Ukrainian and Polish industries have low socio-economic efficiency.

To improve the innovation of the industrial sector of Ukraine's and Poland's economy, on the one hand, it is necessary to improve the macroeconomic conditions of the operation of the subjects of industrial activity in the direction of promoting the expansion of domestic demand for domestic industrial products and increasing its supply, as well as improving the quality management system of in-

dustrial products and accelerating the international certification of enterprises. From the other hand, increase the efficiency of capital investments and the level of implementation of innovations in production. There is also a need for a gradual reorientation of investment flows in the development of high-tech industries, in particular through tax and customs incentives for domestic investors and state guarantees for foreign protection.

An effective tax incentive can be a reduction in the tax rate on income (or tax holidays) for high-tech manufacturers, while increasing the rate for commodity producers. It may be of interest and involve small and medium-sized businesses in the process of investing in high-tech manufacturing.

In its turn, the expansion of opportunities for the introduction of innovations into the industry requires to the next:

– the development of innovation infrastructure by creating innovative clusters or technological parks (for example, Poland), in particular on the basis of institutes of the National Academy of Sciences of Ukraine;

– the monitoring, on the one hand, the needs of enterprises in innovations, and, on the other hand, developments in the scientific and design institutions for sale, and the creation on this basis of the information catalog of innovations on the basis of the "supply-demand" principle;

– the formation of an effective organizational and financial mechanism for the support and development of innovation activities by providing financial and credit assistance to economic entities that implement investment projects of innovative direction, in particular, in energy and resource conservation;

– the organization of an effective network of "science-production" based on the establishment of technology transfer centers for combining the potential of science, production and financial capital (with the involvement of small and medium-sized businesses).

– in order to increase the access of the subjects of industrial activity to investment resources, in particular, foreign ones, it is necessary:

– the formation of a system of monitoring of the investment projects implemented in the framework of public-private partnership, and continuous monitoring, in particular public, for their implementation in order to prevent inefficient use of capital investments;

– a conducting an annual rating assessment of the investment attractiveness of the administrative-territorial units and leading commodity producers in the region, with further placement of its results on the investment portal of the region;

– the creation of conditions for closer cooperation of the oblast with European organizations and funds involved in financial support for regional development within the framework of international cooperation programs, in particular EU funds through the Neighborhood and Partnership Instruments, border cooperation

programs, the other international programs and donors (World Bank, European Bank for Reconstruction and Development, European Investment Bank etc.

A comprehensive solution for the problems related with operation and development of the Ukrainian industry calls for structural modernization of the industry, intended to increase the share of high tech economic activities in the domestic output and exports, to meet the domestic market demand for home-made products and enhance the efficiency of the domestic production.

Literature

Adamczyk, J. (2001). *Koncepcja zrównoważonego rozwoju w zarządzaniu przedsiębiorstwem*. Kraków: Wydawnictwo Akademii Ekonomicznej w Krakowie

Altan, Ş., Doğan, S., & İloğlu, H. (2016). Maximization of National Income with Linear Programming and Input-Output Analysis: An Application for Turkey. *Journal of Business & Economic Policy*, *3*(2), 29-37. http://jbepnet.com/journals/Vol_3_No_2_June_2016/3.pdf

Amir, R. (1996). Cournot oligopoly and the theory of supermodular games. *Games and Economic Behavior*, *15*(2), 132-148

Annual detailed enterprise statistics for industry, Eurostat (2018). http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do [accessed 30.07.2018]

Asheim, G.B., (2017). Sustainable growth. *Social Choice and Welfare*, *49*(3), 825-848. https://doi.org/10.1007/s00355-016-0977-9

Bartkowiak, P., Dudek, D., & Wszendybył-Skulska, E. (2016). *Koncepcja społecznej odpowiedzialności i koncepcja zrównoważonego rozwoju w procesie funkcjonowania organizacji*. Kraków: Wydawnictwo Uniwersytetu Jagielońskiego

Bradley, J., Loucks, J., Macaulay, J., Noronha, A., & Wade, M., (2015). *Digital Vortex. How Digital Disruption is Redefining Industries*. Global Center for Digital Business Transformation. www.cisco.com/c/dam/en/us/solutions/collateral/industry-solutions/digital-vortex-report.pdf

Can, T. (2012). Input-Output Analysis with Linear Programming: The Case of Turkey. *International Research Journal of Finance and Economics*, *89*, 38-145. https://www.researchgate.net/publication/260385907_Input-Output_Analysis_with_Linear_Programming_The_Case_of_Turke

Čapek, J. (2016). Structural Changes in the Czech Economy: A DSGE Model Approach. *Prague Economic Papers*, *25*(1), 37-52. https://doi.org/10.18267/j.pep.535

Caputa, W. (2018). Responsible Market Offer as an Element of Customer Capital Creation: a Theoretical and Empirical Study. *Business and Non-profit Organizations Facing Increased Competitions and Growing Customers' Demands*, *17*, 365-384

Caputa, W. (2019). Sprawozdawcza komunikacja modelu biznesu jako wyraz inteligencji przedsiębiorstwa. In: A. Jabłoński, M. Jabłoński (Eds.), *Perspektywy rozwoju modeli biznesu przedsiębiorstw – uwarunkowania strategiczne* (pp. 59-78). Warszawa: CeDeWu

Caputa, W. (2020). *Kapitał klienta w środowisku wirtualnym*. Warszawa: CeDeWu

Caputa, W., Janik, W., & Paździor, A. (2019). *Przedsiębiorczość i biznes*. Lublin: Wydawnictwo Politechniki Lubelskiej

Caputa, W., Krawczyk-Sokołowska, I., & Pierścieniak, A. (2019). The potential of web awareness as a determinant of dually defined customer value. *Technological Forecasting And Social Change*, 163, 120443. https://doi.org/10.1016/j.techfore.2020.120443

Caputa, W., & Szwajca, D. (2010). *Potencjał konkurencyjny przedsiębiorstwa w warunkach globalizacji*, Warszawa: CeDeWu

Castells, M. (2008). *Społeczeństwo sieci*. Warszawa: Wydawnictwo Naukowe PWN

Chamberlin, E. H. (1962). *The Theory of Monopolistic Competition: A Reorientation of the Theory of Value*. Cambridge, MA: Harvard University Press

Clothing; worn and other worn articles (HScode: 630900) (2019). Official website of United Nations. Retrived from https://comtrade.un.org/data

CSOP (2017). Central Statistical Office of Poland. Official site. Retrieved from http://stat.gov.pl [in Polish]

CSOP (2018). Central Statistical Office of Poland. Official site. Retrieved from www.stat.gov.pl [in Polish]

DSLR (2017) Departament of Statictics in Lviv Region: Official site. Retrieved from http://www.lv.ukrstat.gov.ua [in Ukrainian]

Dunning, J.H. (1997). *Alliance Capitalism and Global Business*. London: Routledge

Enright, M.J. (2000). The globalization of competition and the localization of competitive advantage: policies towards regional clustering. In: N. Hood, & S. Young (Eds.), *The Globalization of Multinational Enterprise Activity and Economic Development* (pp. 303-331). Palgrave Macmillan

Eurostat (2016). Manufacturing groups are formed in accordance with Eurostat indicators on High-tech industry and Knowledge – intensive services: Aggregations of manufacturing based on NACE Rev.2. https://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf

Eurostat (2019). Official website of Eurostat. National accounts aggregates by industry. Retrieved from http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_10_a64&lang=en

FAO Forestry (2019). Food and Agriculture Organization of the United Nations. Retrieved from: http://www.fao.org

Freeman, Ch. (2008). *Systems of Innovation: Selected Essays in Evolutionary Economics*. Edward Elgar Publishing Ltd.

Grzebyk, M., Sołtysiak, M., Stec, M., & Zając, D. (2020). *Społeczne, ekonomiczne i środowiskowe uwarunkowania gospodarki finansowej samorządu lokalnego (przykład województwa podkarpackiego).* Poznań: Bogucki Wydawnictwo Naukowe

Helpman, E., & Krugman, P. (1985). *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy*. Cambridge, MA: MIT Press

Jabłoński A., & Jabłoński M. (Eds.) (2019). *Perspektywy rozwoju modeli biznesu przedsiębiorstw – uwarunkowania strategiczne*. Warszawa: CeDeWu

Kardas, M. (2016). Pojęcia i typy modeli biznesu. In: K. Klincewicz (Ed.) *Zarządzanie, organizacje i organizowanie – przegląd perspektyw teoretycznych* (pp. 298-318). Warszawa: Wydawnictwo Naukowe Wydziału Zarządzania Uniwersytetu Warszawskiego

Krawczyk-Sokołowska, I. (2019). Czynniki rozwoju innowacji w przedsiębiorstwie w świetle teorii ograniczeń. In: I. Krawczyk-Sokołowska (Ed.), *Zrównoważony roz-*

wój w zarządzaniu i finansach (pp. 118-127). Częstochowa: Wydawnictwo Politechniki Częstochowskiej

Krawczyk-Sokołowska, I., Caputa, W., & Łukomska-Szarek, J. (2018). Identification the Activity of Enterprises in Poland from the Perspective of Types of Innovations. In: M. Okręglicka, A. Korombel, & A. Lemańska-Majdzik (Eds.). *Proceedings of the 2nd International Conference "Contemporary Issues in Theory and Practice of Management". CITPM 2018* (pp. 321-328). Częstochowa: Wydawnictwo Wydziału Zarządzania Politechniki Częstochowskiej

Krawczyk-Sokołowska I., Paździor A., & Caputa W. (2019). Crowdsourcing as an Innovative Service Model. In: A. Jabłoński (Ed.), *Hybridization in Network Management* (Chapter 9, pp. 186-212). Nova Science Publishers.

Krawczyk-Sokołowska, I., Pierścieniak, A., & Caputa, W. (2018). Crowdsourcing in public sector activities. In: Bylok F., Albrychiewicz-Słocińska A., & Cichobłaziński L. (Eds.), *Book of Proceedings. ICoM 2018. 8th International Conference on Management "Leadership, Innovativeness and Entrepreneurship in a Sustainable Economy"* (pp. 384-390). Częstochowa: Wydawnictwo Wydziału Zarządzania Politechniki Częstochowskiej

Krawczyk-Sokołowska I., Pierścieniak A., & Caputa, W. (2019). The innovation potential of the enterprise in the context of the economy and the business model. *Review Managerial Science*, published: 30 November 2019. https://doi.org/10.1007/s11846-019-00374-z

Landreth H., & Colander D. C. (2012). *Historia myśli ekonomicznej*. Warszawa: Wydawnictwo Naukowe PWN

Lundvall, B.-Å., & Johnson, B.H. (1994). The learning economy. *Journal of Industry Studies*, *1*(2), 23-42

Manu, A. (2012). *Behavior Space. Play, Pleasure and Discovery as a Model for Business Value*. Routledge

Martin, P. (2000). Carol Ann Rogers. Long-term growth and short-term economic instability. *European Economic Review*, *44*(2), 359-381

NBU (2018). National Bank of Ukraine. Statystyka zovnishn'oho sektoru [External sector statistics] Retrieved from: https://bank.gov.ua/ua/statistic [in Ukrainian]

Nogalski, B. (2009), Modele biznesu jako narzędzia reorientacji strategicznej przedsiębiorstw. *Master of Business Administration*, *17*(2): 3-14

OECD (2019). Official website of the State Service Organisation for Economic Co-operation and Development (OECD). Retrieved from http://www.oecd.org

Olczyk, M., & Kordalska, A. (2017). International Competitiveness of Czech Manufacturing – A Sectoral Approach with Error Correction Model. *Prague Economic Papers*, *26*(2), 213-226. https://doi.org/10.18267/j.pep.605

Pachura, P. (2016). *O przestrzeni w zarządzaniu. Studium metodologiczne*. Warszawa: Wydawnictwo Naukowe PWN

Pierścieniak, A. (2015). *Potencjał organizacji do współpracy zewnętrznej – ujęcie teoretyczne i metodyka pomiaru*. Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego

Poniatowska-Jaksch, M. (2016). Biznes cyfrowy – wyzwania wobec strategii internacjonalizacji przedsiębiorstwa. *Horyzonty Polityki*, *7*(20), 159-175

Porter, M.E. (1986). *Competition in Global Industries*. Boston: Harvard Business School Press

Robinson, J. (1969). *The Economics of Imperfect Competition* (2nd ed.). St. Martin's Press

Sharify, N. (2018). A nonlinear supply-driven input-output model. *Prague Economic Papers*, *27*(4), 494-502. https://doi.org/10.18267/j.pep.657

SOPV (2017). Statistical Office in Podkarpackie Voivodeship. Official site. Retrieved from http://rzeszow.stat.gov.pl [in Polish]

SSSU (2019). State Statistics Service of Ukraine. Official site. Retrieved from http://www.ukrstat.gov.ua [in Ukrainian]

Tan, R.R., Aviso, K.B., Promentilla, M.A.B., Yu, K.D.S., Santos, J.R. (2019). *Input-output models for sustainable industrial systems: implementation using LINGO*. Springer Nature Singapore Pte Ltd. https://doi.org 10.1007/978-981-13-1873-3_5

Taušer, Jo., Arltová, M., & Žamberský, P. (2015). Czech Exports and German Gdp: A Closer Look. *Prague Economic Papers*, *24*(1), 17-37. https://doi.org/10.18267/j.pep.498

Trends in the chemical industry (2017). https://report.basf.com/2017/en/managements-report/basf-group-business-year/economic-environment/chemical-industry.html

UNIDO (2019). United Nations Industrial Development Organization. Classification of manufacturing sectors by technological intensity (ISIC Revision 4). Table 2. Manufacturing industries at the 2-digit level of ISIC Rev 4 by technological intensity. https://stat.unido.org/content/learning-center/classification-of-manufacturing-sectors-by-technological-intensity-%28isic-revision-4%29;jsessionid=B99E902A3918AB9F3DF9859923DFC4F4

Vogstad, K.-O. (2009). Input-Output Analysis and Linear Programming. In: Suh S. (Ed.) *Handbook of Input-Output Economics in Industrial Ecology. Eco-Efficiency in Industry and Science*, vol. 23, Springer. https://doi.org/10.1007/978-1-4020-5737-3_36

Wlodarczyk, A. (2013). The optimization of the structure of the factors of production in the food industry in Poland – the approach based on the production function methodology. In: C.B. Illes, F. Bylok, A. Dunay, L. Cichobłaziński (Eds.), *People, Knowledge and Modern Technologies in the Management of Contemporary Organizations. Theoretical and Practical Approaches* (pp. 225-239). Szent Istvan Egyetemi Kiado Nonprofit Kft.

Annex A

Indicators of import dependence of Ukraine and the EU member states

Table A.1. Share of industrial products in imports of goods and services in Ukraine and the EU-28 member states in 2016, %

Country	Industry	Including:	
		processing industry	mining and quarrying
Ukraine	**79.90**	**69.96**	**9.76**
Belgium	27.34	26.73	0.14
Bulgaria	44.78	41.73	0.08
Czech Republic	42.02	40.80	0.06
Denmark	27.75	27.10	0.17
Germany	43.73	41.77	0.05
Estonia	33.09	…	…
Ireland	32.84	31.85	0.05
Greece	41.71	40.01	0.05
Spain	43.69	41.28	0.05
France	43.52	41.28	0.04
Croatia	38.04	28.34	5.45
Italy	44.72	44.54	0.06
Cyprus	…	8.34	0.02
Latvia	18.32	15.57	0.19
Lithuania	32.81	30.47	0.06
Luxembourg	22.57	…	…
Hungary	55.09	53.62	0.03
Malta	…	…	…
Netherlands	20.63	18.81	…
Austria	40.18	38.61	0.06
Poland	45.87	45.40	0.31
Portugal	43.37	41.37	0.09
Romania	49.06	47.64	0.53
Slovenia	36.19	34.25	0.10
Slovakia	51.77	49.53	0.05
Finland	41.22	39.12	0.14
Sweden	34.21	…	…
United Kingdom	27.62	26.77	0.39

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

Table A.2. Dynamics of total consumption of the processing industry products in Poland, %

The group	The production	Growth rate / decrease in general consumption								
		total			domestic products			imported products		
		2014	2015	2016	2014	2015	2016	2014	2015	2016
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	7.55	12.28	7.26	6.21	9.79	10.38	9.38	15.55	3.35
	Manufacture of computers, electronic and optical products	12.91	–4.41	–1.79	6.51	–22.48	1.28	16.49	4.81	–2.94
	Total	**11.51**	**–0.22**	**0.77**	**6.40**	**–10.83**	**5.32**	**15.15**	**6.74**	**–1.72**
The medium-high-tech	Manufacture of chemicals and chemical products	3.09	1.59	–2.90	2.02	3.12	–2.30	5.65	–1.93	–4.34
	Production of electric equipment	7.53	10.70	0.75	4.04	7.99	–3.73	10.90	13.15	4.62
	Manufacture of machinery and equipment not elsewhere classified	9.31	7.59	0.93	9.14	10.47	–4.45	9.76	0.01	16.54
	Production of motor vehicles, trailers and semitrailers	8.22	5.96	11.05	14.56	–0.17	9.93	5.46	8.86	11.54
	Manufacture of other transport equipment	18.49	37.94	–9.68	44.53	52.16	–22.57	5.26	28.01	1.01
	Total	**7.57**	**7.95**	**2.98**	**8.34**	**7.16**	**–1.70**	**6.80**	**8.74**	**7.64**
The moderately-low-tech	Production of coke and coke products of oil refining	–10.86	–25.31	–12.55	–15.91	–19.97	–6.58	–4.59	–31.17	–20.16
	Manufacture of rubber and plastic products	5.57	4.61	5.00	6.74	6.33	3.62	3.50	1.46	7.64
	Manufacture of other non-metallic mineral products	9.57	1.24	6.62	9.32	0.12	4.26	10.87	7.05	18.05
	Metallurgical production	4.58	–4.61	1.47	1.84	–5.85	–0.24	11.69	–1.65	5.35
	Manufacture of fabricated metal products, except machinery and equipment	2.57	12.46	7.19	3.31	15.62	6.79	0.22	2.01	8.71
	Total	**–1.08**	**–5.65**	**0.52**	**–1.60**	**–1.10**	**1.93**	**–0.05**	**–14.50**	**–2.65**

cont. Table A.2.

The group	The production	Growth rate / decrease in general consumption								
		total			domestic products			imported products		
		2014	2015	2016	2014	2015	2016	2014	2015	2016
The low-tech	Food production; drinks and tobacco products	–0.53	0.41	4.95	–0.43	0.42	3.35	–1.05	0.39	13.56
	Textile production, clothing, leather and other materials	8.66	5.91	5.95	8.07	9.40	3.28	9.90	–1.36	12.10
	Manufacture of wood and paper; printing and duplication	6.43	9.12	1.58	6.75	9.74	1.57	5.22	6.73	1.60
	Furniture production; other products	7.21	9.63	6.11	4.13	12.20	5.79	18.71	1.23	7.26
	Total	**2.10**	**3.41**	**4.28**	**1.85**	**3.76**	**3.09**	**3.22**	**1.86**	**9.67**
Total processing industry		**2.74**	**1.02**	**2.48**	**1.86**	**2.06**	**1.85**	**4.48**	**–0.98**	**3.71**

Source: elaborated by the authors based on CSOP, 2017.

Table A.3. Structure of general consumption of the processing industry products in Poland, %

The group	The production	Total		
		2013	2014	
The high-tech	Manufacture of basic pharmaceutical products and pharmaceuticals	1.58	1.66	
	Manufacture of computers, electronic and optical products	4.49	4.93	
	Total	**6.07**	**6.59**	
The medium-high-tech	Manufacture of hemicals and chemical products	5.56	5.58	
	Production of electric equipment	4.00	4.19	
	Manufacture of machinery and equipment not elsewhere classified	3.36	3.58	
	Production of motor vehicles, trailers and semitrailers	8.51	8.96	
	Manufacture of other transport equipment	1.24	1.43	
	Total	**22.67**	**23.74**	
The moderately-low-tech	Production of coke and coke products of oil refining	14.40	12.49	
	Manufacture of rubber and plastic products	6.81	7.00	
	Manufacture of other non-metallic mineral products	4.35	4.64	
	Metallurgical production	3.76	3.83	
	Manufacture of fabricated metal products, except machinery and equipment	7.62	7.60	
	Total	**36.93**	**35.56**	
The low-tech	Food production; drinks and tobacco products	22.33	21.62	
	Textile production, clothing, leather and other materials	2.29	2.42	
	Manufacture of wood and paper; printing and duplication	7.58	7.85	
	Furniture production; other products	2.13	2.22	
	Total	**34.33**	**34.11**	
Total processing industry		**100.00**	**100.00**	

Source: elaborated by the authors based on CSOP, 2017.

			Domestic products				Imported products			
	2015	2016	2013	2014	2015	2016	2013	2014	2015	2016
	1.84	1.93	1.37	1.43	1.54	1.67	1.99	2.09	2.44	2.43
	4.67	4.47	2.42	2.53	1.92	1.91	8.57	9.56	10.11	9.47
	6.51	**6.40**	**3.80**	**3.96**	**3.46**	**3.58**	**10.56**	**11.64**	**12.55**	**11.89**
	5.61	5.31	5.89	5.90	5.96	5.72	4.90	4.96	4.91	4.53
	4.59	4.51	2.96	3.02	3.20	3.02	6.06	6.43	7.35	7.41
	3.81	3.75	3.68	3.94	4.26	4.00	2.75	2.89	2.92	3.28
	9.40	10.19	3.89	4.37	4.28	4.62	17.64	17.80	19.57	21.05
	1.96	1.73	0.63	0.90	1.34	1.02	2.45	2.47	3.20	3.11
	25.36	**25.49**	**17.04**	**18.13**	**19.03**	**18.37**	**33.80**	**34.55**	**37.94**	**39.38**
	9.23	7.88	12.01	9.92	7.78	7.13	19.10	17.44	12.12	9.33
	7.25	7.43	6.56	6.88	7.17	7.29	7.31	7.24	7.42	7.70
	4.65	4.83	5.50	5.91	5.79	5.93	2.07	2.19	2.37	2.70
	3.62	3.58	4.09	4.09	3.77	3.69	3.11	3.33	3.31	3.36
	8.46	8.85	8.75	8.87	10.05	10.53	5.39	5.17	5.32	5.58
	33.21	**32.58**	**36.92**	**35.66**	**34.56**	**34.58**	**36.97**	**35.37**	**30.54**	**28.67**
	21.49	22.01	28.33	27.70	27.25	27.65	10.47	9.91	10.05	11.00
	2.54	2.63	2.34	2.49	2.67	2.70	2.19	2.30	2.29	2.48
	8.48	8.41	9.05	9.48	10.20	10.17	4.67	4.70	5.07	4.97
	2.41	2.49	2.52	2.58	2.83	2.94	1.34	1.52	1.56	1.61
	34.92	**35.53**	**42.25**	**42.25**	**42.95**	**43.47**	**18.67**	**18.44**	**18.97**	**20.06**
	100.00	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Table A.4. Structure of imports of the processing industry products in Ukraine (by types of

Manufacturing	2013				
	Intermediate consumption	Final consumption	Gross capital accumulation	**Total imports of goods and services**	
Manufacture of food products; beverages and tobacco products	23.77	76.63	–0.40	**100.00**	
Manufacture of textiles, wearing apparel, leather and related products	15.13	88.50	–3.64	**100.00**	
Manufacture of wood, paper, printing and reproduction	88.66	11.68	–0.34	**100.00**	
Manufacture of coke and refined petroleum products	83.76	17.70	–1.46	**100.00**	
Manufacture of chemicals and chemical products	95.66	3.29	1.05	**100.00**	
Manufacture of basic pharmaceutical products and pharmaceutical preparations	59.67	45.28	–4.95	**100.00**	
Manufacture of rubber and plastic products	94.33	2.48	3.19	**100.00**	
Manufacture of other non-metallic mineral products	89.22	10.22	0.56	**100.00**	
Manufacture of basic metals	100.17	0.00	–0.18	**100.00**	
Manufacture of fabricated metal products, except machinery and equipment	95.80	1.31	2.89	**100.00**	
Manufacture of computer, electronic and optical products	29.75	33.24	37.00	**100.00**	
Manufacture of electrical equipment	38.57	24.94	36.49	**100.00**	
Manufacture of machinery and equipment n.e.c.	35.45	0.20	64.36	**100.00**	
Manufacture of motor vehicles, trailers and semi-trailers	29.53	36.23	34.25	**100.00**	
Manufacture of other transport equipment	16.81	10.87	72.32	**100.00**	
Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	11.18	81.97	6.86	**100.00**	
Total processing industry	**58.21**	**27.03**	**14.77**	**100.00**	

Source: elaborated by the authors based on SSSU, 2019.

consumption), %

	2014				2015				2016			
	Intermediate consumption	Final consumption	Gross capital accumulation	**Total imports of goods and services**	Intermediate consumption	Final consumption	Gross capital accumulation	**Total imports of goods and services**	Intermediate consumption	Final consumption	Gross capital accumulation	**Total imports of goods and services**
	22.02	78.03	–0.05	**100.00**	22.71	77.29	0.00	**100.00**	20.59	79.41	0.00	**100.00**
	15.49	85.69	–1.18	**100.00**	14.19	85.43	0.38	**100.00**	12.00	85.25	2.74	**100.00**
	92.22	7.40	0.38	**100.00**	92.40	7.57	0.04	**100.00**	91.69	7.65	0.66	**100.00**
	80.92	20.40	–1.31	**100.00**	74.29	24.17	1.53	**100.00**	87.50	11.53	0.98	**100.00**
	97.53	4.02	–1.55	**100.00**	97.75	4.00	–1.74	**100.00**	93.58	4.98	1.45	**100.00**
	53.34	42.68	3.97	**100.00**	54.73	53.41	–8.14	**100.00**	47.10	49.12	3.77	**100.00**
	95.77	4.89	–0.67	**100.00**	91.07	4.54	4.39	**100.00**	91.46	4.38	4.16	**100.00**
	89.69	11.51	–1.20	**100.00**	84.82	12.79	2.39	**100.00**	86.98	10.79	2.23	**100.00**
	100.24	0.01	–0.24	**100.00**	99.86	0.02	0.12	**100.00**	99.83	0.01	0.16	**100.00**
	95.82	1.83	2.36	**100.00**	82.11	1.86	16.04	**100.00**	83.06	2.15	14.79	**100.00**
	26.43	34.36	39.21	**100.00**	26.34	30.17	43.48	**100.00**	38.75	18.76	42.50	**100.00**
	41.16	22.87	35.97	**100.00**	34.54	26.37	39.09	**100.00**	26.24	24.39	49.38	**100.00**
	51.72	0.70	47.58	**100.00**	40.94	1.35	57.71	**100.00**	51.16	0.25	48.59	**100.00**
	29.83	31.09	39.08	**100.00**	34.83	19.65	45.52	**100.00**	35.78	21.82	42.39	**100.00**
	8.74	7.81	83.45	**100.00**	7.90	19.97	72.13	**100.00**	3.34	11.08	85.58	**100.00**
	30.16	63.55	6.29	**100.00**	29.82	65.50	4.69	**100.00**	24.59	70.55	4.86	**100.00**
	63.01	**25.49**	**11.50**	**100.00**	**60.58**	**25.38**	**14.04**	**100.00**	**59.80**	**23.46**	**16.73**	**100.00**

Annex B

Performance indicators of the textile industry in Ukraine and EU countries

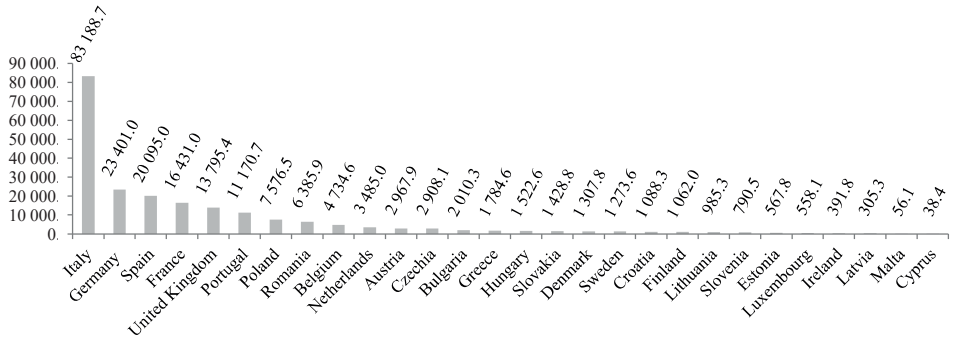


Fig. B.1. Production volume of textile industry in Ukraine and EU countries in 2017, bill. EUR
Source: elaborated by the authors based on SSSU, 2019; Eurostat, 20‹9; OECD, 2019.

Table B.1. Structure of imports of the textile products to Ukraine (in terms of product groups), %

Cargo group		2013		2018		2018/2013	
		amount, thousand USD	in % to result	amount, thousand USD	in % to result	growth / decrease rate, %	deviations in structure, pp.
61.	Knitted clothes	380.8	19.6	260.7	23.18	–31.53	3.20
62.	Textile clothing	510.3	26.3	242.2	21.53	–52.55	–4.90
63.	Other finished textiles	272.8	14.1	270.1	24.02	–1.00	9.43
64.	Shoes, leggings and parts thereof	759.7	39.2	337.7	30.03	–55.55	–9.25
65.	Hats and their parts	16.7	0.9	13.9	1.24	–16.39	0.36
Total		**1940.3**	**100.0**	**1124.7**	**100.00**	**–42.00**	**x**

Source: elaborated by the authors based on SSSU, 2019.

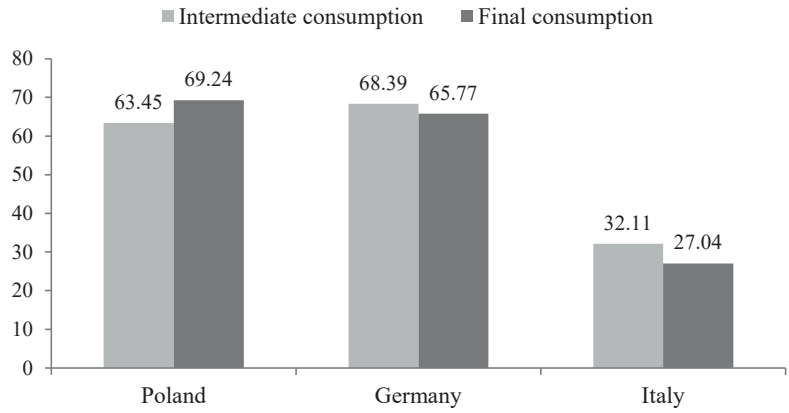


Fig. B.2. Share of imports in intermediate and final consumption of textile products in Poland, Germany and Italy in 2017, %

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

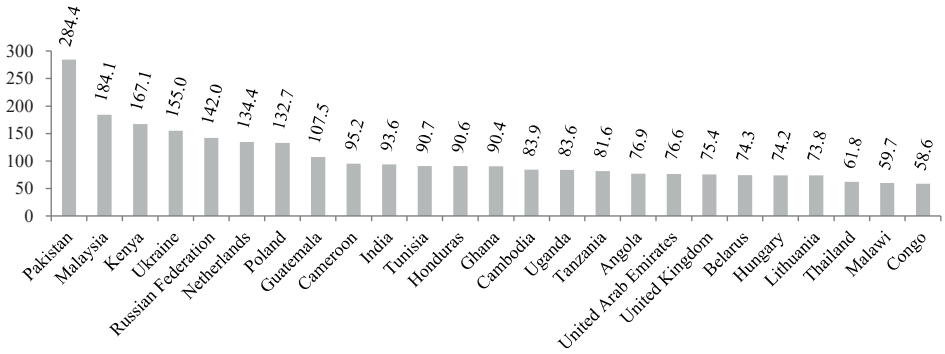


Fig. B.3. TOP-25 countries-importers of clothing and the other products that were in use in 2018, bill. USD

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

Table B.2. Production of textile industry in EU countries

Country	Amount, mln. EUR					In % to result				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Belgium	4983.4	5080.7	5121.5	4804.1	4850.0	2.46	2.45	2.43	2.30	2.28
Bulgaria	1785.8	2009.3	1916.7	2028.6	2094.9	0.88	0.97	0.91	0.97	0.99
Czech Republic	2593.5	2668.3	2737.7	2833.7	3039.6	1.28	1.29	1.30	1.36	1.43
Denmark	1286.3	1223.5	1228.2	1285.5	1340.7	0.63	0.59	0.58	0.62	0.63
Germany	22140.0	23539.0	22507.0	22941.0	23400.0	10.93	11.35	10.68	10.99	11.02
Estonia	448.5	480.2	502.1	550.7	569.2	0.22	0.23	0.24	0.26	0.27
Ireland	398.3	382.6	336.5	332.9	317.3	0.20	0.18	0.16	0.16	0.15
Greece	1667.4	1445.7	1390.3	1356.0	1294.1	0.82	0.70	0.66	0.65	0.61
Spain	18595.0	18598.0	19348.0	19640.0	19976.0	9.18	8.97	9.18	9.41	9.41
France	15896.0	15884.0	16318.0	16121.0	15935.0	7.85	7.66	7.74	7.73	7.51
Croatia	849.2	969.3	1114.8	1139.7	1143.7	0.42	0.47	0.53	0.55	0.54
Italy	82086.7	83200.4	82696.9	81388.0	83343.8	40.51	40.12	39.24	39.00	39.26
Cyprus	29.9	29.7	33.1	34.8	38.5	0.01	0.01	0.02	0.02	0.02
Latvia	356.2	312.1	286.7	282.8	287.2	0.18	0.15	0.14	0.14	0.14
Lithuania	847.1	911.3	928.2	972.2	985.3	0.42	0.44	0.44	0.47	0.46
Luxembourg	670.5	481.7	543.4	537.3	590.7	0.33	0.23	0.26	0.26	0.28
Hungary	1218.4	1292.6	1339.9	1416.4	1501.0	0.60	0.62	0.64	0.68	0.71
Malta	52.1	41.0	42.0	36.1	40.6	0.03	0.02	0.02	0.02	0.02
Netherlands	3359.0	3336.0	3386.0	3496.0	3485.0	1.66	1.61	1.61	1.68	1.64
Austria	3128.1	3187.0	3282.5	2967.2	2977.1	1.54	1.54	1.56	1.42	1.40
Poland	5944.7	6494.0	6876.5	7213.5	7215.4	2.93	3.13	3.26	3.46	3.40
Portugal	9497.9	10055.9	10505.8	10872.1	11170.7	4.69	4.85	4.99	5.21	5.26
Romania	6481.6	6267.0	6246.6	6170.5	6385.9	3.20	3.02	2.96	2.96	3.01
Slovenia	710.9	728.2	720.0	732.8	790.4	0.35	0.35	0.34	0.35	0.37
Slovakia	1349.6	1432.1	1487.1	1470.6	1428.8	0.67	0.69	0.71	0.70	0.67
Finland	1066.0	1051.0	1019.0	1027.0	1062.0	0.53	0.51	0.48	0.49	0.50
Sweden	1233.8	1209.0	1237.5	1277.9	1279.8	0.61	0.58	0.59	0.61	0.60
United Kingdom	13949.8	15047.4	17592.0	15747.8	15749.3	6.88	7.26	8.35	7.55	7.42
Total	**202625.7**	**207357.0**	**210744.0**	**208676.2**	**212292.0**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

Table B.3. Structure of intermediate consumption of textile industry in Poland, Germany and Italy, %

NACE activities	Structure of intermediate consumption			Share of imports in intermediate consumption		
	Poland	Germany	Italy	Poland	Germany	Italy
Agriculture, forestry and fishing	0.82	0.59	0.45	57.23	62.91	22.18
Mining and extraction of energy producing products	0.34	0.07	0.04	65.99	91.67	36.52
Mining and quarrying of non-energy producing products	0.33	0.02	0.00	64.71	69.70	16.67
Mining support service activities	0.03	0.01	0.00	72.22	85.71	50.00
Food products, beverages and tobacco	1.49	1.06	1.18	37.03	33.71	10.01
Textiles, wearing apparel, leather and related products	28.61	25.82	70.59	54.35	62.34	32.57
Wood and of products of wood and cork (except furniture)	1.55	1.57	0.37	60.83	78.98	28.05
Paper products and printing	1.67	1.52	0.79	40.58	58.02	23.24
Coke and refined petroleum products	0.39	0.30	0.09	57.33	49.75	31.47
Chemicals and pharmaceutical products	2.02	3.24	1.32	51.55	57.39	26.13
Rubber and plastics products	5.37	4.93	1.94	53.16	66.82	28.99
Other non-metallic mineral products	0.81	0.67	0.37	51.28	61.57	26.11
Manufacture of basic metals	0.17	0.45	0.26	51.55	62.83	23.29
Fabricated metal products, except machinery and equipment	1.04	1.17	0.57	54.03	63.71	29.04
Computer, electronic and optical products	0.62	0.90	0.20	56.15	66.20	24.12
Electrical equipment	0.84	1.12	0.38	53.61	61.01	26.06
Machinery and equipment n.e.c.	0.56	2.25	0.92	54.94	64.60	27.43
Motor vehicles, trailers and semi-trailers	5.16	11.52	1.37	50.52	72.51	31.71
Other transport equipment	0.50	1.38	0.44	62.15	76.16	29.87
Other manufacturing; repair and installation of machinery and equipment	12.75	13.08	5.54	58.11	76.81	31.03
Electricity, gas, water supply, sewerage, waste and remediation services	1.19	1.21	0.82	59.15	75.14	31.99
Construction	3.60	2.54	1.49	53.26	61.79	27.84
Wholesale and retail trade; repair of motor vehicles	11.61	8.41	3.80	60.64	79.17	36.55
Transportation and storage	2.66	1.86	0.86	60.85	67.92	32.70
Accomodation and food services	0.69	0.70	0.86	54.55	45.91	25.01
Publishing, audiovisual and broadcasting activities	0.75	0.33	0.21	72.98	64.61	31.92
Telecommunications	0.17	0.16	0.08	55.67	34.76	20.62
IT and other information services	0.06	0.21	0.17	13.51	24.64	21.65

cont. Table B.3.

NACE activities	Structure of intermediate consumption			Share of imports in intermediate consumption		
	Poland	Germany	Italy	Poland	Germany	Italy
Financial and insurance activities	0.57	0.43	0.12	65.85	35.53	29.22
Real estate activities	0.36	0.36	0.07	49.28	28.87	19.89
Other business sector services	2.55	2.09	1.22	62.82	61.69	35.21
Public administration and defence; compulsory social security	1.97	4.02	0.67	70.41	82.27	40.85
Education	0.74	1.05	0.12	57.65	76.49	19.87
Human health and social work	5.56	3.36	1.64	69.63	78.14	46.81
Arts, entertainment, recreation and other service activities	2.44	1.59	1.05	65.45	69.15	40.65
Total	**100.00**	**100.00**	**100.00**	**57.01**	**68.39**	**32.11**

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

Table B.4. Cost structure of the textile industry of Poland, Germany and Italy, %

NACE activities	Sectoral cost structure			Share of imports in costs		
	Poland	Germany	Italy	Poland	Germany	Italy
Agriculture, forestry and fishing	2.36	3.57	2.02	12.67	35.73	17.23
Mining and extraction of energy producing products	0.15	0.13	0.03	28.36	78.92	16.84
Mining and quarrying of non-energy producing products	0.05	0.02	0.01	21.74	32.43	71.67
Mining support service activities	0.00	0.00	0.00	0.00	0.00	0.00
Food products, beverages and tobacco	1.49	1.33	2.72	17.37	26.00	16.13
Textiles, wearing apparel, leather and related products	37.04	22.29	32.47	54.35	62.34	32.57
Wood and of products of wood and cork (except furniture)	0.24	0.24	0.27	19.63	24.80	16.97
Paper products and printing	1.32	1.23	1.30	33.16	28.50	17.97
Coke and refined petroleum products	0.88	0.83	0.60	19.02	43.73	23.32
Chemicals and pharmaceutical products	6.60	8.93	6.06	63.61	48.53	43.15
Rubber and plastics products	3.15	2.44	2.37	31.31	31.58	23.27
Other non-metallic mineral products	0.41	0.45	0.33	26.78	25.25	15.73
Manufacture of basic metals	0.17	0.19	0.19	44.16	34.71	24.72
Fabricated metal products, except machinery and equipment	0.89	1.21	1.16	28.54	18.16	10.81
Computer, electronic and optical products	0.19	0.51	0.22	63.86	20.73	25.22

cont. Table B.4.

NACE activities	Sectoral cost structure			Share of imports in costs		
	Poland	Germany	Italy	Poland	Germany	Italy
Electrical equipment	0.21	0.46	0.28	41.94	16.78	17.57
Machinery and equipment n.e.c.	0.76	2.33	1.12	72.27	22.68	20.40
Motor vehicles, trailers and semi-trailers	0.37	0.69	0.28	40.24	13.48	39.72
Other transport equipment	0.07	0.07	0.11	31.03	24.55	7.26
Other manufacturing; repair and installation of machinery and equipment	1.34	1.37	1.40	19.77	21.97	16.86
Electricity, gas, water supply, sewerage, waste and remediation services	3.40	3.60	4.55	5.23	2.95	1.34
Construction	0.81	0.49	0.84	2.79	5.35	1.49
Wholesale and retail trade; repair of motor vehicles	25.87	24.01	20.34	22.39	19.64	17.31
Transportation and storage	4.31	6.04	5.35	34.08	20.74	14.80
Accomodation and food services	0.21	0.32	0.69	7.53	4.66	1.16
Publishing, audiovisual and broadcasting activities	0.13	0.23	0.17	14.29	18.31	9.65
Telecommunications	0.24	0.53	0.64	8.33	8.36	13.76
IT and other information services	0.68	0.87	0.66	22.59	19.84	12.64
Financial and insurance activities	1.34	3.35	3.71	12.46	16.16	12.31
Real estate activities	0.75	2.57	1.81	1.20	0.40	0.73
Other business sector services	3.30	7.31	7.11	14.52	14.82	7.70
Public administration and defence; compulsory social security	0.05	0.08	0.09	20.00	21.14	11.45
Education	0.08	0.10	0.04	8.57	14.11	13.45
Human health and social work	0.62	1.45	0.45	1.09	0.71	1.47
Arts, entertainment, recreation and other service activities	0.53	0.75	0.60	3.80	2.66	1.52
Total	**100.00**	**100.00**	**100.00**	**36.58**	**31.10**	**21.51**

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

Annex C

Structural indicators of the industry of Ukraine and the EU member states (by types of industrial activity)

Table C.1. Place of Ukraine among the EU member states in terms of share of industry in

Rank	Share of industry in the country's output		Share of mining and quarrying in industry output		Share of the processing industry in industry output	
1	Ireland	48.87	Ukraine	**11.67**	Ireland	96.71
2	Slovakia	44.79	Croatia	10.60	Hungary	92.86
3	Czech Republic	44.51	United Kingdom	5.42	Belgium	90.78
4	Hungary	43.98	Netherlands	5.07	Germany	90.05
5	Ukraine	**38.10**	Bulgaria	4.47	Finland	88.13
6	Poland	37.79	Denmark	4.07	Czech Republic	88.07
7	Slovenia	36.90	Poland	3.74	Slovenia	88.04
8	Germany	36.72	Estonia	3.27	Sweden	87.92
9	Romania	35.27	Cyprus	2.85	Lithuania	87.75
10	Bulgaria	34.78	Romania	2.66	Netherlands	87.73
11	Lithuania	33.75	Latvia	2.22	Slovakia	86.07
12	Austria	33.59	Greece	2.09	Italy	85.94
13	Italy	33.42	Sweden	1.80	Denmark	85.05
14	Spain	32.89	Finland	1.55	Poland	84.47
15	Estonia	32.52	Czech Republic	1.51	France	83.80
16	Portugal	32.05	Portugal	1.09	Estonia	83.51
17	Finland	31.03	Slovenia	1.05	Spain	83.23
18	Croatia	30.43	Austria	0.99	Luxembourg	83.05
19	Belgium	28.94	Spain	0.90	Greece	82.70
20	Sweden	26.44	Italy	0.89	Austria	82.26
21	Netherlands	26.24	Lithuania	0.88	Romania	81.73
22	France	23.29	Slovakia	0.70	Bulgaria	81.41
23	Greece	22.74	Luxembourg	0.61	Portugal	80.61
24	Latvia	22.65	Germany	0.58	Latvia	75.87
25	Denmark	22.60	France	0.56	Ukraine	**75.57**
26	United Kingdom	20.78	Ireland	0.55	Malta	73.82
27	Malta	14.06	Hungary	0.38	United Kingdom	72.80
28	Cyprus	10.78	Belgium	0.25	Croatia	71.54
29	Luxembourg	6.39	Malta	…	Cyprus	70.93

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

output in 2015, %

	Share of electricity, gas, steam and air conditioning supply in industry output		Share of water supply; sewerage, waste management in industry output	
	Cyprus	18.35	Cyprus	7.87
	Latvia	18.19	Greece	5.43
	United Kingdom	16.51	United Kingdom	5.26
	Portugal	14.41	Malta	4.82
	Croatia	13.50	Luxembourg	4.45
	Austria	13.26	Belgium	4.43
	Romania	12.86	Denmark	4.39
	Spain	12.04	Croatia	4.36
	Luxembourg	11.89	Italy	4.30
	Bulgaria	11.73	France	4.06
	Slovakia	11.68	Portugal	3.89
	France	11.59	Slovenia	3.84
	Ukraine	**11.08**	Spain	3.83
	Estonia	9.81	Latvia	3.71
	Greece	9.77	Austria	3.49
	Italy	8.87	Estonia	3.41
	Poland	8.82	Sweden	3.38
	Lithuania	8.34	Finland	3.11
	Czech Republic	7.97	Germany	3.09
	Finland	7.22	Lithuania	3.03
	Slovenia	7.07	Poland	2.96
	Sweden	6.89	Romania	2.75
	Denmark	6.50	Netherlands	2.72
	Germany	6.28	Czech Republic	2.45
	Netherlands	4.96	Bulgaria	2.39
	Hungary	4.65	Hungary	2.11
	Belgium	4.54	Ukraine	**1.69**
	Ireland	2.14	Slovakia	1.55
	Malta	…	Ireland	0.60

Table C.2. Place of Ukraine among the EU member states in terms of share of industry in gross

Rank	Share of industry in gross value added of the country		Share of mining and quarrying in gross value added of the industry		Share of the processing industry in gross value added of the industry	
1	Ireland	39.11	Ukraine	**24.20**	Ireland	94.42
2	Czech Republic	32.16	Netherlands	13.35	Germany	88.80
3	Hungary	27.57	Bulgaria	10.46	Hungary	88.66
4	Romania	27.38	Croatia	8.82	Lithuania	85.76
5	Slovenia	27.08	Denmark	8.08	Slovenia	85.25
6	Slovakia	26.36	United Kingdom	7.60	Austria	85.22
7	Poland	26.31	Poland	6.69	Belgium	85.20
8	Germany	25.92	Estonia	6.51	Italy	85.03
9	Bulgaria	23.53	Romania	3.74	Czech Republic	83.38
10	Ukraine	**23.27**	Greece	3.45	Malta	83.15
11	Lithuania	22.47	Latvia	3.12	Finland	83.08
12	Austria	21.78	Czech Republic	2.83	Slovakia	83.01
13	Estonia	21.52	Sweden	2.25	Sweden	82.57
14	Croatia	21.30	Cyprus	2.11	France	81.40
15	Finland	20.65	Slovakia	1.89	Romania	81.35
16	Italy	18.78	Portugal	1.74	Denmark	80.17
17	Sweden	18.71	Austria	1.73	Spain	78.93
18	Portugal	18.33	Finland	1.70	Portugal	76.03
19	Denmark	18.25	Italy	1.57	Latvia	75.93
20	Spain	18.01	Slovenia	1.38	Netherlands	75.75
21	Belgium	16.75	Lithuania	1.30	Luxembourg	75.62
22	Latvia	15.77	Spain	1.26	Poland	74.87
23	Netherlands	15.69	Ireland	0.97	Estonia	74.26
24	France	14.16	France	0.76	United Kingdom	72.05
25	United Kingdom	13.95	Luxembourg	0.76	Croatia	70.53
26	Greece	13.52	Germany	0.67	Greece	69.65
27	Malta	10.93	Hungary	0.59	Bulgaria	66.98
28	Cyprus	7.51	Belgium	0.38	Cyprus	64.46
29	Luxembourg	7.09	Malta	…	Ukraine	**60.21**

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

value added in 2015, %

	Share of electricity, gas, steam and air conditioning supply in gross value added of the industry		Share of water supply; sewerage, waste management in gross value added of the industry	
	Cyprus	22.50	Cyprus	10.94
	Bulgaria	18.04	Greece	10.40
	Greece	16.51	Luxembourg	8.89
	Portugal	15.84	Malta	8.15
	Latvia	15.08	United Kingdom	7.21
	Estonia	14.98	Croatia	7.15
	Luxembourg	14.74	Portugal	6.39
	Spain	14.14	Latvia	5.88
	Ukraine	**13.58**	Belgium	5.87
	Croatia	13.50	Spain	5.66
	Poland	13.43	France	5.10
	France	12.74	Poland	5.01
	United Kingdom	12.03	Italy	4.91
	Sweden	11.68	Austria	4.75
	Romania	11.56	Finland	4.72
	Slovakia	11.27	Bulgaria	4.51
	Czech Republic	10.55	Lithuania	4.51
	Finland	10.50	Estonia	4.25
	Slovenia	9.77	Germany	4.15
	Belgium	8.55	Denmark	4.08
	Italy	8.48	Slovakia	3.83
	Lithuania	8.43	Netherlands	3.79
	Austria	8.30	Slovenia	3.60
	Denmark	7.67	Sweden	3.49
	Hungary	7.30	Hungary	3.45
	Netherlands	7.11	Romania	3.36
	Germany	6.38	Czech Republic	3.24
	Ireland	3.58	Ukraine	**2.02**
	Malta	…	Ireland	1.04

Table C.3. Place of Ukraine among the EU member states in terms of share of gross value

Rank	Share of gross value added in industry output		Share of gross value added in output of mining and quarrying		Share of gross value added in output of the processing industry	
1	Denmark	40.39	Denmark	80.18	Denmark	38.07
2	Sweden	35.75	Netherlands	74.57	United Kingdom	34.77
3	Germany	35.25	Bulgaria	64.47	Germany	34.76
4	United Kingdom	35.13	Slovakia	60.50	Romania	34.69
5	Romania	34.85	Ireland	57.80	Croatia	34.14
6	Lithuania	34.65	Estonia	56.84	Lithuania	33.86
7	Croatia	34.63	United Kingdom	56.44	Sweden	33.57
8	Cyprus	33.88	Poland	55.69	Slovenia	32.64
9	Slovenia	33.71	Austria	54.70	Austria	32.55
10	Greece	33.13	Greece	54.66	Ireland	32.17
11	Ireland	32.95	Czech Republic	52.76	Latvia	31.71
12	Latvia	31.68	Lithuania	51.28	Cyprus	30.79
13	Austria	31.42	Ukraine	**51.10**	France	30.14
14	Finland	31.17	Romania	48.94	Malta	29.44
15	Poland	31.16	Italy	47.02	Finland	29.38
16	France	31.03	Portugal	44.83	Greece	27.90
17	Estonia	28.52	Sweden	44.67	Poland	27.62
18	Luxembourg	28.44	Latvia	44.48	Czech Republic	26.60
19	Netherlands	28.34	Slovenia	44.17	Portugal	26.58
20	Portugal	28.19	France	42.41	Italy	26.36
21	Czech Republic	28.10	Hungary	41.34	Luxembourg	25.89
22	Bulgaria	27.51	Germany	**40.53**	Estonia	25.36
23	Italy	26.65	Belgium	38.44	Hungary	25.25
24	Spain	26.54	Spain	37.40	Spain	25.17
25	Hungary	26.45	Luxembourg	35.09	Netherlands	24.47
26	Malta	26.13	Finland	34.18	Belgium	23.65
27	Belgium	25.20	Croatia	28.81	Bulgaria	22.63
28	Ukraine	**24.63**	Cyprus	25.10	Slovakia	21.62
29	Slovakia	22.42	Malta	…	Ukraine	**19.63**

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

added in industrial output in 2015, %

	Share of gross value added in output of electricity, gas, steam and air conditioning supply		Share of gross value added in output of water supply; sewerage, waste management	
	Sweden	60.62	Greece	63.42
	Greece	55.95	Ireland	57.04
	Ireland	55.01	Luxembourg	56.79
	Denmark	47.69	Croatia	56.78
	Poland	47.44	Slovakia	55.52
	Belgium	47.43	Poland	52.78
	Slovenia	46.58	Bulgaria	51.84
	Finland	45.34	Lithuania	51.48
	Estonia	43.56	Latvia	50.19
	Bulgaria	42.32	United Kingdom	48.10
	Cyprus	41.54	Germany	47.44
	Hungary	41.50	Finland	47.31
	Netherlands	40.63	Cyprus	47.06
	Czech Republic	37.20	Portugal	46.35
	Germany	35.83	Malta	44.19
	Luxembourg	35.25	Hungary	43.36
	Lithuania	35.04	Austria	42.85
	Croatia	34.63	Romania	42.63
	France	34.11	Netherlands	39.56
	Romania	31.32	Spain	39.23
	Spain	31.18	France	38.98
	Portugal	30.97	Denmark	37.55
	Ukraine	**30.20**	Czech Republic	37.09
	Latvia	26.25	Sweden	36.95
	United Kingdom	25.61	Estonia	35.56
	Italy	25.49	Belgium	33.38
	Slovakia	21.62	Slovenia	31.60
	Austria	19.66	Italy	30.46
	Malta	…	Ukraine	**29.37**

Table C.4. Place of Ukraine among the EU member states in terms of share of industry

Rank	Share of industry in gross value added exports of all types of economic activity		Share of mining and quarrying in gross value added exports of the industry		Share of the processing industry in gross value added exports of the industry	
1	Romania	57.22	Ukraine	**19.91**	Austria	99.57
2	Ireland	55.53	Croatia	8.15	Malta	98.72
3	Finland	53.79	Denmark	6.99	Italy	98.62
4	Luxembourg	53.09	Poland	5.47	Ireland	96.99
5	Sweden	50.48	Latvia	3.23	Romania	96.76
6	Croatia	50.06	Bulgaria	3.08	Germany	96.66
7	Germany	49.81	Portugal	2.28	Latvia	96.66
8	Bulgaria	47.32	United Kingdom	2.13	United Kingdom	96.24
9	Denmark	46.67	Romania	1.93	Lithuania	95.77
10	Poland	45.53	Estonia	1.49	France	95.24
11	Italy	44.42	Greece	0.94	Hungary	94.92
12	Austria	44.18	Czech Republic	0.92	Slovenia	94.41
13	Portugal	42.79	Lithuania	0.87	Sweden	93.91
14	Estonia	42.45	Finland	0.77	Spain	93.53
15	Hungary	40.84	Ireland	0.72	Finland	92.77
16	Slovenia	40.62	Spain	0.68	Portugal	92.61
17	France	40.33	Austria	0.45	Belgium	92.57
18	Czech Republic	40.13	Italy	0.31	Czech Republic	91.70
19	Greece	39.90	Belgium	0.28	Luxembourg	90.23
20	Slovakia	37.98	Germany	0.14	Denmark	90.02
21	Ukraine	**37.21**	Luxembourg	0.09	Slovakia	88.15
22	United Kingdom	34.98	Hungary	0.09	Netherlands	85.57
23	Spain	33.61	Slovakia	…	Poland	85.39
24	Lithuania	31.84	Malta	…	Cyprus	85.08
25	Latvia	27.07	France	…	Estonia	85.00
26	Belgium	19.49	Cyprus	…	Croatia	84.31
27	Netherlands	16.73	Netherlands	…	Greece	83.09
28	Malta	15.27	Slovenia	…	Bulgaria	79.00
29	Cyprus	14.62	Sweden	…	Ukraine	**70.92**

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

in exports of gross value added in 2015, %

	Share of electricity, gas, steam and air conditioning supply in gross value added exports of the industry		Share of water supply; sewerage, waste management in gross value added exports of the industry	
	Estonia	4.43	Cyprus	8.87
	Bulgaria	3.75	Croatia	2.42
	Slovenia	3.46	United Kingdom	1.92
	Croatia	3.21	Latvia	1.56
	Czech Republic	2.80	Belgium	1.42
	Malta	1.54	Lithuania	1.32
	Ukraine	**1.49**	Romania	1.26
	Germany	1.46	Netherlands	1.25
	France	1.30	Malta	1.08
	Greece	0.79	France	0.96
	Luxembourg	0.75	Estonia	0.95
	Spain	0.72	Denmark	0.92
	Finland	0.62	Poland	0.83
	Lithuania	0.54	Finland	0.72
	Romania	0.34	Czech Republic	0.71
	Hungary	0.33	Austria	0.67
	Belgium	0.22	Portugal	0.62
	Poland	0.16	Greece	0.56
	Austria	0.14	Germany	0.56
	Latvia	0.10	Hungary	0.51
	Ireland	0.06	Luxembourg	0.46
	United Kingdom	0.01	Bulgaria	0.42
	Portugal	0.01	Spain	0.41
	Italy	…	Slovakia	0.46
	Denmark	…	Ireland	0.36
	Cyprus	…	Ukraine	**0.21**
	Netherlands	…	Italy	0.17
	Slovakia	…	Slovenia	…
	Sweden	…	Sweden	…

Table C.5. Place of Ukraine among the EU member states in terms of coefficient of structural

Rank	Industry		Mining and quarrying		Processing industry	
1	Ireland	0.444	Ukraine	**0.413**	Austria	0.998
2	Romania	0.444	Denmark	0.139	Italy	0.976
3	Denmark	0.377	Poland	0.098	Latvia	0.967
4	Finland	0.358	Bulgaria	0.072	Romania	0.963
5	Sweden	0.357	Croatia	0.068	Germany	0.953
6	Germany	0.352	Latvia	0.045	United Kingdom	0.952
7	Croatia	0.350	Portugal	0.036	Ireland	0.947
8	Bulgaria	0.320	United Kingdom	0.034	Lithuania	0.936
9	Poland	0.317	Estonia	0.030	France	0.925
10	Slovenia	0.298	Romania	0.027	Slovenia	0.914
11	Czech Republic	0.290	Czech Republic	0.017	Hungary	0.906
12	Austria	0.286	Greece	0.016	Spain	0.887
13	Estonia	0.281	Lithuania	0.013	Sweden	0.882
14	Hungary	0.256	Ireland	0.013	Finland	0.875
15	Italy	0.250	Spain	0.010	Portugal	0.873
16	France	0.245	Finland	0.008	Belgium	0.869
17	Portugal	0.245	Austria	0.008	Czech Republic	0.868
18	Greece	0.237	Italy	0.005	Slovakia	0.850
19	United Kingdom	0.235	Belgium	0.004	Denmark	0.849
20	Ukraine	**0.227**	Germany	0.002	Croatia	0.831
21	Slovakia	0.224	Hungary	0.001	Luxembourg	0.822
22	Lithuania	0.212	Luxembourg	0.001	Cyprus	0.773
23	Latvia	0.189	Malta	…	Poland	0.757
24	Spain	0.184	France	…	Estonia	0.756
25	Luxembourg	0.157	Cyprus	…	Netherlands	0.739
26	Malta	0.119	Netherlands	…	Greece	0.700
27	Belgium	0.113	Slovenia	…	Bulgaria	0.650
28	Cyprus	0.102	Slovakia	…	Ukraine	**0.565**
29	Netherlands	0.100	Sweden	…	Malta	0.273

Source: elaborated by the authors' calculations according to tables C.1–C.4

advantages of industry in 2015, %

	Electricity, gas, steam and air conditioning supply		Water supply; sewerage, waste management and remediation activities	
	Estonia	0.068	Cyprus	0.123
	Bulgaria	0.058	Croatia	0.040
	Slovenia	0.048	United Kingdom	0.026
	Czech Republic	0.037	Latvia	0.025
	Croatia	0.032	Lithuania	0.020
	Ukraine	**0.018**	Belgium	0.019
	Germany	0.015	Malta	0.018
	France	0.014	Netherlands	0.017
	Greece	0.013	Romania	0.015
	Luxembourg	0.009	Poland	0.014
	Finland	0.009	France	0.012
	Spain	0.008	Estonia	0.012
	Lithuania	0.005	Slovakia	0.011
	Hungary	0.005	Finland	0.011
	Belgium	0.004	Greece	0.011
	Romania	0.003	Portugal	0.010
	Poland	0.002	Czech Republic	0.009
	Ireland	0.001	Luxembourg	0.009
	Austria	0.001	Austria	0.009
	Latvia	0.001	Denmark	0.009
	Portugal	…	Hungary	0.008
	Italy	…	Bulgaria	0.008
	Malta	…	Germany	0.008
	United Kingdom	…	Ireland	0.006
	Denmark	…	Spain	0.006
	Cyprus	…	Ukraine	**0.003**
	Netherlands	…	Italy	0.002
	Slovakia	…	Slovenia	…
	Sweden	…	Sweden	…

Annex D

Absolute indicators of functioning of industry of Ukraine and the EU member states (by types of industrial activity)

Table D.1. Place of Ukraine among the EU member states in terms of industrial output

Rank	Industry		Mining and quarrying		Processing
1	Germany	2018980.0	United Kingdom	49994.5	Germany
2	Italy	1046507.5	Netherlands	17279.0	Italy
3	United Kingdom	921908.4	Poland	12049.9	France
4	France	896106.0	Germany	11689.0	United Kingdom
5	Spain	664887.0	Italy	9340.9	Spain
6	Netherlands	340555.0	Ukraine	**7684.8**	Netherlands
7	Poland	321844.8	Spain	5954.0	Poland
8	Ireland	281093.5	France	4978.0	Ireland
9	Belgium	244132.8	Denmark	4337.5	Belgium
10	Austria	213017.7	Sweden	3757.3	Sweden
11	Sweden	208175.2	Romania	2945.6	Austria
12	Czech Republic	173503.9	Czech Republic	2616.7	Czech Republic
13	Finland	119813.0	Croatia	2415.1	Finland
14	Romania	110731.5	Austria	2114.4	Denmark
15	Denmark	106602.6	Finland	1858.0	Romania
16	Portugal	102012.7	Ireland	1555.0	Hungary
17	Hungary	96911.1	Bulgaria	1495.0	Portugal
18	Slovakia	83731.7	Greece	1327.9	Slovakia
19	Ukraine	**65872.0**	Portugal	1116.4	Greece
20	Greece	63529.3	Belgium	607.5	Ukraine
21	Bulgaria	33482.4	Slovakia	586.4	Bulgaria
22	Slovenia	26972.3	Estonia	434.2	Slovenia
23	Croatia	22786.3	Hungary	367.7	Lithuania
24	Lithuania	21863.8	Slovenia	284.1	Croatia
25	Estonia	13288.2	Latvia	236.5	Estonia
26	Luxembourg	11764.2	Lithuania	191.9	Luxembourg
27	Latvia	10633.5	Cyprus	98.4	Latvia
28	Cyprus	3456.9	Luxembourg	72.1	Malta
29	Malta	3411.5	Malta	…	Cyprus

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

in 2015, million euros

industry	Electricity, gas, steam and air conditioning supply		Water supply; sewerage, waste management and remediation activities	
1818150.0	United Kingdom	152201.6	Germany	62327.0
899403.3	Germany	126814.0	United Kingdom	48534.1
750897.0	France	103863.0	Italy	44964.9
671178.2	Italy	92798.3	France	36368.0
553403.0	Spain	80044.0	Spain	25486.0
298766.0	Poland	28393.2	Belgium	10813.9
271874.0	Austria	28250.0	Poland	9527.7
271836.1	Netherlands	16882.0	Netherlands	9251.0
221624.7	Portugal	14699.9	Austria	7427.2
183033.6	Sweden	14344.8	Sweden	7039.5
175226.1	Romania	14243.4	Denmark	4675.2
152799.3	Czech Republic	13832.5	Czech Republic	4255.3
105586.0	Belgium	11086.7	Portugal	3967.1
90664.2	Slovakia	9781.4	Finland	3724.0
90502.2	Finland	8645.0	Greece	3451.2
89994.3	Ukraine	**7295.8**	Romania	3040.4
82229.2	Denmark	6925.7	Hungary	2041.9
72068.4	Greece	6209.4	Ireland	1680.8
52540.8	Ireland	6021.5	Slovakia	1295.5
49777.6	Hungary	4507.2	Ukraine	**1113.6**
27259.0	Bulgaria	3927.1	Slovenia	1036.7
23745.4	Croatia	3075.7	Croatia	993.5
19185.9	Latvia	1934.5	Bulgaria	801.3
16302.0	Slovenia	1906.2	Lithuania	663.0
11097.2	Lithuania	1823.1	Luxembourg	523.7
9769.9	Luxembourg	1398.4	Estonia	453.3
8068.1	Estonia	1303.5	Latvia	394.5
2518.2	Cyprus	634.3	Cyprus	272.2
2452.1	Malta	…	Malta	164.5

Table D.2. Place of Ukraine among the EU member states in terms of gross value added

Rank	Industry		Mining and quarrying		Processing
1	Germany	711692.0	United Kingdom	28215.6	Germany
2	United Kingdom	323877.2	Netherlands	12885.0	Italy
3	Italy	278865.9	Poland	6710.6	United Kingdom
4	France	278030.0	Italy	4391.8	France
5	Spain	176484.0	Germany	4738.0	Spain
6	Poland	100295.4	Ukraine	**3926.8**	Ireland
7	Netherlands	96515.0	Denmark	3477.8	Poland
8	Ireland	92618.2	Spain	2227.0	Netherlands
9	Sweden	74424.2	France	2111.0	Sweden
10	Austria	66936.6	Sweden	1678.2	Austria
11	Belgium	61519.0	Romania	1441.6	Belgium
12	Czech Republic	48753.0	Czech Republic	1380.5	Czech Republic
13	Denmark	43053.3	Austria	1156.6	Denmark
14	Romania	38591.7	Bulgaria	963.8	Romania
15	Finland	37341.0	Ireland	898.8	Finland
16	Portugal	28753.0	Greece	725.8	Hungary
17	Hungary	25633.1	Croatia	695.8	Portugal
18	Greece	21047.4	Finland	635.0	Slovakia
19	Slovakia	18773.0	Portugal	500.5	Greece
20	Ukraine	**16226.3**	Slovakia	354.8	Ukraine
21	Bulgaria	9209.9	Estonia	246.8	Slovenia
22	Slovenia	9092.0	Belgium	233.5	Lithuania
23	Croatia	7890.1	Hungary	152.0	Bulgaria
24	Lithuania	7575.0	Slovenia	125.5	Croatia
25	Estonia	3790.4	Latvia	105.2	Estonia
26	Latvia	3369.1	Lithuania	98.4	Latvia
27	Luxembourg	3345.4	Luxembourg	25.3	Luxembourg
28	Cyprus	1171.2	Cyprus	24.7	Cyprus
29	Malta	891.5	Malta	…	Malta

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

of industry in 2015, million euros

industry	Electricity, gas, steam and air conditioning supply		Water supply; sewerage, waste management and remediation activities	
631954.0	Germany	45435.0	Germany	29565.0
237121.4	United Kingdom	38971.4	United Kingdom	23346.7
233343.4	France	35430.0	France	14176.0
226313.0	Spain	24960.0	Italy	13696.2
139300.0	Italy	23656.4	Spain	9997.0
87448.2	Poland	13469.3	Poland	5028.3
75087.1	Sweden	8695.7	Netherlands	3660.0
73110.0	Netherlands	6860.0	Belgium	3609.4
61449.3	Austria	5554.1	Austria	3182.4
57043.4	Belgium	5258.9	Sweden	2601.1
52417.2	Czech Republic	5145.7	Greece	2188.7
40648.8	Portugal	4553.2	Portugal	1838.7
34516.9	Romania	4460.5	Finland	1762.0
31393.3	Finland	3920.0	Denmark	1755.5
31024.0	Greece	3474.4	Czech Republic	1578.1
22725.2	Ireland	3312.5	Romania	1296.2
21860.6	Denmark	3303.1	Ireland	958.7
15584.2	Ukraine	**2203.4**	Hungary	885.4
14658.5	Slovakia	2114.8	Slovakia	719.2
9769.1	Hungary	1870.6	Croatia	564.1
7750.9	Bulgaria	1661.9	Bulgaria	415.4
6496.5	Croatia	1065.0	Lithuania	341.3
6168.8	Slovenia	887.9	Slovenia	327.6
5565.2	Lithuania	638.8	Ukraine	**327.1**
2814.6	Estonia	567.8	Luxembourg	297.4
2558.0	Latvia	507.9	Latvia	198.0
2529.7	Luxembourg	493.0	Estonia	161.2
755.0	Cyprus	263.5	Cyprus	128.1
741.3	Malta	…	Malta	72.7

Table D.3. Place of Ukraine among the EU member states in terms of gross value added exports

Rank	Industry		Mining and quarrying		Processing
1	Germany	296863.9	Poland	2001.39	Germany
2	France	94085.2	United Kingdom	1614.53	France
3	Italy	86853.3	Denmark	1404.35	Italy
4	United Kingdom	75830.0	Ukraine	**1289.74**	United Kingdom
5	Spain	41470.5	Germany	405.28	Spain
6	Netherlands	40823.5	Spain	283.03	Netherlands
7	Poland	36583.2	Romania	271.22	Poland
8	Sweden	32180.1	Italy	268.42	Austria
9	Belgium	30367.7	Portugal	238.65	Sweden
10	Austria	29494.7	Croatia	235.42	Belgium
11	Ireland	25699.3	Czech Republic	203.67	Ireland
12	Czech Republic	22215.5	Ireland	184.66	Czech Republic
13	Denmark	20097.0	Bulgaria	135.64	Denmark
14	Hungary	15300.9	Austria	132.72	Hungary
15	Romania	14024.5	Finland	104.81	Romania
16	Finland	13568.9	Belgium	86.40	Finland
17	Portugal	10463.5	Greece	54.13	Portugal
18	Slovakia	9413.5	Latvia	43.57	Slovakia
19	Ukraine	**6477.2**	Lithuania	33.02	Slovenia
20	Greece	5743.8	Estonia	31.45	Greece
21	Slovenia	5373.3	Hungary	13.35	Ukraine
22	Bulgaria	4401.1	Luxembourg	1.84	Lithuania
23	Lithuania	3794.5	France	…	Bulgaria
24	Croatia	2887.6	Cyprus	…	Croatia
25	Estonia	2116.9	Malta	…	Luxembourg
26	Luxembourg	2098.6	Netherlands	…	Estonia
27	Latvia	1347.5	Slovenia	…	Latvia
28	Cyprus	210.4	Slovakia	…	Cyprus
29	Malta	121.3	Sweden	…	Malta

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

of industry in 2015, million euros

industry	Electricity, gas, steam and air conditioning supply		Water supply; sewerage, waste management and remediation activities	
286959.47	Germany	4319.55	Germany	1668.99
89609.44	France	1225.91	United Kingdom	1456.04
85653.29	Czech Republic	622.22	France	907.33
72980.39	Spain	298.38	Netherlands	510.45
38785.94	Slovenia	185.71	Belgium	431.52
34933.40	Bulgaria	164.97	Poland	301.87
31238.78	Ukraine	**96.23**	Austria	198.55
30259.61	Estonia	93.69	Denmark	184.80
30219.60	Croatia	92.71	Romania	176.09
28110.67	Finland	84.02	Spain	171.01
24926.21	Belgium	66.24	Czech Republic	157.26
20371.99	Poland	56.78	Italy	146.01
18090.58	Hungary	49.83	Finland	97.62
14523.80	Romania	48.37	Ireland	92.96
13569.58	Greece	45.57	Hungary	78.06
12587.29	Austria	40.48	Croatia	69.82
9689.93	Lithuania	20.51	Portugal	64.43
8298.34	Ireland	16.53	Lithuania	50.20
5073.12	Luxembourg	15.77	Slovakia	43.29
4772.27	United Kingdom	11.08	Greece	32.39
4593.43	Latvia	1.28	Latvia	21.06
3633.84	Portugal	0.96	Estonia	20.17
3477.00	Italy	0.75	Cyprus	18.67
2434.56	Denmark	…	Bulgaria	18.38
1893.45	Cyprus	…	Ukraine	**13.62**
1799.28	Malta	…	Luxembourg	9.68
1302.54	Netherlands	…	Malta	4.66
179.03	Slovakia	…	Slovenia	…
133.23	Sweden	…	Sweden	…

Table D.4. Place of Ukraine among the EU member states in terms of industrial product exports

Rank	Industry		Mining and quarrying		Processing
1	Germany	842165.37	Poland	3593.80	Germany
2	Italy	325936.79	United Kingdom	2860.75	Italy
3	France	303241.82	Ukraine	**2524.10**	France
4	United Kingdom	215848.31	Denmark	1751.50	United Kingdom
5	Spain	156236.11	Germany	999.86	Spain
6	Netherlands	144046.48	Croatia	817.14	Netherlands
7	Belgium	120511.76	Spain	756.69	Belgium
8	Poland	117394.29	Italy	570.89	Poland
9	Austria	93863.47	Romania	554.18	Austria
10	Sweden	90012.46	Portugal	532.33	Sweden
11	Czech Republic	79061.27	Czech Republic	386.05	Ireland
12	Ireland	77996.60	Ireland	319.48	Czech Republic
13	Hungary	57848.22	Finland	306.67	Hungary
14	Denmark	49761.48	Austria	242.63	Denmark
15	Finland	43537.40	Belgium	224.79	Finland
16	Slovakia	41986.39	Bulgaria	210.39	Romania
17	Romania	40240.76	Greece	99.03	Slovakia
18	Portugal	37123.35	Latvia	97.94	Portugal
19	Ukraine	**25929.60**	Lithuania	64.40	Ukraine
20	Greece	17336.91	Estonia	55.33	Greece
21	Bulgaria	16000.03	Hungary	32.29	Slovenia
22	Slovenia	15940.54	Luxembourg	5.26	Bulgaria
23	Lithuania	10952.15	Malta	0.95	Lithuania
24	Croatia	8339.33	France	…	Luxembourg
25	Estonia	7421.20	Cyprus	…	Croatia
26	Luxembourg	7379.66	Netherlands	…	Estonia
27	Latvia	4253.10	Slovenia	…	Latvia
28	Cyprus	621.12	Slovakia	…	Cyprus
29	Malta	464.08	Sweden	…	Malta

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

in 2015, million euros

industry	Electricity, gas, steam and air conditioning supply		Water supply; sewerage, waste management and remediation activities	
825590.73	Germany	12056.32	Germany	3518.45
324883.59	France	3593.75	United Kingdom	3026.87
297320.35	Czech Republic	1672.63	France	2327.73
209917.43	Spain	956.88	Belgium	1292.85
154086.56	Slovenia	398.70	Netherlands	1290.20
142756.28	Bulgaria	389.82	Poland	571.98
118854.47	Ukraine	**318.60**	Denmark	492.16
113108.81	Croatia	267.73	Italy	479.36
92951.55	Estonia	215.08	Austria	463.38
90012.46	Austria	205.91	Spain	435.98
77484.09	Finland	185.28	Czech Republic	424.04
76578.55	Romania	154.46	Romania	413.03
57515.84	Belgium	139.65	Finland	206.32
47517.82	Hungary	120.06	Hungary	180.03
42839.13	Poland	119.70	Ireland	162.98
39119.08	Greece	81.44	Portugal	139.02
38375.27	Lithuania	58.54	Croatia	122.97
36448.90	Luxembourg	44.72	Lithuania	97.52
23 405.50	United Kingdom	43.27	Slovakia	77.98
17105.36	Ireland	30.05	Estonia	56.71
15541.84	Latvia	4.88	Greece	51.07
15364.35	Portugal	3.10	Ukraine	**46.40**
10731.70	Italy	2.94	Latvia	41.97
7312.63	Denmark	…	Cyprus	39.66
7131.49	Cyprus	…	Bulgaria	35.46
7094.09	Malta	…	Luxembourg	17.04
4108.31	Netherlands	…	Malta	10.54
581.46	Slovakia	…	Slovenia	…
452.59	Sweden	…	Sweden	…

Annex E

Share of gross operating surplus and net mixed income in the structure of gross value added of industry of Ukraine and the EU member states

Table E.1. Share of gross operating surplus and net mixed income in the structure of gross value

Country	Industry			Mining and quarrying			Processing	
	2013	2014	2015	2013	2014	2015	2013	
Ukraine	**36.2**	**43.3**	**46.71**	**56.1**	**30.0**	**64.44**	**26.9**	
Austria	45.3	44.7	44.66	76.6	74.7	67.70	42.7	
Belgium	41.7	42.4	46.32	38.3	37.6	31.63	39.4	
Bulgaria	54.3	52.2	54.23	57.9	58.6	69.36	50.0	
United Kingdom	41.4	41.5	41.24	75.5	72.9	66.66	31.1	
Greece	62.7	62.2	62.01	54.4	58.0	51.86	61.7	
Denmark	55.8	53.7	54.29	92.5	91.4	86.44	45.4	
Estonia	46.6	47.3	42.95	57.7	58.8	54.34	36.8	
Ireland	71.1	71.2	86.01	59.0	60.5	59.92	72.4	
Spain	50.3	51.0	52.12	53.9	49.7	49.80	44.3	
Italy	42.3	42.6	43.31	78.5	75.7	68.10	38.0	
Cyprus	37.7	33.0	36.01	–39.0	–218.4	–42.51	20.3	
Latvia	54.5	52.8	54.80	62.8	57.0	58.84	51.4	
Lithuania	63.6	61.6	58.28	66.6	65.3	53.05	62.4	
Luxembourg	35.0	38.4	38.15	51.6	50.3	44.27	25.4	
Malta	44.0	45.3	49.42	…	…	…	45.5	
Netherlands	56.5	53.0	53.89	95.1	93.0	90.85	42.1	
Germany	41.4	40.9	41.43	52.8	55.8	51.71	36.8	
Poland	54.8	55.4	58.36	42.2	31.5	40.25	53.3	
Portugal	50.6	51.4	53.42	61.0	57.6	54.31	43.4	
Romania	65.0	64.8	63.58	27.1	9.0	22.94	66.8	
Slovakia	56.7	57.6	56.37	64.1	59.7	62.57	53.2	
Slovenia	41.8	42.5	42.34	26.5	24.4	31.63	40.2	
Hungary	52.4	53.5	55.43	59.6	57.8	49.80	52.9	
Finland	48.9	49.9	51.04	50.9	45.3	53.70	43.8	
France	36.6	37.4	40.47	51.0	52.3	51.97	32.9	
Croatia	41.2	41.5	41.07	70.4	60.6	51.32	32.2	
Czech Republic	54.6	57.3	56.93	41.0	50.4	52.47	50.5	
Sweden	47.2	47.6	48.08	68.8	64.7	62.42	43.7	

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

added of industry of Ukraine and the EU member states (by types of industrial activity), %

industry		Electricity, gas, steam and air conditioning supply			Water supply; sewerage, waste management and remediation activities		
2014	2015	2013	2014	2015	2013	2014	2015
33.17	**41.05**	**41.5**	**50.8**	**45.69**	**–6.0**	**24.5**	**9.65**
42.4	42.13	53.2	49.7	55.35	62.5	62.6	62.91
40.9	44.96	57.2	52.7	58.99	48.4	48.3	48.05
49.3	48.45	69.5	63.9	69.07	38.5	35.1	45.71
32.6	33.33	63.5	64.1	64.40	52.9	51.2	50.87
61.8	62.17	70.2	66.2	63.23	61.4	61.0	62.36
45.2	48.57	76.1	71.0	76.16	66.9	64.1	61.83
38.5	34.62	78.2	77.5	74.99	61.1	60.6	58.19
72.6	87.51	68.2	64.9	65.88	41.0	43.1	43.12
46.5	48.03	79.7	77.0	78.47	50.0	48.6	43.93
38.7	40.51	74.0	73.4	71.17	32.4	34.4	35.65
23.9	25.84	75.8	61.7	65.46	53.8	50.9	50.51
49.8	46.76	67.1	66.8	97.72	48.4	45.3	46.52
60.4	57.95	76.7	75.0	68.46	52.6	53.6	47.03
29.9	31.09	72.8	73.1	69.05	45.1	46.2	46.44
45.8	43.45	…	…	…	51.2	49.8	55.02
41.5	45.88	73.8	70.0	71.47	49.9	50.9	50.71
38.0	38.95	63.9	64.0	60.55	60.7	62.0	63.34
55.0	57.30	70.9	71.2	74.23	53.5	53.6	55.83
44.2	45.49	87.7	87.0	89.62	55.6	56.9	57.80
66.9	64.56	70.0	70.6	74.74	52.5	43.4	46.68
55.0	53.95	77.2	76.0	73.41	55.3	51.9	55.71
41.4	41.49	61.2	59.8	57.43	25.0	27.9	25.61
54.5	56.35	54.6	56.4	58.18	35.2	23.4	27.05
45.0	46.56	79.6	79.1	79.29	64.5	66.1	66.00
33.6	36.98	57.6	59.3	60.19	43.0	42.2	45.07
33.1	34.60	58.0	69.6	69.13	38.3	40.2	39.28
54.5	54.14	84.3	83.3	82.72	46.9	48.5	48.47
44.4	45.82	65.5	65.5	62.23	47.1	46.1	44.99

Table E.2. Share of gross operating surplus and net mixed income in the structure of gross value (by types of production) in 2015, %

Country	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
Ukraine	**52.60**	**35.30**	**49.50**	**26.60**	**14.80**	**49.00**	**38.30**
Austria	47.56	31.47	41.19	69.55	56.50	50.33	35.92
Belgium	43.20	38.27	38.03	69.59	56.18	64.98	36.30
Bulgaria	54.38	29.92	53.68	62.22	71.27	49.37	52.27
United Kingdom	32.84	38.51	32.33	29.73	46.04	63.32	24.73
Greece	68.60	28.93	22.12	34.99	68.07	45.19	35.03
Denmark	7.50	26.53	31.02	75.12	58.10	75.30	22.44
Estonia	39.43	25.70	41.65	44.91	52.91	10.20	29.96
Ireland	75.12	40.04	36.25	…	…	…	38.41
Spain	52.44	34.82	38.20	74.27	56.64	62.41	40.52
Italy	46.27	42.95	43.54	51.45	44.48	49.21	39.24
Cyprus	10.76	10.66	19.19	25.00	25.13	52.25	9.81
Latvia	48.63	30.23	51.58	45.83	43.56	47.84	44.38
Lithuania	61.91	46.16	54.56	…	76.28	89.68	66.34
Luxembourg	27.02	56.78	21.26	…	47.22	…	…
Malta	53.39	36.73	47.83	…	47.52	…	…
Netherlands	56.40	42.45	36.20	52.09	62.35	50.22	40.80
Germany	29.54	25.20	38.17	73.40	48.44	61.00	35.46
Poland	57.50	51.60	63.30	81.70	65.90	59.00	57.20
Portugal	54.94	40.64	53.69	76.28	57.27	44.56	58.25
Romania	84.02	39.03	66.12	93.56	73.32	53.02	64.24
Slovakia	47.02	39.02	66.75	82.41	70.61	30.28	60.64
Slovenia	38.75	27.06	40.82	50.00	52.04	58.75	38.00
Hungary	41.11	27.61	45.63	67.86	75.39	66.45	53.88
Finland	37.53	35.34	48.39	61.91	62.51	80.23	41.12
France	46.24	28.48	25.88	32.16	47.29	62.17	…
Croatia	38.43	11.99	36.25	…	29.83	64.58	47.60
Czech Republic	54.57	44.68	56.23	74.33	64.29	71.82	59.19
Sweden	39.09	28.68	40.03	74.16	…	…	33.46

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

added of the processing industry of Ukraine and the EU member states

	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
	24.10	**45.40**	**26.3**	**13.50**	**41.20**	**26.80**	**–11.40**	**39.50**	**33.30**
	34.31	37.30	35.9	51.22	47.91	38.14	50.77	36.44	32.56
	31.60	25.40	33.86	48.01	32.25	46.73	25.70	51.58	30.76
	59.14	61.44	40.88	53.85	39.77	40.43	39.96	47.94	38.18
	26.90	32.65	25.06	19.12	28.21	16.33	29.83	33.80	39.61
	61.24	77.50	61.01	67.67	52.35	47.94	43.98	63.77	70.65
	37.30	30.20	26.93	50.20	46.65	41.67	39.87	35.47	57.69
	32.13	5.30	30.14	23.80	33.02	28.07	38.37	40.93	27.63
	43.18	22.87	41.87	…	47.81	…	36.46	8.72	н. д
	37.34	53.29	30.45	48.24	47.10	47.62	45.36	58.00	45.61
	35.69	25.75	38.42	41.85	38.10	36.92	35.81	35.88	43.69
	39.37	32.80	20.33	90.23	–2.30	33.52	34.29	–37.50	27.04
	49.49	14.41	36.75	77.62	45.67	33.06	36.25	19.81	41.00
	50.94	49.75	39.53	55.99	46.13	49.33	50.28	68.67	48.88
	…	…	…	…	…	…	…	…	…
	…	90.00	42.78	…	40.18	…	…	…	48.99
	32.47	27.46	38.77	53.46	43.60	42.74	54.98	43.22	25.48
	37.24	32.80	29.62	46.12	33.27	31.71	49.36	38.17	27.44
	60.30	53.80	54.30	48.00	50.50	39.7	55.60	48.50	50.20
	40.71	41.82	29.49	32.64	32.83	45.7	38.83	30.41	35.56
	66.90	61.70	52.83	46.16	67.30	53.34	42.02	33.71	53.96
	48.44	42.29	64.40	59.76	38.23	30.62	55.51	43.25	44.27
	40.66	47.11	34.54	40.80	40.61	32.04	46.53	37.59	32.05
	51.75	42.46	37.29	59.35	41.17	68.53	64.50	47.20	41.91
	38.69	52.20	31.54	53.32	51.77	44.18	37.17	24.94	28.24
	…	…	…	41.43	14.79	29.47	…	…	26.47
	39.92	13.24	33.78	27.32	25.04	34.82	20.97	7.21	24.45
	50.46	46.15	48.41	69.22	50.75	43.71	59.18	53.70	46.89
	29.90	39.94	28.75	52.04	39.42	41.66	52.80	56.35	26.22

Annex F

Structural indicators of the processing industry of Ukraine and the EU member states

Table F.1. Structure of the processing industry output of Ukraine and the EU member states

Country	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	
Ukraine	**33.71**	**1.75**	**5.97**	**5.01**	**6.25**	**1.90**	**3.27**	
Austria	12.00	1.80	9.73	2.59	7.45	2.46	3.53	
Belgium	18.12	2.36	5.07	11.32	14.01	10.20	2.41	
Bulgaria	18.56	7.03	5.06	10.60	5.18	1.83	4.96	
United Kingdom	18.13	2.65	6.60	3.85	8.09	4.49	4.34	
Greece	30.08	2.64	4.03	25.12	4.09	2.63	3.58	
Denmark	19.05	1.31	4.53	4.58	5.79	14.43	2.86	
Estonia	14.24	4.53	20.97	2.32	3.84	0.39	3.02	
Ireland	11.53	0.14	1.19	…	…	…	0.59	
Spain	25.66	3.79	4.91	5.78	8.92	2.74	3.43	
Italy	14.75	9.06	5.23	4.66	5.60	2.75	4.63	
Cyprus	46.15	1.35	8.05	0.17	2.12	8.63	2.76	
Latvia	22.98	3.55	30.98	0.09	3.05	1.94	2.58	
Lithuania	21.76	4.83	9.88	…	10.56	1.12	5.00	
Luxembourg	10.14	5.64	3.52	…	3.84	…	…	
Malta	17.30	1.56	8.10	…	1.24	…	…	
Netherlands	22.43	1.15	4.13	7.99	14.45	1.58	2.79	
Germany	9.82	1.23	4.50	3.02	7.58	2.54	4.32	
Poland	16.95	1.15	3.37	5.63	5.44	1.43	6.97	
Portugal	19.64	12.78	9.85	8.60	5.30	1.43	4.68	
Romania	21.70	6.90	5.76	8.08	3.43	0.75	4.68	
Slovakia	5.23	2.16	5.16	4.66	2.62	0.31	5.85	
Slovenia	7.86	2.97	8.22	0.02	5.65	8.55	6.54	
Hungary	11.20	1.48	3.36	4.76	5.60	3.37	5.32	
Finland	10.38	1.11	19.39	5.80	7.16	1.74	2.85	
France	21.37	2.12	4.81	5.22	8.56	3.53	3.89	
Croatia	28.38	6.85	10.24	…	4.89	4.93	4.66	
Czech Republic	8.22	1.79	4.90	2.18	3.73	1.00	6.51	
Sweden	9.11	0.68	13.99	5.24	…	…	2.65	

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

in 2015, %

	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
	4.59	**21.58**	**2.88**	**0.70**	**2.11**	**3.44**	**1.12**	**2.20**	**3.52**
	3.70	9.04	8.30	3.74	5.92	12.27	8.51	1.35	7.60
	3.26	8.20	5.06	1.52	1.63	4.40	7.47	0.95	3.56
	5.13	13.98	6.61	1.64	4.98	5.04	3.39	1.12	4.89
	3.22	3.90	7.02	4.02	2.82	6.65	10.85	6.47	6.88
	3.55	8.42	5.81	1.08	2.33	1.93	0.27	0.62	3.82
	3.10	1.41	6.72	4.36	2.99	18.06	1.16	0.63	9.02
	3.73	0.57	10.19	14.65	5.19	3.39	3.04	0.54	9.37
	0.91	0.42	0.49	…	0.35	…	0.20	0.10	…
	2.97	7.28	5.51	1.38	3.23	4.90	11.63	3.23	4.65
	3.27	5.80	8.89	2.36	4.33	12.68	6.58	2.82	6.59
	9.72	1.74	7.59	1.67	1.11	1.97	0.37	0.08	6.51
	6.40	1.90	7.16	3.99	2.50	2.47	1.77	1.20	7.44
	2.85	0.35	4.31	1.64	1.73	2.09	1.37	0.79	12.70
	…	…	…	…	…	…	…	…	…
	…	0.05	3.67	…	2.20	…	…	…	16.88
	1.76	2.39	6.26	11.91	1.84	8.50	3.35	2.58	6.90
	2.44	5.40	6.90	4.54	5.61	13.48	21.10	2.48	5.04
	4.42	3.93	8.44	3.23	4.87	3.97	11.29	1.91	3.63
	4.57	2.80	7.03	2.06	3.07	3.01	9.17	0.71	5.30
	3.39	5.10	4.66	2.44	5.86	3.85	15.38	2.16	5.84
	2.24	5.50	8.78	7.94	4.81	5.86	33.90	0.57	4.39
	3.40	8.75	11.69	2.68	9.47	5.96	12.27	0.35	5.63
	2.39	2.89	4.57	10.96	4.18	8.17	27.87	0.59	3.29
	2.67	8.07	6.36	9.12	4.41	13.43	1.52	1.54	4.46
	2.94	3.96	6.68	3.26	2.67	4.84	7.64	9.29	9.23
	5.66	1.64	8.97	2.76	4.99	4.74	0.97	3.44	6.67
	3.31	4.45	8.40	7.85	6.73	7.96	26.41	1.63	4.92
	2.61	7.44	7.45	3.18	3.95	10.85	16.24	2.77	4.35

Table F.2. Structure of gross value added of the processing industry of Ukraine and the EU

Country	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
Ukraine	**31.38**	**4.53**	**6.79**	**3.07**	**3.48**	**2.96**	**2.44**
Austria	10.33	1.74	8.89	0.73	4.89	3.71	4.11
Belgium	15.33	2.81	5.42	4.11	16.96	10.87	8.32
Bulgaria	18.72	11.58	6.28	1.78	6.43	2.44	5.18
United Kingdom	15.89	3.72	6.98	1.81	6.88	7.10	5.20
Greece	37.13	3.38	3.08	2.44	7.04	3.52	2.35
Denmark	8.03	0.98	4.33	0.80	5.99	25.15	2.79
Estonia	14.09	6.10	21.55	2.72	3.61	0.35	3.51
Ireland	10.62	0.18	0.92	…	…	…	0.64
Spain	20.11	4.08	5.77	2.07	7.97	4.79	4.20
Italy	11.12	9.89	5.84	0.97	4.59	3.66	5.05
Cyprus	33.60	1.62	9.18	0.16	2.53	11.48	2.83
Latvia	21.16	4.50	26.31	0.09	2.40	3.16	2.54
Lithuania	22.33	7.82	12.17	…	8.13	2.61	5.91
Luxembourg	11.04	7.40	4.33	…	3.91	…	…
Malta	19.07	1.98	9.93	…	1.36	…	…
Netherlands	19.34	1.52	5.15	1.93	12.87	2.50	3.77
Germany	7.11	1.17	4.11	0.92	7.44	3.63	4.55
Poland	13.77	1.30	3.67	3.15	5.31	1.74	7.66
Portugal	17.63	18.25	10.40	2.70	4.02	2.31	5.61
Romania	23.17	9.62	5.26	8.59	3.77	0.81	3.91
Slovakia	6.45	3.87	8.39	3.48	3.48	0.44	8.22
Slovenia	6.63	2.97	7.66	0.01	5.15	12.04	6.94
Hungary	9.19	1.91	3.79	3.58	5.57	6.43	6.22
Finland	8.43	1.23	15.54	1.92	6.52	4.24	3.28
France	20.67	2.14	5.13	0.60	8.00	5.24	4.83
Croatia	26.74	5.95	9.79	…	3.19	6.68	4.68
Czech Republic	8.09	2.27	5.19	0.43	3.62	1.60	7.91
Sweden	7.55	0.79	11.56	1.28	…	…	2.82

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

member states in 2015, %

	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
	3.88	**16.15**	**3.23**	**1.04**	**3.14**	**5.47**	**1.32**	**4.61**	**6.54**
	4.45	6.92	10.21	5.19	8.37	13.61	6.73	1.29	8.83
	4.48	4.99	7.16	2.27	2.56	7.00	5.54	1.68	5.42
	6.48	5.04	9.14	3.05	4.74	6.80	3.42	1.14	7.77
	2.92	2.18	9.99	4.58	3.01	6.11	7.99	6.30	9.35
	5.29	10.98	8.72	1.62	2.37	3.30	0.44	1.37	6.98
	3.41	1.12	7.41	6.24	3.35	17.47	1.01	0.64	11.28
	4.91	0.47	11.99	4.87	5.60	4.05	3.45	0.76	11.98
	0.61	0.35	0.78	…	0.40	…	0.23	0.07	…
	3.74	5.50	7.18	2.18	3.49	7.50	8.71	4.73	7.98
	3.95	3.24	11.99	3.49	4.57	14.77	5.16	2.76	8.93
	10.97	1.66	8.08	3.52	1.15	2.41	0.46	0.11	10.24
	6.83	0.87	8.26	5.26	2.80	2.84	1.92	1.26	9.79
	3.70	0.31	5.21	2.47	1.89	3.00	1.66	1.36	17.40
	…	…	…	…	…	…	…	…	…
	…	0.13	4.86	….	3.02	…	…	25.28	25.28
	2.33	2.45	9.20	5.91	3.01	12.07	3.41	2.51	12.06
	2.66	3.40	8.57	6.14	6.67	15.17	19.62	2.44	6.40
	5.63	3.00	11.17	2.23	4.27	4.39	8.70	1.91	4.33
	5.78	1.38	9.13	1.91	2.71	3.81	5.93	0.54	7.89
	3.81	3.92	4.77	2.49	6.73	3.99	9.17	2.10	7.90
	3.53	5.70	14.02	3.68	5.21	6.85	18.85	0.77	7.06
	3.79	5.29	13.69	3.30	9.15	6.46	8.70	0.37	7.86
	3.13	2.51	6.41	7.61	4.17	13.51	20.24	0.71	5.01
	3.25	5.04	8.07	12.51	5.84	14.96	1.57	1.24	6.35
	3.23	2.51	9.17	5.04	2.63	5.53	4.62	7.17	13.49
	5.95	1.15	11.39	3.64	4.51	5.10	0.81	2.64	7.56
	4.61	3.74	11.27	5.59	7.75	9.51	19.29	2.23	6.90
	2.49	5.03	8.81	4.80	4.12	12.43	15.17	4.25	5.35

Table F.3. Share of gross value added in output of the processing industry of Ukraine

Country	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
Ukraine	**18.27**	**50.82**	**22.32**	**12.05**	**10.92**	**30.51**	**14.66**
Austria	28.04	31.45	29.75	9.19	21.37	49.09	37.92
Belgium	20.01	28.13	25.32	8.60	28.62	25.21	33.18
Bulgaria	22.84	37.27	28.12	3.81	28.11	30.24	23.62
United Kingdom	30.48	48.78	36.76	16.34	29.56	54.90	41.59
Greece	34.44	35.76	21.31	2.71	47.95	37.44	18.32
Denmark	16.04	28.35	36.34	6.63	39.40	66.37	37.09
Estonia	25.11	34.14	26.06	29.72	23.80	22.43	29.47
Ireland	29.62	42.05	24.81	…	…	…	34.62
Spain	19.73	27.12	29.58	9.01	22.51	44.02	30.77
Italy	19.89	28.78	29.48	5.48	21.61	35.11	28.80
Cyprus	22.42	36.86	35.12	28.57	36.73	40.99	31.56
Latvia	29.20	40.15	26.93	32.00	24.93	51.79	31.20
Lithuania	34.74	54.83	41.70	…	26.05	78.59	40.07
Luxembourg	28.20	33.97	31.87	…	…	…	…
Malta	32.45	37.31	36.08	…	32.27	…	34.08
Netherlands	21.10	32.42	30.51	5.91	21.79	38.57	33.08
Germany	25.14	32.88	31.74	10.60	34.11	49.75	36.65
Poland	22.44	31.29	30.07	15.45	26.98	33.49	30.38
Portugal	23.86	37.98	28.07	8.33	20.17	42.96	31.91
Romania	37.04	48.34	31.68	36.88	38.14	37.32	28.94
Slovakia	26.66	38.69	35.18	16.13	28.69	30.49	30.40
Slovenia	27.50	32.60	30.42	21.74	29.75	45.96	34.66
Hungary	20.73	32.77	28.47	18.98	25.12	48.15	29.53
Finland	23.86	32.54	23.55	9.73	26.75	71.66	33.83
France	29.15	30.48	32.11	3.49	28.19	44.70	37.41
Croatia	32.17	29.66	32.63	…	22.30	46.19	34.29
Czech Republic	26.17	33.66	28.18	5.27	25.77	42.31	32.33
Sweden	27.84	39.25	27.74	8.22	…	…	35.71

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

and the EU member states in 2015, %

	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
	16.57	**14.68**	**22.01**	**29.18**	**29.24**	**31.17**	**22.98**	**41.11**	**36.49**
	39.19	24.92	40.04	45.09	46.04	36.11	25.71	31.06	37.82
	31.10	13.78	32.01	35.28	37.19	37.59	16.79	39.88	35.93
	28.60	8.15	31.31	41.95	21.54	30.50	22.86	23.14	35.91
	31.52	19.38	49.44	39.60	37.11	31.95	25.60	33.81	47.28
	41.58	36.35	41.89	41.89	28.34	47.65	45.89	61.34	50.92
	41.94	30.29	41.97	54.45	42.68	36.84	33.09	38.83	47.61
	33.36	20.95	29.85	8.42	27.34	30.26	28.79	35.60	32.45
	21.65	26.53	50.55	…	36.87	….	37.28	21.28	…
	31.73	19.02	32.82	39.70	27.22	38.52	18.86	36.86	43.16
	31.87	14.74	35.58	38.97	27.84	30.71	20.66	25.73	35.71
	34.73	29.27	32.78	64.88	32.10	37.60	38.89	40.00	48.40
	33.85	14.46	36.59	41.80	35.53	36.48	34.36	33.23	41.76
	44.01	30.16	40.97	51.02	36.94	48.60	40.83	58.20	46.38
	…	…	…	…	…	…	…	…	…
	…	77.78	38.99	…	38.21	…	…	…	43.36
	32.46	25.07	35.94	12.13	39.87	34.73	24.91	23.83	42.80
	38.00	21.90	43.13	47.02	41.35	39.14	32.32	34.18	44.10
	35.24	21.05	36.56	19.02	24.21	30.52	21.28	27.68	32.97
	33.62	13.14	34.51	24.69	23.47	33.66	17.19	19.98	39.57
	38.95	26.64	35.47	35.30	39.83	35.93	20.69	33.69	46.91
	34.01	22.39	34.52	10.04	23.44	25.25	12.03	29.03	34.74
	36.42	19.74	38.22	40.26	31.52	35.35	23.14	34.86	45.58
	33.09	21.94	35.37	17.53	25.20	41.75	18.33	30.80	38.58
	35.71	18.37	37.33	40.31	38.93	32.74	30.38	23.72	41.78
	33.08	19.11	41.34	46.60	29.72	34.43	18.23	23.28	44.06
	35.85	23.96	43.33	45.15	30.87	36.78	28.74	26.22	38.69
	37.05	22.38	35.72	18.94	30.62	31.77	19.43	36.38	37.31
	31.95	22.68	39.72	50.55	35.04	38.49	31.37	51.66	41.31

Table F.4. Structure of gross value added exports of the processing industry of Ukraine

Country	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	
Ukraine	**24.33**	**4.98**	**5.93**	**0.90**	**3.94**	**1.11**	**0.91**	
Austria	6.53	2.75	8.05	0.36	3.72	7.22	5.15	
Belgium	12.86	4.00	4.2	3.05	20.61	10.35	5.03	
Bulgaria	9.81	19.46	3.8	1.93	5.84	2.02	4.92	
United Kingdom	7.75	1.98	1.61	2.13	7.54	10.33	3.37	
Greece	17.43	9.18	2.00	3.74	7.26	3.80	2.07	
Denmark	9.43	1.20	2.00	…	8.24	27.75	3.34	
Estonia	7.93	7.99	20.15	1.57	4.14	0.52	3.20	
Ireland	10.74	0.32	0.71	…	…	74.61	1.14	
Spain	9.34	3.29	3.80	1.93	8.46	6.91	5.03	
Italy	5.62	11.81	2.90	0.60	4.99	7.65	4.98	
Cyprus	26.70	0.40	0.40	…	3.94	62.73	…	
Latvia	11.12	6.04	29.60	0.06	3.52	5.57	2.40	
Lithuania	19.89	13.84	13.81	…	14.60	1.23	8.08	
Luxembourg	…	…	…	…	7.93	…	32.22	
Malta	6.96	2.39	7.68	0.07	0.07	0.07	5.17	
Netherlands	20.30	2.24	5.0	…	16.75	8.50	5.13	
Germany	3.19	1.25	2.23	0.32	7.84	6.47	3.49	
Poland	7.74	1.50	2.43	1.70	4.81	1.64	7.85	
Portugal	8.64	22.42	7.00	3.08	4.11	2.60	7.90	
Romania	3.72	17.93	4.31	3.88	1.71	1.04	5.66	
Slovakia	3.13	4.05	5.77	…	3.35	…	10.18	
Slovenia	2.95	2.55	7.27	…	7.51	…	7.90	
Hungary	5.20	2.98	2.18	1.75	5.07	8.35	7.16	
Finland	2.24	1.02	23.87	…	6.12	…	3.97	
France	10.14	2.55	2.60	0.14	11.96	8.10	3.82	
Croatia	11.92	11.56	9.10	…	3.82	10.29	5.04	
Czech Republic	3.42	2.81	4.10	…	3.69	1.91	7.11	
Sweden	2.85	0.77	15.05	…	…	…	3.45	

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

and the EU member states in 2015, %

	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
	1.24	**26.08**	**2.22**	**1.94**	**4.77**	**11.57**	**1.80**	**3.89**	**5.10**
	2.00	8.07	11.54	5.34	11.45	16.49	9.05	1.21	4.08
	2.84	6.63	4.18	4.08	2.32	9.00	1.40	1.40	3.36
	4.34	7.51	5.67	4.08	6.54	8.01	5.77	1.13	4.39
	0.86	2.43	3.95	10.28	2.67	9.56	12.33	13.60	6.41
	3.24	17.23	6.58	2.26	3.13	2.18	0.47	0.73	2.11
	1.03	1.57	4.03	10.05	4.02	21.74	1.24	0.57	6.23
	2.92	0.77	8.31	7.41	9.76	4.44	6.00	0.47	8.24
	0.34	0.82	1.09	9.18	0.60	3.17	0.89	0.02	1.00
	3.93	6.36	6.94	1.48	5.14	8.59	18.88	5.68	2.77
	3.08	3.25	8.60	3.77	5.52	21.62	7.67	3.49	7.37
	…	…	2.75	…	0.75	8.95	0.36	…	2.07
	6.39	1.10	7.24	8.65	3.93	4.79	3.34	0.69	6.97
	2.76	0.53	6.06	4.20	3.46	4.85	2.22	2.43	19.42
	…	…	…	…	…	…	…	…	…
	…	…	0.78	…	4.53	…	…	…	20.43
	1.35	5.37	8.26	3.32	4.08	20.91	2.53	3.39	6.05
	1.45	3.38	4.77	6.63	7.20	17.75	26.56	6.05	3.78
	3.38	3.35	9.36	3.56	6.53	4.25	16.48	2.91	5.88
	5.48	1.83	8.27	2.26	3.45	5.07	9.70	0.46	6.29
	1.09	4.30	4.17	3.77	7.85	6.22	18.56	3.39	5.66
	2.40	3.48	8.03	3.14	7.22	8.78	24.53	…	11.10
	3.90	7.27	11.61	…	13.87	8.36	13.29	0.52	5.16
	2.43	2.80	5.00	8.66	6.06	13.08	24.35	0.72	3.45
	1.79	8.18	3.20	7.25	8.81	20.62	5.64	1.67	1.88
	1.63	3.31	4.86	6.54	4.14	7.81	7.76	14.89	6.40
	6.12	1.83	13.02	3.20	5.24	7.57	1.67	3.52	6.21
	3.33	3.32	11.39	4.07	9.26	11.35	26.65	2.65	4.29
	1.02	9.67	6.03	…	…	21.49	3.77	3.77	4.21

Table F.5. Coefficient of structural advantages of the processing industry of Ukraine

Country	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	
Ukraine	**0.215**	**0.129**	**0.067**	**0.006**	**0.022**	**0.017**	**0.007**	
Austria	0.109	0.048	0.045	0.011	0.249	0.110	0.089	
Belgium	0.099	0.320	0.048	0.003	0.073	0.027	0.051	
Bulgaria	0.099	0.320	0.048	0.003	0.073	0.027	0.051	
United Kingdom	0.068	0.028	0.017	0.010	0.064	0.163	0.040	
Greece	0.226	0.118	0.015	0.004	0.125	0.051	0.014	
Denmark	0.040	0.009	0.019	…	0.085	0.484	0.032	
Estonia	0.079	0.108	0.207	0.018	0.039	0.005	0.037	
Ireland	0.099	0.004	0.005	…	…	0.991	0.012	
Spain	0.073	0.035	0.045	0.007	0.076	0.121	0.062	
Italy	0.042	0.129	0.032	0.001	0.041	0.102	0.054	
Cyprus	0.194	0.005	0.005	…	0.047	0.835	…	
Latvia	0.102	0.076	0.251	0.001	0.028	0.091	0.024	
Lithuania	0.204	0.224	0.170	…	0.112	0.029	0.096	
Luxembourg	0.095	0.026	0.131	…	0.062	…	…	
Malta	0.077	0.030	0.094	…	0.001	…	…	
Netherlands	0.175	0.030	0.062	…	0.149	0.134	0.069	
Germany	0.023	0.012	0.020	0.001	0.077	0.093	0.037	
Poland	0.063	0.017	0.026	0.010	0.047	0.020	0.086	
Portugal	0.078	0.320	0.074	0.010	0.031	0.042	0.095	
Romania	0.040	0.250	0.039	0.041	0.019	0.011	0.047	
Slovakia	0.039	0.072	0.094	…	0.044	…	0.143	
Slovenia	0.025	0.025	0.068	…	0.068	…	0.084	
Hungary	0.043	0.039	0.025	0.013	0.050	0.159	0.084	
Finland	0.018	0.011	0.191	…	0.056	…	0.046	
France	0.098	0.026	0.028	…	0.112	0.120	0.047	
Croatia	0.112	0.100	0.087	…	0.025	0.139	0.051	
Czech Republic	0.034	0.036	0.043	…	0.036	0.030	0.086	
Sweden	0.023	0.009	0.121	…	…	…	0.034	

Source: elaborated by the authors' calculations according to tables F.1-F.4.

and the EU member states in 2015, %

	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
	0.010	**0.225**	**0.025**	**0.029**	**0.071**	**0.184**	**0.021**	**0.082**	**0.095**
	0.035	0.037	0.052	0.061	0.037	0.143	0.050	0.025	0.051
	0.055	0.027	0.078	0.076	0.062	0.108	0.058	0.012	0.070
	0.055	0.027	0.078	0.076	0.062	0.108	0.058	0.012	0.070
	0.008	0.014	0.056	0.117	0.028	0.088	0.091	0.132	0.087
	0.048	0.195	0.099	0.034	0.032	0.037	0.008	0.016	0.038
	0.011	0.012	0.044	0.144	0.045	0.210	0.011	0.006	0.078
	0.038	0.006	0.098	0.025	0.105	0.053	0.068	0.007	0.105
	0.002	0.007	0.017	0.084	0.007	0.040	0.010	…	0.013
	0.050	0.048	0.091	0.023	0.056	0.131	0.141	0.083	0.048
	0.037	0.018	0.116	0.056	0.058	0.252	0.060	0.034	0.100
	…	…	0.029	…	0.008	0.109	0.004	…	0.033
	0.068	0.005	0.084	0.114	0.044	0.055	0.036	0.007	0.092
	0.036	0.005	0.073	0.063	0.038	0.070	0.027	0.042	0.266
	…	…	…	…	…	…	…	…	…
	…	…	0.010	…	0.062	…	…	…	0.306
	0.018	0.055	0.121	0.016	0.066	0.297	0.026	0.033	0.106
	0.016	0.021	0.059	0.090	0.086	0.200	0.247	0.060	0.048
	0.043	0.026	0.124	0.025	0.057	0.047	0.127	0.029	0.070
	0.069	0.009	0.107	0.021	0.030	0.064	0.063	0.003	0.094
	0.012	0.033	0.043	0.038	0.090	0.064	0.111	0.033	0.077
	0.038	0.036	0.128	0.015	0.078	0.103	0.136	…	0.178
	0.044	0.044	0.136	…	0.134	0.091	0.094	0.006	0.072
	0.032	0.024	0.070	0.060	0.061	0.216	0.177	0.009	0.053
	0.022	0.051	0.041	0.099	0.117	0.230	0.058	0.013	0.027
	0.018	0.021	0.067	0.101	0.041	0.089	0.047	0.115	0.094
	0.064	0.013	0.165	0.042	0.047	0.082	0.014	0.027	0.070
	0.046	0.028	0.153	0.029	0.107	0.136	0.195	0.036	0.060
	0.010	0.065	0.073	…	…	0.237	0.030	0.059	0.053

Annex G

Absolute indicators of functioning of the processing industry of Ukraine and the EU member states

Table G.1. Output volumes of the processing industry of Ukraine and the EU member states

Country	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	
Ukraine	**16778.8**	**870.1**	**2972.4**	**2492.5**	**3112.5**	**947.3**	**1626.7**	
Austria	21018.7	3161.7	17056.1	4536.5	13059.2	4307.3	6183.9	
Belgium	40166.0	5232.4	11232.1	25081.2	31058.6	22596.6	5347.7	
Bulgaria	5058.2	1916.7	1378.0	2889.8	1411.4	498.4	1351.7	
United Kingdom	121672.8	17815.2	44296.3	25828.0	54272.3	30163.7	29152.4	
Greece	15802.3	1387.3	2115.3	13197.4	2150.9	1379.5	1880.9	
Denmark	17268.8	1189.9	4111.0	4155.5	5245.1	13079.6	2597.0	
Estonia	1580.0	502.6	2327.4	257.7	426.5	43.7	335.3	
Ireland	31350.3	377.2	3227.4	…	…	30328.6	1611.9	
Spain	141999.0	20962.0	27149.0	31974.0	49350.0	15144.0	18991.0	
Italy	132634.4	81507.5	47008.3	41912.2	50368.5	24732.2	41609.2	
Cyprus	1131.7	33.1	197.3	4.2	52.0	211.5	67.8	
Latvia	1854.3	286.7	2499.4	7.5	245.9	156.2	208.0	
Lithuania	4175.4	926.9	1895.4	…	2026.6	215.8	958.6	
Luxembourg	990.9	551.0	343.9	…	374.7	…	…	
Malta	435.7	39.4	204.0	…	31.3	…	…	
Netherlands	67004.0	3430.0	12332.0	23858.0	43162.0	4734.0	8329.0	
Germany	178633.0	22 424.0	81 852.0	54 978.0	137754.0	46 157.0	78 504.0	
Poland	46085.78	3126.32	9172.71	15303.81	14790.58	3893.83	18946.82	
Portugal	16150.9	10505.8	8098.4	7072.8	4356.5	1175.9	3845.6	
Romania	19636.6	6246.6	5211.7	7312.7	3107.0	678.8	4236.5	
Slovakia	3771.0	1558.0	3718.4	3359.9	1889.6	225.3	4216.0	
Slovenia	1867.1	705.2	1951.3	4.6	1341.7	2030.1	1551.8	
Hungary	10079.7	1323.1	3022.7	4285.2	5041.4	3035.6	4788.4	
Finland	10957.0	1174.0	20470.0	6123.0	7559.0	1835.0	3012.0	
France	160433.0	15897.0	36147.0	39189.0	64251.0	26516.0	29196.0	
Croatia	4626.0	1116.5	1669.6	…	796.8	804.3	760.2	
Czech Republic	12561.0	2737.7	7493.1	3334.8	5703.2	1534.0	9940.6	
Sweden	16671.3	1237.3	25601.0	9587.3	…	…	4853.2	

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

in 2015, million EUR

	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
	2286.1	**10743.7**	**1433.4**	**347.6**	**1047.8**	**1713.2**	**559.0**	**1095.8**	**1750.7**
	6477.7	15844.5	14547.3	6559.7	10371.3	21497.5	14918.9	2371.4	13314.4
	7227.6	18178.7	11221.9	3377.6	3601.6	9762.0	16547.8	2116.3	7900.9
	1398.2	3811.8	1801.3	448.4	1357.7	1374.6	924.0	304.7	1334.1
	21626.0	26195.9	47145.4	27000.4	18898.1	44647.6	72850.8	43446.2	46167.2
	1863.5	4426.2	3050.4	568.6	1224.9	1015.5	141.2	328.0	2009.0
	2807.6	1274.5	6094.4	3957.4	2708.0	16369.7	1055.9	571.5	8178.2
	414.3	63.0	1130.4	1626.2	576.0	376.7	337.6	60.4	1039.4
	2478.9	1148.7	1342.9	9979.3	960.4	2627.8	534.9	280.1	11592.3
	16433.0	40293.0	30486.0	7639.0	17878.0	27141.0	64345.0	17877.0	25742.0
	29366.2	52159.3	79938.9	21262.6	38957.4	114047.1	59193.5	25397.9	59308.0
	238.4	42.7	186.1	41.0	27.1	48.4	9.0	2.0	159.7
	516.4	153.5	577.7	321.8	201.5	199.0	142.9	97.2	599.9
	546.5	67.3	826.8	314.4	332.2	400.8	263.5	151.9	2436.8
	…	…	…	…	…	…	…	…	…
	…	1.3	92.3	…	55.3	…	…	…	425.1
	5246.0	7148.0	18714.0	35594.0	5511.0	25402.0	9997.0	7699.0	20606.0
	44 284.0	98 194.0	125537.0	82 539.0	101969.0	245010.0	383546.0	45 095.0	91 674.0
	12004.33	10696.98	22947.47	8792.78	13237.48	10791.84	30709.0	5183.01	9859.41
	3755.6	2302.8	5781.6	1695.2	2521.1	2476.0	7544.2	587.6	4359.1
	3069.2	4619.3	4217.9	2211.5	5307.8	3487.6	13916.0	1958.4	5284.5
	1616.5	3965.7	6328.3	5719.7	3466.9	4225.7	24431.4	411.0	3165.0
	806.9	2076.8	2776.5	635.6	2248.8	1416.0	2912.8	83.2	1337.0
	2152.3	2600.6	4115.4	9870.5	3759.8	7355.9	25085.5	526.9	2951.1
	2823.0	8520.0	6710.0	9630.0	4654.0	14180.0	1603.0	1623.0	4713.0
	22067.0	29724.0	50188.0	24474.0	20044.0	36358.0	57396.0	69743.0	69274.0
	923.1	268.0	1462.8	449.2	813.8	772.1	157.6	561.1	1087.9
	5059.1	6797.2	12828.2	11987.2	10291.0	12165.3	40352.0	2492.0	7522.9
	4781.5	13617.1	13627.5	5829.5	7224.5	19851.6	29717.8	5060.9	7955.0

Table G.2. Gross value added volumes of the processing industry of Ukraine and the EU

Country	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
Ukraine	**3065.1**	**442.2**	**663.3**	**300.3**	**339.8**	**288.9**	**238.6**
Austria	5893.8	994.5	5074.0	417.1	2790.2	2114.4	2345.2
Belgium	8036.6	1471.8	2843.6	2156.3	8890.2	5697.3	1925.0
Bulgaria	1155.1	714.3	387.5	110.1	396.8	150.7	319.3
United Kingdom	37079.8	8 690.6	16284.6	4 221.3	16 044.9	16 558.7	12 123.9
Greece	5442.3	496.1	450.8	357.5	1031.4	516.5	344.6
Denmark	2770.7	337.3	1493.8	275.7	2066.6	8680.9	963.2
Estonia	396.7	171.6	606.5	76.6	101.5	9.8	98.8
Ireland	9286.6	158.6	800.6	…	…	12965.0	558.0
Spain	28017.0	5684.0	8032.0	2880.0	11108.0	6666.0	5844.0
Italy	26378.5	23454.1	13856.3	2295.8	10887.1	8682.8	11983.8
Cyprus	253.7	12.2	69.3	1.2	19.1	86.7	21.4
Latvia	541.4	115.1	673.1	2.4	61.3	80.9	64.9
Lithuania	1450.4	508.2	790.3	…	527.9	169.6	384.1
Luxembourg	279.4	187.2	109.6	…	98.9	…	…
Malta	141.4	14.7	73.6	…	10.1	…	…
Netherlands	14136.0	1112.0	3762.0	1409.0	9407.0	1826.0	2755.0
Germany	44902.0	7 374.0	25 978.0	5 828.0	46 994.0	22 961.0	28 771.0
Poland	10341.05	978.15	2758.65	2363.89	3990.94	1304.12	5755.11
Portugal	3853.9	3990.2	2273.2	589.4	878.7	505.2	1227.0
Romania	7273.5	3019.4	1650.9	2697.1	1184.9	253.3	1226.1
Slovakia	1005.2	602.8	1308.2	541.9	542.1	68.7	1281.5
Slovenia	513.5	229.9	593.6	1.0	399.1	933.1	537.9
Hungary	2089.3	433.6	860.6	813.2	1266.2	1461.6	1414.2
Finland	2614.0	382.0	4821.0	596.0	2022.0	1315.0	1019.0
France	46768.0	4846.0	11608.0	1368.0	18115.0	11853.0	10921.0
Croatia	1488.0	331.2	544.8	…	177.7	371.5	260.7
Czech Republic	3287.1	921.6	2111.2	175.7	1469.8	649.1	3213.6
Sweden	4642.1	485.7	7102.6	787.8	…	…	1733.1

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

member states in 2015, million EUR

	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
	378.7	**1577.3**	**315.5**	**101.5**	**306.4**	**533.9**	**128.5**	**450.5**	**638.8**
	2538.3	3947.8	5824.2	2957.9	4774.7	7763.0	3836.3	736.5	5035.5
	2247.5	2504.5	3591.6	1191.6	1339.6	3669.5	2778.5	843.9	2838.7
	399.9	310.7	563.9	188.1	292.4	419.2	211.2	70.5	479.1
	6 815.6	5 075.5	23 310.9	10 692.4	7 013.9	14 264.9	18 647.4	14 690.6	21 828.5
	774.8	1608.8	1277.7	238.2	347.1	483.9	64.8	201.2	1022.9
	1177.6	386.1	2558.1	2154.7	1155.8	6031.2	349.4	221.9	3894.0
	138.2	13.2	337.4	137.0	157.5	114.0	97.2	21.5	337.3
	536.6	304.8	678.8	2928.5	354.1	1057.8	199.4	59.6	4878.3
	5214.0	7662.0	10004.0	3033.0	4866.0	10454.0	12135.0	6590.0	11111.0
	9359.8	7687.7	28439.4	8285.2	10844.2	35022.0	12232.1	6535.3	21177.3
	82.8	12.5	61.0	26.6	8.7	18.2	3.5	0.8	77.3
	174.8	22.2	211.4	134.5	71.6	72.6	49.1	32.3	250.5
	240.5	20.3	338.7	160.4	122.7	194.8	107.6	88.4	1130.1
	…	…	…	…	…	…	…	…	…
	…	1.0	36.0	…	22.4	…	…	…	187.4
	1703.0	1792.0	6726.0	4319.0	2197.0	8821.0	2490.0	1835.0	8820.0
	16 828.0	21 504.0	54 143.0	38 812.0	42 165.0	95 894.0	123960.0	15 412.0	40 428.0
	4230.07	2251.94	8390.02	1672.12	3205.05	3293.51	6535.98	1434.69	3250.87
	1262.6	302.5	1995.2	418.5	591.6	833.5	1296.8	117.4	1724.9
	1195.6	1230.7	1496.2	780.7	2114.3	1253.2	2878.6	659.7	2479.2
	549.8	888.0	2184.6	574.0	812.7	1067.2	2938.4	119.3	1099.6
	293.9	409.9	1061.3	255.9	708.9	500.6	674.0	29.0	609.4
	712.3	570.6	1455.6	1730.2	947.6	3070.9	4598.7	162.3	1138.4
	1008.0	1565.0	2505.0	3882.0	1812.0	4642.0	487.0	385.0	1969.0
	7300.0	5680.0	20750.0	11406.0	5957.0	12518.0	10461.0	16236.0	30524.0
	330.9	64.2	633.8	202.8	251.2	284.0	45.3	147.1	420.9
	1874.6	1521.4	4582.5	2270.6	3151.6	3864.8	7841.9	906.6	2806.6
	1527.6	3088.4	5412.2	2946.8	2531.7	7640.1	9321.9	2614.5	3286.0

Table G.3. Volumes of gross value added exports of the processing industry of Ukraine

Country	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
Ukraine	**1117.5**	**228.7**	**272.3**	**41.4**	**181.2**	**50.8**	**41.7**
Austria	1974.6	832.5	2436.1	108.0	1124.4	2183.6	1559.8
Belgium	3614.9	1125.8	1188.8	857.0	5792.6	2908.5	1645.2
Bulgaria	340.9	676.6	133.5	67.1	203.0	70.1	171.0
United Kingdom	5654.46	1443.36	1172.29	1555.61	5503.20	7539.48	2456.75
Greece	831.8	438.1	95.2	178.2	346.3	181.4	99.0
Denmark	1600.2	203.0	345.4	…	1398.4	4710.5	566.2
Estonia	142.7	143.7	362.6	28.3	74.4	9.3	57.5
Ireland	2367.2	70.8	156.8	…	…	16448.3	251.8
Spain	3621.6	1274.2	1472.5	749.8	3281.4	2678.6	1952.5
Italy	4809.5	10116.3	2476.9	511.0	4276.1	6556.7	4267.2
Cyprus	37.6	0.6	0.6	…	5.5	88.3	…
Latvia	144.8	78.6	385.5	0.7	45.8	72.6	31.2
Lithuania	525.7	366.0	365.1	…	386.1	32.6	213.7
Luxembourg	165.6	37.6	200.9	…	115.0	…	…
Malta	…	…	…	…	0.3	…	…
Netherlands	5779.0	636.7	1427.1	…	4767.6	2419.6	1461.0
Germany	9153.55	3573.84	6412.69	921.85	22483.60	18580.01	10015.89
Poland	2579.2	904.9	1911.1	527.9	1493.1	507.4	2456.0
Portugal	836.8	2172.1	679.4	298.5	398.6	252.3	765.6
Romania	504.9	2432.8	584.9	525.9	231.5	141.2	767.4
Slovakia	277.1	357.6	510.4	…	296.4	…	900.2
Slovenia	126.1	108.8	310.5	…	320.8	…	337.5
Hungary	755.3	433.0	316.8	254.7	736.2	1212.1	1039.8
Finland	258.6	117.6	2753.3	…	706.1	…	457.5
France	9074.7	2278.8	2316.8	129.3	10699.3	7248.6	3413.9
Croatia	290.3	281.3	220.7	…	93.0	250.6	122.8
Czech Republic	697.3	572.4	835.8	0.1	751.1	389.9	1448.9
Sweden	619.2	168.6	33536.1	…	…	…	770.0

Source: elaborated by the authors based on SSSU, 2019; Eurostat, 2019; OECD, 2019.

and the EU member states in 2015, million EUR

	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
	57.1	**1198.0**	**101.8**	**89.1**	**219.1**	**531.4**	**82.6**	**178.8**	**234.4**
	603.8	2443.0	3490.8	1615.2	3464.1	4989.0	2737.2	365.8	1235.0
	752.9	1773.0	1082.5	1147.8	653.4	2529.7	1964.8	412.1	945.1
	150.7	261.2	197.3	141.8	227.6	278.7	200.6	39.4	152.8
	630.98	1775.09	2883.92	7502.42	1947.54	6979.68	9000.48	9924.95	4677.01
	154.7	822.4	314.0	108.1	149.6	103.9	22.6	34.7	100.5
	175.6	266.0	684.4	1706.2	681.7	3691.0	209.9	96.1	1057.8
	52.5	13.9	149.6	133.3	175.6	79.8	107.9	8.5	148.2
	74.1	181.6	239.7	2023.4	132.9	698.5	196.0	4.5	220.7
	1524.2	2467.7	2693.5	574.4	1994.8	3332.0	7324.3	2204.5	1074.6
	2639.8	2781.9	7365.7	3229.9	4727.0	18521.6	6570.0	2990.9	6311.2
	…	…	3.9	…	1.1	12.6	0.5	…	2.9
	83.2	14.4	94.3	112.7	51.2	62.4	43.5	8.9	90.8
	73.1	14.1	160.1	111.1	91.5	128.1	58.8	64.1	513.4
	…	…	…	…	…	…	…	…	…
	…	…	…	…	22.8	…	…	…	103.8
	383.8	1529.0	2352.1	943.8	1160.4	5953.6	…	965.0	1722.2
	4150.54	9708.74	13696.23	19026.21	20664.93	50943.81	76204.79	17365.45	10854.32
	1059.1	1041.1	2966.2	1104.7	2026.3	1326.5	5106.4	904.5	3946.1
	531.5	177.1	801.7	219.4	334.7	491.3	939.8	44.6	609.8
	148.3	583.3	565.4	511.9	1065.0	843.9	2517.9	460.6	768.4
	211.8	308.0	709.7	277.8	637.9	776.1	2169.0	…	981.0
	166.5	310.5	495.9	…	592.2	356.8	567.2	22.3	220.4
	353.2	407.3	726.5	1257.2	880.7	1900.0	3536.9	103.9	501.6
	206.7	943.7	369.4	835.6	1016.3	2377.8	650.0	192.8	216.7
	1459.3	2962.8	4343.2	5849.0	3702.8	6983.7	6942.5	13317.0	5721.6
	149.0	44.5	317.0	77.8	127.5	184.2	40.6	85.6	151.2
	678.8	676.9	2321.1	828.3	1887.4	2311.6	5429.0	540.1	873.3
	209.6	2022.4	1236.6	…	…	4654.4	3951.1	773.4	863.4

Table G.4. Volumes of exports of the processing industry products of Ukraine and the EU

Country	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	
Ukraine	**6117.7**	**450.0**	**1220.4**	**343.5**	**1659.6**	**166.6**	**284.4**	
Austria	7042.0	2646.5	8189.0	1175.1	5262.8	4448.4	4113.0	
Belgium	18066.8	4002.4	4695.6	9968.3	20237.0	11535.8	4570.3	
Bulgaria	1493.0	1815.5	474.7	1760.3	722.1	231.9	723.8	
United Kingdom	18554.4	2958.8	3188.8	9518.0	18614.7	13734.1	5907.4	
Greece	2415.1	1225.2	446.9	6580.1	722.1	484.4	540.3	
Denmark	9973.7	716.0	950.7	…	3549.2	7097.4	1526.6	
Estonia	568.5	421.0	1391.3	95.0	312.8	41.5	195.1	
Ireland	7991.3	168.4	632.2	…	8972.8	38476.9	727.4	
Spain	18355.4	4698.9	4977.3	8324.0	14578.4	6085.2	6345.1	
Italy	24182.6	35156.3	8402.9	9329.1	19782.9	18676.2	14816.4	
Cyprus	167.7	1.5	1.6	…	15.1	215.5	…	
Latvia	496.0	195.9	1431.6	2.3	183.7	140.1	100.1	
Lithuania	1513.5	667.6	875.6	…	1482.3	41.5	533.3	
Luxembourg	587.4	110.8	630.3	…	435.7	1.2	1454.7	
Malta	…	…	…	…	0.9	64.2	71.5	
Netherlands	27392.3	1963.9	4678.2	…	21875.0	6272.9	4416.9	
Germany	36415.4	10867.9	20205.2	8696.2	65906.4	37350.2	27329.2	
Poland	11494.6	2892.0	6354.7	3417.6	5533.4	1514.9	8085.5	
Portugal	3506.7	5718.9	2420.4	3581.7	1976.1	587.3	2399.6	
Romania	1363.1	5033.0	1846.5	1426.0	606.9	378.3	2651.5	
Slovakia	1039.7	924.3	1450.7	…	1033.3	…	2961.7	
Slovenia	458.4	333.8	1020.6	…	1078.6	…	973.5	
Hungary	3644.1	1321.2	1112.8	1341.9	2931.3	2517.4	3520.8	
Finland	1084.0	361.3	11690.4	…	2639.6	…	1352.2	
France	31129.8	7475.4	7214.5	3703.7	37948.5	16215.7	9126.7	
Croatia	902.5	948.4	676.5	8.7	417.1	542.5	358.0	
Czech Republic	2664.5	1700.4	2966.4	2.3	2914.3	921.5	4481.8	
Sweden	2223.8	429.4	120879.2	…	4713.2	…	2156.3	

Source: elaborated by the authors based on SSSU. 2019; Eurostat. 2019; OECD. 2019.

member states in 2015, million EUR

	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products	Manufacture of food products; beverages and tobacco products
	344.4	**8159.9**	**462.5**	**305.3**	**749.2**	**1705.2**	**359.4**	**435.0**	**642.5**
	1540.8	9804.9	8719.2	3582.0	7524.4	13815.6	10644.7	1177.7	3265.4
	2421.3	12868.9	3382.2	3253.6	1756.6	6729.7	11701.8	1033.5	2630.5
	527.0	3204.1	630.1	338.0	1056.6	913.8	877.6	170.3	425.4
	2002.1	9161.7	5832.6	18945.1	5247.4	21845.7	35162.7	29352.2	9891.9
	372.1	2262.6	749.6	257.9	527.8	218.0	49.3	56.5	197.4
	418.7	878.0	1630.6	3133.6	1597.1	10017.9	634.3	247.5	2221.7
	157.5	66.3	501.1	1582.6	642.1	263.8	374.7	24.0	456.8
	342.3	684.4	474.3	6895.0	360.4	1735.2	525.7	21.0	524.5
	4803.9	12977.1	8208.3	1446.6	7329.1	8650.7	38836.8	5980.1	2489.7
	8282.2	18874.3	20703.9	8289.0	16981.7	60314.6	31793.4	11623.3	17674.7
	…	…	11.8	…	3.3	33.5	1.3	…	6.0
	245.9	99.3	257.8	269.6	144.0	170.9	126.6	26.9	217.5
	166.0	46.8	390.8	217.8	247.7	263.7	144.0	110.2	1107.0
	338.8	2277.9	241.6	170.9	60.0	877.5	97.6	1.7	26.5
	…	…	…	…	56.3	24.2	…	…	235.5
	1182.4	6098.9	6544.2	7778.4	2910.9	17144.8	…	4048.6	4023.6
	10922.4	44333.2	31756.3	40461.8	49974.7	130161.9	235786.1	50810.7	24613.1
	3005.7	4945.2	8112.9	5809.2	8369.0	4346.5	23992.2	3267.6	11967.9
	1580.8	1348.0	2323.1	888.8	1426.4	1459.4	5467.5	223.0	1541.1
	380.8	2189.5	1593.8	1450.1	2673.5	2348.6	12172.4	1367.2	1637.9
	622.8	1375.7	2055.9	2767.9	2721.4	3072.9	18034.1	…	2823.6
	457.1	1573.4	1297.2	…	1878.6	1009.2	2451.3	63.9	483.7
	1067.1	1856.2	2054.1	7172.3	3494.4	4551.2	19293.6	337.3	1300.2
	578.9	5137.9	989.4	2072.8	2610.2	7263.4	2139.6	812.7	518.7
	4411.4	15504.7	10504.8	12550.3	12459.2	20283.7	38091.4	57204.1	12985.2
	415.7	185.8	731.6	172.3	413.0	500.9	141.1	326.6	390.8
	1832.0	3024.0	6497.8	4373.1	6162.9	7276.1	27935.9	1484.5	2340.9
	656.1	8917.1	3113.8	…	…	12093.8	12595.9	1497.2	2090.1

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