UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

GEIPP
UKRAINE
GLOBAL ECO-INDUSTRIAL PARKS PROGRAMME

SURVEY OF SUPPLY CHAINS IN POST-CONFLICT CONDITIONS IN UKRAINE

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
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Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Economic Affairs SECO

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Executive Summary

Since the start of the armed conflict, hundreds of manufacturing companies operating in Ukraine's eastern and central regions have been forced to suspend their operations, and some have been relocated to Western and South-western Ukraine. According to the Ministry of Economy of Ukraine[1], as of the beginning of March 2023, 800 companies have already relocated to safer areas, 623 enterprises have resumed operations in new locations, 239 enterprises are actively searching for recent locations or transportation methods, and 650 companies have cancelled their relocation due to the de-occupation of the territories where they were located.

This process needs to be managed carefully, as preserving every job and ensuring uninterrupted business operations is an extremely important government task.

That is why the purpose of this assessment is to research, analyse and select the most promising supply chains[2] for the formation of industry clusters in Ukraine based on the EIP principles[3], capable of supporting the country's economy during the war and making the most significant contribution to its post-war recovery, thereby contributing to inclusive and sustainable industrial development.

The report presents an analyses of critical industrial supply chains with the highest potential for growth, profitability, increase and job creation in Western Ukraine, focusing on resource efficiency, clean production and industrial symbiosis opportunities at the industrial park and company level.

This research was carried out within the framework of the Global Eco-Industrial Parks Program (GEIPP) in Developing Countries and Countries with Economies in Transition; the currently implemented UNIDO project "Global Eco-Industrial Parks Program - Ukraine: Country Level Intervention" (GEIPP-Ukraine) will address the development of eco-industrial parks (EIPs) in Ukraine.

GEIPP is an initiative led by the United Nations Industrial Development Organization (UNIDO) and funded by the Swiss State Secretariat for Economic Affairs (SECO) to demonstrate the viability and benefits of EIP approaches to increase resource productivity and improve the economic, environmental, and social performance of businesses by creating shared economic opportunities, improving ecosystems and innovative opportunities for responsible business.

This research addresses only some of the points below:

- Mapping the demand and supply of services in the target areas (west and southwest of Ukraine) and identifying market dynamics and opportunities.

[1]Ministry of Economy of Ukraine https://www.me.gov.ua/News/Detail?lang=uk-UA&id=a700c206-722a-4752-b5bb-78a1063ae9db&title=ZaRikViiniVBilsh

[2] Supply chain is a network of facilities that procure raw materials, transform them into intermediate goods and then final products to customers through a distribution system. Supply chain activities involve the transformation of natural resources, raw materials, and components into a finished product and delivering the same to the end customer.

[3] The following definition, commonly employed by UNIDO recognizes the importance of the three pillars of sustainable development and of integrating EIP considerations into all phases of the development and operations of industrial parks: "A community of manufacturing and service businesses located together on a common property. Member businesses seek enhanced environmental, economic, and social performance through collaboration in managing environmental and resource issues."

- Selection of critical industrial supply chains with the highest potential for growth, profitability, increase and job creation able to accommodate internally displaced persons.
- Mapping selected supply chains for development, including cross-sectoral relationships between supply chains to create new EIP clusters.
- Identification of supporting functions and infrastructure required to operate the operation of the identified supply chains or industrial clusters.
- Summarise the rules and regulations for selected supply chains.
- Identification of any regulatory gaps in selected supply chains
- Assessing the supply chain's competitiveness and identifying ways to create competitive advantages for target sectors when relocating production enterprises from the eastern regions to the western areas of Ukraine to benefit of the internally displaced population.
- Assessing the supply chain's cost, profit, marketing, supply and demand dynamics.
- Development of recommendations for selected supply chains.
- Identifying gaps and opportunities for investment, including risk appetite and willingness of financial intermediaries to develop products and services in Ukraine for post-conflict conditions.

A group of research experts conducted a study between September 2022 and November 2022. The report is structured as follows: after describing the executive summary and background, the methodology used in the study is explained. The market and the findings on supply chain assessment are presented in section 2, which includes sub-sections 2.1 to 2.4. In sub-section 2.1, the supply and demand of services in the target regions are mapped, and market dynamics and opportunities are identified. Sub-section 2.2 assesses the competitiveness of the supply chains and determines how to create competitive advantages for the target sectors. Sub-section 2.3 focuses on selecting key industrial supply chains with the highest growth and job creation potential, capable of accepting internally displaced persons. Sub-section 2.4 assesses three selected supply chains in detail: the food supply chain of the plant group, the meat and meat products supply chain, and the forest products supply chain. Each sub-section concludes with a SWOT analysis and recommendations for the respective supply chains. Section 3 discusses gaps and opportunities for investments, while section 4 presents priority potential development interventions based on the analysis conducted. The report ends with annexes, including references, calculations, and other supplementary information.

The research team gathered information from the industry analysis as well as data from a stakeholder workshop. As not all data from February to the present is in the public domain in accordance with the established Law of Ukraine, "On the Protection of Subjects of Reporting and Other Documents during Martial Law or the State of War", the report also uses empirical methods of analysis, assumptions, consultations with market participants and authorities, public statements of enterprises. The assessment approach was based on proven methodologies that provide structure, rigour and objectivity in the analysis of potential supply chains to compare and prioritize project interventions based on data analysis from the State Statistics Service of Ukraine, the UN Refugee Agency, the World Bank, and other sources to which there are references in the report.

To analyse the possibilities of development of clustering in Ukraine, various factors are considered. These factors include: cross-sectoral production relations, definition of auxiliary functions and infrastructure, assessment of the competitiveness of supply chains in the conditions of relocation of production enterprises from eastern regions to western regions of Ukraine, dynamics of demand and supply in the supply chain and other data used of "input-output" tables (inter-sectoral balance) disaggregated by 25 regions of Ukraine.

The analysis of the leading economic indicators of Ukrainian economic sectors reveals that, in terms of the total final product of the Ukrainian economy, personal consumption of households holds the largest share (39.6%) in the structure. It is followed by export consumption outside the national economy (34.0%), government expenditure (14.7%), gross capital formation (11.0%) and the smallest share of non-profit institutions serving households (0.7%). The structure of these indicators varies across different regions of Ukraine.

The analysis of the structure of regional value added by sector showed that Kyiv is the largest contributor to the value of the total amount of weight added (23.9%). Dnipropetrovsk (9.8%), Kharkiv (6.2%), Lviv (5.4%), and Donetsk (5.2%) are also major regions by the share of value added by regions taking part in the business relocation program: Vinnytsia (3.2%), Ivano-Frankivsk (2.2%), Khmelnytskyi (2.1%), Rivne and Volyn (1.9% each), Zakarpattia (1.5%), Ternopil (1.4%), and Chernivtsi (1.0%).

The largest sectors of the economy in terms of value added are Industry (23.1%), Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles (15.4%), Agriculture, Forestry and Fisheries (10.4%). Dnipropetrovsk Region (UAH 133,529.8 million .), the Real Estate Operations (UAH 121,754.9 million .) and the Information and Communications (UAH 115,694.2 million) sectors of Kyiv generate the greatest amount of value added in monetary terms.

In terms of sectoral distribution and specialisation of the regions, the greatest concentration of industry is in Donetsk, Zaporizhzhia, Dnipropetrovsk, Poltava, Ivano-Frankivsk, Kharkiv, Luhansk, Cherkasy, Sumy, Mykolaiv regions. Meanwhile, wholesale and retail trade is primarily centered in Zakarpattia, Chernivtsi, Volyn, Rivne, Luhansk, Odesa, Kherson, Ternopil, Zhytomyr, Chernihiv, Lviv, Khmelnytskyi, Ivano-Frankivsk, Kyiv, Sumy, Mykolaiv regions. Agriculture, forestry and fisheries are mainly found in Kirovohrad, Ternopil, Kherson, Khmelnytskyi, Chernihiv, Vinnytsia, Sumy, Luhansk, Cherkasy, Zhytomyr, Chernivtsi, Volyn, Rivne, Poltava, Kyiv, Mykolaiv regions.

The analysis of inter-sectoral production relations[4], demonstrates that the main sectors-buyers of resources are Industry (UAH 1,530.47 million, 42% of the total amount of consumption), Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles (UAH 445,10 million, 12%), Agriculture, Forestry and Fishing (UAH 3,847.90 million, 11%). The largest consuming sectors are Industry (UAH 1,355,338, 37% of the total supply), wholesale and retail trade, repair of motor vehicles and motorcycles (UAH 563,48 million, 15%), Agriculture, Forestry and Fisheries (UAH 359,415 million, 10%). It should be noted that sectors such as industry, construction, public administration and defence, and mandatory social insurance fix larger amounts as buyers of resources than suppliers. It means that the output of these sectors uses relatively more inputs and is, therefore, more dependent on supplies from other sectors. On the other hand, sectors such as Agriculture, Forestry and Fisheries, Wholesale and Retail Trade, Motor Vehicle and Motorcycle Repair, Transport and Storage sell more resources than they consume. It shows that these sectors supply more production in the economy by providing the necessary raw materials and services.

An economic sensitivity analysis of Ukrainian economic sectors demonstrates the overall production effects for the two leading sectors of each oblast. Thus, on the example of the industry leader - Dnipropetrovsk region: the increase in the final consumption of UAH 1 million in this sector will lead to the growth of the total output of the whole economy by

[4] The analysis of inter-sectoral production relation with the corresponding nominal values of supply and demand in monetary terms and their structural shares, showing the dual role of each sector: as a supplier and as a consumer of resources

UAH 1,950 million including UAH 1 million. directly through the increase in the final product in the total output, by UAH 510,000 - due to the increased consumption of resources in the industrial sector to produce this final product, by UAH 440,000 through the growth of production links (intermediate products) of other industries in different regions to ensure industrial output growth in the Dnipropetrovsk region. The example of the industry of the relocation region - Zakarpattia region: the increase of final consumption of UAH 1 million in this sector will lead to the increase in the total output of the whole economy by UAH 1,920 million, including UAH 1 million directly due to the increase in the final product as part of the total output, by UAH 500,000 as a result of the increase in the consumption of resources in the industrial sector to produce this final product, by UAH 420,000 due to the increase in production links (intermediate product) of other industries in different regions to ensure the growth of industrial output in Zakarpattia region.

Further analysis of the simple output multipliers of the two main sectors of all regions shows extremely high values. It means that the economies of all parts are sensitive to changes in final demand, needing the largest additional output to meet the increase in demand for the final product. In the structure of all output multipliers, more than half of their value is accounted for by the initial effect, i.e., most of the increase in demand for the products of all sectors is provided by the increase in output in these same sectors.

Analysis of simple multipliers of the value added of the Industrial sector for many regions, such as Donetsk (-2.48), Poltava (-2.05), and Zaporizhzhya (-1.16), is below 1, indicating that part of the income does not flow into the domestic economy. At the same time, all positive values of multipliers do not exceed 1.

It should be noted that most large GDP regions, such as Dnipropetrovsk, Kharkiv, Kyiv region and Kyiv city Lviv region, have relatively low sectoral multiplier values compared to the national average, as their economies are strongly attracted to the middle part of production value chains, where the value-added multipliers are low.

Since value-added multipliers refer to the content of domestic income in demand, lower indices also tend to be due to the higher share of foreign resources in final output production. These regions that determine the state of the entire national economy, which is also characterized by an extremely low ratio of value added and final consumption to total output and requires systemic changes.

A macroeconomic analysis based on the national input-output table finds, among other things, a multiplier effect of increasing final demand on intermediate production and consumption, value-added, and, consequently, on total GDP. According to the current government program, the results are suitable for identifying attractive directions for relocating businesses belonging to different economic sectors. The program for the relocation of businesses from areas close to or in the war zone to safer areas of Western Ukraine has identified nine regions (Zakarpattia, Lviv, Ivano-Frankivsk, Ternopil, Khmelnytskyi, Chernivtsi, Vinnytsia, Volyn and Rivne regions) to which businesses can relocate.

The assessment of the attractiveness of the specified regions in terms of business relocation is based on the assumption that the final demand for the products of all regional economic sectors is not fully satisfied. Consequently, enterprises relocated to these regions will be able to sell their products to the end consumer, will be to "integrate" into the relevant regional economic structure and will cause equivalent multiplier effects in the sectors to which they belong. It is also assumed that one can neglect the impact of relocation of businesses from the economy of donor regions, because the relocation attractiveness is assessed by comparing the recipient regions in terms of multiplier effects, and the relocation effects will be the same in all cases.

Thus, businesses belonging to the Agriculture, Forestry and Fisheries sectors are more likely to relocate to the Rivne or Chernivtsi regions since their further production activities with the increase in the final product they create will have the maximum multiplier effect on the total output and value added at the level of the entire country. Rivne and Ivano-Frankivsk regions are the most attractive concerning business relocation. Relocating businesses in the Zakarpattia and Storage sector to Ivano-Frankivsk, Khmelnytskyi, or Chernivtsi will stimulate the greatest growth of the national economy.

Ivano-Frankivsk and Rivne regions are the leading regions with relocation attractiveness among those participating in the Enterprise Relocation Program, due to the highest sensitivity of total output and value-added levels in most sectors. Thus, 11 out of 16 sectors are desirable to relocate to the Ivano-Frankivsk region, and 8 out of 16 sectors are desirable to relocate to the Rivne region.

According to the analysis, the key industrial supply chains with the highest potential for growth in intermediate consumption, value-added, and total output are located in the following regions:

1. **Vinnytsia region**. Businesses are involved in the beverages production industry, tobacco production industry, computer industry, electronic and optical products, as well as of machinery and equipment production industry.
2. **Khmelnytskyi region.** Businesses are involved in the sector of beverage production, clothing manufacturing industry, paper, and paper products manufacturing sector, as well as in the production of chemicals and chemical products.
3. **Chernivtsi region**. Businesses are involved in the food production sector, the leather and related products manufacturing sector, the paper and paper products manufacturing sector, and the production of other non-metallic mineral products.
4. **Ternopil region**. Businesses are involved the tobacco production industry, and basic metals, as well as in machinery and equipment production.
5. **Ivano-Frankivsk region**. Businesses are involved in the production of:
    - wood and products made of wood and cork, (excluding furniture),
    - manufacture of straw products and weaving materials;
    - paper and paper products; printing and duplicating recorded media;
    - basic pharmaceutical products and pharmaceutical manufacture;
    - the manufacture of rubber and plastic products;
    - the manufacture of finished metal products, other than machinery and equipment,
    - the manufacture of computer, electronic and optical products;
    - furniture manufacturing.
6. **Zakarpattia region**. Businesses are involved in the paper and paper products manufacturing sector, the electrical equipment manufacturing sector, the production of other transport equipment, and the repair and installation of machinery and equipment.
7. **Lviv region**. Businesses are involved in the textile manufacturing sector and the repair and installation of machinery and equipment .
8. **Volyn region**. Businesses are involved in printing and duplicating recorded media, in the manufacture of coke and petroleum products, in the manufacture of motor vehicles, trailers and semi-trailers, and other manufacturing.
9. **Rivne region**. Enterprises are involved in the following sectors:
    - food production sector,

- beverage production sector,
- tobacco production,
- textile manufacturing sector,
- clothing manufacturing sector,
- leather and related products manufacturing sector,
- wood and wood products and cork products, except furniture,
- production of straw products and weaving materials,
- sector of printing and duplicating recorded media,
- production sector of coke and petroleum products,
- production sector of chemicals and chemical products,
- sector of basic pharmaceuticals and pharmaceutical products,
- sector of rubber and plastic products,
- manufacture of other non-metallic mineral products,
- manufacture of basic metals sector,
- manufacture of finished metal products, except for machines and equipment,
- electrical equipment sector,
- manufacture of motor vehicle, trailer and semi-trailer sector,
- other transport equipment manufacturing sector,
- furniture manufacturing sector,
- other manufacturing sector,
- repair and installation of machinery and equipment sector.

The analysis of labour potential in the Western regions shows that Lviv and Khmelnytskyi regions have the highest labour potential in almost all sectors and have the highest indicators. At the same time, the Chernivtsi region has the lowest potential among the western area.

By considering the economic characteristics of Western Ukraine (Zakarpattia, Ivano-Frankivsk, Lviv, Ternopil, Khmelnytskyi, Chernivtsi, Vinnytsia, Volyn, Rivne oblasts). The research expert group included in the scoring model of more than 23 sectors and 43 subsectors in the context of the main product components of the supply chain. The analysis involved studying labour supply and demand in terms of regions and economic activities. Based on these findings the research identified specific supply chains with the highest potential for growth, profitability, and job creation, while also being suitable for accommodating internally displaced persons. These supply chains include:

- Chain of bread, pastry, cakes, biscuits, and other bakers' wares
- Chain of animal or vegetable fats and oils and their cleavage products
- Chain of pasta (whether or not cooked or stuffed with meat or other substances or otherwise prepared).
- Chain of meat and edible meat offal.
- Chain of animal fodder.
- Chain of sauces and mixed seasonings; mustard flour and meal and prepared mustard.

- Chain of prepared foods obtained by the swelling or roasting of cereals or cereal products
- Chain of paper and paperboard.
- Chain of wood and articles of wood.
- Chain of packing cases (e.g boxes, crates, drums, and similar wood products).

The authors of the report took into consideration the sustainable, innovative links among the participants and the specificities of creating the products and material flows resulting from economic activities, including input resources, supply, production, storage, processing, sorting, purification, packaging, retail and wholesale trade, national consumption, and export. Based on these factors, they identified three key directions of supply chain integration in the western regions of the business relocation program based on the principles of EIP.

These key directions include the food supply chain of the plant group of goods, the meat and meat products supply chain, and the forest products supply chain.

The application of the service supply and demand mapping method in the target areas (west and south-west of Ukraine) enabled the identification of market dynamics, key industrial supply chains with the highest potential for growth, profitability, increase and job creation, as well as capable of hosting internally displaced persons.

Based on the use of the structural analysis method, the production costs of enterprises were grouped by economic activity and the average parts of material costs, depreciation, labour costs, social security contributions and other costs were calculated and analysed for each link in the supply chain and its components.

An in-depth analysis of key industrial supply chains with high potential for growth, profitability, and job creation for internally displaced persons has been conducted, and the following conclusions have been drawn:

- **For the food supply chain of the plant group of the goods supply chain,** the analysis showed the presence of specific threats. However, the situation for the plant group food supply chain in the Western regions of Ukraine can be considered favourable. Weaknesses were identified, such as significant depreciation of fixed assets, dependence on credit terms, low technology compliance culture, and weakness in marketing (working with intermediaries). Consolidating enterprises based on industrial parks will enable small and medium-sized enterprises to increase profitability and production efficiency in the Western regions of Ukraine. Level-cluster analysis of regions of food clustering of the vegetable group of goods[5] showed that the first level of the most promising cluster includes: Vinnytsia, Ternopil, Khmelnytskiy oblasts, and the second level: Rivne oblast, up to the third level: Volyn, Chernivtsi, Lviv, Ivano-Frankivsk regions, up to the fourth level: Zakarpattia region.
- **For the meat and meat products supply chain,** the analysis illustrates that it is difficult for most enterprises in the sector to catch up with the busy global and domestic agricultural leaders in producing and processing meat products. It is difficult for a significant number of agribusiness enterprises to achieve competitive production without state support. Level-cluster analysis of regions of food clustering of the vegetable group of goods showed that the first level of the most promising cluster includes: Lviv and Vinnytsia regions, the second level:

[5] Based on the principles of EIP for the benefit of the development of the industry and the creation of conditions for business relocation, the increase of jobs to attract internally displaced persons

Khmelnytskiy, Ivano-Frankivsk, Volyn oblasts, up to the third level: Ternopil and Rivne oblasts, up to the fourth level: Chernivtsi and Zakarpattia regions.

- **For the forest products supply chain,** the analysis illustrates that it is difficult for most enterprises in the sector to catch up with the world leaders in the production and processing of forest products supply chain. It is easier for a significant number of enterprises to ensure competitive production with state support. A Level-by-level cluster analysis of regions of food clustering of plant products group showed that the first level of the most promising cluster includes: Lviv, Volyn, Zakarpattia, Ivano-Frankivsk regions, up to the second level: Rivne region, up to the third level: Vinnytsia region, up to the fourth level: Chernivtsi, Khmelnytskyi, Ternopil regions.

As a result of the analysis, the research experts developed general recommendations for developing the above supply chains based on EIP principles and constructed a matrix of priority interventions. The main recommendations include:

Proposals for the first stage of the chain: "Product selection, provision of resources and services for production":

a. Training in the production of food products of the plant group of products of their processing, meat and meat products, forest industry, familiarisation with modern technologies and equipment used in production.
b. Improvement of the regulatory framework in the forestry sector and its harmonisation with international principles of sustainable development and forest management.
c. Training and advisory services on proper selection of technologies (soil sampling, selection of varieties and PPE, fertiliser application rates, selection of equipment and production technologies).
d. Seeking cooperation with the leading companies supplying resources (hybrid seeds, fertilizers, pesticides, equipment, etc.).
e. Involvement of financial institutions for financial support in the purchase of resources.

Proposals for the second stage: "Primary production":

a. Further consulting support of small and medium-sized enterprises in the production of food products of the vegetable group of goods, meat and meat products, and forest industry.
b. Consulting on improving producers' understanding and use of improved production systems, improving crop, livestock, and forestry management.
c. Develop training programs based on the knowledge and experience of resource producers and suppliers.
d. Support in the certification procedures of the main production according to HACCP and ISO 14001, ISO 5000, ISO 37000, ISO 26000, and ISO 45001 in the past: OHSAS 18001, GRI, as well as religious schemes Halal+, Kosher+, Bio/Eco, Vegan+, etc.
e. Financing of capital investments.

Proposals for the third stage: "Processing or storage":

a. Consulting support on issues of storage and sale of finished products.
b. Coordination on the establishment of links between primary producers and the processing industry, which should ensure the stability of direct producers from the point of view of the market and the continuity of production of raw materials of domestic origin.

c. Organization of cooperation with suppliers of storage and processing equipment. Joining efforts for consolidated storage, ensuring conditions for storage.
d. Expanding access to short-term credit to improve prompt payment capacity to producers.

Proposals for the fourth stage: "Pre-sale preparation and sale":

a. Consultations on the introduction of new upgraded packaging and labelling technologies that meet the requirements of high-end buyers and extend the shelf life of new products.
b. Promotion of local products through the help of registration of products with a geographical indication following a defined production scheme, careful selection of raw materials, and quality control at all stages of production.
c. Promote branding, and conduct promotional measures, such as assistance in developing websites and promotional materials.

Background

Background

The Russian Federation's full-scale invasion of Ukraine, which began on February 24, 2022, has caused severe human, social and economic damage. By the end of 2022, approximately 7.9 million refugees[6] had left Ukraine and sought protection throughout Europe, with almost 7 million internally displaced persons, of which 4.8 million are registered[7]. The war in Ukraine represents the second-largest humanitarian crisis since the 1960s in terms of the number of people fleeing or displaced and the fifth-largest affected population [8].

Millions of Ukrainians now live in destroyed houses or buildings not sufficiently protected from harsh winter conditions. Inadequate housing particularly affects vulnerable groups, including the elderly, people with disabilities, chronic illnesses and children. The Government of Ukraine, with the support of humanitarian partners, is leading the preparation and implementation of winter activities. However, they may not meet the full scope of needs on the ground, leading to further internal and cross-border displacement.

The National Recovery Council's preliminary assessment of Ukraine's losses from the war with Russia is USD 95.5 billion. The World Bank's Rapid Damage and Needs Assessment (RDNA) as of 1 June estimates USD 97 billion in direct losses, USD 252 billion in indirect losses and USD 349 billion in recovery needs. According to the Rapid Damage and Needs Assessment (RDNA2)[9] as of February 24, 2023, direct damage in Ukraine due to Russia's invasion has reached over USD 135 billion, USD 276 billion in indirect losses and USD 411 billion in recovery needs.

The areas of Ukraine directly affected by the fighting have been the hardest hit: Donetsk, Kharkiv, Luhansk, Zaporizhzhya, Kyiv, Chernihiv and, Mykolaiv regions.

Among the sectors of the economy, the biggest losers were metallurgy, machine building, oil refining, aircraft manufacturing, coke producing, glass and paper production, chemical industry, beverage production, pharmaceuticals, and gas extraction. By the way, metallurgy lost at least 30% of its assets. Some large mining enterprises have resumed work or have not stopped working since the beginning of the war.

Even after the liberation of the regions in the north of Ukraine, about 13% of the territory was contaminated by Russian minefields. In the areas where hostilities took place, farmers suffered from unexploded ammunition, improvised explosive devices, and spilt fuel; from the replacement of the territory, which made it impossible to conduct economic activity; from theft and destruction of equipment.

The “Grain Initiative” signed by representatives of Ukraine, Turkey, and the United Nations in late July 2022, unlocked the ports for the safe transportation of grain and food at the seaports of Odesa, Chornomorsk and Pivdenny which were previously responsible for 80% of agro-exports before the war. The initiative has supported Ukrainian farmers, increased foreign currency inflows to Ukraine, stabilized global food prices, and prevented a significant deterioration of the humanitarian situation in countries on the brink of famine, including Ethiopia, Somalia, and Afghanistan. As of March 26, 2023, the Grain Initiative has

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[6] Ukraine Situation - 2022 Final Report Regional Refugee Response Plan https://data.unhcr.org/en/documents/details/99791

[7] Vereshchuk named the exact number of internally displaced persons https://ua.news/ua/ukraine/vereshhuk-nazvala-tochnoe-chyslo-vnutrennyh-pereselentsev

[8] McKinsey&Co. War in Ukraine: Twelve disruptions changing the world.

[9] conducted by the World Bank, the Government of Ukraine, the European Commission, and the United Nations, along with other partners,

sent 845 vessels carrying 25.7 million tons of agricultural products to countries in Africa, Asia, and Europe through the ports of Odessa. [10].

Despite the reserves formed by agricultural producers before the war, during the sowing season, farmers faced a lack of fuel, fertilizers, crop protection products and blocked logistics, and the regional military administrations helped solve all problematic issues of farmers as much as possible.

The prices for some categories of fertilizers reached the level of 70%, mainly nitrogen and potassium fertilizers, since a significant part of them was purchased in Belarus or produced in the affected territories of Ukraine (OSTCHEM Group plant in Severodonetsk and State Enterprise "Sumykhimprom" in Sumy). The state program "Affordable loans 5-7-9%" helped farmers overcome unforeseen obstacles and complete the sowing campaign.

Some producers specialized in highly profitable niche markets, which made their products unnecessary in the wartime economy and resulted in reduced sales due to falling domestic demand or the collapse of supply chains.

With the outbreak of war, the structure of trade in services also changed fundamentally. Exports declined in almost all types. In particular, the export of transport services decreased due to the blocked port infrastructure and the closure of airspace. The export of tolling services also decreased significantly because of both the temporary shutdown of certain factories at the beginning of the war and the relocation of some production facilities from Ukraine. IT services expectedly declined less. They were among the first to start recovering since April. Over the forecast horizon, IT services will remain the main driver of service export growth at a stable high rate (10–14%).

The services sector has suffered due to a significant decrease in demand for all secondary services in the occupied regions and regions immediately adjacent to or close to the area of active hostilities. The main reasons include 1) a change in the priority of household expenses and 2) a general decline in the population due to mass migration. The biggest losses due to lack of demand have been incurred by enterprises from the entertainment and hospitality sector.

Other enterprises in the sector also expect a decrease in revenues. Still, with some regional specificity - some businesses in the western region expect an rise in revenues due to the increase in demand for their services due to the influx of internally displaced persons to the west of Ukraine.

Global trade tensions caused by the lockdown through COVID-19 and the closure of the Suez Canal were the beginning of changes and realignments of global supply chains. More companies are strategically shifting from just-in-time supply optimization to "just in case" preparation, combining increased stocks of critical products, components, and materials with efforts to diversify supply bases while localizing or regionalizing supply and manufacturing networks.

The war in Ukraine and the ensuing sanctions give even more reasons to examine the sources and countries of origin of the goods. Considering the war, dual delivery became even more important for supply chain security. However, many sources of supply can increase dependency, flexibility, and capacity, but this can complicate relations with suppliers and require more resources to manage them. As the number of suppliers increases, the price often rises, and the following disadvantages may arise: Information sharing may become more difficult.

[10]Grain corridor: almost 26 million tons of agricultural products were shipped https://ports.ua/zernovij-koridor-vidvantazheno-majzhe-26-mln-tonn-agroprodukczi%D1%97/

Thus, supply chains change again as part of the long road to sustainability. It may well be that as costs shift from goods to services, some pressure on supply chains will diminish, but not all. Meanwhile, as stress mounts, nearshoring (especially in the high-tech and construction industries) and on-shoring are returning to the market, united by a new idea: "friend-shoring" (a commitment to work with countries that clearly adhere to a set of norms and values about how to operate in the global economy.

1. Methodology

1. Methodology

The supply chain assessment is based on the inter-sectoral balance method or input–output balance tables method (IOT method). One of the core indicators calculated using the input–output balance tables is multipliers. The multiplier method has made it possible to identify changes in total output or value added generated by sectors when their final demand changes per unit of value. By applying the multiplicative effects comparing method, the main sectors for each region that have the maximum impact on the entire structure through their respective input and output relationships with other sectors are identified. The hypothetical extraction method, which is based on the assumption that a certain sector "disappears" from the economy, enables the estimation of conditional losses for the region and for the country in absolute and relative terms and establishes measures of sectoral importance. The developed methodology for determining the relocation attractiveness of the regions is based on the method of scoring regions defined by the State Relocation Program, using multipliers of total backward and forward linkages, as well as a simple value-added multiplier.

The application of the service supply and demand *mapping method* in the target areas (west and south-west of Ukraine) enabled the identification of market dynamics, key industrial supply chains with the highest potential for growth, profitability, increase and job creation, as well as capable of hosting internally displaced persons. To assess the potential of creating eco-industrial parks, the *matrix* method was used, which consists of building matrices of key products and supporting services that form chains with complete cycles of the production process – from cultivation to final consumption. The list of products to be included in the chain is formed based on the *rating method and construction of the scoring model.*

Given the empirical and econometric approaches, the clustering method was applied to form EIP clusters in the regions of the relocation program by grouping regions by four-level clustering: the least, sufficient, good and the greatest attractiveness.

The supply chains *SWOT analysis method* consists in dividing product supply factors into four categories: strengths and weaknesses of sector policy, opportunities arising from the implementation of sectoral policies, and threats hindering the implementation of sectoral policy.

Based on the use of *the method of structural analysis*, the grouping of production costs of enterprises by type of economic activity was carried out, and the average shares of material costs, depreciation, labour costs, social security charges and others for each link of supply chains and their components were calculated and analysed. *The coefficients method* is the basis for profitability at certain stages of supply and production consumption, carried out based on the profitability of operating activities of large, medium, and small enterprises that are part of a particular chain. Some intensity coefficients, which characterises the ratio of individual links as suppliers and/or buyers of products of previous and/or subsequent participants in the chains, have been calculated and compared in time to assess the dynamics of supply and demand in the supply scheme. By using the functional *analysis method,* the supporting functions and infrastructure required for the supply chains are discovered.

The identification, analysis, assessment, and development of supply chain recommendations are based on *a systematic approach* and adherence to the principle of "quadruple profit", considering the four pillars of sustainability – economic, social,

environmental and institutional – that will support long-term competitiveness and economic growth.

For a detailed overview of the research methodology, please refer to Annex 1.

2. Findings from Market and Supply Chains

2. Findings from Market and Supply Chains Assessment.

2.1 Mapping the Supply and Demand of Services in the Target Regions

This sub-chapter will provide a map of the Ukraine's supply and demand of services in the target regions (west and southwest of Ukraine) and identify market dynamics and opportunities.

Ukraine has the largest land area in Europe, measuring 603.7 thousand square kilometres, and ranks sixth in terms of population. Its favourable geographical and geopolitical location, abundant natural resources, and production potential contribute to developing domestic economic inter-sectoral linkages and foreign economic relations with neighbouring countries.

Historically, Ukraine has been a transit hub connecting Asia, Western, and Central Europe. The country is home to major pipelines such as the oil pipeline "Druzhba" and gas pipelines "Progress", "Soyuz", and "Urengoy-Uzhgorod". Highways such as Kyiv - Brest, Kharkiv - Moscow, and Kyiv - Lviv also pass through Ukraine.

Since gaining independence, sea and river transport have played a significant role in Ukraine's economy. The country has access to the Black Sea, the Bosphorus Straits, the Aegean Sea (Dardanelles Strait), and the Mediterranean Sea. Ukraine has 19 seaports, with Odesa, Mykolaiv, and Illichivsk (Chornomorsk) being the largest. Additionally, Ukraine has 11 river ports and piers, including Kamensky, Dnipro, Zaporizhzhya, Kyiv, Kremenchuk, Mykolayiv, Nikopol, Novokakhovsky, Kherson, Cherkasy, and Chernihiv River ports. Ferry crossings include Illichivsk-Varna (Bulgaria), Illichivsk - Poti (Georgia), and Crimea - Caucasus.

In the past, the Danube ports (Reni, Izmail, Ust-Danube) served the cargo flows of the seventh (Cretan) transport corridor with the countries of the Danube and Central Europe. Azov ports (Kerch, Berdyansk, Mariupol) served the countries of the Mediterranean, the Danube, and Central Europe. Recently, the share of Danube ports in Ukraine's total cargo turnover has been between 2.5% and 4.2%, or 4-6 million tons of cargo annually. Before the war, only a narrow group of cargo carriers used these ports, either for river export through the Danube or small shipments to Turkey. However, limited infrastructure, insufficient depths, and navigational problems with Romania made the Danube ports unattractive to companies. The lack of economic benefits made investors unwilling to invest, and the government did not want to upgrade them.

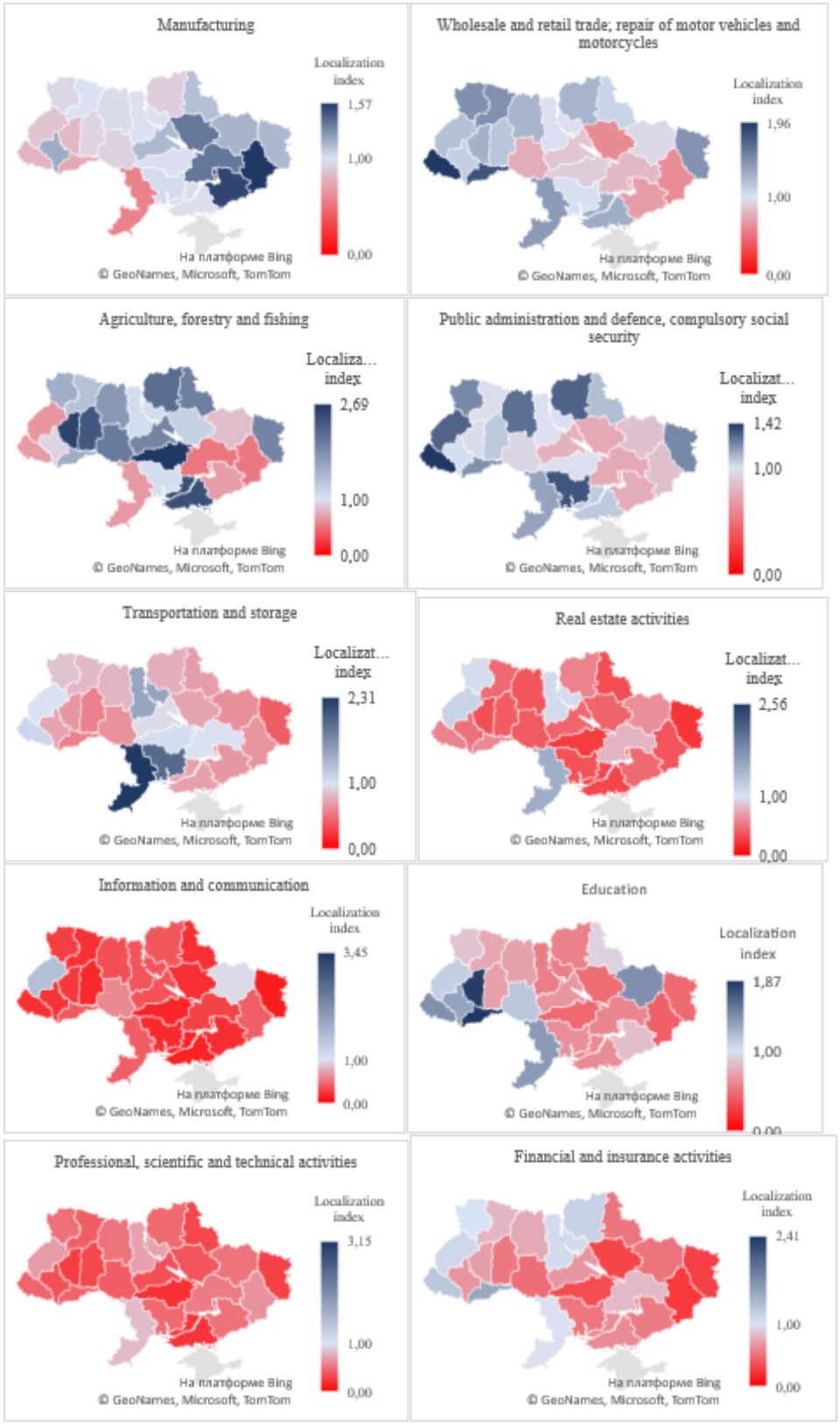
According to USM, in 2021, the volume of cargo turnover in Danube ports was relatively low: Izmail port handled 3.9 million tons, Reni - 1.37 million tons, and Ust-Dunaisk - only 64.3 thousand tons. For comparison, the cargo turnover of the Odesa port in the same year was 22.55 million tons, and the Chornomorsk port - as much as 25.63 million tons. However, the war changed everything. During the blockade, the ports on the river were operational, with ships exporting goods to Romania via the Sulina Estuary. Currently, the Danube ports have demonstrated record cargo handling volumes. The total cargo turnover here has tripled. Port Reni has surpassed its own cargo handling figures by five times, handling 6.82 million tons in 2022, compared to 1.37 million tons in 2021. Port Izmail has doubled its cargo handling volume, with 8.89 million tons in 2022, compared to 4 million tons in the previous year. Ust-Danube Port saw a cargo handling increase from 64,000 tons in 2021 to 785,000 tons in 2022. These figures indicate a significant growth trend in the cargo

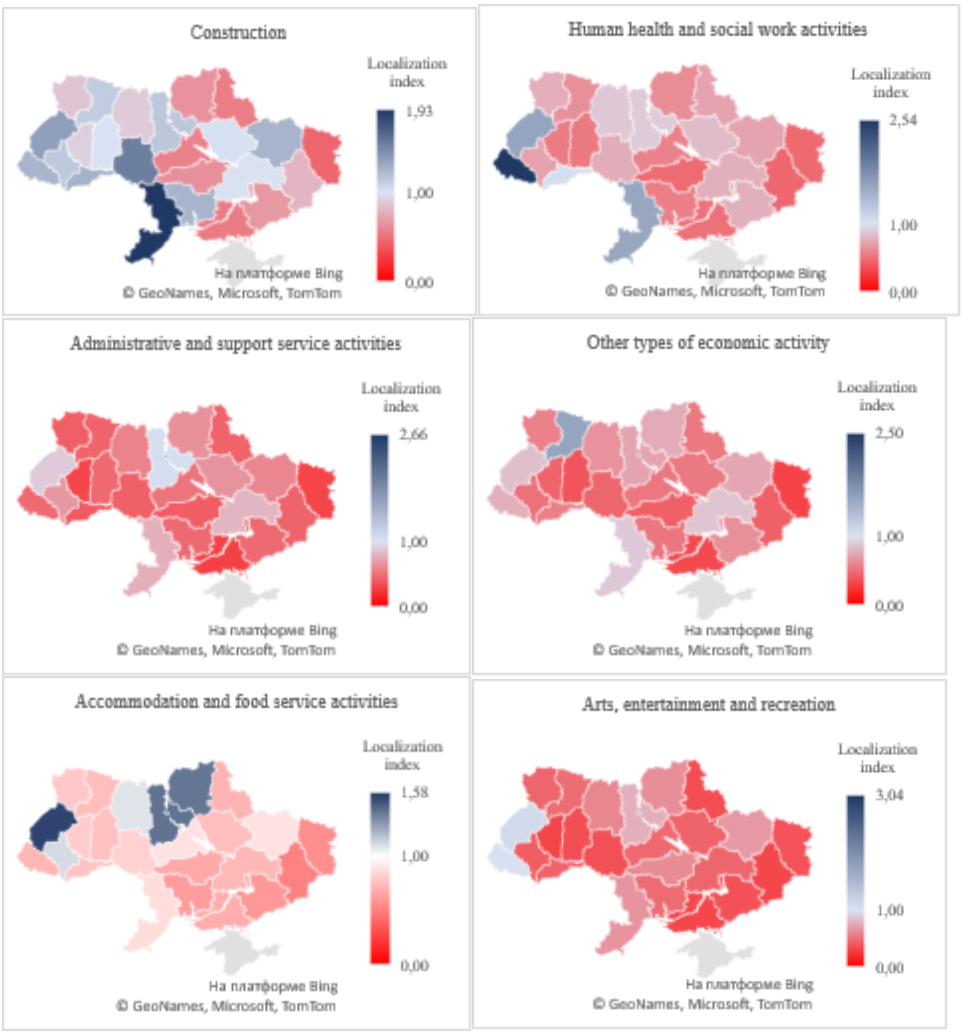
handling capabilities of the Danube ports, which have become important waterways for grain export in post-war Ukraine. It is worth noting that the Ukrainian government, in collaboration with Romania, has plans to develop the Danube ports further.

Traditional drivers of Ukraine's economy are manufacturing, wholesale and retail trade and agriculture.

As for the sectoral distribution and specialization of the regions, the largest concentration of manufacturing is in Donetsk, Zaporizhzhya, Dnipropetrovsk, Poltava, Ivano-Frankivsk, Kharkiv, Luhansk, Cherkasy, Sumy, Mykolayiv regions. Wholesale and retail trade are concentrated in Zakarpattia, Chernivtsi, Volyn, Rivne, Luhansk, Odesa, Kherson, Ternopil, Zhytomyr, Chernihiv, Lviv, Khmelnytskiy, Ivano-Frankivsk, Kyiv, Sumy, Mykolayiv regions. Agriculture, forestry, and fishing are concentrated in Kirovohrad, Ternopil, Kherson, Khmelnytskiy, Chernihiv, Vinnytsya, Sumy, Luhansk, Cherkasy, Zhytomyr, Chernivtsi, Volyn, Rivne, Poltava, Kyiv, Mykolayiv regions. Other industry concentrations, including various services, are presented in Fig.2.1. If the value is less than one of the corresponding industries, the lower the concentration relative to the entire country**.**

Fig. 2.1. Sectoral concentrations of economic activity by region



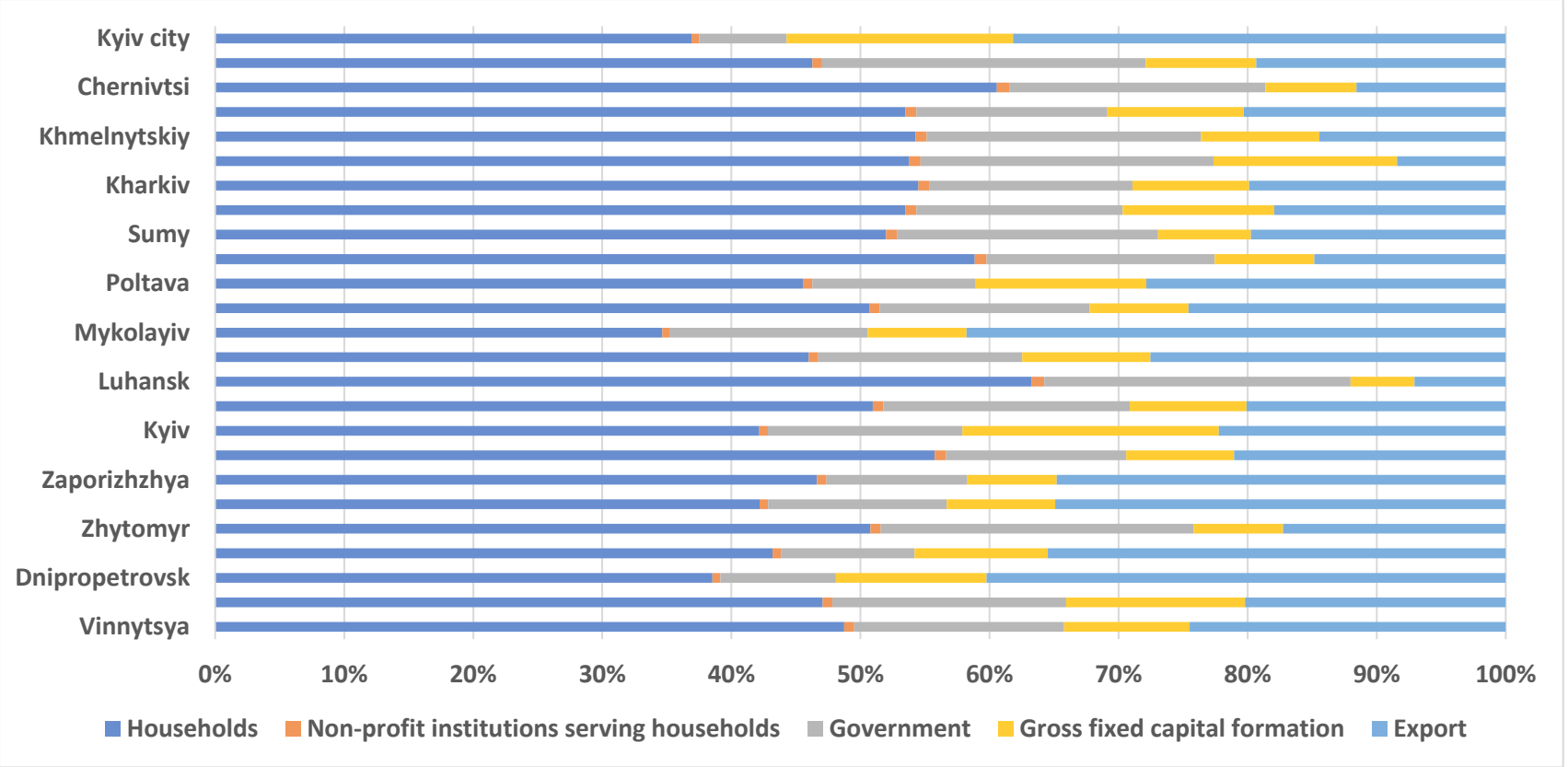


Source: IPG calculations using the interregional input–output Table for 2019. Disaggregated data for 25 regions according to the research paper "Input–output analysis of the war in Ukraine: a tool for assessing the internal territorial consequences of the conflict by Eduardo A. Haddad, Inacio F. Araujo, Ademir Rocha and Karina Sass (as of August 2022)

Analysis of the Basic Economic Indicators of Ukrainian Economy by Sectors.

Fig. 2.1.1. shows the structure of the economy of each region of Ukraine in terms of final demand, which includes the shares of households, non-profit organizations and institutions serving households, government, gross fixed capital formation and exports in the total final product in 2019

Fig. 2.1.1. Composition of the final demand of individual regional economies of Ukraine (in % of the total amount)



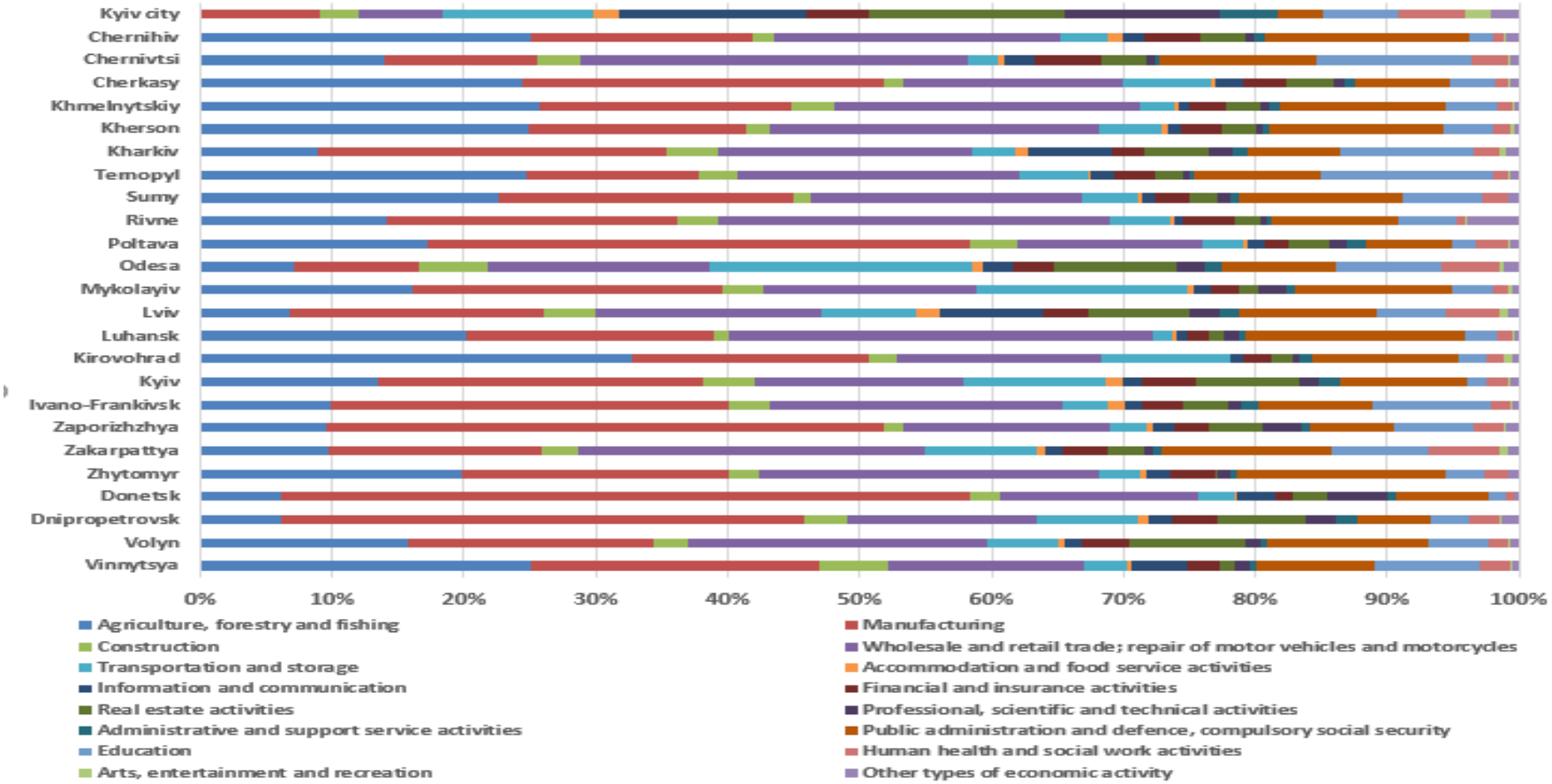
Source: IPG calculations using the 2019 Interregional Output-Output Table. Disaggregated data for 25 regions according to the research paper in August 2022 "Input-Output Analysis of the Ukraine War: A Tool for Assessing the Internal Territorial Impacts of the Conflict" by Eduardo A. Haddad, Inácio F. Araújo, Ademir Rocha & Karina Sass. Research Paper.

On average, in Ukraine, the share of households in final demand was the largest in the structure, amounting to 39.6% and ranged by region from 29.5% (Mykolayiv region) to 58.1% (Luhansk region). The average consumption share corresponding to non-profit institutions serving households was 0.7% and varied from 0.6% (Dnipropetrovsk region and Kyiv) to 1.1% (Luhansk region). The share of the final product, which was consumed by the government (state and local), ranged from 7.4% (Kyiv) to 27.9% (Chernihiv region), around the average value in Ukraine of 14.7%. Gross accumulation averaged 11.0% of the total GDP in Ukraine; by regions, the minimum share of gross accumulation corresponded to the Luhansk region (4.8% of the total final demand), and the maximum – 18.6% (Kyiv region). Consumption outside the national economy (export) in the structure of the final product throughout Ukraine amounted to 34.0%, with a minimum value of this indicator of 8.6% in the Luhansk region and a maximum value of 46.8% in the Mykolayiv region.

Fig. 2.1.2 (provided on the next page) shows the sectoral composition of value-added by regions of the economy. The total amount of value-added created by the Ukrainian economy in 2019 amounted to UAH 3,421,628. The largest contribution to the value of the total amount of value added is provided by the city of Kyiv (23.9%). Also, large regions in terms of the share of value added are Dnipropetrovsk (9.8%), Kharkiv (6.2%), Lviv (5.4%), and Donetsk (5.2%).

The largest sectors of the economy in terms of value added are manufacturing (23.1%), wholesale and retail trade, repair of motor vehicles and motorcycles (15.4%), Agriculture, forestry and fishing (10.4%). The largest volumes of value added in terms of value were created by the manufacturing of the Dnipropetrovsk region (UAH 133,529.8 million), the sectors of real estate activities (UAH 121,754.9 million) and information and communications (UAH 115,694.2 million) in Kyiv.

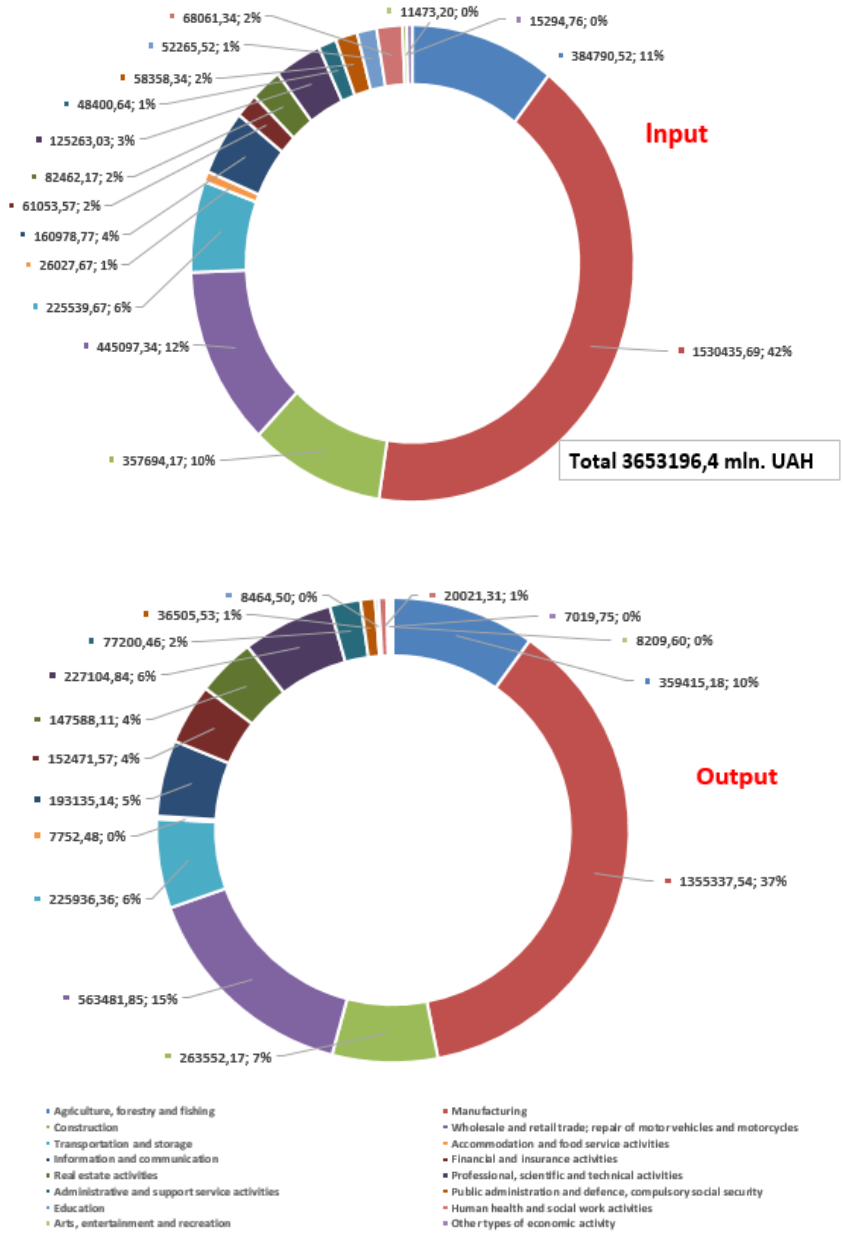
Fig. 2.1.2 Sectoral composition of value-added by regions of Ukraine



Source: IPG calculations using the 2019 Interregional Output-Output Table. Disaggregated data for 25 regions according to the research paper in August 2022 "Input-Output Analysis of the Ukraine War: A Tool for Assessing the Internal Territorial Impacts of the Conflict" by Eduardo A. Haddad, Inácio F. Araújo, Ademir Rocha & Karina Sass. Research Paper

To determine and analyse the structure of the national economy, along with indicators of final demand and value-added, inter-sectoral linkages are of great importance, which are given in the first quadrant of the input–output matrix and show the dual role of each sector: as a supplier and as a consumer of resources. In Fig. 2.1.3, structural diagrams of intermediate transactions of 25 regions of Ukraine as sellers and buyers with corresponding nominal values of supply and demand in monetary terms and their structural shares are given.

Fig. 2.1.3. Intraregional intermediate transactions of individual sectors of the economy



Source: IPG calculations using the 2019 Interregional Output-Output Table. Disaggregated data for 25 regions according to the research paper in August 2022 "Input-Output Analysis of the Ukraine War: A Tool for Assessing the Internal Territorial Impacts of the Conflict" by Eduardo A. Haddad, Inácio F. Araújo, Ademir Rocha & Karina Sass. Research Paper

The sectors in the upper diagram characterise the volumes and shares of intermediate purchases of sectors of the economy, which they have carried out as consumers of resources realised by economic sectors from the bottom diagram. The total amount of unidirectional flows ("input" or "output") is equal to UAH 3,653.19 million for 2019. The main sectors-buyers of resources are manufacturing (UAH 1,530.44 million, 42% of total consumption), wholesale and retail trade, repair of motor vehicles and motorcycles (UAH 445,097 million, 12%), agriculture, forestry, and fishing (UAH 3,847.90 million, 11%). The largest industries-sellers of resources are also manufacturing (UAH 1,355.34 million, 37% of the total supply), wholesale and retail trade, repair of motor vehicles and motorcycles (UAH 563,482 million, 15%), agriculture, forestry, and fisheries (UAH 359,415 million, 10%).

It should be noted that in sectors such as manufacturing, construction, public administration and defense, compulsory social insurance record larger amounts as buyers of resources than as suppliers. This means that the products of these sectors use a relatively larger amount of input resources and therefore depend more on supplies from other sectors. On the other hand, sectors such as Agriculture, Forestry and Fishing, Wholesale and Retail, Motor Vehicle and Motorcycle Repair, Transportation and Storage sell more resources than they consume. This indicates that these sectors provide production to a greater extent in the economy, providing the necessary raw materials and services.

Analysis of economic sensitivity of the Ukrainian economy by sectors.

a) Simple output multipliers

The values of output multipliers for the two leading sectors of each region of Ukraine and their composition are shown in Fig. 2.1.4.

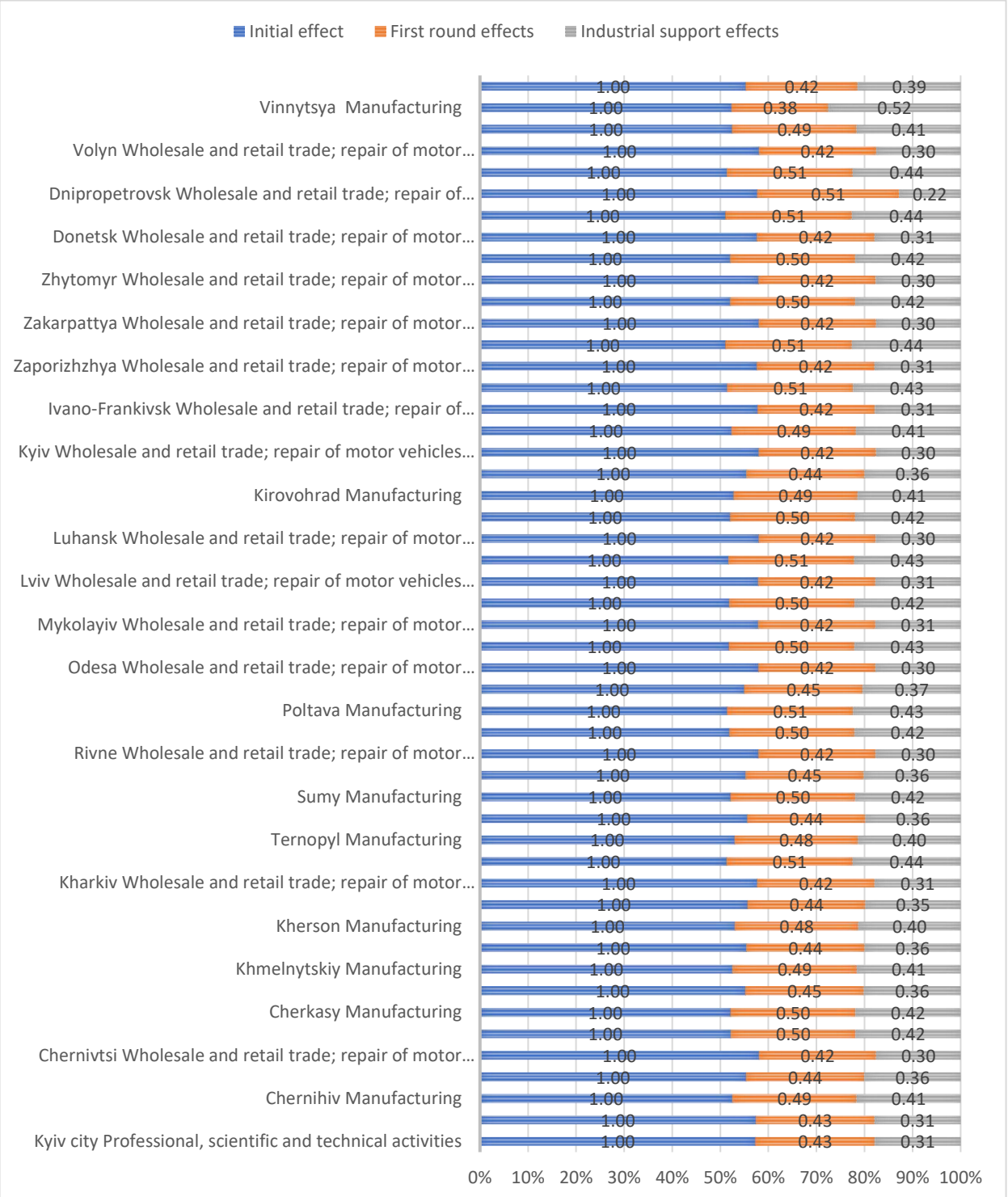
As shown in Fig. 2.1.4, general production effects (simple multipliers) are broken down into initial, first-round, and industrial support effects. Thus, in the Dnipropetrovsk region's manufacturing, the first round effect for each unit (initial effect) of demand is UAH 0.51. – the number of resources required for all sectors to meet the additional demand for the final product of the manufacturing for UAH 1. Industrial support effects for the manufacturing of the Dnipropetrovsk region are calculated as 1.95 (total effect) minus 1 (initial effect) minus 0.51 and is equal to 0.44. The increase in final demand (UAH 1 million) in this sector will lead to an increase in the total output of the entire economy by UAH 1,950,000, including UAH 1 million – directly due to the increase in the final product in the glass of the total output, by UAH 510,000– as a result of an increase in the consumption of resources in the industrial sector for the production of this final product, by UAH 440,000. – due to the increase in production links (intermediate products) of other industries in different regions to ensure industrial production growth in the Dnipropetrovsk region.

In 2019, the manufacturing of the Donetsk region had the highest simple multiplier of UAH 1.96. If the demand for final industrial products increased by UAH 1 million, the total output in the economy would rise by UAH 1,960,000. It is followed by the Manufacturing of Zakarpattya (1.95), Kharkiv (1.95), Poltava (1.94). Such high Simple output multipliers mean that the economies of these areas are susceptible to changes in final demand.

In a detailed review, the highest shares of first-round effects in simple multipliers of output were the sectors of wholesale and retail trade, repair of motor vehicles and motorcycles in Dnipropetrovsk region (29.4% in the multiplier structure), Zaporizhzhya manufacturing (26.3%), Poltava (26.2%), Kharkiv (26.2%) regions. It means that the economy needs the largest additional production volumes to meet the increase in demand for the final product of these industries. The largest share of the overall effect among other sectors, which is relevant to the industrial support effect, is observed in the Manufacturing of Vinnytsya (27.5%). It indicates that the additional demand for industrial

products causes the highest production levels in other sectors than for the products of other industries. But in the structure of all multipliers of production, more than half of their value falls on the initial effect; that is, most of the increase in demand for products of all sectors is provided by the rise in output in the same sectors.

Fig. 2.1.4. Simple output multipliers for two leading sectors of the economy of the regions of Ukraine



Source: IPG calculations using the 2019 Interregional Output-Output Table. Disaggregated data for 25 regions according to the research paper in August 2022 "Input-Output Analysis of the Ukraine War: A Tool for Assessing the Internal Territorial Impacts of the Conflict" by Eduardo A. Haddad, Inácio F. Araújo, Ademir Rocha & Karina Sass. Research Paper

b) Value-added multipliers

Table 2.1.1. shows the matrix of simple value-added multipliers for regions and sectors of the Ukrainian economy in 2019. A simple value-added multiplier of manufacturing for many regions, such as Donetsk (-2.48), Poltava (-2.05), and Zaporizhzhya (-1.16), is lower than 1, which indicates that part of the income does not go to the domestic economy. In this case, all positive values of multipliers do not exceed 1.

Table 2.1.1. Simple value-added multipliers for all sectors by regions of Ukraine

Sector	Vinnytsya	Volyn	Dnipropetrov	Donetsk	Zhytomyr	Zakarpattya	Zaporizhzhya	Ivano-Frankiv	Kyiv
Agriculture, forestry and fishing	0,31	0,65	0,84	0,88	0,59	0,96	0,85	0,76	0,50
Manufacturing	-0,47	-0,08	-2,52	-2,48	-0,03	0,56	-1,16	-0,72	-0,84
Construction	0,29	0,62	0,34	0,55	0,54	0,55	0,64	0,45	0,52
Wholesale and retail trade; repair of motor vehicles and motorcycles	0,41	0,22	0,31	0,45	0,24	0,21	0,44	0,25	0,32
Transportation and storage	0,90	0,81	0,47	0,87	0,93	0,96	0,92	0,88	0,43
Accommodation and food service activities	0,99	0,99	0,95	0,99	0,99	0,99	0,98	0,96	0,94
Information and communication	0,52	0,80	0,50	0,43	0,82	0,98	0,79	0,80	0,73
Financial and insurance activities	0,66	0,58	0,43	0,82	0,63	0,65	0,67	0,64	0,42
Real estate activities	0,94	0,57	0,49	0,85	0,99	0,89	0,80	0,84	0,46
Professional, scientific and technical activities	0,83	0,87	0,47	0,28	0,91	0,94	0,62	0,86	0,76
Administrative and support service activities	0,90	0,91	0,55	0,85	0,90	0,92	0,86	0,77	0,65
Public administration and defence, compulsory social security	0,92	0,91	0,92	0,92	0,92	0,92	0,93	0,92	0,90
Education	0,96	0,98	0,97	0,99	0,99	0,97	0,96	0,96	0,99
Human health and social work activities	0,92	0,95	0,88	0,97	0,96	0,88	0,91	0,95	0,92
Arts, entertainment and recreation	0,98	0,98	0,93	0,99	0,99	0,95	0,97	0,98	0,96
Other types of economic activity	0,99	0,99	0,94	0,99	0,99	0,99	0,98	0,99	0,98
Region Average	***0,90***	***0,84***	***0,53***	***0,86***	***0,91***	***0,93***	***0,85***	***0,85***	***0,69***

Sector	Kirovohrad	Luhansk	Lviv	Mykolayiv	Odesa	Poltava	Rivne	Sumy	Ternopyl
Agriculture, forestry and fishing	0,42	0,67	0,79	0,91	0,82	0,41	0,67	0,61	0,53
Manufacturing	0,04	0,10	-0,81	0,01	0,26	-2,05	-0,16	-0,09	0,27
Construction	0,56	0,71	0,31	0,49	0,11	0,38	0,47	0,69	0,55
Wholesale and retail trade; repair of motor vehicles and motorcycles	0,37	0,25	0,22	0,37	0,26	0,41	0,19	0,30	0,28
Transportation and storage	0,63	0,98	0,76	0,78	0,27	0,84	0,88	0,85	0,90
Accommodation and food service activities	1,00	1,00	0,91	0,99	0,97	0,98	0,99	0,99	0,99
Information and communication	0,78	0,93	0,22	0,88	0,67	0,70	0,90	0,81	0,83
Financial and insurance activities	0,74	0,83	0,52	0,74	0,58	0,72	0,61	0,70	0,65
Real estate activities	0,92	0,97	0,51	0,92	0,43	0,79	0,92	0,91	0,91
Professional, scientific and technical activities	0,93	0,89	0,62	0,78	0,66	0,77	0,95	0,88	0,94
Administrative and support service activities	0,85	0,93	0,66	0,89	0,77	0,70	0,94	0,88	0,94
Public administration and defence, compulsory social security	0,92	0,92	0,90	0,92	0,93	0,91	0,93	0,92	0,93
Education	0,99	0,99	0,97	0,99	0,95	0,98	0,98	0,98	0,95
Human health and social work activities	0,96	0,98	0,83	0,97	0,85	0,88	0,98	0,95	0,97
Arts, entertainment and recreation	0,93	0,98	0,89	0,97	0,94	0,97	0,99	0,99	0,99
Other types of economic activity	0,99	1,00	0,98	0,99	0,97	0,98	0,94	0,98	0,99
Region Average	***0,88***	***0,93***	***0,71***	***0,90***	***0,72***	***0,78***	***0,92***	***0,88***	***0,92***

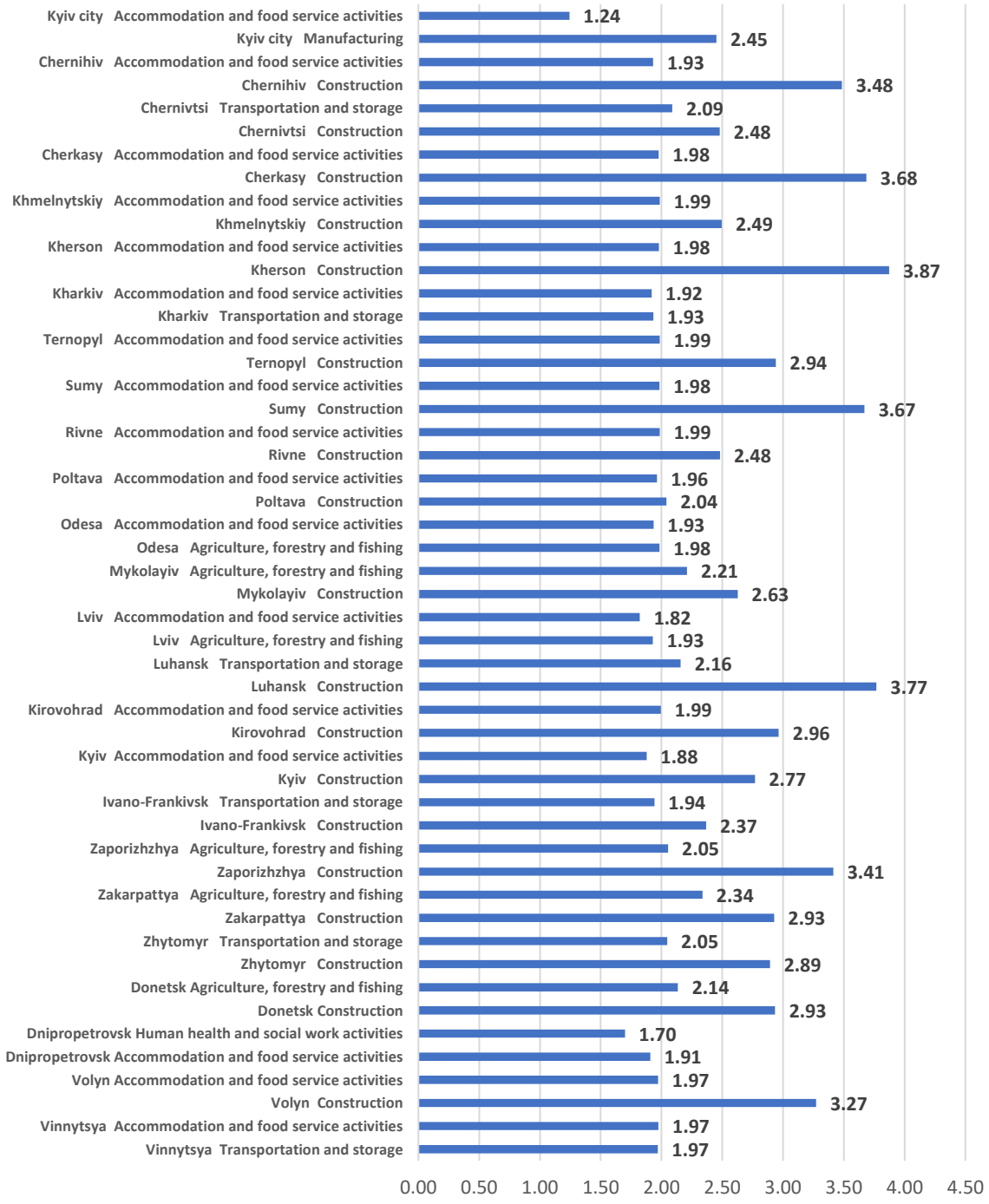
Sector	Kharkiv	Kherson	Khmelnytskiy	Cherkasy	Chernivtsi	Chernihiv	Kyiv city	***Sector Averange***
Agriculture, forestry and fishing	0,58	0,49	0,38	0,41	0,72	0,56		***0,63***
Manufacturing	-1,57	0,08	-0,17	-0,50	0,38	0,12	0,64	***-0,09***
Construction	0,15	0,73	0,47	0,69	0,47	0,66	0,03	***0,52***
Wholesale and retail trade; repair of motor vehicles and motorcycles	0,14	0,24	0,23	0,34	0,23	0,27	0,43	***0,27***
Transportation and storage	0,88	0,84	0,90	0,71	0,95	0,86	-0,88	***0,86***
Accommodation and food service activities	0,96	0,99	0,99	0,99	0,99	0,96	0,62	***0,99***
Information and communication	0,27	0,83	0,84	0,60	0,78	0,73	-5,91	***0,78***
Financial and insurance activities	0,63	0,65	0,67	0,58	0,55	0,54	-0,77	***0,64***
Real estate activities	0,68	0,89	0,88	0,81	0,88	0,83	-3,06	***0,85***
Professional, scientific and technical activities	0,69	0,94	0,90	0,88	0,93	0,93	-8,10	***0,87***
Administrative and support service activities	0,76	0,92	0,84	0,86	0,94	0,84	-2,82	***0,86***
Public administration and defence, compulsory social security	0,92	0,93	0,92	0,92	0,93	0,92	0,91	***0,92***
Education	0,91	0,99	0,98	0,98	0,96	0,99	0,84	***0,98***
Human health and social work activities	0,91	0,97	0,97	0,96	0,94	0,98	0,02	***0,95***
Arts, entertainment and recreation	0,91	0,98	0,99	0,98	0,99	0,98	-0,67	***0,98***
Other types of economic activity	0,97	0,99	0,99	0,98	0,99	0,98	0,74	***0,99***
Region Average	***0,72***	***0,91***	***0,89***	***0,83***	***0,93***	***0,85***	***0,02***	

Source: IPG calculations using the 2019 Interregional Output-Output Table. Disaggregated data for 25 regions according to the research paper in August 2022 "Input-Output Analysis of the Ukraine War: A Tool for Assessing the Internal Territorial Impacts of the Conflict" by Eduardo A. Haddad, Inácio F. Araújo, Ademir Rocha & Karina Sass. Research Paper

Among the sectors studied, on average, in Ukraine, the highest value of a simple value-added multiplier corresponds to the arts, entertainment, and recreation sector (0.98). It means that the additional final demand for products and services in this sector is UAH 1 million will bring income or value added in the amount of UAH 980,000 to the sector. The highest sectoral values of the multiplier (close to 1) by regions were demonstrated by the accommodation and food service activities secor in the Kirovohrad and Luhansk regions. In Table 2.1.1. highlighted the values of simple value-added multipliers, higher than the industry average. The regions in which in most industries the value of the multiplier exceeded the industry average are Donetsk, Zhytomyr, Luhansk, Rivne, and Kherson regions.

It should be noted that most of the regions large in terms of GDP, such as Dnipropetrovsk, Kharkiv, Kyiv and Kyiv city, Lviv regions, have relatively low industry multiplier values compared to the national average since their economy is strongly involved in the middle part of value chains for production, where the value-added ratio is low. Since value-added multipliers relate to the content of domestic income in demand, lower indices are usually also explained by a larger share of foreign resources in the producing of final products. These regions determine the state of the entire national economy of the country, which is also characterized by an extremely small ratio of value added and final demand to total output and needs systemic changes.

Fig. 2.1.5. Type I value-added multipliers for the two leading industries in the regions of Ukraine



Source: IPG calculations using the 2019 Interregional Output-Output Table. Disaggregated data for 25 regions according to the research paper in August 2022 "Input-Output Analysis of the Ukraine War: A Tool for Assessing the Internal Territorial Impacts of the Conflict" by Eduardo A. Haddad, Inácio F. Araújo, Ademir Rocha & Karina Sass. Research Paper

Fig. 2.1.5 shows the values of type I value-added multipliers for the two leading industries in the regions of Ukraine. Thus, the type I value-added multiplier for the construction industry of the Kirovograd region is 2.96, and the volume of its final demand is 3,835 million. If the volume of final demand in this sector increases by UAH 100 million, the economy should expect an increase in the value-added created in it by 2.6*100 =UAH 260

million. In this case, the initial effect will be UAH 100 million, and the difference is UAH 160 million. will have an impact on the economy because of the effects of the next round of the cycle by implementing the inter-sectoral flows present in the input–output matrix. Fig. 2.1.5. shows that the largest values of multipliers of type I correspond to the construction industry of most regions of Ukraine. This indicates a high level of production chain effects associated with the increased backward linkages of this sector regarding the consumption of resources of other sectors throughout the year.

Intersectoral relations.

a) Backward linkages

In Fig. 2.1.6. shows the backward linkages indicators of the sectors that are most important for each region of Ukraine, and therefore are most strongly associated with resource providers. For example, in Vinnytsya, Volyn, Donetsk, Zhytomyr and other regions, the industrial sector has the maximum impact on the economy through input links; in Zakarpattya, Kherson and Ternopil regions – the sector of agriculture, forestry and fisheries; in the city of Kyiv – professional sector, scientific and technical activities, etc.

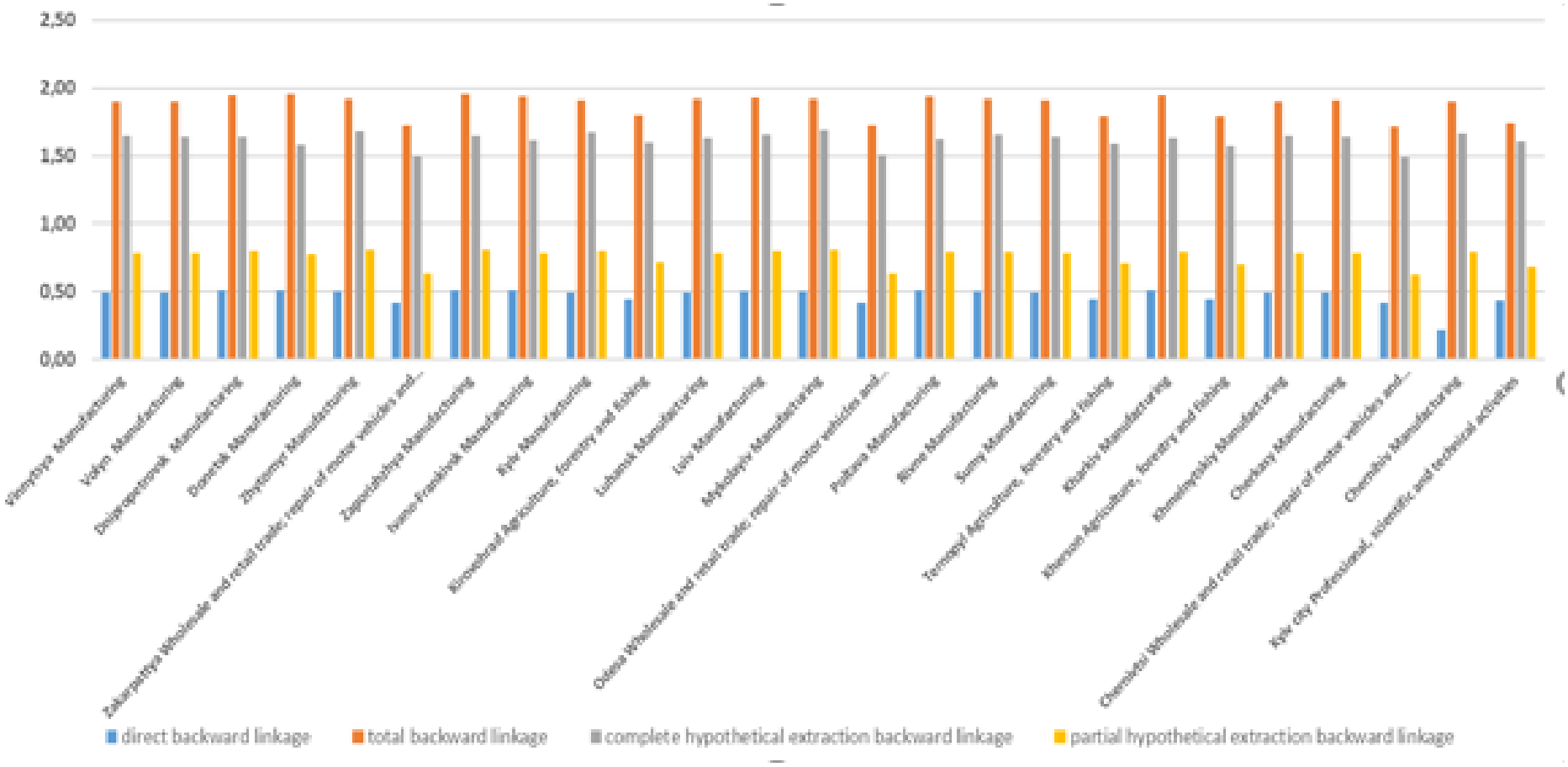
The graph shows that each indicator of direct backward linkages (the first, blue columns of the chart for each sector) is the smallest among all (four) indicators since it characterizes only direct links between sectors. Thus, the value of the direct backward linkages indicator for manufacturing of Vinnytsya region, which is equal to 0.50, means that the total share of resources consumed in this sector in the structure of gross industrial output is 50% (the remaining 50% is value added). With an increase in resource consumption in the manufacturing of Vinnytsia by UAH 1000 the volume of industrial products will increase by UAH 500.

The indicator of total backward linkages shown in the second order, orange columns of the chart in Fig. 2.1.6. Thus, the coefficient (multiplier) of total backward linkages in agriculture of the Kirovograd region is 1.80. He points out that in order to increase the demand for agricultural products by UAH 1,000, production in all sectors should increase by UAH 1,800.

Sectors with high total backward linkages, such as the manufacturing of Donetsk, Zaporizhzhya, Kharkiv, and Dnipropetrovsk regions, stimulate a relatively large volume of production in the economy. At the same time, they half use the resources of their own industry group, so they also have sufficient potential to spread exogenous impulses throughout the economy.

By eliminating the auto-dependence of sectors, the backward linkages indicator of *complete hypothetical extraction backward linkage* (grey columns in the diagram) takes on a lower value compared to the previous total backward linkages indicator. For example, the indicator of total backward linkages from the wholesale and retail sector of Zakarpattya decreased from 1.72 to 1.49 after subtracting the sector backward linkages within this sector group. This difference is due to the dependence of the trade sector on supply of goods from trade organizations (for example, from wholesale to reta

Fig. 2.1.6. Variations of backward linkages options for the main sector of the economy by region



Source: IPG calculations using the 2019 Interregional Output-Output Table. Disaggregated data for 25 regions according to the research paper in August 2022 "Input-Output Analysis of the Ukraine War: A Tool for Assessing the Internal Territorial Impacts of the Conflict" by Eduardo A. Haddad, Inácio F. Araújo, Ademir Rocha & Karina Sass. Research Paper

The partial hypothetical extraction backward linkage index measures a sector's backward linkages only with those sectors that buy resources from it, i.e., "lower" links. Thus, the backward linkages indicator of partial hypothetical extraction of the wholesale and retail sector of Zakarpattya decreased even more to 0.63 after deducting relations with suppliers.

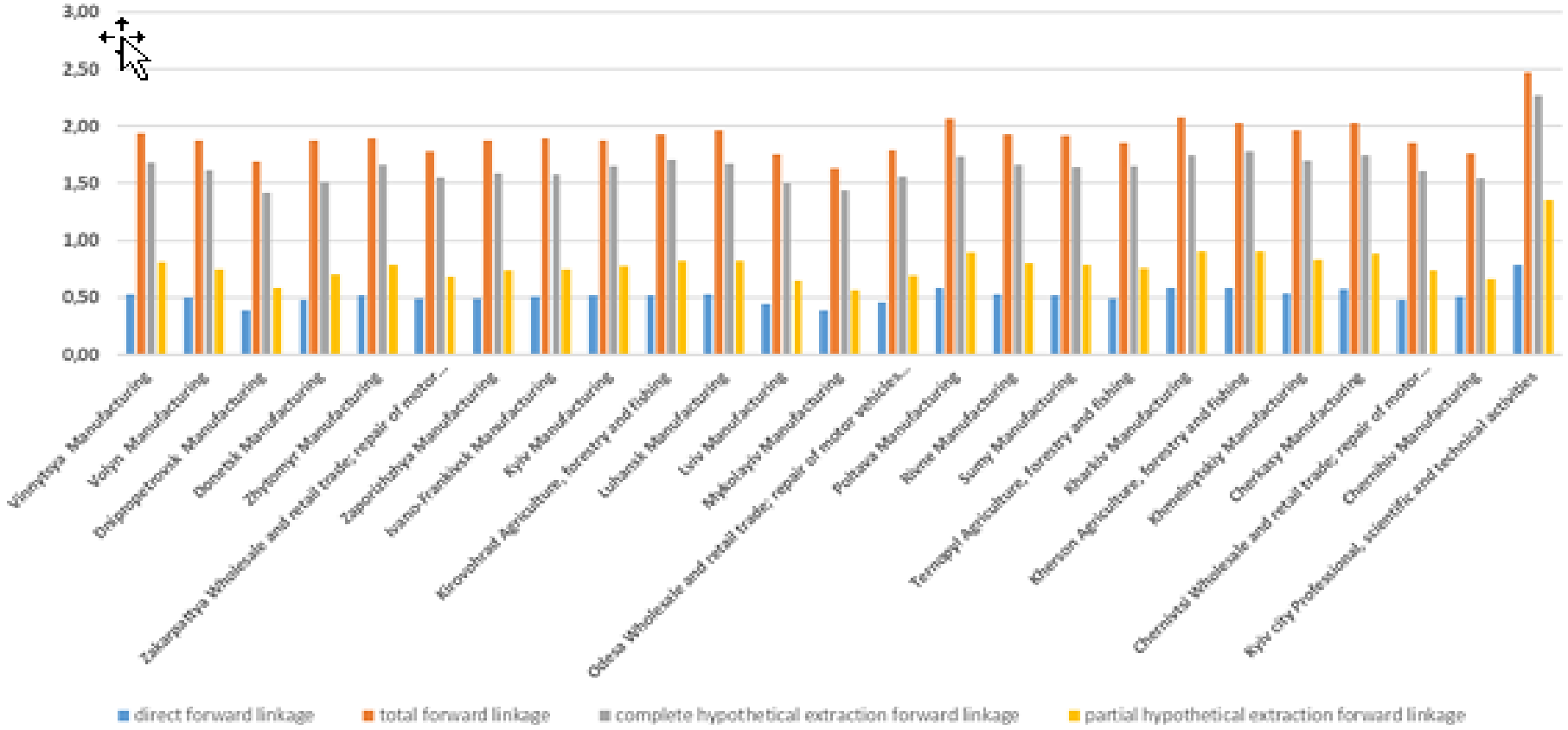
In 2019, the highest levels of direct backward linkages (0.51) were observed in the industrial sector of Dnipropetrovsk, Donetsk, Zaporizhzhya, Ivano-Frankivsk, Lviv, Poltava and Kharkiv regions. The sector with the highest rates of total backward linkages was the manufacturing of Donetsk, Dnipropetrovsk, Zaporizhzhya and Kharkiv regions (1.94 - 1.96). The closest complete and partial hypothetical extraction backward linkages (1.69 and 0.81, respectively) existed in the manufacturing of Zhytomyr and Mykolayiv regions.

Direct forward linkage

Fig. 2.1.7 shows a comparison of different types of direct forward linkage in the leading sectors in particular regions of Ukraine. The share of sales of a particular industry (procurement sector) in the overall level of production of this industry (supply sector) are direct forward linkages. Each of their values (the first, blue columns of the chart for each sector) are the smallest among all (four) indicators since it applies exclusively to direct forward linkages between sectors. The largest value of the coefficient of direct distribution (direct forward linkages) in 2019 was characterized by the sector of professional, scientific, and technical activities in Kyiv (0.78). This means that the sales volumes of this sector correlated to the volume of production in it as 78:100.

Total forward linkages show higher values due to the step-by-step impact of intersectoral flows. Thus, in the Kyiv sector of professional, scientific, and technical activities, the indicator of direct forward linkages increased compared to the previous indicator to 2.47. Also, the measure of total forward linkage was high in the manufacturing of Poltava (2.07), Cherkasy (2.03) and Khmelnytskiy (1.96) regions. These coefficients characterize the impact of supply changes not only on one particular sector, and in general on the econo

Fig.2.1.7. Variants of direct forward linkages for the main sectors of the economy by region



Source: IPG calculations using the 2019 Interregional Output-Output Table. Disaggregated data for 25 regions according to the research paper in August 2022 "Input-Output Analysis of the Ukraine War: A Tool for Assessing the Internal Territorial Impacts of the Conflict" by Eduardo A. Haddad, Inácio F. Araújo, Ademir Rocha & Karina Sass. Research Paper

Except for *autodependence, the complete hypothetical extraction forward linkage* in Kyiv decreased slightly, to 2.27, which means that the sector of professional, scientific and technical activity provides itself with a small number of services. In other sectors, the auto-dependence of the supply turned out to be more significant (Poltava region – 1.73, Cherkasy region – 1.74, and Khmelnytskiy region – 1.70), which means the presence of high intra-industry transactions and indicates that any incentives from the supply side may have less impact on other sectors of the economy.

The indicator of *partial hypothetical extraction forward linkage* excludes the interaction of the sector on the part of consumption and calculates relations with buyers of products of this sector. For example, the indicator of direct connection of partial hypothetical extraction of the sector of professional, scientific and technical activity decreased to 1.35, considering only relations with suppliers, that is, "upper" links.

Hypothetical extraction.

Table 2.1.2. shows the results of the hypothetical extraction of industrial sectors in four regions of the country – Donetsk, Luhansk, Zaporizhzhya and Kherson regions. The initial real situation (data from the initial input-output matrix, namely production linkage, final product and total output, which correspond to these sectors, in total by region and by country), the hypothetical situation after the extraction of manufacturing from the economy, as well as the difference between the corresponding ones, are presented before and after extraction and relative loss rate.

Thus, the hypothetical extraction of manufacturing of Donetsk region has the initial effect, which consists of a 100% reduction in its intersectoral relations for UAH 170,604.02 million, final demand of UAH 182,693.09 million and a total output of UAH 353,297.11 million. In the future, the impact extends to the economy of the region and the country, creating a second-round effect through production linkage. This results in corresponding absolute losses at the regional level (in "input-output" relations – by UAH 217,430.19 million, in total output – by UAH 400,123.27 million) and the national level (in "input–output" relations – by UAH 374,784.07 million, in total output – by UAH 557,477.15 million). The impact on final demand has not changed since the recalculations are based on the assumption that the demand for the final product of other industries and regions will be fully satisfied. In relative terms, the economy of the Donetsk region will lose 85% of intersectoral relations "supply-consumption", 66.6% of the final product and 75.5% of regional GDP. The corresponding relative conditional losses at the country level will be 10.3% in linkages, 3.9% in the final product and 6.7% in the total output

Table 2.1.2. Impact of hypothetical extraction of manufacturing from the economy of Donetsk, Luhansk, Zaporizhzhya and Kherson regions

Level of research	Initial data (before removal), UAH mln.			Result (after exclusion), UAH mln.			Losses from hypothetical exclusion, UAH mln.			Losses in % to the initial data		
	Input-output relationships	Final product	Total output	Input-output relationships	Final product	Total output	Input-output relationships	Final product	Total output	Input-output relationships	Final product	Total output
Donetsk region												
Industry	170604	182693	353297	0	0	0	-170604	-182693	-353297	100,0	100,0	100,0
Region	254292	274204	528496	36862	91511	128373	-217430	-182693	-400123	85,5	66,6	75,7
Ukraine	3653196	4718601	8371797	3278412	4535908	7814320	-374784	-182693	-557477	10,3	3,9	6,7
Zaporizhzhya region												
Industry	106237	110178	216414	0	0	0	-106237	-110178	-216414	100,0	100,0	100,0
Region	165958	202307	368265	32973	92129	125103	-132984	-110178	-243162	80,1	54,5	66,0
Ukraine	3653196	4718601	8371797	3402675	4608423	8014475	-250522	-110178	-357322	6,9	2,3	4,3
Luhansk region												
Industry	13106	11904	25010	0	0	0	-13106	-11904	-25010	100,0	100,0	100,0
Region	36521	44250	80771	19572	32346	51918	-16949	-11904	-28853	46,4	26,9	35,7
Ukraine	3653196	4718601	8371797	3624262	4706696	8330958	-28934	-11904	-40839	0,8	0,3	0,5
Kherson region												
Industry	17991	15524	33515	0	0	0	-17991	-15524	-33515	100,0	100,0	100,0
Region	58970	65684	124654	35029	50159	85189	-23941	-15524	-39465	40,6	23,6	31,7
Ukraine	3653196	4718601	8371797	3614058	4703076	8317134	-39138	-15524	-54663	1,1	0,3	0,7

Source: IPG calculations using the 2019 Interregional Output-Output Table. Disaggregated data for 25 regions according to the research paper in August 2022 "Input-Output Analysis of the Ukraine War: A Tool for Assessing the Internal Territorial Impacts of the Conflict" by Eduardo A. Haddad, Inácio F. Araújo, Ademir Rocha & Karina Sass. Research Paper

Among the four regions studied, the manufacturing of Donetsk region has the most significant impact on the economy, since the level of relative losses is the highest. Zaporizhzhya region is also an industrial region, so the extraction of manufacturing from its economy will also have a significant impact on the economic sector (in intersectoral regional relations - 80.1%, in the final product - 54.5%, in the total output - 66.0%) and macroeconomic indicators (in relations - 6.9%, in the final product - 2.3%, in the total output - 4.3%). At the same time, the hypothetical extraction of Industry in Luhansk and Kherson regions has a much smaller impact on all levels, since these regions are agricultural. Thus, conditional regional losses of intersectoral relations for these regions will be 46.4% and 40.6%, respectively, final demand – 26.9% and 23.6%, GDP – 35.7% and 31.7%, and losses for the country's economy – 0.8% and 1.1%, in final demand – 0.3% and 0.3%, in GDP – 0.5% and 0.7%, respectively.

2.2 Assessing the competitiveness of the supply chains

This sub-chapter will assess the supply chains competitiveness and determine how to create competitive advantages. This assessment will focus on for the target sectors during the relocation of production companies from the eastern regions to western regions of Ukraine, for the benefit of the internally displaced population.

2.2.1. Attractiveness of the Western regions of Ukraine regarding business relocation.

In the process of macroeconomic analysis conducted on the basis of the national input–output table, it was established, among other things, the multiplier effect of increasing the final demand for intermediate production and consumption, value-added, and, as a result, on the total GDP. The obtained results are suitable for use in determining attractive regions for the relocation of businesses belonging to different economic sectors, in accordance with the current government program. The program of relocation of enterprises from the territories close to or in the war zone to safer regions of the West of Ukraine identifies 9 regions (Zakarpattya, Lviv, Ivano-Frankivsk, Ternopil, Khmelnytskiy, Chernivtsi, Vinnytsya, Volyn and Rivne) to which enterprises can move.

The assessment of the attractiveness of these regions for business relocation is predicated on the assumption that the final demand for products of all regional sectors of the economy remains unmet. Consequently, enterprises that move to these recipient regions will have the opportunity to sell their product directly to the final consumer. This would enable them to integrate seamlessly into the relevant regional economic structure and their activities will entail equivalent multiplier impacts within the industries to which they belong. It is also assumed that the effect of removing moving enterprises from the economy of donor regions can be neglected, since relocation attractiveness is estimated by comparing recipient regions according to the degree of multiplier impacts, and the effects of extraction in all cases will be the same (calculations of these effects are given in paragraph 2.1.2.).

The attractiveness of the regions in terms of relocation of enterprises is estimated based on the values of three coefficients:

1. Total backward linkage multiplier (equal to a simple output multiplier).
2. Total forward linkage multiplier - these two multipliers characterize the general economic impacts of sectors that, accordingly, sell resources to this buyer or buy resources from this supplier.
3. Simple value-added multiplier - shows the amount of value-added caused by changes in final demand in a particular sector.

Considering the above assumptions, the model of relocation of enterprises, based on the specified multipliers, can be described as follows (on the example of moving the enterprise of the manufacturing sector to the Vinnytsya region). The output of the product for the final consumer for an additional UAH 1 million. The enterprise, which moved to the Vinnytsya region, is accompanied by an increase in intersectoral incoming flows from all other sectors-suppliers of resources in the country to the sector of the Manufacturing of Vinnytsya region by UAH1.91 million. (total backward linkages multiplier value). This one has the same value of UAH 1.91 million. There is an increase in GDP in the country's economy (since a simple backward linkages multiplier is equal to a simple output multiplier). At the same time, there is an increase in intersectoral output flows from the sector of the Manufacturing Vinnytsya region to all sectors of the national economy that buy resources from this sector in the amount of UAH 1.94 million (the value of the multiplier of total forward linkage). At the same time, there is no increase in value added in the manufacturing sector (a simple value-added multiplier is negative and equal to -0.47), which means a high degree of sector involvement in the middle part of value chains.

Similar influences occur in other regions when enterprises are moved to them.

The task is to justify the choice of recipient regions based on the combination of multipliers, in which the maximum multiplier effect in the economy will be ensured - the growth of intermediate consumption, value-added and total output.

Table 2.2.1. (provided below) shows the values of the three main multipliers for 9 Western regions of Ukraine in terms of sectors of the economy.

To establish the attractiveness of the regions, a point assessment method was used. To do this, the regions are ranked by the values of the corresponding multipliers for each sector (row of the table from table 2.2.1.). The region with the lowest multiplier value is assigned the lowest rank of 1, with the highest value being the highest rank of 9. If the regions have multipliers equal, then such regions are assigned an equivalent rank, which is equal to the average value of the corresponding ranks that they occupy. Thus, in the field of agriculture, forestry and fisheries, the coefficients of total backward linkages are the same in the Volyn, Zakarpattya, Ternopil and Khmelnytskiy regions. Since the ranks of these regions are from 1 to 4, the average rank is (1+2+3+4):4=2.5, which is assigned to each of these regions.

Table 2.2.1. Value of multipliers for individual regions participating in the Enterprise Relocation Program

Sector		Volyn			Zakarpattya			Ivano-Frankivsk			Lviv			Ternopyl		
		Total backward linkage	Total forward linkage	Simple value-added multiplier	Total backward linkage	Total forward linkage	Simple value-added multiplier	Total backward linkage	Total forward linkage	Simple value-added multiplier	Total backward linkage	Total forward linkage	Simple value-added multiplier	Total backward linkage	Total forward linkage	Simple value-added multiplier
S01	*Agriculture, forestry and fishing*	1,80	1,72	0,65	1,80	1,09	0,96	1,81	1,68	0,76	1,81	1,42	0,79	1,80	1,86	0,53
S02	*Manufacturing*	1,90	1,87	-0,08	1,92	1,34	0,56	1,94	1,90	-0,72	1,93	1,75	-0,81	1,89	1,88	0,27
S03	*Construction*	2,26	1,70	0,62	2,27	1,67	0,55	2,30	1,98	0,45	2,29	1,90	0,31	2,24	1,70	0,55
S04	*Wholesale and retail trade; repair of motor vehicles and motorcycles*	1,72	1,96	0,22	1,72	1,78	0,21	1,73	1,98	0,25	1,73	1,89	0,22	1,72	1,87	0,28
S05	*Transportation and storage*	1,69	1,75	0,81	1,70	1,09	0,96	1,72	1,79	0,88	1,71	1,47	0,76	1,68	1,44	0,90
S06	*Accommodation and food service activities*	1,65	1,15	0,99	1,66	1,09	0,99	1,67	1,15	0,96	1,67	1,15	0,91	1,65	1,11	0,99
S07	*Information and communication*	1,74	1,85	0,80	1,74	1,09	0,98	1,74	1,85	0,80	1,75	1,75	0,22	1,74	1,55	0,83
S08	*Financial and insurance activities*	1,53	2,67	0,58	1,53	2,28	0,65	1,53	2,62	0,64	1,53	2,53	0,52	1,53	2,49	0,65
S09	*Real estate activities*	1,43	1,76	0,57	1,43	1,57	0,89	1,44	1,70	0,84	1,43	1,73	0,51	1,43	1,61	0,91
S10	*Professional, scientific and technical activities*	1,74	2,44	0,87	1,75	1,86	0,94	1,75	2,49	0,86	1,75	2,29	0,62	1,74	2,26	0,94
S11	*Administrative and support service activities*	1,69	2,02	0,91	1,69	1,61	0,92	1,70	2,00	0,77	1,70	1,95	0,66	1,68	1,84	0,94
S12	*Public administration and defence, compulsory social security*	1,30	1,14	0,91	1,30	1,11	0,92	1,31	1,19	0,92	1,30	1,14	0,90	1,29	1,13	0,93
S13	*Education*	1,36	1,03	0,98	1,36	1,03	0,97	1,37	1,05	0,96	1,37	1,03	0,97	1,36	1,04	0,95
S14	*Human health and social work activities*	1,63	1,07	0,95	1,64	1,13	0,88	1,64	1,08	0,95	1,64	1,13	0,83	1,62	1,06	0,97
S15	*Arts, entertainment and recreation*	1,50	1,21	0,98	1,50	1,16	0,95	1,50	1,20	0,98	1,50	1,25	0,89	1,49	1,18	0,99
S16	*Other types of economic activity*	1,44	1,18	0,99	1,44	1,11	0,99	1,44	1,17	0,99	1,44	1,17	0,98	1,43	1,13	0,99

Sector		Vinnytsya			Rivne			Khmelnytskiy			Chernivtsi		
		Total backward linkage	Total forward linkage	Simple value-added multiplier	Total backward linkage	Total forward linkage	Simple value-added multiplier	Total backward linkage	Total forward linkage	Simple value-added multiplier	Total backward linkage	Total forward linkage	Simple value-added multiplier
S01	*Agriculture, forestry and fishing*	1,81	1,79	0,31	1,81	1,84	0,67	1,80	1,92	0,38	1,81	1,79	0,72
S02	*Manufacturing*	1,91	1,94	-0,47	1,93	1,93	-0,16	1,90	1,96	-0,17	1,91	1,83	0,38
S03	*Construction*	2,26	1,98	0,29	2,28	1,97	0,47	2,26	1,90	0,47	2,27	1,95	0,47
S04	*Wholesale and retail trade; repair of motor vehicles and motorcycles*	1,72	1,99	0,41	1,73	1,95	0,19	1,72	1,96	0,23	1,72	1,85	0,23
S05	*Transportation and storage*	1,70	1,62	0,90	1,70	1,70	0,88	1,69	1,89	0,90	1,70	1,50	0,95
S06	*Accommodation and food service activities*	1,66	1,14	0,99	1,66	1,13	0,99	1,65	1,14	0,99	1,66	1,11	0,99
S07	*Information and communication*	1,74	1,82	0,52	1,74	1,77	0,90	1,74	1,93	0,84	1,74	1,65	0,78
S08	*Financial and insurance activities*	1,53	2,58	0,66	1,53	2,64	0,61	1,53	2,64	0,67	1,53	2,56	0,55
S09	*Real estate activities*	1,43	1,70	0,94	1,43	1,69	0,92	1,43	1,68	0,88	1,43	1,62	0,88
S10	*Professional, scientific and technical activities*	1,74	2,40	0,83	1,75	2,45	0,95	1,74	2,54	0,90	1,75	2,32	0,93
S11	*Administrative and support service activities*	1,69	1,97	0,90	1,70	1,94	0,94	1,69	2,01	0,84	1,69	1,80	0,94
S12	*Public administration and defence, compulsory social security*	1,30	1,15	0,92	1,30	1,14	0,93	1,30	1,12	0,92	1,30	1,11	0,93
S13	*Education*	1,36	1,04	0,96	1,36	1,03	0,98	1,36	1,02	0,98	1,36	1,04	0,96
S14	*Human health and social work activities*	1,63	1,09	0,92	1,64	1,06	0,98	1,63	1,06	0,97	1,63	1,08	0,94
S15	*Arts, entertainment and recreation*	1,50	1,21	0,98	1,50	1,27	0,99	1,50	1,19	0,99	1,50	1,17	0,99
S16	*Other types of economic activity*	1,44	1,16	0,99	1,44	1,17	0,94	1,44	1,17	0,99	1,44	1,14	0,99

Table 2.2.2. Ranking regions by total backward linkages multiplier

Sector		Volyn	Zakarpattya	Ivano-Frankivsk	Lviv	Ternopyl	Vinnytsya	Rivne	Khmelnytskiy	Chernivtsi
		Total backward linkage	Total backward linkage	Total backward linkage	Total backward linkage	Total backward linkage	Total backward linkage	Total backward linkage	Total backward linkage	Total backward linkage
R01	*Agriculture, forestry and fishing*	2,5	2,5	7,0	7,0	2,5	7,0	7,0	2,5	7,0
R02	*Manufacturing*	2,5	6,0	9,0	7,5	1,0	4,5	7,5	2,5	4,5
R03	*Construction*	3,0	5,5	9,0	8,0	1,0	3,0	7,0	3,0	5,5
R04	*Wholesale and retail trade; repair of motor vehicles and motorcycles*	3,5	3,5	8,0	8,0	3,5	3,5	8,0	3,5	3,5
R05	*Transportation and storage*	2,5	5,5	9,0	8,0	1,0	5,5	5,5	2,5	5,5
R06	*Accommodation and food service activities*	2,0	5,5	8,5	8,5	2,0	5,5	5,5	2,0	5,5
R07	*Information and communication*	4,5	4,5	4,5	9,0	4,5	4,5	4,5	4,5	4,5
R08	*Financial and insurance activities*	5,0	5,0	5,0	5,0	5,0	5,0	5,0	5,0	5,0
R09	*Real estate activities*	4,5	4,5	9,0	4,5	4,5	4,5	4,5	4,5	4,5
R10	*Professional, scientific and technical activities*	2,5	7,0	7,0	7,0	2,5	2,5	7,0	2,5	7,0
R11	*Administrative and support service activities*	4,0	4,0	8,0	8,0	1,0	4,0	8,0	4,0	4,0
R12	*Public administration and defence, compulsory social security*	5,0	5,0	9,0	5,0	1,0	5,0	5,0	5,0	5,0
R13	*Education*	4,0	4,0	8,5	8,5	4,0	4,0	4,0	4,0	4,0
R14	*Human health and social work activities*	3,5	7,5	7,5	7,5	1,0	3,5	7,5	3,5	3,5
R15	*Arts, entertainment and recreation*	5,5	5,5	5,5	5,5	1,0	5,5	5,5	5,5	5,5
R16	*Other types of economic activity*	5,5	5,5	5,5	5,5	1,0	5,5	5,5	5,5	5,5

The following are the results of ranking the regions by the values of the three studied multipliers - total backward linkages s (table 2.2.2.),total forward linkage (table 2.2.3) and a simple value-added multiplier (table 2.2.4).[15]

[15] Source: IPG calculations using the 2019 Interregional Output-Output Table. Disaggregated data for 25 regions according to the research paper in August 2022 "Input-Output Analysis of the Ukraine War: A Tool for Assessing the Internal Territorial Impacts of the Conflict" by Eduardo A. Haddad, Inácio

Table 2.2.3. Ranking regions by multiplier of total forward linkage

Sector		Volyn	Zakarpattya	Ivano-Frankivsk	Lviv	Ternopyl	Vinnytsya	Rivne	Khmelnytskiy	Chernivtsi
		Total forward linkage	Total forward linkage	Total forward linkage	Total forward linkage	Total forward linkage	Total forward linkage	Total forward linkage	Total forward linkage	Total forward linkage
R01	*Agriculture, forestry and fishing*	4,0	1,0	3,0	2,0	8,0	6,0	7,0	9,0	5,0
R02	*Manufacturing*	4,0	1,0	6,0	2,0	5,0	8,0	7,0	9,0	3,0
R03	*Construction*	3,0	1,0	8,0	4,0	2,0	9,0	7,0	5,0	6,0
R04	*Wholesale and retail trade; repair of motor vehicles and motorcycles*	7,0	1,0	8,0	4,0	3,0	9,0	5,0	6,0	2,0
R05	*Transportation and storage*	7,0	1,0	8,0	3,0	2,0	5,0	6,0	9,0	4,0
R06	*Accommodation and food service activities*	8,0	1,0	7,0	9,0	3,0	5,0	4,0	6,0	2,0
R07	*Information and communication*	7,0	1,0	8,0	4,0	2,0	6,0	5,0	9,0	3,0
R08	*Financial and insurance activities*	9,0	1,0	6,0	3,0	2,0	5,0	7,0	8,0	4,0
R09	*Real estate activities*	9,0	1,0	7,0	8,0	2,0	6,0	5,0	4,0	3,0
R10	*Professional, scientific and technical activities*	6,0	1,0	8,0	3,0	2,0	5,0	7,0	9,0	4,0
R11	*Administrative and support service activities*	9,0	1,0	7,0	5,0	3,0	6,0	4,0	8,0	2,0
R12	*Public administration and defence, compulsory social security*	6,0	2,0	9,0	5,0	4,0	8,0	7,0	3,0	1,0
R13	*Education*	3,0	5,0	9,0	4,0	8,0	7,0	2,0	1,0	6,0
R14	*Human health and social work activities*	4,0	9,0	8,0	8,0	3,0	7,0	1,0	2,0	5,0
R15	*Arts, entertainment and recreation*	7,0	1,0	5,0	8,0	3,0	6,0	9,0	4,0	2,0
R16	*Other types of economic activity*	9,0	1,0	7,0	5,0	2,0	4,0	8,0	6,0	3,0

Table 2.2.4. Ranking regions by a simple value-added multiplier

Sector		Volyn	Zakarpattya	Ivano-Frankivsk	Lviv	Ternopyl	Vinnytsya	Rivne	Khmelnytskiy	Chernivtsi
		Simple value-added multiplier	Simple value-added multiplier	Simple value-added multiplier	Simple value-added multiplier	Simple value-added multiplier	Simple value-added multiplier	Simple value-added multiplier	Simple value-added multiplier	Simple value-added multiplier
R01	*Agriculture, forestry and fishing*	4,0	9,0	7,0	8,0	3,0	1,0	5,0	2,0	6,0
R02	*Manufacturing*	6,0	9,0	2,0	1,0	7,0	3,0	5,0	4,0	8,0
R03	*Construction*	9,0	7,5	3,0	2,0	7,5	1,0	5,0	5,0	5,0
R04	*Wholesale and retail trade; repair of motor vehicles and motorcycles*	3,5	2,0	7,0	3,5	8,0	9,0	1,0	5,5	5,5
R05	*Transportation and storage*	2,0	9,0	3,5	1,0	6,0	6,0	3,5	6,0	8,0
R06	*Accommodation and food service activities*	6,0	6,0	2,0	1,0	6,0	6,0	6,0	6,0	6,0
R07	*Information and communication*	4,5	0,0	4,5	1,0	6,0	2,0	8,0	7,0	3,0
R08	*Financial and insurance activities*	3,0	6,5	5,0	1,0	6,5	8,0	4,0	9,0	2,0
R09	*Real estate activities*	2,0	6,0	3,0	1,0	7,0	9,0	8,0	4,5	4,5
R10	*Professional, scientific and technical activities*	4,0	7,5	3,0	1,0	7,5	2,0	9,0	5,0	6,0
R11	*Administrative and support service activities*	5,0	6,0	2,0	1,0	8,0	4,0	8,0	3,0	8,0
R12	*Public administration and defence, compulsory social security*	2,0	4,5	4,5	1,0	8,0	4,5	8,0	4,5	8,0
R13	*Education*	8,0	5,5	3,0	5,5	1,0	3,0	8,0	8,0	3,0
R14	*Human health and social work activities*	5,5	2,0	5,5	1,0	7,5	3,0	9,0	7,5	4,0
R15	*Arts, entertainment and recreation*	4,0	2,0	4,0	1,0	7,5	4,0	7,5	7,5	7,5
R16	*Other types of economic activity*	6,0	6,0	6,0	2,0	6,0	6,0	1,0	6,0	6,0

All assigned ranks are summarized by regions and industries. A score assessment of the relocation attractiveness of regions in terms of industries is obtained, shown in table 2.2.5.

Table 2.2.5. Score assessment of Western regions of Ukraine's attractiveness regarding business relocation.

	Sector	Volyn	Zakarpattya	Ivano-Frankivsk	Lviv	Ternopyl	Vinnytsya	Rivne	Khmelnytskiy	Chernivtsi
R01	*Agriculture, forestry and fishing*	10,5	12,5	17,0	17,0	13,5	14,0	19,0	13,5	18,0
R02	*Manufacturing*	12,5	16,0	17,0	10,5	13,0	15,5	19,5	15,5	15,5
R03	*Construction*	15,0	14,0	20,0	14,0	10,5	13,0	19,0	13,0	16,5
R04	*Wholesale and retail trade; repair of motor vehicles and motorcycles*	14,0	6,5	23,0	15,5	14,5	21,5	14,0	15,0	11,0
R05	*Transportation and storage*	11,5	15,5	20,5	12,0	9,0	16,5	15,0	17,5	17,5
R06	*Accommodation and food service activities*	16,0	12,5	17,5	18,5	11,0	16,5	15,5	14,0	13,5
R07	*Information and communication*	16,0	5,5	17,0	14,0	12,5	12,5	17,5	20,5	10,5
R08	*Financial and insurance activities*	17,0	12,5	16,0	9,0	13,5	18,0	16,0	22,0	11,0
R09	*Real estate activities*	15,5	11,5	19,0	13,5	13,5	19,5	17,5	13,0	12,0
R10	*Professional, scientific and technical activities*	12,5	15,5	18,0	11,0	12,0	9,5	23,0	16,5	17,0
R11	*Administrative and support service activities*	18,0	11,0	17,0	14,0	12,0	14,0	20,0	15,0	14,0
R12	*Public administration and defence, compulsory social security*	13,0	11,5	22,5	11,0	13,0	17,5	20,0	12,5	14,0
R13	*Education*	15,0	14,5	20,5	18,0	13,0	14,0	14,0	13,0	13,0
R14	*Human health and social work activities*	13,0	18,5	21,0	16,5	11,5	13,5	17,5	13,0	12,5
R15	*Arts, entertainment and recreation*	16,5	8,5	14,5	14,5	11,5	15,5	22,0	17,0	15,0
R16	*Other types of economic activity*	20,5	12,5	18,5	12,5	9,0	15,5	14,5	17,5	14,5

Source: IPG calculations using the 2019 Interregional Output-Output Table. Disaggregated data for 25 regions according to the research paper in August 2022 "Input-Output Analysis of the Ukraine War: A Tool for Assessing the Internal Territorial Impacts of the Conflict" by Eduardo A. Haddad, Inácio F. Araújo, Ademir Rocha & Karina Sass. Research Paper

For each sector of the economy, two regions with the highest score of relocation attractiveness are highlighted in color (see table 2.2.6.) Thus, it is more expedient for enterprises belonging to the Agriculture, Forestry and Fisheries sectors to move to Rivne or Chernivtsi regions, since their further production activities with the growth of the final product created by them will entail the maximum multiplier impact on total output and value added at the level of the whole country. In the field of Industry, Rivne and Ivano-Frankivsk regions have the greatest attractiveness in terms of business relocation. The movement of enterprises in the transportation and storage sector in Ivano-Frankivsk, Khmelnytskiy or Chernivtsi will stimulate the greatest growth of the national economy.

Table 2.2.6. Score assessment of Western regions of Ukraine attractiveness regarding manufacturing enterprises relocation.

Sector		Volyn	Zakarpattya	Ivano-Frankivsk	Lviv	Ternopyl	Vinnytsya	Rivne	Khmelnytskiy	Chernivtsi
50210	Manufacture of food products	10,5	16,0	15,5	12,0	12,5	15,0	19,0	16,0	18,5
50211	Manufacture of beverages	11,5	16,5	17,0	6,0	13,5	17,5	20,0	17,5	15,5
50212	Manufacture of tobacco products	13,5	16,0	16,5	9,0	17,0	17,0	18,0	16,0	12,0
50213	Manufacture of textiles	12,0	13,0	14,0	18,0	12,0	15,5	19,0	16,0	15,5
50214	Manufacture of wearing apparel	11,5	15,5	12,5	8,5	18,0	13,5	20,5	21,5	13,5
50215	Manufacture of leather and related	11,0	16,0	11,5	11,0	14,0	16,0	20,0	16,5	19,0
50216	Wood and cork; except furniture; manufacture of articles of straw and plaiting materials	13,5	11,0	17,0	10,0	14,0	16,5	20,0	16,5	16,5
50217	Manufacture of paper and paper	14,5	17,0	17,0	11,0	14,5	12,0	14,5	17,5	17,0
50218	Printing and reproduction of recorded	17,0	15,0	17,0	10,0	13,0	14,5	19,0	15,0	14,5
50219	Manufacture of coke and refined petroleum products	17,0	13,5	15,5	11,0	11,0	16,5	20,0	15,0	15,5
50220	Manufacture of chemicals and chemical products	13,5	16,0	15,5	10,5	14,0	16,0	21,0	16,5	12,0
50221	Manufacture of basic pharmaceutical products and pharmaceutical	10,5	16,0	18,0	11,5	13,0	14,5	19,5	15,5	16,5
50222	Manufacture of rubber and plastic	12,0	16,0	17,0	10,5	13,0	15,5	19,5	16,0	15,5
50223	Manufacture of other non-metallic mineral products	14,5	11,5	17,0	10,5	11,5	16,5	19,5	16,5	17,5
50224	Manufacture of basic metals	13,0	15,5	16,5	10,0	17,5	12,0	20,5	16,0	14,0
50225	Manufacture of fabricated metal products, except machinery and	11,0	16,0	17,0	10,5	14,5	15,0	19,5	15,5	16,0
50226	Manufacture of computer, electronic and optical products	13,0	15,0	18,0	9,5	12,5	19,0	17,5	15,5	15,0
50227	Manufacture of electrical equipment	11,5	20,5	15,5	11,0	12,0	15,5	19,0	15,5	14,5
50228	Manufacture of machinery and equipment n.e.c.	12,0	15,0	9,5	9,5	21,5	19,0	18,5	15,0	15,0
50229	Manufacture of motor vehicles, trailers and semi-trailers	17,0	11,0	16,5	10,5	13,5	16,0	19,5	16,0	15,0
50230	Manufacture of other transport	13,5	17,0	16,5	4,5	13,5	16,5	20,5	16,5	16,5
50231	Manufacture of furniture	11,0	16,0	17,0	10,5	14,5	15,5	19,5	15,5	15,5
50232	Other manufacturing	21,0	14,5	15,0	11,0	11,5	14,0	18,5	15,0	14,5
50233	Repair and installation of machinery and equipment	11,5	17,5	16,0	16,5	13,0	14,0	16,5	14,5	15,5

Source: IPG calculation

The leading regions with relocation attractiveness among those participating in the Enterprise Relocation Program, due to the highest levels of sensitivity of total output and value-added in most sectors, are Ivano-Frankivsk and Rivne regions. Thus, it is desirable to move business to the Ivano-Frankivsk region from 11 out of 16 sectors of the economy, and to the Rivne region – 8 sectors.

To detail the results obtained, a detailed initial input-output table was used in the context of sub-sectors of the manufacturing sector, where, instead of rows and columns corresponding to this sector, the allocation of resources, final output, value-added and total output by 24 sub-sectors is performed. To assess the attractiveness of the regions regarding the relocation of enterprises of manufacturing, a similar technique was used. Based on the results of calculations of multipliers of total backward and forward linkages and value added by sub-sectors of the manufacturing and the subsequent ranking of values, the total point estimate of the relocation attractiveness of the regions is determined, shown in Table 2.2.6.

For each sub-sector of manufacturing, two or three regions are highlighted in colour, which has the highest total attractiveness points for the relocation of enterprises according to the rating of the three indicated multipliers (see fig. 2.2.6.). The table shows that enterprises engaged in food production when moving to Rivne or Chernivtsi regions will provide these regions with a certain increase in final demand, which will have the greatest impact on the growth of national GDP and value-added. For business entities-representatives of the beverage production sector, the best direction of relocation in terms of the final effect on the national economy is Rivne, Vinnytsya and Khmelnytskiy regions. In general, the analysis showed that the sub-sectors of the manufacturing in Rivne and Ivano-Frankivsk regions have the greatest sensitivity of total output and value added to the increase in the final product, which does not contradict the previous conclusions about the expediency of moving the industrial business to these regions.

It should be noted that the potential of the regions for a multiplier effect in sectors can be successfully realized only if business entities are actively supported to move their capacities, personnel, vacancies, selection of locations, consulting, etc. by the state and regional authorities.

Thus, considering the above, the key industrial supply chains in terms of regions with the highest growth potential for intermediate consumption, value-added and total output are:

1. *Enterprises are involved in the food production sector – for Rivne and Chernivtsi regions.*
2. *Enterprises are involved in the beverage production sector – for Vinnytsya, Rivne and Khmelnytskiy regions.*
3. *Enterprises are involved in the tobacco products production sector – for Ternopil, Vinnytsya and Rivne regions.*
4. *Enterprises are involved in the production of textiles – for Lviv and Rivne regions.*
5. *Enterprises are involved in the production of wearing apparel – for Rivne and Khmelnytskiy regions.*
6. *Enterprises are involved in the production of leather and related products - for Rivne and Chernivtsi regions.*
7. *Enterprises are involved in the production of wood and wood products - for Ivano-Frankivsk and Rivne regions.*
8. *Enterprises are involved in the production of paper and paper products – for Zakarpattya, Ivano-Frankivsk, Khmelnytskiy and Chernivtsi regions.*
9. *Enterprises are involved in the printing and reproduction of recorded media – for Volyn, Ivano-Frankivsk and Rivne regions.*

10. *Enterprises are involved in the production of coke and oil petroleum products - for Volyn and Rivne regions.*
11. *Enterprises are involved in the production of chemicals and chemical products – for Rivne and Khmelnytskiy regions.*
12. *Enterprises are involved in the production of basic pharmaceutical products and pharmaceuticals – for Ivano-Frankivsk and Rivne regions.*
13. *Enterprises are involved in the production of rubber and plastics products, and other non-metallic mineral products– for Ivano-Frankivsk and Rivne regions.*
14. *Enterprises are involved in the production of other non-metallic mineral products – for Rivne and Chernivtsi regions.*
15. *Enterprises are involved in the production of basic metals – for Ternopil and Rivne regions.*
16. *Enterprises are involved in the production of fabricated metal products, except machinery and equipment – for Ivano-Frankivsk and Rivne regions.*
17. *Enterprises are involved in the production of computer, electronic and optical products – for the Ivano-Frankivsk and Vinnytsya regions.*
18. *Enterprises are involved in the production of electrical equipment – for Zakarpattya and Rivne regions.*
19. *Enterprises are involved in the production of machinery and equipment - for Ternopil and Vinnytsya regions.*
20. *Enterprises are involved in the production of motor vehicles, trailers and semi-trailers– for the Volyn and Rivne regions.*
21. *Enterprises are involved in the production of other transport equipment – for Zakarpattya and Rivne regions.*
22. *Enterprises are involved in the production of furniture – for Ivano-Frankivsk and Rivne regions.*
23. *Enterprises are involved in the production of other manufacturing – for Volyn and Rivne regions.*
24. *Enterprises are involved in the production of repair and installation of machinery and equipment for the Zakarpattya, Lviv and Rivne regions.*

2.2.2. Analysis of the labour market potential of the Western regions.

As of January 1, 2022, the State Statistics Service of Ukraine lived in the western regions a quarter (25.2%) of the total population of Ukraine. The largest available number among the western regions of Ukraine in the Lviv region is 2,478,134 people. The population (estimated) as of January 1, 2022, and the average number in 2021 is shown in Table 2.2.7.

Table 2.2.7. Population (estimated) as of January 1, 2022, and average number in 2021, persons

Region	Current population, persons		Permanent population, persons	
	on January 1, 2022	Average number in 2021	on January 1, 2022	Average number in 2021
Ukraine	41167336	41377845	40997699	41208208
Volyn	1021356	1024376	1018628	1021648
Zakarpattya	1244476	1247302	1241643	1244469
Ivano-Frankivsk	1351822	1356466	1349096	1353740
Lviv	2478134	2487942	2459764	2469572
Rivne	1141784	1145120	1140724	1144060
Ternopil	1021713	1026138	1018462	1022887
Khmelnytskiy	1228829	1236308	1225666	1233145
Chernivtsi	890457	893511	887392	890446

Source: State Statistics Service of Ukraine

Among the largest cities of the western regions, there are the following cities: Lviv, Chernivtsi, Rivne, Ivano-Frankivsk, Ternopil, Lutsk, Uzhgorod, Kamianets-Podilskyi, Mukachevo, Drohobych, Kovel, Chervonohrad, Kalush, Kolomyia, Stryi, Novovolynsk.

The main components of the labour market are the aggregate supply, which covers all hired labour (quantitative and composition of the population, its qualification level, the corresponding structure), and aggregate demand, as the general need of the economy of hired labour. They constitute the total labour market or the labour market in a broad sense.

To confirm the results of indirect indicators: macroeconomic, as well as indicators of the business environment of the industry, the IPG team calculated the labour market potential index, which shows the state of the labour market – the availability of vacancies and resumes, the number of unemployed, the unemployment rate and its dynamics over the past two years (Table 2.2.8.). This approach allows us to understand the current situation of the "labor economy" and build the most accurate forecast of the future state of the labor market, including trends in the development of the market situation in the region for the future period

Table 2.2.8. Average Labor Market Potential Loading for 2021-2022 years persons

		Вінницька/ Vinnytsya	Волинська/ Volyn	Закарпатська/ Zakarpattya	Івано-Франківська/ Ivano-Frankivsk	Львівська/ Lviv	Рівненська/ Rivne	Тернопільська/ Ternopil	Хмельницька/ Khmelnytskiy	Чернівецька/ Chernivtsi
S0210	Manufacture of food products	2429	951	253	690	1436	1073	704	1625	403
S0211	Manufacture of beverages	124	43	46	49	208	29	191	78	30
S0212	Manufacture of tobacco products	1	1	0	0	13	0	2	0	0
S0213	Manufacture of textiles	26	69	66	70	314	146	50	231	44
S0214	Manufacture of wearing apparel	214	208	290	193	734	294	106	344	156
S0215	Manufacture of leather and related products	10	27	168	77	284	20	58	109	14
S0216	Manufacture of wood and of products of wood and cork, except furniture; ma	284	357	329	426	631	720	105	177	218
S0217	Manufacture of paper and paper products	41	140	17	55	260	36	40	157	8
S0218	Printing and reproduction of recorded media	20	23	6	17	68	16	9	12	6
S0219	Manufacture of coke and refined petroleum products	3	24	0	23	52	8	2	2	0
S0220	Manufacture of chemicals and chemical products	110	65	80	113	59	223	23	42	16
S0221	Manufacture of basic pharmaceutical products and pharmaceutical preparatio	39	3	4	9	41	4	9	13	4
S0222	Manufacture of rubber and plastic products	79	51	62	130	145	91	63	108	56
S0223	Manufacture of other non-metallic mineral products	505	205	103	669	898	606	497	586	744
S0224	Manufacture of basic metals	18	106	8	26	45	37	20	84	4
S0225	Manufacture of fabricated metal products, except machinery and equipment	326	117	48	85	363	161	68	186	49
S0226	Manufacture of computer, electronic and optical products	66	65	151	15	60	24	14	71	7
S0227	Manufacture of electrical equipment	134	35	215	54	243	33	73	118	16
S0228	Manufacture of machinery and equipment n.e.c.	242	220	26	51	144	87	29	200	33
S0229	Manufacture of motor vehicles, trailersand semi-trailers	141	371	397	318	577	87	240	202	245
S0230	Manufacture of other transport equipment	47	30	2	2	172	5	13	99	4
S0231	Manufacture of furniture	116	242	147	168	546	114	66	172	44
S0232	Other manufacturing	50	37	134	44	79	37	42	22	5
S0233	Repair and installation of machineryand equipment	88	36	13	104	228	33	185	226	38

Source: IPG calculation, Source: State Statistics Service of Ukraine

The production of food products has the highest potential in Vinnytsya, Lviv and Khmelnytskiy regions. The production of beverages has the highest potential in Vinnytsya, Lviv and Ternopil regions. In addition to furniture, the production of wood and wood products and cork has the highest potential in Lviv, Rivne and Ivano-Frankivsk regions.

The analysis of labour potential in the Western regions shows that the largest in terms of labour potential is Lviv region and Khmelnytskiy region in almost all sectors and has the highest rates. At the same time, the Chernivtsi region has the lowest potential among the western regions.

2.3. Selection of Key Industrial Supply Chains

This sub-chapter will discuss how key industrial supply chains are selected by considering their potential for growth, profitability, ability to increase and create jobs, as well as capability of accepting internally displaced persons.

Formation of a list of chains for evaluation.

Considering the economic profile of Western Ukraine (Zakarpattya, Ivano-Frankivsk, Lviv, Ternopil, Khmelnytskiy, Chernivtsi Vinnytsya, Volyn, Rivne regions), the IPG expert group included more than 23 sectors and 43 sub-sectors in the scoring model. The analysis focused on the main product components of the supply chain and involved studying labour supply demand and supply by regions and types of economic activity as follows:

1. Summering of the available data on the number of vacancies and registered unemployed by type of economic activity, which were published by the state employment services of 24 regions of Ukraine and the city of Kyiv during January-August 2022.
2. Carrying out a general ranking from greater to lower values in all sectors of economic activity throughout Ukraine.
3. Filtering the generalized list by 9 regions and subsectors participating in the state relocation program.
4. Calculation of the load index of registered unemployed per vacancy for each sub-sector.
5. Formation of a list of chains for scoring according to the load index less than 1 (business need).

Food products supply chains:

- Sauces and preparations, therefore, mixed condiments and mixed seasonings; mustard flour and meal and prepared mustard.
- Meat and edible meat offal.
- Animal or vegetable fats and oils and their cleavage products; prepared edible fats; waxes of animal or vegetable origin.
- Prepared foods obtained by the swelling or roasting of cereals or cereal products.
- Bread, pastry, cakes, biscuits, and other bakers' wares.
  Pasta, whether or not cooked or stuffed with meat or other substances or otherwise prepared.

Apparel supply chains:

- Articles of apparel and clothing accessories knitted or crocheted.
- Tracksuits, ski suits, swimwear, and other garments, n.e.s. (excluding knitted or crocheted).
- Men's or boys' underpants, briefs, nightshirts, pyjamas, bathrobes, dressing gowns and similar.
- Women's or girls' slips, petticoats, briefs, panties, nightdresses, pyjamas, négligés, bathrobes.
- Babies' garments and clothing accessories knitted or crocheted (excluding hats).
- Brassieres, girdles, corsets, braces, suspenders, garters and similar articles and parts thereof.

Basic metals supply chains: Wire of iron or non-alloy steel, in coils.

Chemicals and chemical products supply chain: Mineral or chemical nitrogenous fertilizers.

Computer, electronic and optical products supply chain: Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles.

Electrical energy supply chain

Electrical equipment supplies chains: Electric motors and generators.

Fabricated metal products supply chains:

- Structures and parts of structures e.g., bridges and bridge-sections, lock-gates, towers, lattice masts, roofs, roofing frameworks, doors and windows and their frames and thresholds for doors, shutters, balustrades, pillars and columns", of iron or steel; plates, rods, angles, shapes, sections, tubes and the like, prepared for use in structures, of iron or steel.
- Radiators for central heating, non-electrically heated, and parts thereof, of iron or steel.
- Arms and ammunition; parts and accessories thereof.

Animal fodder supply chain

Furniture supply chain: Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included illuminated signs, illuminated nameplates and the like; prefabricated buildings.

Ground and pipeline transport supply chain: Motor vehicles for the transport of >= 10 persons, incl. driver.

Leather and leather products supply chains: Footwear with outer soles of rubber, plastics, leather or composition leather and uppers of leather.

Machinery and equipment n.e.c. supply chains: Ball or roller bearings

Mining of coal and lignite supply chains:

- Lignite, whether or not agglomerated (excluding jet).
- Coal; briquettes, ovoids and similar solid fuels manufactured from coal.

Non-metallic mineral products supply chains: Gypsum; anhydrite; plasters consisting of calcined gypsum or calcium sulphate, and whatnot

Other mining and quarrying supply chains: Peat, incl. peat litter, whether or not agglomerated.

Other products: Toys, games, and sports requisites; parts and accessories thereof supply chains.

Other transport facilities excluding railway supply chains:

- Bicycles and other cycles, incl. delivery tricycles, are not motorised.
- Aircraft, spacecraft, and parts thereof.
- Ships, boats, and floating structures.

Paper and paper products supply chains:

- Paper and paperboard; articles of paper pulp, of paper or paperboard.
- Paper and paperboard, coated on one or both sides with kaolin "China clay" or another inorganic.

Textiles supply chains:

- Carpets and other textile floor coverings
- Pile fabrics
- Other made-up textile articles; sets; worn clothing and worn textile articles; rags.

Tobacco products supply chain

Transport equipment, trailers, and semi-trailers supply chains: Trailers and semi-trailers; other vehicles, not mechanically propelled (excluding railway and tramway vehicles); parts thereof, n.e.s.

Wood and products supply chains:

- Wood and articles of wood; wood charcoal
- Packing cases, boxes, crates, drums and similar packings, of wood; cable drums of wood; pallets

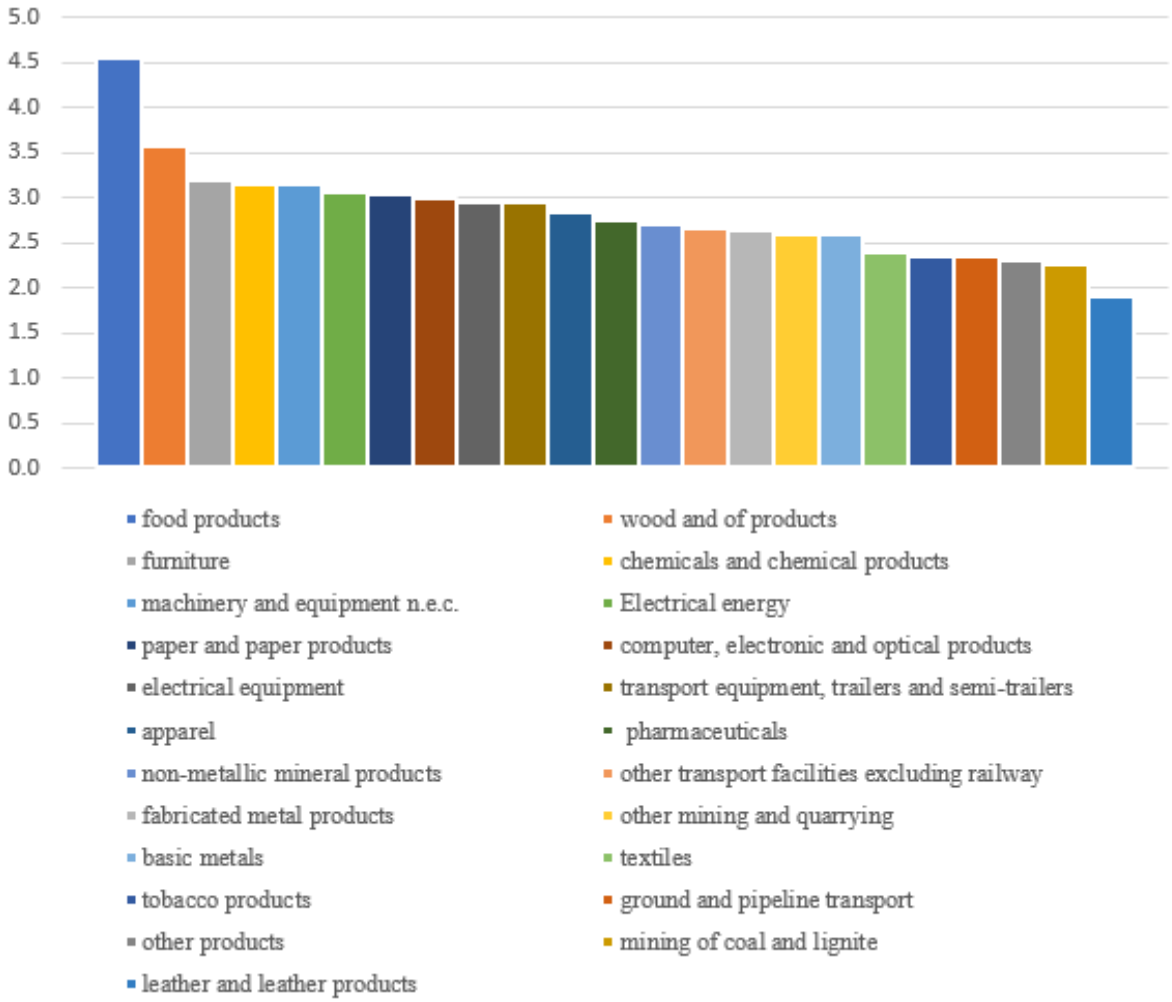
The Pharmaceutical supply chains:

- Dried glands and other organs for organo-therapeutic uses, whether or not powdered; extracts of glands or other organs or their secretions, for organo-therapeutic uses; heparin and its salts; other human or animal substances prepared for therapeutic or prophylactic uses, n.e.s.
- Human blood; animal blood prepared for therapeutic, prophylactic or diagnostic uses; antisera and other blood fractions and immunological products, whether or not modified or obtained using biotechnological processes; vaccines, toxins, cultures of micro-organisms (excl. yeasts) and similar products; cell cultures, whether or not modified.
- Medicaments consisting of two or more constituents mixed for therapeutic or prophylactic uses, not in measured doses or put up for retail sale.
- Medicaments consisting of mixed or unmixed products for therapeutic or prophylactic uses, put up in measured doses "incl. those for transdermal administration" or forms or packings for retail sale.

» Wadding, gauze, bandages and the like, e.g., dressings, adhesive plasters, poultices, impregnated or covered with pharmaceutical substances or put up for retail sale for medical, surgical, dental or veterinary purposes and others.

Using all available information, each product was awarded points for each sub-criterion using the Likert five-point scale with a large/highly positive score (like 5), moderate or neutral (like 3), or small or limited value, or non-positive (like 1), which is presented in Table 2.3.2. of Annex 2 and in Fig. 2.3.1. Detailed calculations of the score model are given in Annex 3.

Fig.2.3.1. Graphic image of the rating of supply chains in the order of the final assessment rating by sectors (Source: IPG calculations)



When analysing supply chains in the order of the rating of the final assessment in the context of subsectors (Table 2.3.2.) it was found that the chain "Bread, pastry, cakes, biscuits, and other bakers' wares" scored the highest (4.3 points). It is followed by the chain of "Animal or vegetable fats and oils and their cleavage products" and the Chain of "Pasta, boiled or uncooked, stuffed with meat or other substances or otherwise cooked" (scored 4.2 points, respectively). The chain "Meat and edible meat offal" and chain" Animal Fodder" scored 4.1, and the chain "Sauces and preparations for them, mixed seasonings and mixed seasonings; Mustard flour and meal and finished mustard" scored 4.0. Other clusters includes "Prepared foods obtained by the swelling or roasting of cereals or cereal

products", "Paper and cardboard", "Wood and wood products" and the Chain "Packing cases, boxes, crates, drums and similar wood product" scored from 3.9 to 3.3 points, respectively.

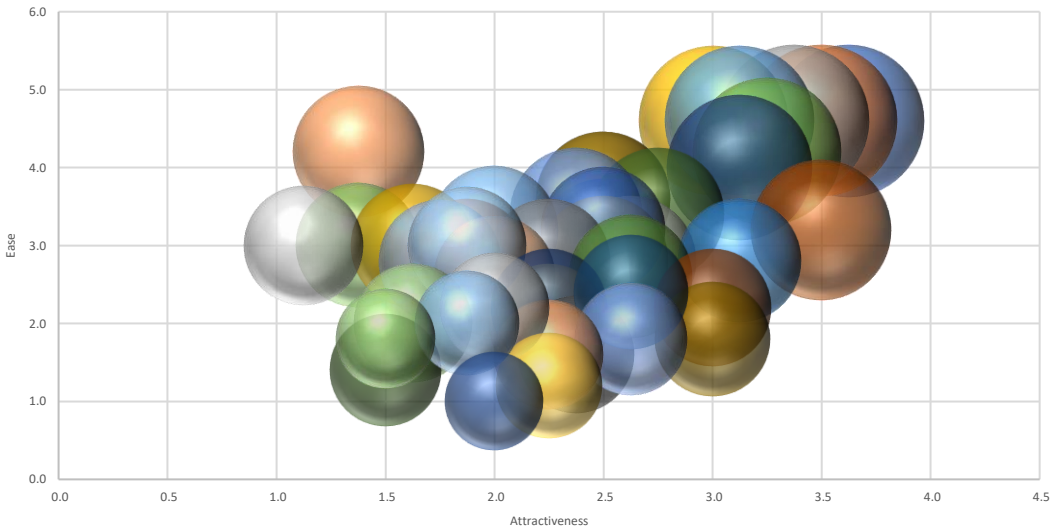
Based on the evaluation data, the IPG team also developed an ease and attractiveness matrix of supply chains. (Fig. 2.3.2.), which considers the strength of the existing supply chain (ease), as well as market opportunities and development (attractiveness).

Table 2.3.2 Evaluation model of product supply chains in the order of the final assessment rating by subsectors

№ Sub-sector	Supply chain	Economic					Social						Institutional		Environment	Score
		Market size (USD)	Market growth	Ukraine's market share in the world	Current exports from Ukraine	Current imports to Ukraine	Scalability	Labor demand by product groups	Labor supply by product groups	Labor demand by sub-sector	Labor supply by sub-sector	Labor index	Capital investments by 9 oblasts	Number of industrial enterprises that implemented innovations	Share of global greenhouse gas emissions	
	Weight	10	5	5	5	5	5	5	5	5	5	5	10	10	20	100
10	Bread, pastry, cakes, biscuits and other bakers' wares	5	3	5	5	5	5	4	5	1	1	5	5	3	5	4,3
10	Animal or vegetable fats and oils and their cleavage products	5	3	5	5	5	5	4	5	1	1	4	5	3	5	4,2
10	Pasta, whether or not cooked or stuffed with meat or other substances or otherwise prepared	5	3	5	5	5	5	4	5	1	1	3	5	3	5	4,2
10	Meat and edible meat offal	5	3	5	5	5	5	4	5	1	1	1	5	3	5	4,1
10	Animal fodder	5	3	5	5	5	5	4	5	1	1	1	5	3	5	4,1
10	Sauces And Preparations Therefor, Mixed Condiments And Mixed Seasonings; Mustard Flour And Meal And Prepared Mustard	5	3	3	5	5	5	4	5	1	1	2	5	3	5	4,0
10	Prepared foods obtained by the swelling or roasting of cereals or cereal products	5	2	2	5	5	5	4	5	1	1	2	5	3	5	3,9
17	Paper and paperboard	5	2	3	5	5	4	1	1	5	5	5	2	1	5	3,6
16	Wood and articles of wood	5	3	5	5	5	5	2	2	1	1	1	2	1	5	3,3
16	Packing cases, boxes, crates, drums and similar packings, of wood	5	3	5	5	4	5	2	2	1	1	1	2	1	5	3,3
14	Tracksuits, ski suits, swimwear and other garments, n.e.s. (excluding knitted or crocheted)	5	2	2	5	5	4	2	2	1	1	3	1	1	6	3,3
20	Mineral or chemical nitrogenous fertilisers	5	4	5	5	5	4	1	1	1	1	5	1	2	4	3,2
31	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings	5	2	4	5	5	4	1	1	2	3	1	1	2	5	3,2
13	Other made-up textile articles	5	0	5	5	5	1	1	1	1	1	1	5	1	5	3,2
29	Trailers and semi-trailers; other vehicles, not mechanically propelled	5	2	1	5	5	2	1	2	3	5	1	1	2	5	3,2
26	Electrical machinery and equipment and parts thereof	5	3	1	5	5	3	1	1	1	1	5	1	2	5	3,1
28	Ball or roller bearings	5	2	3	5	5	4	1	1	1	1	1	1	2	5	3,0
30	Aircraft, spacecraft, and parts thereof	5	-4	1	5	5	4	1	1	1	1	2	1	2	6	2,9
25	Radiators for central heating, non-electrically heated, and parts thereof	4	2	5	5	5	5	1	1	1	1	5	1	2	3	2,9
27	Electric motors and generators	5	2	1	5	5	3	1	1	1	1	1	1	2	5	2,9
14	Babies' garments and clothing accessories, knitted or crocheted (excluding hats)	5	2	3	5	5	4	2	2	1	1	1	1	1	4	2,8
17	Paper and paperboard, coated on one or both sides with kaolin	5	-2	2	5	5	4	1	1	1	1	2	2	1	5	2,8
35	Electrical energy	5	5	4	5	5	5	2	3	2	1	2	3	1	1	2,8
25	bridges and bridge-sections, lock-gates, towers, lattice masts, roofs, roofing frameworks, doors and windows and their frames and thresholds	5	2	2	5	5	5	1	1	1	1	5	1	2	3	2,8
14	Brassieres, girdles, corsets, braces, suspenders, garters and similar articles and parts thereof	5	-2	2	5	5	4	2	2	1	1	1	1	1	5	2,8
21	Pharmaceutical products	5	4	1	5	5	2	1	1	1	1	1	1	2	4	2,7
30	Ships, boats and floating structures	5	-2	2	5	5	1	1	1	1	1	1	1	2	5	2,6
8	Peat	3	3	1	2	4	4	1	1	1	1	4	1	1	5	2,6
24	Wire of iron or non-alloy steel, in coils (excluding bars and rods)	5	3	5	5	5	2	1	1	1	1	1	1	1	3	2,6
30	Bicycles and other cycles, incl. delivery tricycles, not motorised	5	-3	1	1	5	2	1	1	1	1	5	1	2	5	2,6
14	Women's or girls' slips, petticoats, briefs, panties, nightdresses, pyjamas, négligés, bathrobes	5	2	1	5	5	4	2	2	1	1	1	1	1	3	2,5
23	Gypsum; anhydrite; plasters consisting of calcined gypsum or calcium sulphate, whether or not	5	3	2	3	2	5	2	3	1	1	4	3	2	1	2,5
5	Lignite, whether or not agglomerated (excluding jet)	5	4	0	1	1	1	1	1	1	1	5	1	1	5	2,5
14	Articles of apparel and clothing accessories, knitted or crocheted	5	2	1	5	5	4	2	2	2	2	5	1	1	1	2,4
12	Tobacco and manufactured tobacco substitutes	5	5	4	5	5	3	1	1	1	1	4	1	1	1	2,4
5	Coal; briquettes, ovoids and similar solid fuels manufactured from coal	5	-2	0	0	5	1	1	1	1	1	4	1	1	5	2,3
49	Motor vehicles for the transport of >= 10 persons	5	-3	1	4	5	4	3	3	3	2	4	1	2	1	2,3
14	Men's or boys' underpants, briefs, nightshirts, pyjamas, bathrobes, dressing gowns and similar	5	2	1	3	5	4	2	2	1	1	1	1	1	2	2,2
32	Toys, games and sports requisites	5	3	1	5	5	3	1	1	1	1	1	3	1	1	2,2
25	Arms and ammunition; parts and accessories thereof	5	3	0	0	0	5	1	1	1	1	1	1	2	3	2,1
13	Carpets and other textile floor coverings	5	2	2	5	5	3	1	1	1	1	1	1	1	1	2,0
15	Footwear	5	-1	1	5	5	3	1	1	1	1	1	1	1	1	1,8
13	Pile fabrics	4	3	1	1	5	3	1	1	1	1	2	1	1	1	1,8

Source: IPG calculations

Fig.2.3.2. An ease and attractiveness matrix of supply chains.



- Bread, pastry, cakes, biscuits and other bakers' wares
- Pasta, whether or not cooked or stuffed with meat or other substances or otherwise prepared
- Meat and edible meat offal
- Animal fodder
- Sauces And Preparations Therefor, Mixed Condiments And Mixed Seasonings; Mustard Flour And Meal And Prepared Mustard
- Prepared foods obtained by the swelling or roasting of cereals or cereal products
- Paper and paperboard
- Wood and articles of wood
- Packing cases, boxes, crates, drums and similar packings, of wood
- Tracksuits, ski suits, swimwear and other garments, n.e.s. (excluding knitted or crocheted)
- Mineral or chemical nitrogenous fertilisers
- Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings
- Other made-up textile articles
- Trailers and semi-trailers; other vehicles, not mechanically propelled
- Electrical machinery and equipment and parts thereof

Source: IPG calculations based on USAID approach[16]

[16] Developed by IPG for current report using USAID approach from report of Value chain assessment and selection of Moldova high value agriculture activity, March 17, 2017. Factors considered: attractiveness: opportunities, i.e., market size, market growth, scalability, integration of IDPs, ease: strength of the supply chain i.e., existing market share, current exports, sector investment, institutional capacity.

In this way, the following supply chains can be identified with the highest potential for growth, profitability, increase and job creation, as well as capable of accepting internally displaced persons.

1. Bread, pastry, cakes, biscuits, and other bakers' wares supply chain.
2. Animal or vegetable fats and oils and their cleavage products supply chain.
3. Pasta, whether or not cooked or stuffed with meat or other substances or otherwise prepared supply chain.
4. Meat and edible meat offal supply chain.
5. Animal fodder supply chain.
6. Sauces And Preparations Therefor, Mixed Condiments and Mixed Seasonings; Mustard Flour and Meal and Prepared Mustard supply chain.
7. Prepared foods obtained by the swelling or roasting of cereals or cereal products supply chain.
8. Paper and paperboard supply chain.
9. Wood and articles of the wood supply chain.
10. Packing cases, boxes, crates, drums, and similar packings, of wood supply chain.

Considering the innovative connections among participants and the distinct characteristics involved in creating the aforementioned products, as well as the material flow resulting from economic activity—which encompasses input resources, production, storage, processing, sorting, cleaning, packaging, retail and wholesale trade, national consumption, and export—the authors of the report have identified three key areas of integration in supply chains. These areas include the chain of food products from the plant group, the supply chain of meat and meat products, and the supply chain of forest products. These areas will be further discussed in the subsequent chapter.

2.4. Assessing the selected supply chains

2.4.1. Food supply chain of the plant group of goods

2.4.1.a. Mapping the food supply chain of the plant group

The food chain of the plant group includes the functioning of its various counterparties (agricultural, procurement, processing, and trade organizations), between which production relations objectively arise and economic relations are successfully resolved. (Fig. 2.4.1.)

The market for providing resources and services for production is the first link in the supply chain.

Chain members - Suppliers of resources, services (seeds, fertilizers, plant protection products, fuels and lubricants, innovative technologies (irrigation equipment, agricultural tools and machinery) and financial, information resources, transport services), and equipment and machinery.

Six large multinational corporations import fertilizers, pesticides, and seeds used by Ukrainian farmers. The corporations include Syngenta, Bayer, Limagrain, Pioneer, Petrochemical Industries Company and Euralis[17]. Ukrainian distribution companies such as Eridon and LNZ[18] also takes part in this activity. These companies have regional representatives and handle farmers' orders. Farmers can buy these products through local shops, specialized Internet sites or place orders directly during agricultural seminars and exhibitions. These orders come with delivery and training to work with these products.

Machinery and equipment for agricultural production in Ukraine are represented by the following companies John Deere, CNH (Case New Holland), AGCO (Fendt, Massey Ferguson, Valtra, Challenge), Claas, Kuhn, Krone[19].

Primary production is the second link in the chain.

Producers of grain and oilseeds in Ukraine are divided into three categories:

- private farms (population) or traditional farmers - families in rural areas with small plots of land and homesteads, with an area of not more than 2 hectares;
- modern farmers working independently or joined in cooperatives;
- large commercial farmers and large agricultural holdings, which own vast areas of land, use powerful agricultural machinery, and can afford to hire qualified agronomists. Cooperation between large and small farmers and between small farms is rare.

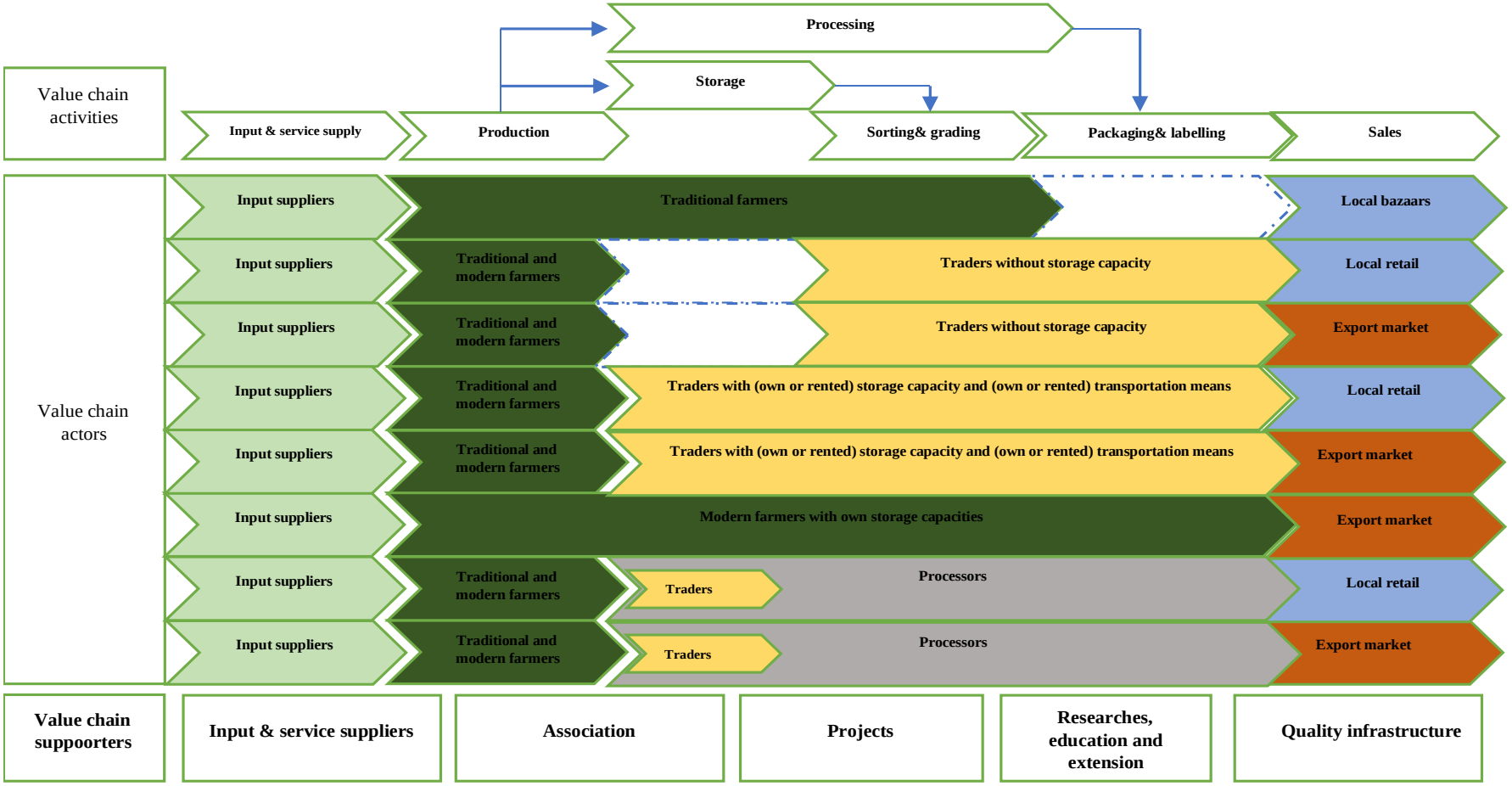
The main consumers of the link: exporters, livestock breeders, and food processors.

[17] Six large multinational corporations import fertilizers, pesticides, and seeds used by Ukrainian farmershttps://landlord.ua/reytingi/reyting-importerov-krupneyshie-importeryi-sredstv-zashhityi-rasteniy

[18] Ukrainian distribution companies https://superagronom.com/news/9735-viznacheno-logistichni-potujnosti-naybilshih-postachalnikiv-nasinnya-ta-zzr-v-ukrayini

[19] Machinery and equipment for agricultural production in Ukraine https://agravery.com/uk/posts/show/10-years-challenge-traktori-todi-i-zaraz

Fig. 2.4.1. Stages of the food supply chain of the plant group of goods



Source: IPG developments

The third link in the chain is processing or storage.

After harvesting from the field, the products go to storage facilities or for processing into semi-processed products, processed and ready for consumption. Intermediaries/traders continue the value chain; buy products directly from the field or from storage warehouses, and form wholesale batches for sales to the address of domestic processing or export.

Processing companies are key representatives of the link that create value added of the product by purchasing products from intermediaries or collecting from their own fields or directly from farmers and processing products.

The fourth link in the turnover of goods are buyers of the secondary market:

- corporate-type trading networks;
- franchise networks (branded, branded partner retail);
- other retail outlets (traditional trade) and HoReCa;
- exporters.

2.4.1.b. Key stakeholders in the food supply chain of a plant group of goods.

The Cabinet of Ministers of Ukraine is the central executive body that ensures the formation and implementation of the state agrarian policy, within the limits of powers determined by law[20].

Ministry of Agrarian Policy and Food of Ukraine -forms and implements the state agrarian policy.[21]

Ministry of Economy of Ukraine - is the main body in the system of central executive bodies that ensures the formation and implementation of state policy of economic, social development and trade.[22].

The State Service of Ukraine for Food Safety and Consumer Protection (hereinafter referred to as SSUFSCP) is the competent authority that implements the state policy in the field of safety and individual indicators of food and feed quality, animal health and welfare and veterinary medicine. The powers of the Main Department of the State Food and Consumer Service extend to the territory of the relevant region, the city of Kyiv, and the district[23].

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[20] The Cabinet of Ministers of Ukraine https://zakon.rada.gov.ua/laws/show/124-2021-%D0%BF#Text

[21] Ministry of Agrarian Policy and Food of Ukraine -forms and implements the state agrarian policy https://minagro.gov.ua/en/pro-nas/mission-and-strategy. These policy includes: state policy in the fields of agriculture and food security, protection of rights to plant varieties, animal husbandry, crop production, rural development, horticulture, viticulture, winemaking, hops, food and manufacturing (hereinafter - the sphere of agro-industrial production), technical policy in the field of agro-industrial complex and mechanical engineering for agro-industrial complex, rural development, development of farming, agricultural cooperation, agricultural advisory activities, monitoring and fertility of soils on agricultural lands, seed and seedling, etc

[22] Ministry of Agrarian Policy and Food of Ukraine https://zakon.rada.gov.ua/laws/show/459-2014-%D0%BF#Text These policies include: state pricing policy, state policy in the field of technical regulation, standardization, metrology and metrological activity, management of state property, sale of property (property rights, other assets) or rights to it on a competitive basis in the form of auctions, in particular, electronic, and monitoring its implementation; performs the functions of a management body in relation to state-owned objects belonging to the sphere of its management

[23] The State Service of Ukraine for Food Safety and Consumer Protection (hereinafter referred to as SSUFSCP)https://dpss.gov.ua/bezpechnist-harchovih-produktiv-ta-veterinarna-medicina/pro-departament

The Ministry of Finance of Ukraine ensures the implementation of a unified state financial, budgetary, and tax policy aimed at implementing certain tasks of economic and social development of Ukraine[24].

The Ministry for Communities, Territories and Infrastructure Development of Ukraine is the main body in the system of central executive bodies that ensures the formation and implementation of state policy on safety in public road transport, urban electric, rail, sea and river transport.[25].

The State Fiscal Service of Ukraine implements and submits to the Minister of Finance proposals on state tax policy and policy in the field of state customs affairs, as well as on state policy in the field of combating offences in the application of tax and customs legislation[26].

The State Service of Ukraine for Geodesy, Cartography and Cadastre (Derzhgeocadastre) is the central executive body, and which implements the state policy in the field of national infrastructure of geospatial data, land relations, land management, in the field of the State Land Cadastre.[27]

State Specialized Budgetary Institution (SSU) Agrarian Fund is an operator of the agricultural sector of Ukraine, the purpose of which is to create favorable conditions for the development of agriculture, the functioning of the agricultural market, support for domestic agricultural producers, as well as profit from economic activities in accordance with the law[28]**.**

State Scientific Institution "**Ukrainian Research Institute for Forecasting and Testing of Machinery and Technologies for Agricultural Production named after Leonid Pogorily**"[29]

- Ukrainian Research Institute of Productivity of the Agro-industrial Complex
- Ukrainian Institute for Plant Variety Examination (UIPD)
- Scientific and Technical Council at the Ministries.
- Grain producers (including farms, peasant farms)
- Association
- Society
- Grain keepers
- Grain traders, intermediaries of the commodity market

[24] The Ministry of Finance of Ukraine https://mof.gov.ua/storage/files/157.PDF

[25] The Ministry for Communities Territories and Infrastructure Development of Ukraine https://mtu.gov.ua/content/zavdannya-ta-funkcii-ministerstva-u-sferi-bezpeki-na-transporti.html The task include: maintaining state supervision (control) over safety in public road transport, urban electric, rail, sea and river transport (except for security navigation of vessels of the fleet of the fishing industry)

[26] The State Fiscal Service of Ukraine https://mof.gov.ua/uk/state-fiscal-service-state-fiscal-service

[27] The State Service of Ukraine for Geodesy, Cartography and Cadastre (Derzhgeocadastre) https://zakon.rada.gov.ua/laws/show/15-2015-%D0%BF#Text This agency's activities are directed and coordinated by the Cabinet of Ministers of Ukraine through the Minister of Agrarian Policy and Food

[28] State Specialized Budgetary Institution (SSU) Agrarian Fund is an operator of the agricultural http://agrofond.gov.ua/about/main-facts/

[29] Ukrainian Research Institute for Forecasting and Testing of Machinery and Technologies for Agricultural Production named after Leonid Pogorily https://minagro.gov.ua/napryamki/agrarna-nauka-ta-osvita/naukovi-ustanovi

- Processors of food of the plant group

Supporting chain organizations at the national level:

- Public Union "Flour Mills of Ukraine";
- International Buckwheat Association;
- American Chamber of Commerce;
- Assembly of Agrarian Chambers of Ukraine;
- Association "National Tourism Organization of Ukraine";
- Association "Union of Exchanges of Ukraine";
- Association "Ukrainian Club of Agrarian Business";
- Association of Local Self-Government Bodies "Association of United Territorial Communities";
- Charitable organization League of Food Producers;
- All-Ukrainian public non-profit organization "Union for the promotion of rural green tourism in Ukraine";
- All-Ukrainian Union of Certified Land Surveyors;
- All-Ukrainian public organization "Fund for the promotion of land protection";
- All-Ukrainian Agrarian Organization "Agrarian Chamber of Ukraine";
- NGO "Association of Farmers and Private Landowners of Ukraine";
- NGO "Public control of consumer rights protection";
- NGO "Center for Environmental Initiatives "Ecodia";
- Public Union "Agrarian Union of Ukraine";
- Public Union "Agri-Food Council";
- Public Union "All-Ukrainian Association of Farmers and Agricultural Producers";
- Public Union "All-Ukrainian Agrarian Forum";
- Public Union "Ukrainian Cooperative Federation";
- Public Union "Ukrainian Control of Agrarian Protection";
- European Business Association;
- Ukrainian Agrarian Confederation;
- Ukrainian Association of Agricultural Exports;
- Ukrainian Cooperative Federation;
- Ukrainian Union of Associations, Organizations and Enterprises for the Production of Food Products "Ukrprodspilka";
- Federation of Employers of Ukraine;
- Ukrainian Association of Soybean Producers and Processors;
- Ukrainian Technical Hemp Association;
- Association of Producers of Phyto Raw Materials of Ukraine;
- Association for the Development of Flax and Hemp Breeding of Ukraine;

- International Grain and Feed Trade Association GAFTA;
- Ukrainian Grain Association;
- Phytosanitary Association of Ukraine;
- Public Union "Ukrainian Association of Manufacturers and Distributors of Veterinary Drugs and Feed Additives";
- Association "Ukrainian Seed Society";
- "Ukrsortnasinneovoch"Association;
- Seed Association of Ukraine;
- "Ukroliyaprom" Association;
- All-Ukrainian Association of Agricultural Entrepreneurs;
- Association of enterprises-producers of machinery and equipment for the agro-industrial complex "Ukragromash";
- Ukrainian Association of Manufacturers of Electrical Engineering;
- Ukrkhlibprom Association of Bakery Enterprises.

To assess the potential of creating eco-industrial parks and the level of existing clustering of regions of Western Ukraine, a matrix of basic products and ancillary services was built, which forms a chain (Fig.2.4.2 provided below) with a full cycle of the production process – from cultivation to consumption of final products. The list of products for inclusion in the chain is formed based on the rating of the scoring model, namely:

1. Bread, cakes, cookies and other bakery products (No. 1 in the rating of the scoring model).
2. Animal or vegetable fats and oils and their cleavage products (No. 2 in the rating of the scoring model).
3. Pasta (No. 3 in the rating of the scoring model).
4. Pet food (No. 5 in the rating of the scoring model).
5. Sauces and seasonings (No. 6 in the rating of the scoring model).
6. Ready-to-eat grain group (No. 7 in the rating of the scoring model).

Fig. 2.4.2 Matrix of products and supporting services of the food supply chain of plant goods.

<table>
<tr><th></th><th>Input resources, primary products and services</th><th>Processing (semi-processed and processed and ready to eat)</th><th>Packing</th><th>Sales</th></tr>
<tr><td rowspan="2">Services</td><td>Support activities for crop production, carried out for remuneration or a contract basis: pre-sowing preparation of fields, sowing and planting of agricultural crops, processing of agricultural crops, spraying of agricultural crops, incl. from the air, harvesting, pest control, maintenance of land in proper agricultural and ecological condition, operation of agricultural irrigation equipment, provision of agricultural machinery with service personnel according to NACE Class 01.61</td><td colspan="3" rowspan="4"></td></tr>
<tr><td>Post-harvest activities (cleaning, trimming, grading, disinfecting, drying) according to NACE Class 01.63</td></tr>
<tr><td rowspan="2">Input resources</td><td>Fertilizers and nitrogen compounds according to NACE Class 20.15</td></tr>
<tr><td>Pesticides and other agrochemical products according to NACE Class 20.20</td></tr>
<tr><td rowspan="4">Products of plant origin</td><td rowspan="4">Cereals (except rice), leguminous crops and seeds of oil crops according to NACE Class 01.11 KVED–2010, such as wheat, corn (for grain), sorghum, barley, rye, oats, millet, buckwheat, peas, soybeans; seeds of mustard, rapeseed, safflower, sesame, sunflower), etc</td><td>Production of oil and animal fats according to NACE class 10.41 (production of unrefined vegetable oil: sunflower, safflower, mustard, linseed, etc., production of defatted flour and meal from oilseeds, production of refined vegetable oil: soybean, sunflower, etc., processing of vegetable oils: distillation, boiling, dehydration, hydrogenation, etc., as well as the production of inedible animal oils and fats, cake and other waste from the production of vegetable oils)</td><td rowspan="4">Packaging activities for a fee or on a contract basis, whether or not the process is automated: filling bottles and cans with liquid products, incl. beverages and food products, packaging of solid goods in blisters, foil, etc., labeling, labeling and inscriptions on packages according to NACE class 82.92</td><td rowspan="2">Wholesale trade of grain, seeds and fodder for animals according to NACE class 46.21</td></tr>
<tr><td>Production of starches, glucose, glucose syrup, maltose, inulin, etc., production of gluten (gluten), production of tapioca and its substitutes made from starch, production of corn oil, production of fructose and fructose syrup, etc. according to NACE Class 10.62</td></tr>
<tr><td>Production of sauces, spices and seasonings: mayonnaise, coarse and fine ground mustard flour, ready-made mustard, etc. according to NACE class 10.84 KVED–2010</td><td rowspan="2">Retail trade of bread, cakes, flour confectionery and sugar confectionery in specialized stores according to NACE class 47.24</td></tr>
<tr><td>Manufacture of grain mill products class (grain milling: production of flour, groats, meal or pellets of wheat, rye, oats, maize (corn) or other cereal grains, manufacture of cereal breakfast foods, manufacture of flour mixes and prepared blended flour and dough for bread, cakes, biscuits or pancakes) according to NACE class 10.61</td></tr>
<tr><td>Logistics and infrastructure</td><td colspan="4">Infrastructure: storage and warehousing activities of all types of goods: operation of granaries, general purpose warehouses, refrigerated warehouses, bunkers, etc. according to NACE class 52.10, Logistics: freight rail transport (NACE class 49.20), freight transport by road (NACE class 49.41), inland freight water transport (NACE class 50.40), freight air transport (NACE class 51.21), service activities incidental to land transportation (NACE class 52.21), service activities incidental to water transportation (NACE class 52.22), service activities incidental to air transportation (NACE class 52.23), cargo handling (NACE class 52.24), other transportation support activities (NACE class 52.29).</td></tr>
</table>

Source: IPG developments

Table 2.4.1. Rating of food chain cluster formation by region

	Investment attractiveness*	Value added**	Job creation ***	Concentration of enterprises****	Rating
Vinnytsya	7,5	6,5	6,6	6,0	1
Ternopil	4,0	4,5	8,6	8,2	2
Khmelnytskiy	6,0	5,3	6,4	5,4	3
Rivne	3,5	4,0	4,0	6,0	4
Volyn	5,0	4,5	3,2	4,4	5
Chernivtsi	2,0	2,0	5,8	7,0	6
Lviv	7,5	5,5	1,8	1,8	7
Ivano-Frankivsk	3,0	3,3	5,0	3,2	8
Zakarpattya	1,0	1,0	3,6	3,0	9

*Investment attractiveness – the average score of the monetary assessment of capital investments in food production for 2020-2021 according to the list

** Value added - the average score of the monetary assessment of value added by production costs, distributed by links according to Fig. 2

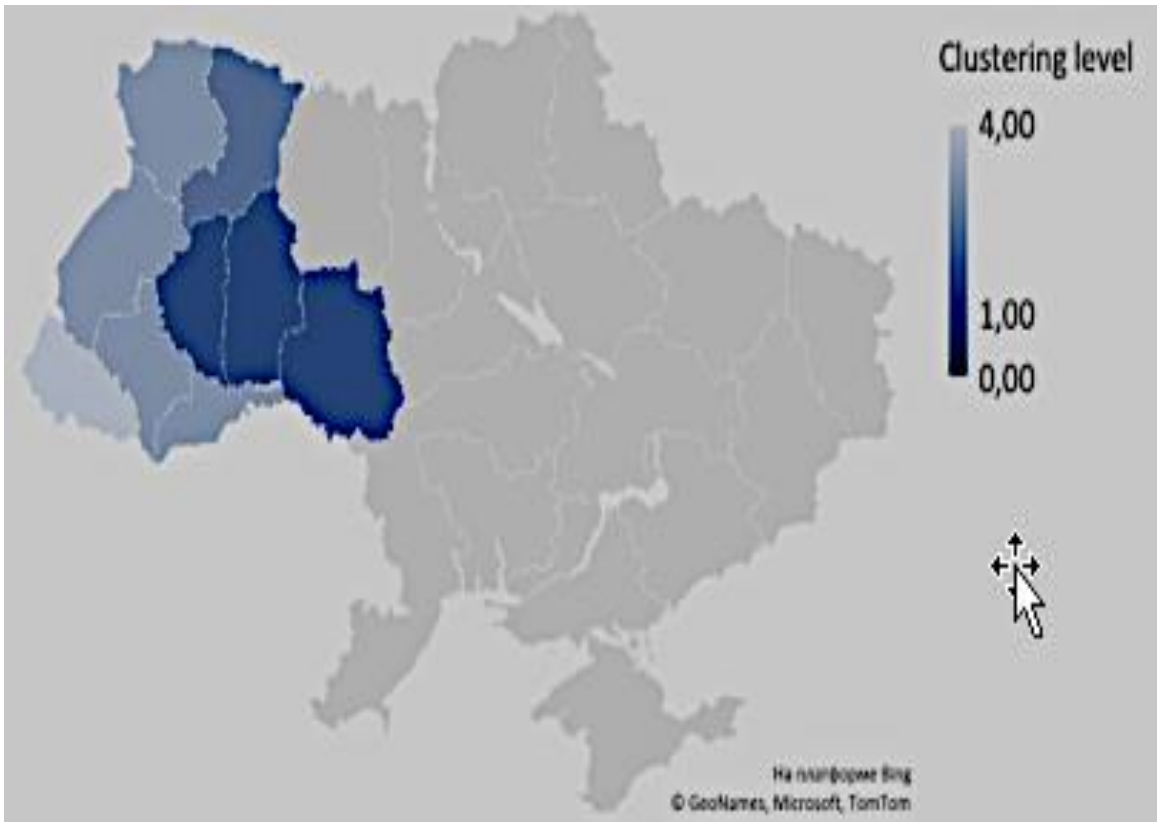
*** Job creation - the average score of the assessment of the number of employed populations along all parts of the chain for 2017-2022.

****Concentration of enterprises - the average score of the assessment of the number of enterprises along all links in the chain for 2017-2020.

Source: IPG calculations

Thus, considering empirical and econometric approaches using the method of clustering k-averages in relation to the analysis of the information obtained during the study, it is possible to determine the following ratings of the formation of food chain clusters in the regions of the relocation program (Table 2.4.1). All assigned points are averaged by regions and criteria.

Fig. 2.4.3. Level-cluster analysis of food chain of the plant group of goods by regions



Source: IPG developments

For grouping regions by level clustering (Fig. 2.4.3.) is carried out according to the following definitions:

1st level of the cluster: the regions that have the greatest attractiveness in food clustering on the principles of EIP in favor of building the industry and creating conditions for business relocation, increasing jobs to attract internally displaced persons;

2nd level of the cluster: districts that have a good attractiveness for food clustering on the principles of EIP in favor of building the industry and creating conditions for business relocation, increasing jobs to attract internally displaced persons;

3rd level of the cluster: districts that have sufficient attractiveness for food clustering on the principles of EIP in favor of building the industry and creating conditions for business relocation, increasing jobs to attract internally displaced persons;

4th level of the cluster: districts that have the least attractiveness in food clustering on the principles of EIP in favor of building the industry and creating conditions for business relocation, increasing jobs to attract internally displaced persons.

Level-cluster analysis of the regions of 9 relocation regions in terms of priority activities showed that the first level of the cluster includes: Vinnytsia, Ternopil, Khmelnytskiy regions, to the second level: Rivne region, to the third level: Volyn, Chernivtsi, Lviv, Ivano-Frankivsk regions, to the fourth level: Zakarpattya region.

2.4.1.c. Assessing the cost, profit, marketing, and supply and demand dynamics

The cost structure of the supply chain of food products of the plant group of goods was calculated by grouping the production costs of enterprises. The calculation was done by classifying types of economic activity. The analysis involved calculating the average shares of material costs, depreciation, labor costs, deductions for social protection and other costs for the period 2017-2020 each link of the supply chain and its components (Table 2.4.2.

Table 2.4.2. Costs of the supply chain of food products of the plant group of goods links, average for 2017-2020 in %

Links of the supply chain	Material costs and costs of services used in production	Amortization	Wages and salaries	Social security costs	Other costs
Input resources, primary products and services	**77,5**	**6,5**	**12,2**	**2,7**	**1,1**
Fertilizers and nitrogen compounds	77,3	4,5	13,7	3,3	1,3
Pesticides and other agrochemical products	87,0	3,1	7,8	1,7	0,4
Support activities for crop production	73,4	10,9	12,1	2,6	1,1
Post-harvest activities	74,9	6,7	14,1	3,0	1,4
Primary production	**80,4**	**7,0**	**8,2**	**1,8**	**2,6**
cultivation of grain crops (except rice), legumes and oilseeds	80,4	7,0	8,2	1,8	2,6

Processing	**87,9**	**3,1**	**7,0**	**1,4**	**0,5**
Production of starches, glucose, glucose syrup, maltose, inulin, etc.	86,2	4,7	7,4	1,4	0,3
Production of pasta and similar flour products	85,3	3,8	7,8	1,7	1,4
Production of oil and animal fats	94,9	1,8	2,7	0,5	0,2
Manufacture of grain mill products class	87,5	2,6	7,8	1,6	0,5
Production of sauces, spices and seasonings	87,4	2,4	8,4	1,7	0,2
Packaging	**58,8**	**2,3**	**31,6**	**6,8**	**0,6**
packaging	58,8	2,3	31,6	6,8	0,6
Sales	**62,6**	**8,4**	**23,2**	**4,8**	**1,0**
Wholesale of grain, seeds and animal feed	74,8	8,3	13,2	2,4	1,4
Retail trade of bread, cakes, flour confectionery and sugar confectionery	50,5	8,5	33,2	7,1	0,7

Source: State Statistics Service of Ukraine

In fig. 2.4.4. the structure of links costs of the supply chain of food products of the plant group of goods in 2017-2020 is clearly depicted.

Fig. 2.4.4. The structure of the links costs of the food products supply chain of the plant group of goods (average indicators for the period 2017-2020)

Source: State Statistics Service of Ukraine

The given data indicate that the largest share in the cost structure at all stages of the supply chain is the cost of materials and services of a production nature. The most material-intensive production links of the chain are Processing with an average share of material costs of 87.9%, Primary production (growing of plant products) - 80.4% of material costs in the cost structure, Input resources and primary products - 77.5%. At the same time, at the first stage of the supply chain in the field of production of pesticides and other agrochemical products, material costs make up 87%, which is the largest structural share of this group of costs in this link. At the Processing stage, the highest share of material costs is provided by such sectors as Production of oil and animal fats (94.9%), Production of flour and grain industry products (87.5%), Production of spices and seasonings (87.4%).

Labor and insurance costs are the second most important cost element in the plant food supply chain. The most significant share is labor costs with accruals in the Packaging chain (38.4%). The share of labor and insurance costs at the Sales stage is also high - an average of 28%, including in the field of Retail trade of bakery products, flour and sugar confectionary products in specialized stores - 40.3%, which is the largest share of this group of costs throughout the supply chain.

The share of amortization costs in the supply chain is insignificant. The largest structural share of amortization costs was provided at the stage of Sales (8.4%).

The assessment of profitability at individual stages of supply and production consumption was carried out based on the indicator of the profitability of the operational activities of large, medium and small enterprises that are part of the supply chain of food products of the plant group of goods. Average values of profitability indicators are given in the table. 2.4.3

At the first stage of this supply chain, the largest profitability was provided by large enterprises producing fertilizers and nitrogen compounds (29.8%). In the second link of the chain, the highest percentage of profitability was achieved at medium-sized enterprises (29.3%). The processing industry in the supply chain of food products of the plant group of goods is the least profitable link. And the highest level of profitability in

the chain is ensured in the sector of Wholesale trade of grain, unprocessed tobacco, seeds and animal feed at the stage of Sales at large enterprises (37.4%).

Table 2.4.3. The level of profitability (loss) of the operational activities of enterprises for 2017-2021

Links of the supply chain	Average	large enterprises	medium enterprises	small enterprises	of which microenterprises
Input resources, primary products and services	**10,7**	**27,6**	**6,8**	**4,5**	**8,3**
Fertilizers and nitrogen compounds	25,4	29,8	10,9	4,7	8,0
Pesticides and other agrochemical products	10,1		4,9	9,6	9,0
Support activities for crop production	2,3	16,4	1,9	3,9	7,7
Post-harvest activities	4,8		5,9	2,7	8,6
Primary production	**27,9**	**28,2**	**29,3**	**25,9**	**25,0**
Cultivation of grain crops (except rice), legumes and oilseeds	27,9	28,2	29,3	25,9	25,0
Processing	**4,9**	**4,1**	**5,5**	**6,6**	**7,3**
Production of starches, glucose, glucose syrup, maltose, inulin, etc.	9,8		9,9	22,8	15,5
Production of pasta and similar flour products	2,4		3,1	2,3	2,5
Production of oil and animal fats	2,6	1,3	3,1	1,1	8,9
Manufacture of grain mill products class	2,9	8,7	3,1	1,7	4,0
Production of sauces, spices and seasonings	6,2	2,4	4,3	5,2	5,3
Sales	**14,3**	**34,6**	**24,9**	**8,6**	**9,5**
Wholesale of grain, seeds and animal feed	19,9	37,7	28,7	10,3	14,1
Retail trade of bread, cakes, flour	8,6	19,1	9,9	6,3	5,0

confectionery and sugar confectionery					

Source: State Statistics Service of Ukraine

Based on the calculation and comparison over time of some intensity coefficients, which characterize the ratio of individual links as suppliers and/or buyers of products of previous and/or subsequent participants in the chain, an assessment of the dynamics of supply and demand in the supply scheme of food products of the plant group of goods was carried out.

In the table 2.4.4. initial indicators for calculations of supply and demand dynamics are given.

Table 2.4.4. Input data for calculating supply / demand indicators (intensity factors) for links in the supply chain of food products of plant group of goods.

Links of the supply chain	Years	Fertilizers production, thousand tons	Agricultural machinery at the beginning of the year, thousand hryvnias/1 unit.	Wheat cultivation, million hryvnias.	Cultivation of sunflower seeds, million hryvnias.	Production of flour and groats from wheat grown in the country, million hryvnias.	Production of sunflower oil, million hryvnias.	Wholesale turnover of goods produced in the country, million hryvnias.	
								Flour, cereals from wheat	Vegetable oils
Input resources, primary products and services									
	2017	925,4	307,1						
	2018	785	303						
	2019	1291,6	303,6						
	2020	1707,2	307,3						
Primary production									
	2017			94588	103437				
	2018			109884	125139				
	2019			113855,0	119261				
	2020			122984	142477				
Processing (semi-processed and processed and ready for consumption)									
	2017					7276	28474,9		
	2018					7991,5	28092,7		
	2019					8906,9	27094,6		
	2020					8799,3	36455,5		
Sales	2017							2892,9	12615,9
	2018							2687,1	12767,1
	2019							2457,1	12564,9
	2020							2653,4	15639,0

Source: IPG calculation

The assessment of demand/supply is carried out based on the coefficients obtained as a result of dividing the relevant data of each subsequent link of the supply chain by the data of the previous link for each year of the analyzed period, the values of which are given in the table. 2.4.5.

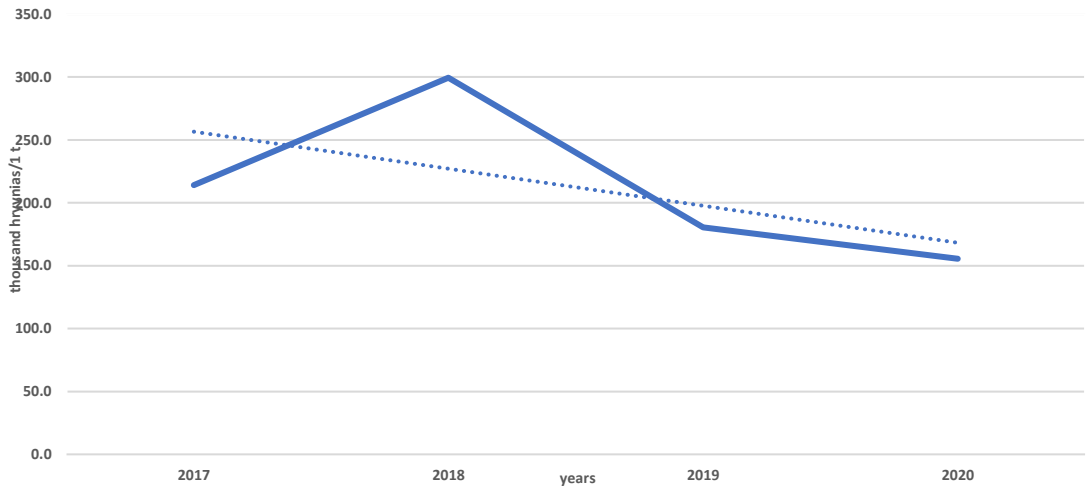
Table 2.4.5. Assessment of demand/supply in the supply chain of food products of the plant group of goods

Links of the supply chain	Years	Cultivation of cereals (except rice), leguminous crops and oil seeds per 1 ton of mineral fertilizer production, thousand hryvnias/1 ton	Cultivation of cereals (except rice), leguminous crops and oil seeds per 1 agricultural machinery unit, thousand hryvnias/1 unit.	Production of wheat flour and groats for UAH 1. production of raw materials, UAH/1 UAH.	Production of sunflower oil for UAH 1. production of raw materials, UAH/1 UAH.	Wholesale turnover of flour, wheat groats for UAH 1. of industrial production, hryvnia/1 hryvnia	Wholesale turnover of vegetable oil for UAH 1. of industrial oil production, hryvnia/1 hryvnia
Primary production							
	2017	214,0	644,8				
	2018	299,4	775,7				
	2019	180,5	767,8				
	2020	155,5	863,8				
Processing (semi-processed and processed and ready for consumption)							
	2017			0,077	0,28		
	2018			0,073	0,22		
	2019			0,078	0,23		
	2020			0,072	0,26		
Sales							
	2017					0,40	0,44
	2018					0,34	0,45
	2019					0,28	0,46
	2020					0,30	0,43

Source: IPG calculations

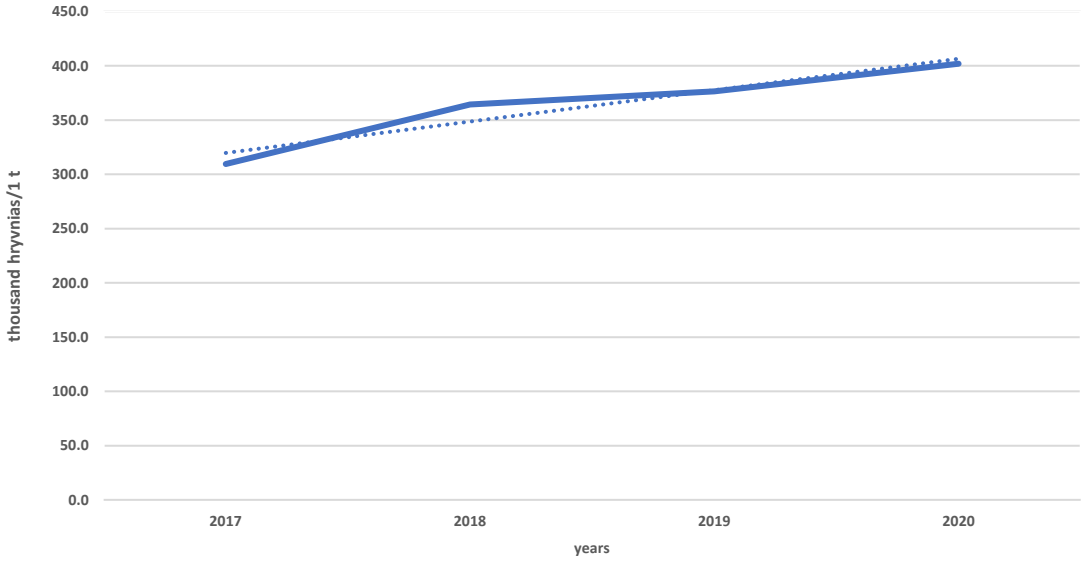
For the interpretation of the obtained data and the analysis of demand/supply in the supply chain, it is advisable to present the dynamics of the calculated coefficients on linear graphs (Fig. 2.4.5. - 2.4.10).

Fig. 2.4.5. Cultivation of wheat and sunflower seeds (link 2) per 1 ton of mineral fertilizer production (link 1), thousand hryvnias/1



Source: IPG calculations

Fig. 2.4.6. Cultivation of wheat and sunflower seeds (link 2) per 1 agricultural unit of equipment (link 1), thousand hryvnias/1

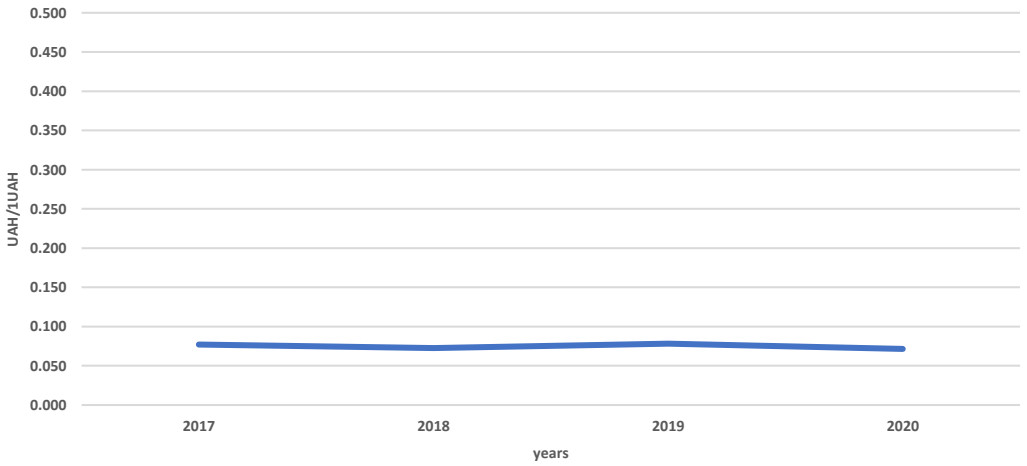


Source: IPG calculations

Fig. 2.4.5. and 2.4.6. characterize the demand of the second link Primary production and supply of the first link Input resources, primary products and services. The given ratios are stimulator indicators, that is, their increasing dynamics is desirable. The value of the Wheat and sunflower seed cultivation indicator (link 2) per 1 ton of mineral fertilizer production (link 1) (2.4.6.) decreases during the period. From the table 2.4.5. we can see that both the numerator and the denominator of this coefficient have an increasing trend, but the growth of the denominator (production of mineral fertilizers) is faster. Supply exceeds demand in dynamics. It is necessary to stimulate demand in link 2.

The indicator of Cultivation of wheat and sunflower seeds (link 2) per 1 agricultural unit of equipment (link 1) (Fig. 2.4.6.) has a satisfactory growth trend. An increase in the cultivation of wheat and sunflower seeds (link 2) during the period proposed above will require the involvement of a larger number of resources in the previous stage of the chain, in particular an increase in the amount of machinery used in link 1. So currently the proposal in link 1 for the item Agricultural machinery in the stage 1 is sufficient. But further growth in the volume of wheat and seed cultivation in link 2 will require the involvement of additional resources, in particular the supply of agricultural machinery in link 1.

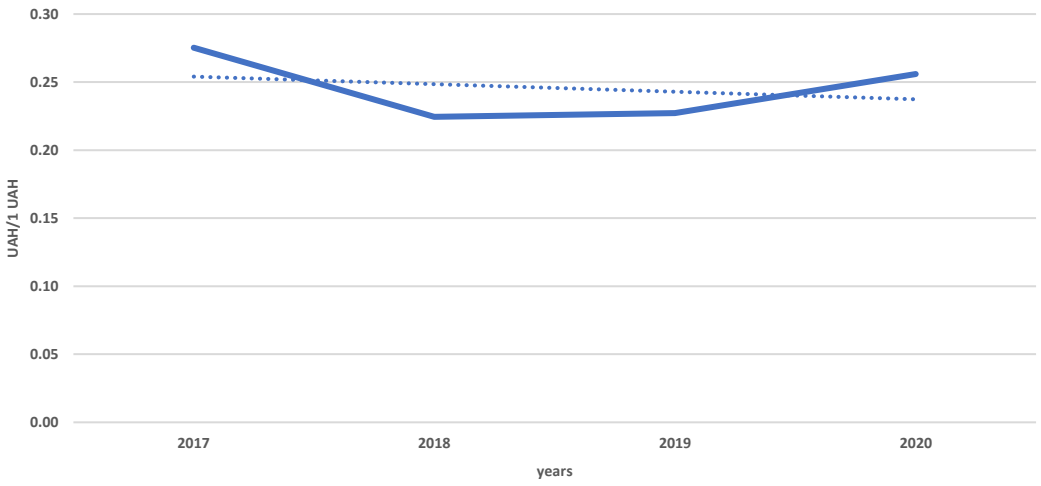
Fig. 2.4.7. Production of flour and groats from wheat (link 3) for UAH 1. production of raw materials (link 2), UAH/1 UAH.



Source: IPG calculations

In fig. 2.4.7. the dynamics of the ratio of monetary indicators are given: the production of flour and groats from wheat (link 3) and the production (growing) of raw materials (link 2). The value of the coefficients during the period almost does not change since there is an equivalent growth rate of wheat cultivation and processing. The demand for wheat in link 3 is satisfied by an adequate supply of grain. Supply and demand are appropriate.

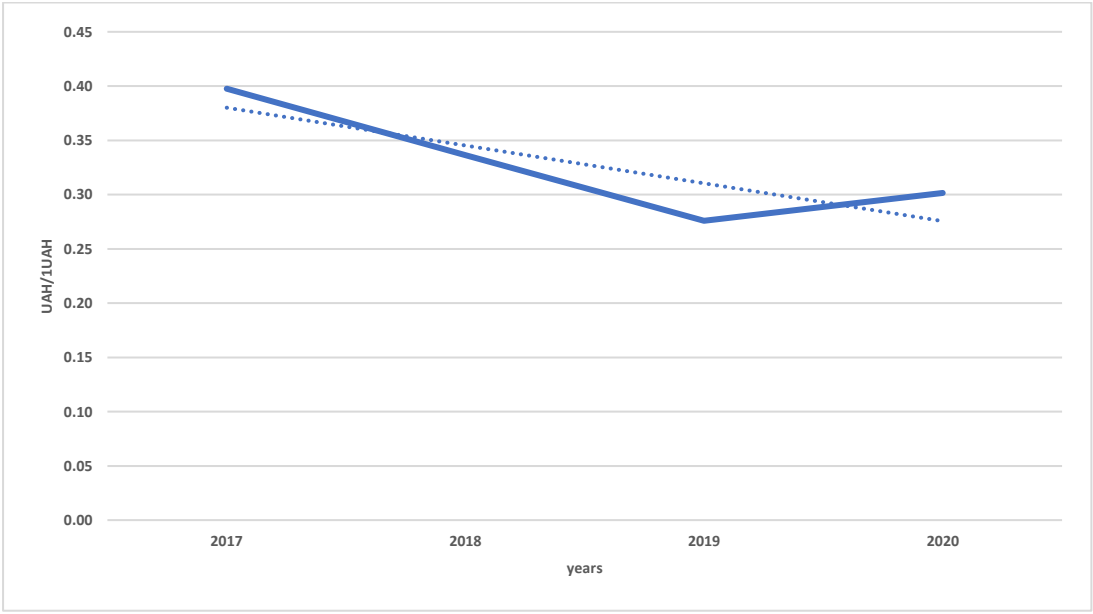
Fig. 2.4.8. Production of sunflower oil (link 3) for UAH 1. production of raw materials (link 2), UAH/1 UAH.



Source: IPG calculations

In fig. 2.4.8. the depicted trend of the ratio of sunflower oil production (link 3) to the production of raw materials (link 2) is almost unchanged during the period (as a whole, during the period, the rate of growth of the indicated indicators-stimulators in the numerator and denominator is the same). The demand for seeds grown in line 2 in the production of sunflower oil (line 3) is fully satisfied.

Fig. 2.4.9. Wholesale turnover of flour, wheat groats (link 4) for UAH 1. of industrial production (link 3), UAH/1 UAH.

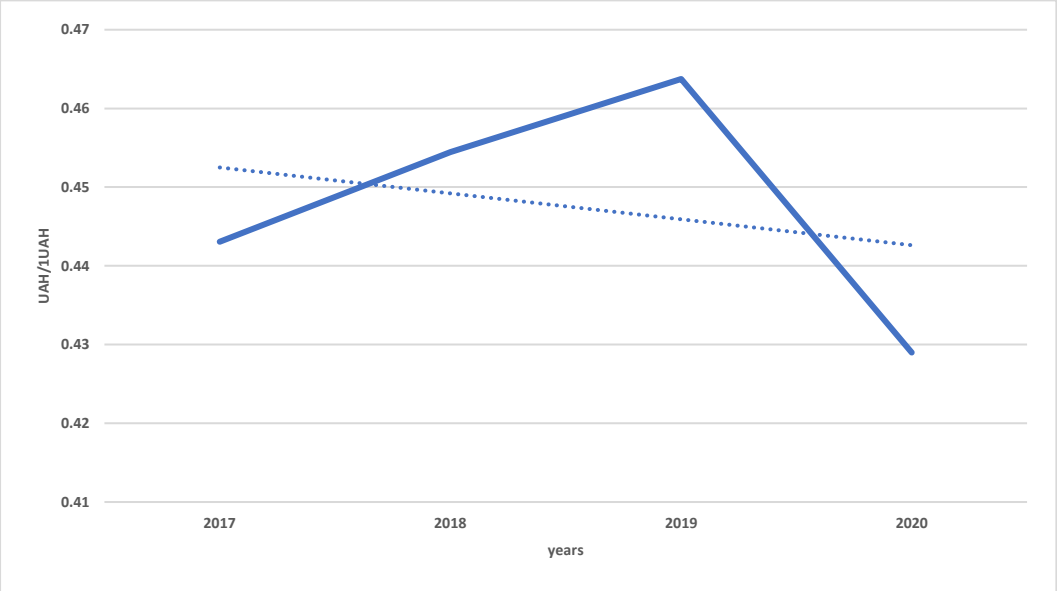


Source: IPG calculations

In fig. 2.4.9. and 2.4.10. the supply and supply trends of the third and fourth links of the supply chain of flour and groats of wheat and rice are shown. Indicator Wholesale turnover of flour, wheat groats (link 4) for 1 hryvnia. industrial production (link 3) (Fig. 2.4.9.). has

unsatisfactory downward dynamics. With the growth of flour production at the Processing stage, sales of flour are decreasing. The demand in link 4 does not correspond to the existing supply. It is advisable to increase the volume of wholesale trade in wheat flour in link 4.

Fig. 2.4.10. Wholesale turnover of vegetable oil (link 4) for UAH 1. of industrial production (link 3), UAH/1 UAH.



Source: IPG calculations

The more rapid growth of sunflower oil production in the third stage led to a change in the direction of the trend of the indicator Wholesale turnover of vegetable oil (link 4) by UAH 1. of industrial production (link 3) (Fig. 2.4.10.). In the current situation, the demand in the wholesale trade of vegetable oil in link 4 does not correspond to the supply. It is desirable to increase domestic wholesale trade in vegetable oil.

2.4.1.d. Supporting functions and infrastructure are required for food supply chain of plant goods and their clusters work on the principles of EIP.

Table 2.4.6. Supporting functions and infrastructure are required for food supply chain of plant goods and their clusters work on the principles of EIP

Supporting functions of the chain and the necessary infrastructure	Input and service supply	Production	Processing (semi-processed and processed and ready for consumption)	Packing	Sales
Weather data monitoring and analytics, forecast.					
Phytosanitary monitoring					
Testing the soil, determining the productive moisture content and indicators of soil hardness. Modeling the calculation of the introduction of goodness					
Analysis of fertilizers for the content of the active substance					
Analysis of water and assessment of its suitability for spraying crops / irrigation.					
Introduction of saving technologies for tillage					
Evaluation and recommendations for the preparation of technological maps of cultivation					
Use of irrigation systems and sprinkler equipment					

Services of agricultural machinery according to the agreed schedule					
Quality control of seed material and plant protection products					
Timely delivery of security resources and appropriate storage					
Improvement of zonal technologies for growing high-quality grain of grain, oilseeds and fodder crops;					
Use of energy-efficient technologies for the production and supply of input resources and services					
Disposal of waste from the production and supply of input resources and services					
Agronomic support of cultivation (assessment and recommendations of the necessary technologies, selection of varieties / hybrids, fertilizers, protection systems with norms and methods of seeding application)					
Comprehensive or separate services of pre-sowing preparation of fields: sowing and planting of crops, processing of crops, spraying of crops, including from the air, pest control associated with agriculture, and maintenance of land in proper agricultural and ecological condition					

Land resources, ownership, and efficient use of land					
Harvesting					
Preparation of crops for initial implementation: cleaning, drying, sorting, packing in big bags, weighing, loading and shipment					
Harvest transportation to storage warehouses					
Organization of appropriate crop storage					
Expert services for the preparation, development, implementation, and adaptation of the HACCP food safety management system (HACCP), as well as its certification.					
Preparation and certification according to ISO 14001, ISO 5000, ISO 37000, ISO 45001 in the past: OHSAS 18001, GRI, as well as religious schemes Halal+, Kosher+, Bio/Eco, Vegan+, etc.					
Organization of incoming control of raw materials for processing and output quality control of products in accordance with HACPP					
Conducting research on all necessary indicators of product quality using high-precision modern equipment					
Use of the latest energy-efficient processing technologies and					

modernization of existing ones to more productive ones					
Recovery (recycling) and disposal of waste for the circular economy, as well as ensuring maximum recycling					
Operational performance management					
Automation of resistance activities and increasing the level of timely response to deviations					
Services for the purchase and supply of means of production, material and technical resources necessary for processing					
Tolling operations					
Production of semi-processed, processed and ready-to-eat products, appropriate packaging and storage, compliance with temperature conditions					
Transportation of semi-processed, processed and ready-to-eat products,					

availability of specialized transport and the possibility of its operation					
Improvement and expansion of the range in accordance with the market demand based on marketing research					
Using the Internet platform for sales and promotion of products and services					
Training and raising the level of qualification of personnel. Development of incentives to work.					
Supply of electricity, gas, steam, and air conditioning					
Water supply; sewerage, waste management, other types of communication networks					
Expanding the ties of enterprises through the development of the "food chain" by attracting to it economic entities of the external (environmental) region as consumers and producers suitable for the use of by-products through the exchange of resources and disposal.					
Entering new markets for existing goods and services (in particular, by-product trade)					
Formation of a profitable business image for enterprises, which contributes to increasing competitiveness					

Attracting new customers (customers) of products (services) and concluding promising contracts					
Emergency Management					
Creation of environmental information systems					
Overall increase in energy efficiency, cascade energy use and cogeneration, including stimulating the development and use of alternative energy sources					
Financing of operating activities, grant support for the latest technologies, simplified lending procedures for small and medium-sized enterprises					
Private investment in the launch of modern technologies for storage and trans-shipment of grain.					
Diversification of supply chains and development of logistics infrastructure facilities					
Investing in the development of inland waterways the Danube River (P80), Dnipro (P40), Dniester (P90)					
Liberalization of railway transport. Integration of the country's railway infrastructure with the EU infrastructure with a parallel transition to a single standard of European track – 1435 mm					

Road management and investment in providing better access to roads connecting production sites with ports and railways.					

Source: IPG developments

2.4.1. e. Summarizing the rules and regulations related to the food supply chain of the plant group of goods.

The transition to a market economy, and approximation of national legislation to the legislation of European countries in accordance with the Association Agreement with the EU, led to the reform of the food sector, the implementation of measures for the safety and quality of agricultural products and food products, which are provided by various laws and regulations. Including:

Food security

The Law of Ukraine "On Grain and the Grain Market in Ukraine" (Edition of 16.10.2022), aimed at creating legal, economic and organizational conditions for competitive production and the formation of the grain market to meet the internal needs of the state in food, seed and feed grains, increasing its export potential.[30]

Resolution of the Cabinet of Ministers of Ukraine dated 06.07.2005 No 543 "On the Agrarian Fund", the purpose of which is to create favorable conditions for the development of agriculture, the functioning of the agricultural market, support domestic agricultural producers, as well as profit from economic activities in accordance with the law.[31]

Primary producers

The Law of Ukraine "On the Farm"[32] (Edition of 20.10.2021).

The Law of Ukraine "On Personal Peasant Economy"[33] (Edition of 15.08.2020).

Market manufacturers

The Law of Ukraine "On the permitting system in the field of economic activity" of 06.09.2005 No 2806-IV (Edition of 10.10.2022).[34]

The Law of Ukraine "On the List of permits in the field of economic activity" of 19.05.2011 No3392-VI (Edition 01.01.2022).[35]

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for state registration of capacities, maintaining the state register of capacities of market operators and providing information from it to interested entities" dated 10.02.2016 No39.[36]

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for maintaining the register of market operators and capacities for which an operational permit has been issued" of 10.02.2016 No40.[37]

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[30] The Law of Ukraine "On Grain and the Grain Market in Ukraine" https://zakon.rada.gov.ua/laws/show/37-15#Text

[31] Resolution of the Cabinet of Ministers of Ukraine https://zakon.rada.gov.ua/laws/show/543-2005-%D0%BF#Text

[32] The Law of Ukraine "On the Farm https://zakon.rada.gov.ua/laws/show/973-15#Text

[33] The Law of Ukraine "On Personal Peasant Economy"https://zakon.rada.gov.ua/laws/show/742-15#Text

[34] The Law of Ukraine "On the permitting system in the field of economic activity" https://zakon.rada.gov.ua/laws/show/2806-15#Text

[35] The Law of Ukraine "On the List of permits in the field of economic activity" https://zakon.rada.gov.ua/laws/show/3392-17#Text

[36] The Law of Ukraine "On the List of permits in the field of economic activity" https://zakon.rada.gov.ua/laws/show/z0382-16#Text

[37] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for state registration of capacities, maintaining the state register of capacities of market operators and

The Law of Ukraine "On Environmental Impact Assessment" of 23.05.2017 No 2059-VIII (Edition of 13.05.2022)[38]

The Law of Ukraine "On Waste" (Edition of 16.10.2020)[39]

Resolution of the Cabinet of Ministers of Ukraine "Some issues of implementation of planned measures of state control by the State Service for Food Safety and Consumer Protection" of 31.10.2018 No 896.[40]

Order of the Ministry of Agrarian Policy and Food of Ukraine dated "On approval of the Procedure for approval of export capacities, their entry and extraction from the register of approved export capacities" of 10.02.2016 No38.[41]

Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of professions, industries and organizations whose employees are subject to mandatory preventive medical examinations, the procedure for conducting these examinations and issuing personal medical books" of 23.05.2001 No559.[42]

Food safety and quality

The Law of Ukraine "On Plant Quarantine" (Edition of 27.05.2022)[43]

Resolution of the Cabinet of Ministers of Ukraine "On Certain Issues of Implementation of the Law of Ukraine "and "On Plant Quarantine" dated 15.11.2019 No. 1177 (Edition of 26.07.2022).[44]

The Law of Ukraine "On Seeds and Planting Material" of December 26, 2002 No. 411-IV.[45]

The Law of Ukraine "On Basic Principles and Requirements for Organic Production, Circulation and Labeling of Organic Products" of July 10, 2018 No. 2496-VIII[46]

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providing information from it to interested entities"https://zakon.rada.gov.ua/laws/show/z0383-16#Text

[38] The Law of Ukraine "On Environmental Impact Assessment" https://zakon.rada.gov.ua/laws/show/2059-19#Text

[39] The Law of Ukraine "On Waste" https://zakon.rada.gov.ua/laws/show/187/98-%D0%B2%D1%80#Text

[40] Resolution of the Cabinet of Ministers of Ukraine "Some issues of implementation of planned measures of state control by the State Service for Food Safety and Consumer Protection" https://zakon.rada.gov.ua/laws/show/896-2018-%D0%BF#Text

[41] Order of the Ministry of Agrarian Policy and Food of Ukraine dated "On approval of the Procedure for approval of export capacities, their entry and extraction from the register of approved export capacities"https://zakon.rada.gov.ua/laws/show/z0381-16#Text

[42] Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of professions, industries and organizations whose employees are subject to mandatory preventive medical examinations, the procedure for conducting these examinations and issuing personal medical books"https://zakon.rada.gov.ua/laws/show/559-2001-%D0%BF#Text

[43] Resolution of the Cabinet of Ministers of Ukraine "On Certain Issues of Implementation of the Law of Ukraine "On Plant Quarantine" The Law of Ukraine "On Plant Quarantine https://zakon.rada.gov.ua/laws/show/3348-12#Text

[44] The Law of Ukraine "On Seeds and Planting Material" https://zakon.rada.gov.ua/laws/show/1177-2019-%D0%BF#Text

[45] The Law of Ukraine "On Basic Principles and Requirements for Organic Production, Circulation and Labeling of Organic Products"https://zakon.rada.gov.ua/laws/show/411-15#Text

[46] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for maintaining the agrochemical passport of the field, land plot"https://zakon.rada.gov.ua/laws/show/2496-19#Text

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for maintaining the agrochemical passport of the field, land plot" of 11.10.2011 No 536.[47]

Resolution of the Cabinet of Ministers of Ukraine dated 10.10.2001 No. 1306 "On traffic rules" (clause 22.5) establishes traffic restrictions for road freight transport, the weight of which exceeds 40 tons on roads of state importance and 24 tons on public roads of local importance.[48]

The Law of Ukraine "On seaports of Ukraine" No4709-VI of 17.05.2012 implements the procedure for passing border, customs, phytosanitary, state control over compliance with the legislation on food products.[49]

The Law of Ukraine "On Basic Principles and Requirements for Food Safety and Quality" of 23.12.1997 No. 771/97-VR (Revision 19.08.2022), which regulates the procedure for ensuring safety and individual indicators of food quality.[50]

The Law of Ukraine "On Protection of the Population from Infectious Diseases" of 06.04.2000 No 1645-III (Revision 10.12.2021).[51]

The Law of Ukraine "On State Control over Compliance with the Legislation on Food, Feed, Animal By-Products, Veterinary Medicine, and Animal Welfare" (No. 2042-VIII) was adopted on May 18, 2017, and revised on May 27, 2022. This law outlines the principles of state control aimed at verifying compliance by market operators with relevant legislation in the areas of food, feed, animal by-products, veterinary medicine, and animal welfare.[52]

Order of the Ministry of Agrarian Policy "On approval of the Requirements for the development, implementation and application of permanent procedures based on the principles of the Food Safety Management System (HACCP) dated 01.10.2012 No. 590.[53]

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the form of the act drawn up as a result of the state control measure in the form of an audit of permanent procedures based on the principles of HACCP" dated 08.08.2019 No446.[54]

Order of the Ministry of Economy of Ukraine "On approval of the forms of acts drawn up as a result of planned (unscheduled) measures of state control (inspection) regarding compliance by market operators with the requirements of legislation on food, feed,

[47] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for maintaining the agrochemical passport of the field, land plot"https://zakon.rada.gov.ua/laws/show/z1517-11#Text

[48] Resolution of the Cabinet of Ministers of Ukraine https://zakon.rada.gov.ua/laws/show/1306-2001-%D0%BF#Text

[49] The Law of Ukraine "On seaports of Ukraine" https://zakon.rada.gov.ua/laws/show/4709-17#Text

[50] The Law of Ukraine "On Basic Principles and Requirements for Food Safety and Quality" https://zakon.rada.gov.ua/laws/show/771/97-%D0%B2%D1%80#Text

[51] The Law of Ukraine "On Protection of the Population from Infectious Diseases" https://zakon.rada.gov.ua/laws/show/1645-14#Text

[52] The Law of Ukraine "On State Control over Compliance with the Legislation on Food, Feed, Animal By-Products, Veterinary Medicine, and Animal Welfare" https://zakon.rada.gov.ua/laws/show/2042-19#Text

[53] Order of the Ministry of Agrarian Policy "On approval of the Requirements for the development, implementation and application of permanent procedures based on the principles of the Food Safety Management System (HACCP)https://zakon.rada.gov.ua/laws/show/z1704-12#Text

[54] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the form of the act drawn up as a result of the state control measure in the form of an audit of permanent procedures based on the principles of HACCP" https://zakon.rada.gov.ua/laws/show/z0980-19#Text

animal by-products, animal health and welfare, and other forms of administrative documents" of 21.01.2022 No 143-22[55]

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for sampling and their transportation (shipment) to authorized laboratories for the purposes of state control and the Form of the act of sampling" dated 11.10.2018 No490.[56]

The Law of Ukraine "On Accreditation of Conformity Assessment Bodies" of 17.05.2001 No2407-III [57]

Resolution of the Cabinet of Ministers of Ukraine "On approval of general requirements for the processing, disposal, destruction or further use of low-quality and dangerous products withdrawn from circulation" of 24.01.2001 No50.[58]

Order of the Ministry of Health of Ukraine "On approval of the Temporary procedure for conducting state sanitary and hygienic examination" of 09.10.2000 No247.[59]

The Law of Ukraine "On withdrawal from circulation, processing, disposal, destruction or further use of low-quality and dangerous products" of 14.01.2000 No1393-XIV.[60]

Resolution of the Cabinet of Ministers of Ukraine from "On approval of the Procedure for sampling products of animal, plant and biotechnological origin for research" of 14.06.2002 No833.[61]

Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Procedure for Declaring Grain by Grain Storage Entities" of 12.12.2002 No. 1877 on the monthly submission of information on the volumes of grain that are in storage.[62]

Cabinet of Ministers of Ukraine "On the procedure for issuing warehouse documents for grain, their transfer and sale to grain warehouses and a standard contract for grain storage" dated 11.04.2003. No. 510 (Revision 22.05.2021) establishes the rules for issuing

[55] Order of the Ministry of Economy of Ukraine "On approval of the forms of acts drawn up as a result of planned (unscheduled) measures of state control (inspection) regarding compliance by market operators with the requirements of legislation on food, feed, animal by-products, animal health and welfare, and other forms of administrative documents"https://zakon.rada.gov.ua/laws/show/z0151-22#Text

[56] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for sampling and their transportation (shipment) to authorized laboratories for the purposes of state control and the Form of the act of sampling"https://zakon.rada.gov.ua/laws/show/z1464-18#Text

[57] The Law of Ukraine "On Accreditation of Conformity Assessment Bodies"https://zakon.rada.gov.ua/laws/show/2407-14#Text

[58] Resolution of the Cabinet of Ministers of Ukraine "On approval of general requirements for the processing, disposal, destruction or further use of low-quality and dangerous products withdrawn from circulation"https://zakon.rada.gov.ua/laws/show/50-2001-%D0%BF#Text

[59] Order of the Ministry of Health of Ukraine "On approval of the Temporary procedure for conducting state sanitary and hygienic examination"https://zakon.rada.gov.ua/laws/show/z0004-01#Text

[60] The Law of Ukraine "On withdrawal from circulation, processing, disposal, destruction or further use of low-quality and dangerous products"https://zakon.rada.gov.ua/laws/show/1393-14#Text

[61] Resolution of the Cabinet of Ministers of Ukraine from "On approval of the Procedure for sampling products of animal, plant and biotechnological origin for research" https://zakon.rada.gov.ua/laws/show/833-2002-%D0%BF#Text

[62] Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Procedure for Declaring Grain by Grain Storage Entities" https://zakon.rada.gov.ua/laws/show/1877-2002-%D0%BF#Text

and using warehouse certificate forms and establishes the form of forms for simple and double warehouse certificates and a warehouse receipt.[63]

Order of the Ministry of Transport of Ukraine "On approval of the Rules of transportation of goods by road in Ukraine" of 14.10.1997 No363.[64]

Order of the Ministry of Transport of Ukraine "On approval of certain sections of the Rules for the carriage of goods" of 21.11.2000 No 644.[65]

Strategy of development and market stimulation

The Law of Ukraine "On Cooperation" 1087-IV 10.07.2003 (Revision 10.10.2022).[66]

The Law of Ukraine "On State Support of Agriculture of Ukraine" of 24.06.2004 No1877-IV (Revision 27.10.2022).[67]

The Law of Ukraine "On peculiarities of insurance of agricultural products with state support" (Revision 24.07.2021)[68]

The Law of Ukraine "On Agrarian Receipts" (Revision 16.10.2022)[69]

The Law of Ukraine "On Agricultural Cooperation" of 17.07.1997 No469/97-VR.[70]

The Law of Ukraine "On priority of social development of the village and agro-industrial complex in the national economy" of 17.10.1990 No400-XII.[71]

Tax Code of Ukraine dated 02.12.2010 No2755-VI (Revision 28.10.2022)[72]

The Law of Ukraine "On the system of engineering and technical support of the agro-industrial complex of Ukraine" dated 05.10.2006 No 229-V (Revision 17.06.2022)73

The Law of Ukraine "On Industrial Parks" (Edition of 19.07.2022).[74]

Decree of the President of Ukraine "On the Sustainable Development Goals of Ukraine until 2030" of 30.09.2019 No 722[75]

Resolution of the Cabinet of Ministers of Ukraine No 179 "On approval of the National Economic Strategy for the period until 2030" dated 03.03.2021.

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[63] Cabinet of Ministers of Ukraine "On the procedure for issuing warehouse documents for grain, their transfer and sale to grain warehouses and a standard contract for grain storage" https://zakon.rada.gov.ua/laws/show/510-2003-%D0%BF#Text

[64] Order of the Ministry of Transport of Ukraine "On approval of the Rules of transportation of goods by road in Ukraine" https://zakon.rada.gov.ua/laws/show/z0128-98#Text

[65] The Law of Ukraine "On Cooperation" https://zakon.rada.gov.ua/laws/show/z0861-00#Text

[66] The Law of Ukraine "On State Support of Agriculture of Ukraine" https://zakon.rada.gov.ua/laws/show/1087-15#Text

[67] The Law of Ukraine "On peculiarities of insurance of agricultural products with state support" https://zakon.rada.gov.ua/laws/show/1877-15#Text

[68] The Law of Ukraine "On Agrarian Receipts" https://zakon.rada.gov.ua/laws/show/4391-17#Text

[69] The Law of Ukraine "On Agricultural Cooperation" https://zakon.rada.gov.ua/laws/show/5479-17#Text

[70] The Law of Ukraine "On priority of social development of the village and agro-industrial complex in the national economy"https://zakon.rada.gov.ua/laws/show/469/97-%D0%B2%D1%80#Text

[71] Tax Code of Ukraine https://zakon.rada.gov.ua/laws/show/400-12#Text

[72] The Law of Ukraine "On the system of engineering and technical support of the agro-industrial complex of Ukraine"https://zakon.rada.gov.ua/laws/show/2755-17#Text

[73] The Law of Ukraine "On Industrial Parks" https://zakon.rada.gov.ua/laws/show/229-16#Text

[74] Decree of the President of Ukraine "On the Sustainable Development Goals of Ukraine until 2030" https://zakon.rada.gov.ua/laws/show/5018-17#Text

[75] Resolution of the Cabinet of Ministers of Ukraine No 179 "On approval of the National Economic Strategy for the period until 2030" https://zakon.rada.gov.ua/laws/show/722/2019#Text

Resolution of the Cabinet of Ministers of Ukraine dated 27.05.2020 No 534 "On approval of the State program of economic stimulation to overcome the negative consequences caused by restrictive measures to prevent the emergence and spread of acute respiratory disease COVID-19 caused by the coronavirus SARS-CoV-2 for 2020-2022";

Resolution of the Cabinet of Ministers of Ukraine dated 19.01.2022 No 25 "On approval of the Procedure for consideration of documents on the inclusion of an industrial (industrial) park in the Register of industrial (industrial) parks".

Trade and consumer protection

The Law of Ukraine "On Information for Consumers regarding Food Products" of 06.12.2018 (Revision 01.10.2022)[76]

Order of the Ministry of Agro-industrial Complex of Ukraine, Chief State Inspector of Veterinary Medicine of Ukraine "On Approval of Veterinary and Sanitary Rules for Markets" of 04.06.1996 No 23.[77]

The Law of Ukraine "On Protection of Consumer Rights" of 12.05.1991 No1023-XII (Revision 10.10.2022).[78]

Order of the Ministry of Economy and European Integration of Ukraine "On Approval of the Rules of Retail Trade in Food Products" 11.07.2003 No 185. [79]

2.4.1. f. Outlining any regulation gaps in the food supply chain of a plant group of goods.

Primary producers

- The mechanism of regulation of the land market and measures of de-offshorization of the economy has been started, but is still unfinished;
- Low level of use of accurate, factual data with forecasting of expected weather conditions and other modern technologies by small manufacturers;
- Use of low-quality or limited access to high-quality chemical fertilizers and seed material to reduce the cost of production;
- Falsification of plant protection products;
- Partial digitalization of crop production;
- Low volumes of seed supply of domestic breeding organizations of various forms of ownership and non-competitive financing of innovative projects in comparison with import proposals from transnational companies;
- Imperfection of the procedure for quarantine procedures Underdevelopment of the agricultural insurance system, as there are significant risks of agriculture due to dangerous natural phenomena and adverse weather conditions, which can affect significant yield losses (up to 70%) and losses of producers;

[76] Resolution of the Cabinet of Ministers of Ukraine https://zakon.rada.gov.ua/laws/show/2639-19#Text
[77] Resolution of the Cabinet of Ministers of Ukraine https://zakon.rada.gov.ua/laws/show/z0314-96#Text
[78] The Law of Ukraine "On Information for Consumers regarding Food Products"https://zakon.rada.gov.ua/laws/show/1023-12#Text
[79] Order of the Ministry of Agro-industrial Complex of Ukraine, Chief State Inspector of Veterinary Medicine of Ukraine "On Approval of Veterinary and Sanitary Rules for Markets" https://zakon.rada.gov.ua/laws/show/z0628-03#Text

- Unjustified refusal to comply with crop rotations is the key to the sustainable development of the agricultural sector of the economy, which leads to exhausting use of soils, excessive agricultural activity and the use of low-margin crops;
- Limited bank lending to small enterprises or their excessive demands, as well as a lack of own funds, stimulate the search for alternative mechanisms for attracting financing, including those that are not transparent to the market;
- Primary production is significantly shadowed (on average from 25 to 40 percent), which is believed to be due to a low motivation to pay taxes and register activities;
- Incomplete mechanism for the use of agrarian receipts by participants;
- Violation of the terms of research and issuance of phytosanitary certificates, abuse of official duties in this regard;
- Imperfect legislation affecting investment attractiveness, underdeveloped system of water resources management and land reclamation, outdated technical condition of engineering infrastructure;
- Unsatisfactory condition of elevator, transport and irrigation infrastructure;
- Imperfect mechanism of accounting and storage of grain and processed products, nonregulated by their shadow circulation;
- Insufficient provision of equipment and agricultural machinery of small and medium-sized producers;
- Lack of skilled labor, low popularity of agricultural specialties among young people, an increase in the number of retired workers, and growing migration;
- Low activity of cooperation of primary producers along the chain to produce value-added products.

Market operators, food processors

- Non-compliance with the quality standards of food processing by all market operators due to the presence of a shadow segment;
- Probability of uncontrolled penetration, spread of harmful organisms, their untimely localization and elimination;
- Outbreaks of acute intestinal infections due to non-compliance with hygienic and sanitary requirements during the production and circulation of food products;
- Lower degree of manufacturability of processed products and slow introduction of innovations compared to competing countries;
- Low level of automation of food production and accounting;
- Damage to products during transportation due to poor vehicle quality;
- Curbing the development of the organic processing sector;
- Functioning of the shadow market;
- Low educational and technological base;
- A high share of product transportation in the costs of manufacturers (logistics costs occupy a significant share in the final cost of production).

Market and consumer protection

- On the bumble in international trade, affecting sales volumes;
- High transportation costs (low logistics development of sales chains reduces the quality of products received by the end user and reduces the volume of exported products);
- Imperfect legislation makes it impossible to effectively implement the state policy in the field of sanitary and phytosanitary measures);
- An inefficient system of registrations, permits and burdensome state regulation (excessive bureaucratic burden on business creates additional financial and time costs for business and incurs corruption risk);
- Inefficiency of interaction between state bodies (lack of a clear delineation at the legislative level of the functions of policy formation and implementation, inefficient distribution of control functions between state bodies, regarding border control during the import of regulatory objects);
- Lack of an adequate level of protection of health and interests of consumers, their awareness, establishment of means of guaranteeing the right of consumers to information and procedures for providing information about food products;
- Consumption of low-quality products by the population.
- Application by a person or to a person of deliberately forged (falsified) food products.

Environmental impact

- Significant amounts of waste accumulated in Ukraine and the lack of effective measures aimed at preventing their formation, recycling, restoration and disposal, deepen the environmental crisis and become a braking factor in the development of the national economy.
- Low regulation at the legislative level of waste management issues, lack of an effective mechanism for managing certain types of waste, low institutional capacity of state bodies, duplication of powers of state and local authorities, insufficient level of interdepartmental interaction, lack of strategic planning leads to an increase in the number of unauthorized landfills and overloaded landfills, landfills that do not meet environmental safety standards;
- Exceeding the powers of the authorized bodies of executive power, eliminating unnecessary regulatory procedures in the implementation of environmental impact assessment of the planned activities;
- Imperfect organizational procedure for holding public hearings, which is mandatory in the process of environmental impact assessment at the stage of consideration of the Environmental Impact Assessment Report and other documentation necessary for environmental impact assessment of the planned activities.

2.4.1. g. SWOT—analysis of the food supply chain of the plant group

SWOT analysis for the food supply chain of the plant group of goods involves identifying and categorizing factors into four areas: strengths and weaknesses of the sectoral policy, as well as opportunities and threats that arise from its implementation. This analysis can

help identify key areas for improvement and guide strategic decision-making in the industry.

Table 2.4.7. SWOT—analysis of the supply chain of food products of plant group of goods.

Strengths	**Weaknesses**
1. Steady demand for cereals and technical crops, as well as their processed products, on external and internal markets. 2. Large area of arable land. 3. Availability of high educational and scientific potential in this field.	1. Remoteness from ports and poor quality of roads, which complicates the export of grains and oil seeds 2. Low quality of seed material, plant protection products when purchased in small batches 3. Insufficient number of agricultural machinery and significant wear and tear of fixed assets used in the production process. 4. Insufficient development of the storage system. 5. Limited access to credit resources. 6. Limited amounts of state support.
Opportunities	**Threats**
1. Introduction of modern technologies, which allows increasing the efficiency and profitability of production of grain crops and processed products. 2. Wholesale purchase of seeds, plant protection products, mineral fertilizers, raw materials. 3. Development of processing or pre-sale preparation. 4. Attraction of financial resources.	1. Soil degradation and salinization. 2. High cost of mineral fertilizers produced from natural gas. 3. Intensification of the military conflict. 4. Dependence of yields on natural and climatic conditions.

Source: IPG developments

SWOT analysis showed the presence of certain threats, but in general, the situation in the supply chain of food products of the plant group of goods in the Western regions of Ukraine can be considered favourable. However, shortcomings were identified, such as significant depreciation of fixed assets, dependence on credit conditions, low culture of technology compliance, as well as weakness in marketing (work with intermediaries). Instead, the association of enterprises based on industrial parks will allow small and medium-sized enterprises to increase the profitability and efficiency of production in the Western regions of Ukraine.

2.4.1. h. Recommendations for food supply chain of the plant group

- **In the first stage "Product selection, provision of resources and services for production" we suggest:**

a. Conducting training on the production of food products of plant group of goods, and products of their processing, familiarization with modern technologies and equipment used in production.
b. Conducting consultations for the correct choice of technologies (soil research, selection of varieties and plant protection products, fertilizer application rates, selection of equipment and production technologies).
c. Finding options for cooperation with major input suppliers (hybrid seeds, fertilizers, pesticides, equipment, etc.).
d. Assistance in organizing cooperation with input suppliers.
e. Involvement of financial institutions for financial support in the purchase of inputs.

» **In the second stage "Primary production" we offer:**

a. Further, consulting support of farmers in the production of food products of plant group of goods.
b. Develop training programs based on the knowledge and experience of producers and input suppliers.
c. Support in the certification procedures of the main production according to HACCP and ISO 14001, ISO 5000, ISO 37000, ISO 37000, ISO 45001 in the past: OHSAS 18001, GRI, as well as religious schemes Halal+, Kosher+, Bio/Eco, Vegan+, etc..
d. Financing of capital investments.

» **In the third stage "Processing or storage" we propose:**

a. Consulting support on storage and sale of finished products.
b. Organization of cooperation with suppliers of storage equipment.
c. Joining efforts for consolidated storage, providing conditions for storage.

» **At the fourth stage "Pre-sale preparation and sale" we offer:**

a. Consulting support on the sale of finished products.
b. Optimization of the structure of sales channels and logistics chains of food products of plant group of goods.
c. Assistance in the formation of wholesale batches.

After conducting a detailed analysis of the food supply chain of the plant group, which covered various aspects such as level-cluster analysis, cost assessment, profit, marketing and demand dynamics, supporting functions and infrastructure identification, and rules and regulations analysis, it can be noted that cluster cooperation based on the eco-industrial parks concept has significant potential for chain development.

Clusters ensure the interaction of various market participants, promoting cooperation and relationship development. Vinnytsia, Ternopil, and Khmelnytskyi regions proved to be the most attractive for cluster creation, while Rivne, Volyn, Chernivtsi, Lviv, Ivano-Frankivsk, and Zakarpattia regions also have development potential.

The creation of eco-industrial parks within cluster frameworks will contribute to jointly addressing challenges, increasing competitiveness, and stimulating innovation. Involving international experience and expertise will help implement advanced technologies and environmentally sustainable approaches to production.

Since the list of supporting functions and infrastructure has already been formed, it is important to work on developing the necessary connections between supply chain participants. Ensuring policy and regulation compatibility at the state and regional levels will guarantee the harmonious development of clusters, which will contribute to sustainable economic growth and environmental stability.

Given the results of the SWOT analysis of the plant food supply chain, it is important to focus on neutralizing threats and minimizing weaknesses, as well as on using opportunities to ensure the sustainable development of the cluster.

Ensuring effective cooperation between scientists, manufacturers, suppliers, and authorities will allow for the creation of solutions that will be useful for all participants of the cluster. Facilitating the exchange of knowledge and experience between different cluster actors can ensure innovative development and the creation of new jobs. Also, the introduction of industrial symbiosis principles can help reduce the amount of waste and use it as a resource for other enterprises.

However, when implementing industrial symbiosis recommendations, certain problems may arise that require attention and resolution. For example, technology needs to be adapted and staff trained to ensure safety and minimize waste. In addition, cooperation between public and private entities can help support industrial development and ensure efficient use of resources.

It is important to adapt the legislative policy to promote sustainable development and clustering in the western and southwestern regions of Ukraine. It is necessary to ensure legal regulation of interaction processes between cluster participants, including determining the status of clusters and their financing, stimulating innovative solutions, and providing a favourable environment for the development of small and medium-sized enterprises.

To achieve success in the development of cluster cooperation, it is also necessary to ensure constant monitoring and evaluation of the results of new solutions and technologies implementation. Determining performance indicators and regularly analyzing possible risks and problems will help ensure sustainable growth of clusters and increase their competitiveness.

It is also important to pay attention to the information support of projects and initiatives in the field of cluster development. The development and popularization of informational materials, holding conferences, and seminars will help attract new participants and partners to cooperation and create a favorable atmosphere for the development of innovations and interaction in the cluster.

For the successful development of a cluster based on the principles of eco-industrial parks, it is necessary to ensure effective interaction between cluster participants, which can help minimize waste and use it as a resource for other enterprises. Adapting technologies and legislation to the needs of the ecological industry can ensure the safety and health of workers, increase the competitiveness of cluster participants, and reduce the impact on the environment. It is also important to ensure the availability of financial resources and stimulate investment in the development of the cluster. The result of implementing the recommendations can be the creation of a sustainable cluster that will contribute to the development of the region's economy and ensure environmental sustainability.

Therefore, for the successful implementation of the first pilot projects of cluster cooperation in the plant-based food product supply chain based on the principles of eco-industrial parks, we recommend the following roadmap of actions:

1. Creation of a working group of the project from representatives of manufacturers, suppliers, distributors, scientists, and authorities (see point 2.4.1.b Key stakeholders in the food supply chain of a plant group of goods.
2. Development of the pilot cluster concept, including a definition of its purpose and tasks, and analysis of opportunities and resources. Creation and implementation

of cooperation mechanisms between cluster participants in order to solve joint tasks, including the development of innovations.

3. Study of the material flow of raw materials of cluster participants to find opportunities for synergy and optimization of operational processes, energy and water use, increase safety in working with hazardous substances, improve waste management, as well as determine optimal technologies and standards to produce plant-based food products.
4. Development of cluster infrastructure, in particular, development and implementation of energy-efficient and environmentally friendly technologies that will help reduce the environmental impact of production on the environment and ensure efficient use of resources. The following technologies can be used for the food supply chain of a plant group of goods:
    - Adoption of organic farming methods and biologically active fertilizers, as well as employing integrated pest management and plant protection methods to decrease the use of chemical fertilizers and pesticides.
    - Implementation of environmentally friendly technologies for food processing and storage, such as utilizing solar energy for drying grains and oilseeds, applying steam chambers for processing and preservation of products, and using energy-efficient ventilation, cooling and heating systems, highly efficient storage systems, and loss reduction technologies.
    - Embracing environmentally friendly packaging technologies, for example, incorporating biodegradable materials and ecological films.
    - Utilizing efficient renewable energy systems, such as solar panels, wind turbines, and hydropower plants, to ensure the environmental and economic sustainability of the supply chain.
    - Integrating technologies that allow reducing the amount of waste and repurposing it as raw material to produce new products, as well as implementing energy-efficient lighting systems and waste disposal systems.
    - Implementation of innovative systems of automation and monitoring of production processes to increase the efficiency and quality of products.
5. Attracting financial resources for the project implementation, in particular, from the state, investors, and other sources.
6. Developing and implementing training and personnel development programs to ensure the efficient operation of the cluster. This includes organizing seminars, exercises, and trainings to improve skills and ensure cooperation between cluster participants.
7. Implementing environmentally friendly technologies and production standards in all parts of the plant-based food supply chain, including growing, harvesting, transportation, processing, and storage of products. To achieve this, it is necessary to conduct a study of environmental problems and production opportunities, determine environmental indicators of production, establish environmental standards, and also study the ecological aspects of producing plant-based food products.
8. Establishing mechanisms for monitoring and evaluating environmental and economic indicators of the cluster's activity, aiming for constant improvement and enhancement of the environmental efficiency of production.
9. Expanding the network of cluster cooperation by attracting new participants and developing joint projects. To achieve this, information campaigns can be conducted, and events organized to attract new participants.

10. Promotion and advertising of the cluster participants' products, ensuring their compliance with environmental and social standards, and creating a favorable image of the cluster and its participants in the market.
11. Monitoring and evaluation of the results of the implementation of the cluster initiative in order to improve and improve the strategy of further development.
12. Development and implementation of mechanisms for sharing experience and knowledge transfer between cluster participants, as well as between the cluster and other sectors of the economy.
13. Conducting marketing research to determine consumer demand for the cluster's products and developing a marketing strategy for its promotion on the market.
14. Implementation of a pilot project of cluster cooperation based on an eco-industrial park to produce food products of the plant group.
15. Development and implementation of a system for monitoring environmental and economic indicators of cluster activity.
16. Development and implementation of mechanisms for disseminating information about the cluster's successes on the market and in the field of sustainable development.
17. Development and implementation of programs to increase environmental awareness among consumers and the population.
18. Attracting new participants to the cluster and expanding the network of cluster cooperation.
19. Increasing the competitiveness of cluster products on the market by improving quality and reducing production costs.

These steps will help create effective cluster cooperation within the eco-industrial park for the development of food products of the plant group.

Cluster initiatives can become a powerful tool for ensuring the sustainable development of the economy and increasing the competitiveness of Ukrainian manufacturers on the world market. The implementation of the principles of eco-industrial parks in the development of the chain of food products of the plant group of goods will contribute not only to increasing business profitability, but also to improving the ecological situation in the region, reducing the use of natural resources, and ensuring sustainable economic development.

Business case: The Forssa cluster is an innovative project to support business development in Finland.

Project description: The Forssa cluster was created to support the development of small and medium-sized businesses in Finland. The project was launched in 2015 as part of the national program to support innovation and business development. The main goal of the cluster is to ensure joint efforts between companies, scientific institutions, and government bodies to create conditions for the development of innovations and the strengthening of business competitiveness in the region.

Project participants: The Forssa cluster unites more than 50 companies from various industries, scientific institutions, academic institutions, and government bodies such as the Ministry of Economy and Industry, as well as the Entrepreneurship Support Council.

Examples of joint projects:

- The project "Ecologically Clean Grain" - this project aims at increasing the quality and ecological safety of grain in the region. Participants of the cluster jointly develop technologies for growing and storing grain, which allows reducing the use of chemical fertilizers and reducing the risk of contamination of grain with toxic substances. The approximate budget of the project is about 500,000 euros.
- "Oil Crops for Energy" project - this project aims at growing oil crops for use in biofuel production. Participants of the cluster jointly develop technologies for growing and processing oil crops, which allows ensuring the energy independence of the region and reducing the use of traditional types of fuel. The approximate budget of the project is about 1 million euros.
- The project "Development of New Oil Crops" - this project aims at the study and development of new oil crops with high productivity and resistance to pests and diseases. Participants of the cluster jointly conduct scientific research and test new varieties of oil crops in field experiments. The approximate budget of the project is about 700,000 euros.
- The project "Creation of a Joint Training and Development Center" for employees of cluster participants. The center provides training and development of personnel to increase the efficiency of the work of manufacturers and reduce the costs of training employees. The approximate budget of the project is about 200,000 euros.
- Project "Introduction of New Ecological Technologies in Paper Production". Within the framework of the project, cluster participants jointly studied the possibilities of using renewable energy sources and reducing the use of harmful substances in paper production. The approximate budget of the project is about 500,000 euros.
- Another successful example of joint projects of the Forssa cluster is the "Eco-friendly Water Treatment Technologies" project, which was launched in 2018. This project focuses on the development of water

treatment technologies that would be more environmentally friendly and have less impact on the environment. As part of the project, a study was conducted to determine the possibilities of using renewable energy sources for water purification, as well as the use of new materials and technologies.

Now the Forssa cluster continues to develop and attract new members. Within the framework of the cluster, there is a constant exchange of ideas and resources between participants, which contributes to the creation of new innovative projects and increases the competitiveness of businesses. The Forssa cluster is a successful example of effective cluster cooperation that promotes sustainable economic development and ecological growth.

The Forssa cluster demonstrates the potential benefits of collaborative initiatives in driving innovation, fostering economic development, and promoting environmental sustainability. By bringing together a diverse group of stakeholders, the cluster can leverage the unique strengths and expertise of each participant to address shared challenges and create new opportunities. As the Forssa cluster continues to grow and evolve, it serves as an inspiring model for other regions seeking to harness the power of collaboration to drive positive change.

2.4.2. Meat and Meat Products Supply Chain

2.4.2.a. Mapping the Meat and Meat Products Supply Chain

Market of meat and meat products" includes the functioning of its various counterparties (agricultural, procurement, processing and trade organizations), between which production relations objectively arise and economic relations are successfully resolved.

According to the specifics of product production, the meat market is divided into two segments:

- industrial meat production.
- meat production by private farms (population).

Consequently, the main producers of meat are business entities (legal entities of private law), in different organizational and legal forms, with different levels of subordination and integration, which represent industrial production.

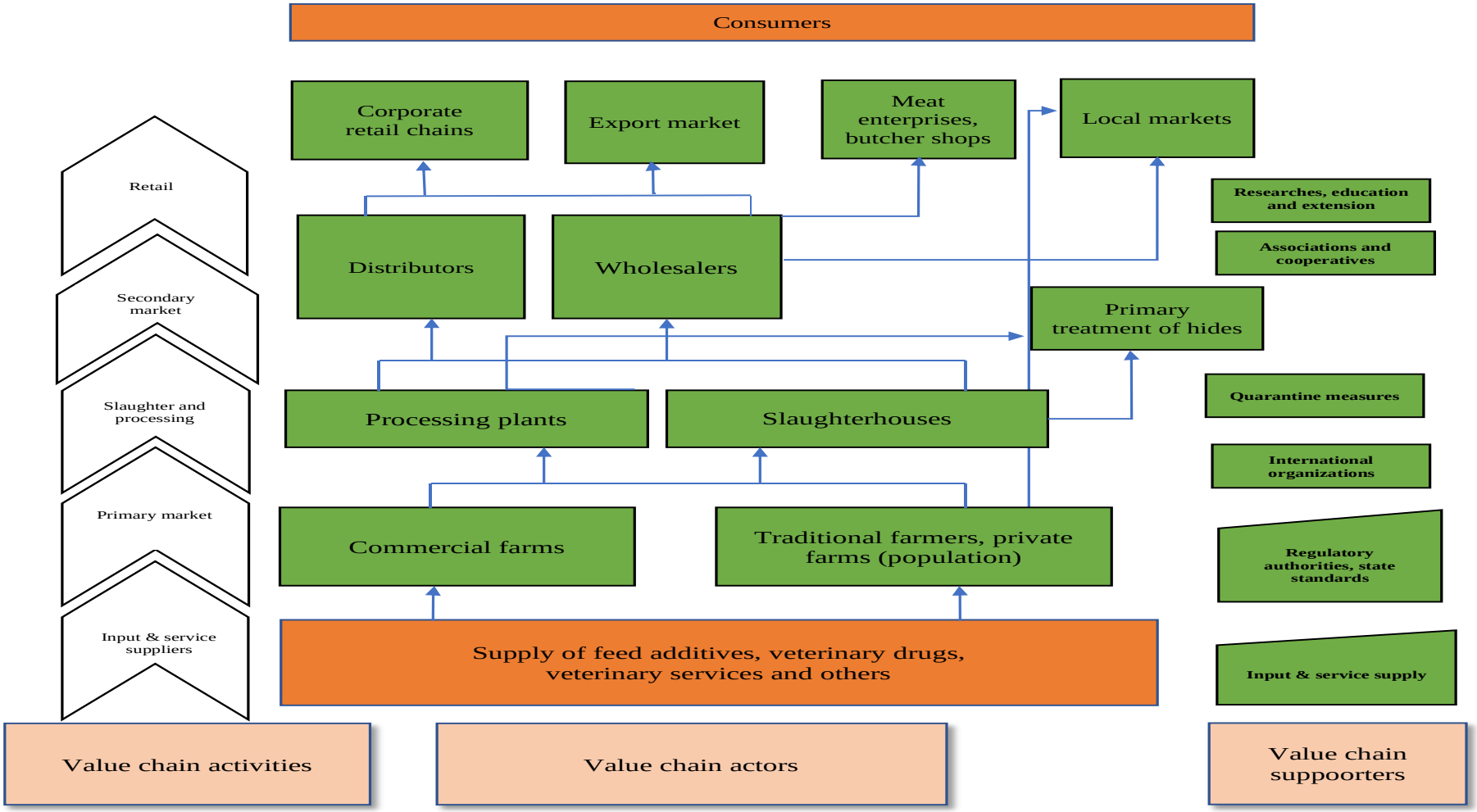
The market of primary sale of meat is **the first link** in the turnover of goods, passing meat from the producer or importer to the following sales channel. The main participants in the market of primary sale of meat (sellers), which form the supply of meat and conduct economic activities for the primary sale of meat are producers - agricultural enterprises and importers of live animals.

The largest agricultural enterprises of the pork and poultry market are vertically integrated agricultural holdings, which combine all the main links of production and turnover into a single technological process.

The largest participants in the primary sale of beef meat are divided into:

- Producers of dairy farms that write off low-productive cows, according to clinical health, age, etc.
- Farms or complexes for fattening cattle for further slaughter or for export.

Fig. 2.4.11. Meat and meat products supply chain map.



The second link in the turnover of goods are buyers, who forming the demand and, accordingly, pricing in the primary meat market:

- Processing enterprises (direct contracts);
- Procurers - intermediaries of processing enterprises, working for commission or for a special price of the relevant processing plant, or cooperating with several processing plants on a common basis. According to the respondents, there were cases when the prices of the procurer were higher than the direct contract. This is primarily due to incorrect determination of fatness / class of animals at the point of sale - "by eye". Because the final quality and variety of goods is determined by the results of animals' slaughter.
- Private entrepreneurs that purchase live animals with a subsequent plan for sale for export or to the final consumer after processing of raw materials (separation, deboning, trimming).

The market of products of the meat processing subcomplex of agro-industrial complex consists of the following elements: the market of meat, the market of meat semi-finished products, the market of sausages and the market of canned meat.

In Ukrainian market of meat and meat products there are more than 150 meat processing enterprises (meat plants), more than 3000 private shops, several dozen poultry farms. Researching the meat market, it is possible to allocate its institutional and social efficiency. Institutional efficiency indicates how the interests of different market participants who are business partners are coordinated; fairness (rationality) of income distribution between market subjects can serve as its necessary indicator. Social efficiency of the market is characterized by the level of availability of quality food products for end consumers - the population.

The third link in the turnover of goods are buyers of the secondary market:

- distributors (including sub-distributors, partners, other wholesale intermediaries); corporate retail chains;
- franchising networks (branded partner retail);
- other retail outlets (traditional trade) and HoReCa

To enable consumers to purchase meat, packaged and edible goods from the producer or importer come through various sales channels (direct, indirect, combined) to retail outlets or food industry enterprises.

At the same time, sales of large batches of meat (processing enterprises and corporate-type retail chains) are carried out mainly through direct sales channels, while sales to smaller retail outlets are carried out with the involvement of intermediaries.

Producers sell a considerable part of their products through legal entities related to them in terms of control in the exchange of Article 1 of the Law of Ukraine "On Protection of Economic Competition". However, in such a scheme of sale, apart from the legal entity selling the main vol of goods outside the group, the sale of goods can be carried out through a "lower level" distribution system (which can branch out to sub-distributors), wholesalers etc.

Therefore, out meat is purchased by final consumers, the product passes a certain way from the producer / importer to the distributors and / or wholesalers, then from those businesses to industrial consumers or retail outlets for export.

Since at least three groups of products market participants are involved in the meat supply chain to the final consumer (population) or for export (domestic

producer/importer → distributor / business entity that conducts wholesale sales →retail outlet) each of these participants may have a direct impact on the formation of meat prices.

2.4.2. b. Key stakeholders in the meat and meat products supply chain

- **The Cabinet of Ministers of Ukraine** is the central executive body that ensures the formation and implementation of the state agrarian policy, within the limits of powers determined by the Law.
- **Ministry of Agrarian Policy and Food of Ukraine** forms and implements the state agrarian policy
- **Ministry of Economy of Ukraine** - is the main body in the system of central executive bodies that ensures the formation and implementation of state policy of economic, social development and trade.
- **The State Service of Ukraine for Food Safety and Consumer Protection** (hereinafter referred to as SSUFSCP) is the competent authority that implements the state policy in the field of safety and individual indicators of food and feed quality, animal health and welfare and veterinary medicine. The powers of the Main Department of the State Food and Consumer Service extend to the territory of the relevant region, the city of Kyiv, and the district.
- **The State Service of Ukraine for Geodesy, Cartography and Cadastre** (Derzhgeocadastre) is the central executive body, which implements the state policy in the field of national infrastructure of geospatial data, land relations, land management, in the field of the State Land Cadastre.[80]
- **The Ministry of Finance of Ukraine** ensures the implementation of a unified state financial, budgetary, tax policy aimed at implementing certain tasks of economic and social development of Ukraine.
- **The Ministry for Communities, Territories and Infrastructure Development of Ukraine** is the main body in the system of central executive bodies that ensures the formation and implementation of state policy on safety in public road transport, urban electric, rail, sea and river transport.
- **The State Fiscal Service of Ukraine implements and submits to the Minister of Finance** proposals on state tax policy and policy in the field of state customs affairs, as well as on state policy in the field of combating offences in the application of tax and customs legislation.
- **Agricultural enterprises and importers of animals in live weight.**
- **Processing enterprises (direct contracts).**
- **Traders**
- **Distributors, corporate-type retail chains, franchise networks (branded, branded partner retail), other retail outlets.**
- **Organizations that support the meat chain at the national level:**
  - Association "All-Ukrainian Association of Importers of Meat and Meat Products" (VAIMM);
  - Meat Industry Association, All-Ukrainian Association of Exporters of Meat and Dairy Products “UkrMyasoMolExport”;
  - Public Union "Ukrainian Association of Manufacturers and Distributors of Veterinary Drugs and Feed Additives";

[80] https://zakon.rada.gov.ua/laws/show/15-2015-%D0%BF#Text

- National Association of Meat and Meat Producers of Ukraine "Ukrmyaso";
- Association "Union of Poultry Farmers of Ukraine";
- Ukrainian Pig Breeders Association.

Barriers to the meat market

The main barriers that prevent new businesses from starting to compete on an equal footing with businesses already operating in a particular product market are administrative, and environmental barriers and barriers related to capital expenditures and the amount of investment required to enter the product market.

Thus, the main barriers to entering the market are high investments required by new businesses to build a poultry/pig farm/complex for fattening cattle for meat, slaughter complex, as well as the cost of waste disposal, the formation of channels for the sale of meat etc. The amount of capital investments is high, and their payback period is quite long.

Fig. 2.4.12. Matrix of meat and meat products supply chain as well as supporting services

<table>
<tr><th></th><th>Input resources, primary products and services</th><th>Processing (semi-processed and processed and ready to eat)</th><th>Packing</th><th>Sales</th></tr>
<tr><td rowspan="2">Services</td><td>Support activities for animal production according NACE class 01.62 (agricultural activities that are carried out for remuneration or on the basis of a contract: activities to stimulate breeding and increase the productivity of animals, inspection of the state of the herd, provision of services for racing and grazing livestock, emasculation of poultry, cleaning and disinfection livestock premises, etc., artificial insemination of animals, animal breeding services, sheep shearing, maintenance and care of farm animals)</td><td colspan="3" rowspan="2"></td></tr>
<tr><td>Veterinary activities according to NACE class 75 (activities of treatment of animals and monitoring of the condition of farm animals and pets. This activity is carried out by qualified veterinarians in veterinary hospitals, on farms, kennels or kennels, in their own consulting rooms, in operating rooms or elsewhere)</td></tr>
<tr><td>Input resources</td><td>Manufacture of prepared feeds for farm animals according to NACE class 10.91 (production of ready-made feed for farm animals, including concentrated feed and feed additives, preparation of unbalanced (one-component) feed for farm animals, processing of animal slaughter waste for production animal feed)</td><td colspan="3"></td></tr>
<tr><td rowspan="3">Products of animal origin</td><td rowspan="3">Animal husbandry according to NACE class 01.4 KVED-2010 (including raising of dairy cattle (01.41 NACE), raising of other cattle and buffaloes (01.42 NACE), raising of pigs (01.46 NACE), raising of poultry (01.47 NACE) and other.</td><td rowspan="3">Production of meat and meat products according to NACE class 10.1 (production of meat: slaughter of livestock, processing and packaging of meat: beef, pork, lamb, rabbit, production of fresh, chilled or frozen meat in carcasses or in offals, obtaining and primary processing of raw skins of agricultural animals (except pigs) obtained from slaughter, rendering of lard and other edible fats of animal origin, processing of food by-products of animals, processing of waste obtained from slaughterhouses, production of bone meal; production of meat poultry: slaughter, processing and packaging of poultry meat, production of fresh, chilled or frozen meat (carcasses and separate parts of carcasses), rendering of poultry fat, production of poultry feathers and down; meat productionof clear products: production of dried, salted, smoked meat, production of meat products: sausages, salami, blood sausage, cervelat, smoked Boulogne sausage, pates, rolls, boiled ham, etc., production of meat flour production of meat canned goods)</td><td rowspan="3">Packaging activities for a fee or on a contract basis, whether or not the process is automated: filling bottles and cans with liquid products, incl. beverages and food products, packaging of solid goods in blisters, foil, etc., labeling, labeling and inscriptions on packages according to NACE class 82.92</td><td>wholesale of live animalsaccording to NACE class 46.23</td></tr>
<tr><td>wholesale of meat and meat products according to NACE class 46.32</td></tr>
<tr><td>retail trade of meat and meat products in specialized stores according to NACE class 47.22</td></tr>
<tr><td>Logistics and infrastructure</td><td colspan="4">Infrastructure: storage and warehousing activities of all types of goods: operation of granaries, general purpose warehouses, refrigerated warehouses, bunkers, etc. according to NACE class 52.10, Logistics: freight rail transport (NACE class 49.20), freight transport by road (NACE class 49.41), inland freight water transport (NACE class 50.40), freight air transport (NACE class 51.21), service activities incidental to land transportation (NACE class 52.21), service activities incidental to water transportation (NACE class 52.22), service activities incidental to air transportation (NACE class 52.23), cargo handling (NACE class 52.24), other transportation support activities (NACE class 52.29).</td></tr>
</table>

Also, market participants noted environmental barriers to entry into the market, which consist in the costs of the business entity, which it must incur for the processing of production waste. This is because the issue of environmental safety in the industry has become acute with improper organization of production, which can lead to a negative impact on the environment.

The main administrative barriers are the need for market operators to obtain an operational permit and conduct state registration of capacities for the production and / or circulation of food products that do not require an operational permit.

In addition, obstacles to the development of the market are low purchasing power of the population, poor development of retail trade, low quality of goods and high cost of production in comparison with major market players.

To assess the potential of creating eco-industrial parks and the level of existing clustering of regions of Western Ukraine, a matrix of main products and ancillary services that form a chain was built (fig. 2.4.12.) supply of meat products with a full cycle of the production

process – from fattening to consumption of final products. According to the results of the scoring model, the chain takes 4th place in the ranking.

The rating of the formation of meat supply chain clusters using the method of clustering k-averages, it is possible to determine the following rating of regions.

Table 2.4.8. Rating of meat chain cluster formation by region.

	Investment attractiveness*	Value added**	Job creation**	Concentration of enterprises***	Rating
Lviv	7,50	8,67	7,33	8,67	1
Vinnytsya	7,50	7,33	7,33	6,67	2
Khmelnytskiy	6,00	4,33	5,00	7,33	3
Ivano-Frankivsk	3,00	6,33	5,00	7,00	4
Volyn	5,00	6,00	7,33	2,67	5
Ternopil	4,00	4,33	3,00	3,00	6
Rivne	3,50	3,33	3,67	3,67	7
Chernivtsi	2,00	3,33	5,33	2,00	8
Zakarpattya	1,00	1,33	1,00	4,00	9

* Investment attractiveness – the average score of the monetary assessment of capital investments in food production for 2020-2021 according to the list

**Value added - the average score of the monetary assessment of value added by production costs, distributed by links according to Fig. 2.4.12.

*** Job creation - the average score of the assessment of the number of employed populations along all parts of the chain for 2017-2022.

****Concentration of enterprises - the average score of the assessment of the number of enterprises along all links in the chain for 2017-2020.

Source: IPG calculations

For grouping regions by level clustering (Fig. 2.4.13) is conducted according to the following definitions:

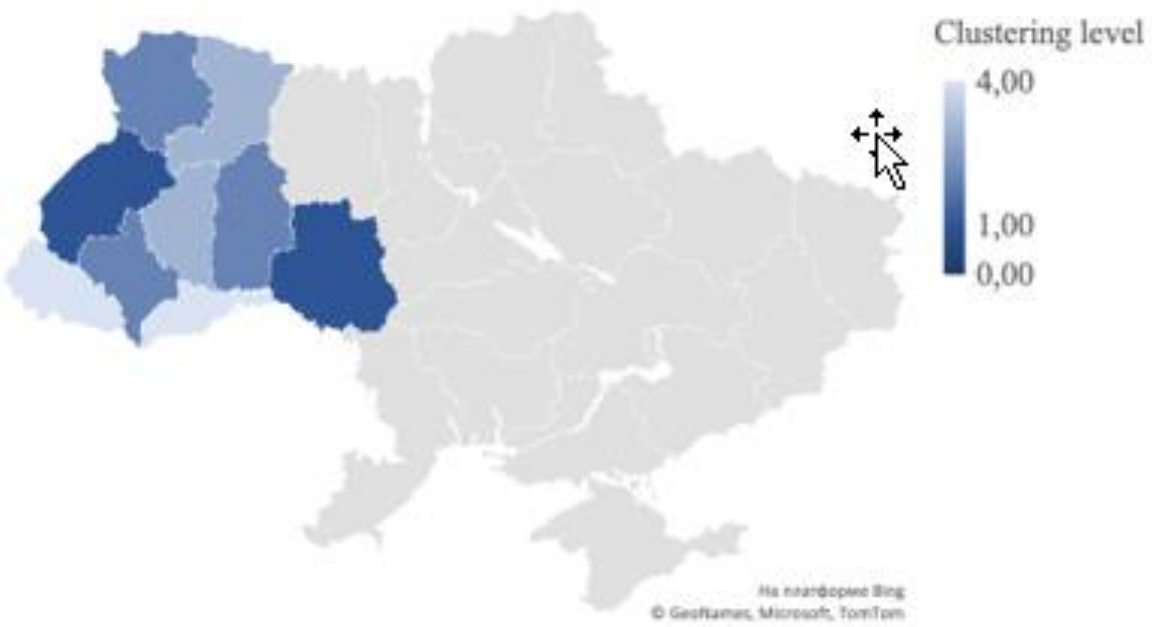
1st level of the cluster: the regions that have the greatest attractiveness in meat clustering on the principles of EIP in favor of building the industry and creating conditions for business relocation, increasing jobs to attract internally displaced persons;

2nd level of the cluster: regions that have a good attractiveness for meat clustering on the principles of EIP in favor of building the industry and creating conditions for business relocation, increasing jobs to attract internally displaced persons;

3rd level of the cluster: districts that have sufficient attractiveness in meat clustering on the principles of EIP in favor of building the industry and creating conditions for business relocation, increasing jobs to attract internally displaced persons;

4th level of the cluster: regions that have the least attractiveness in meat clustering on the principles of EIP in favor of building the industry and creating conditions for business relocation, increasing jobs to attract internally displaced persons.

Fig. 2.4.13 Level-cluster analysis of meat cluster development by regions



Source: IPG developments

Thus, the level-cluster analysis of the regions of 9 relocation regions in terms of priority activities showed that the first level of the cluster includes: Lviv and Vinnytsya regions, to the second level: Khmelnytskiy, Ivano-Frankivsk, Volyn regions, to the third level: Ternopil and Rivne regions, to the fourth level: Chernivtsi and Zakarpattya regions.

2.4.2. c. Assessing the cost, profit, marketing, and supply and demand dynamics.

Based on the grouping of costs to produce enterprises by types of environmental activity, the average (for the period 2017-2020) is calculated shares of material costs, depreciation, labor costs, social protection deductions and other vat rates for each link in the supply chain of meat and meat products and its components (Table 2.4.9).

Table 2.4.9. Phased costs of the supply chain of meat and meat products (goods, services), average for 2017-2020 in %

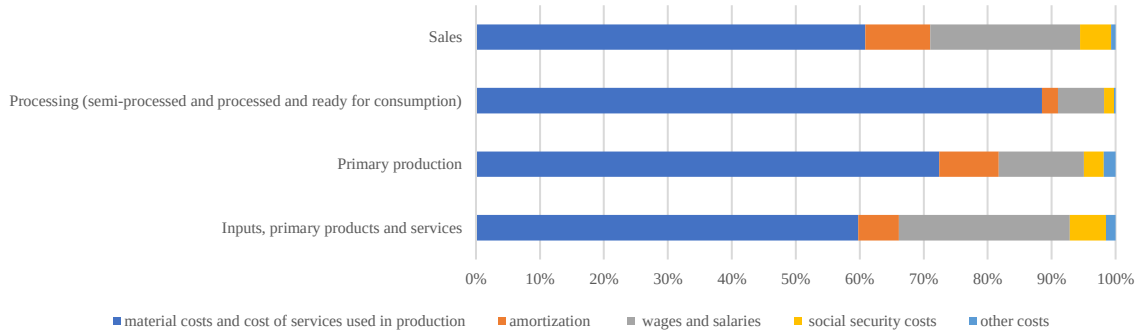
Links in the supply chain of meat and meat products	material costs and costs of services used in production	amortization	wages and salaries	Social Security Costs	other costs
Input resources, primary products, and services	**60**	**6**	**27**	**6**	**2**
Veterinary activities	41	5	43	9	2
production of ready-made feed for animals kept on the farm	91	1	5	1	2
Supporting activities in animal husbandry	57	8	28	6	1
Primary production	**72**	**9**	**13**	**3**	**2**
raising dairy cattle	77	6	13	3	2
raising other animals	74	10	13	3	1
raising other cattle and buffaloes	82	4	11	2	1
raising horses and other animals of the horse family	49	17	23	6	5
Raising sheep and goats	65	9	18	5	2
Pig raising	81	7	9	2	1
Raising poultry	78	12	8	2	1
Processing (semi-processed and processed and ready for consumption)	**88**	**3**	**7**	**2**	**0**
Meat production	90	2	6	1	0
poultry meat production	88	3	7	2	0
Production of meat products	87	3	8	2	0
Sales	**61**	**10**	**23**	**5**	**1**
wholesale of live animals	83	6	8	2	1
wholesale of meat and meat products	48	15	30	6	1

retail sale of meat and meat products in specialized stores	48	8	35	8	1

Source: State Statistics Service of Ukraine

Schematically, the structure of phased costs of the meat and meat supply chain in 2017-2020 shown in Fig. 2.4.14.

Fig. 2.4.14. The structure of phased costs of the supply chain of meat and meat products (average for the period 2017-2020)



Source: State Statistics Service of Ukraine

From the given data, all links of this supply chain are material-intensive, since the share of material costs is not lower than 60%. Approximately this level in the cost structure is material costs at the stages of creation of input resources and primary products and services, as well as in the Sales chain. In the initial link of the production chain, the largest component of material costs is the production of ready-made fodder for animals kept on the farm, accounting for 91% of the total. At the final stage of the chain, in the field of wholesale trade of live animals, 83% of the costs are attributed to paying for goods (live animals) and services related to their supply and storage.

The most material-intensive is the third link Processing (semi-processed and processed and ready for consumption), in which in meat production 90% of the cost base is the cost of material resources and payment for whirlpool services, which is the largest structural coefficient among the productions of this stage of the chain.

Remuneration is the second item in the cost structure in the supply chain of meat and meat products. Along with social security costs, their largest share is in the first (33%) and final (28%) links. And the most labor-intensive areas in the chain are veterinary activity, wholesale and retail trade in meat and meat products.

The assessment of profitability at certain stages of supply and production consumption is carried out according to the indicator of profitability of operating activities of large, medium and small enterprises that are part of this chain (Table 2.4.10.).

At the stage of creation of input resources, primary products and services, production and service facilities are carried out within medium and small farms. Among the most profitable (with a profitability higher than the average in this link) are microenterprises of veterinary activity (8.9%) and enterprises of Supporting activities in animal husbandry (8.2%), medium-sized enterprises to produce ready-made animal feed kept on farms (6.1%).

The highest level of profitability is ensured at the stage of primary production (on average by link – 17.4%). At this stage of the value chain, the most profitable are the activities of raising horses and other animals of the horse family (55.3%), raising dairy cattle (21%), raising pigs (18.4%).

At the subsequent stage of processing, the average profitability is low (6.4%) with the most profitable Production of poultry meat in large enterprises (15.4%). The average profitability of the final link of sales is 11.9% to a greater extent provided by medium and small enterprises in the wholesale of live animals and meat and meat products.

Table 2.4.10 Profitability of operational activity of enterprises

Links in the supply chain of meat and meat products	Medium	large enterprises	medium enterprises	small enterprises	of which microenterprises
Input resources, primary products, and services	**4,1**		**4,2**	**3,1**	**7,7**
Veterinary activity	0,3		3,9	2,7	8,9
Production of ready-made feed for animals kept on farms	5,2		6,1	2,3	6,0
Supporting activities in animal husbandry	4,6		2,6	8,7	8,2
Primary production	**17,4**	**15,8**	**9,9**	**11,6**	**11,8**
Raising of dairy cattle	21,0		21,7	16,2	4,8
Raising of other animals	5,9		8,7	5,8	14,2
Raising of other cattle and buffaloes	6,2		5,0	15,2	12,0
Raising of horses and other animals of the horse family	55,3		6,1	41,7	19,5
Raising of sheep and goats	13,3			13,3	16,4
Raising of pigs	18,4	20,0	5,8	7,9	9,4
Raising of poultry	8,2	14,4	4,8	2,5	6,5
Processing	**6,4**	**8,9**	**4,1**	**0,8**	**2,9**
Meat production	6,3	8,2	1,7	0,9	1,4
Poultry meat production	10,7	15,4	6,6	0,8	4,8
Production of meat products	2,2	2,7	2,5	0,8	2,4
Sales	**11,9**	**10,2**	**6,5**	**22,7**	**50,7**
Wholesale of live animals	12,9			16,6	10,7
Wholesale of meat and meat products	13,4	10,2	16,8	14,0	8,9
Retail sale of meat and meat products in specialized stores	7,8		3,1	38,1	132,4

Source: State Statistics Service of Ukraine

To assess the dynamics of supply and demand in the scheme of supply of meat and meat products, some intensity coefficients are calculated and compared in time, which characterize the ratio of individual links as suppliers and / or buyers of products of previous and / or subsequent participants in the chain.

Based on statistical data, a table of initial indicators for further calculations has been formed (Table 2.4.11.)

Table 2.4.11. Initial data for calculating supply/demand indicators (intensity coefficients for links in the supply chain of meat and meat products

Links of the meat and meat products supply chain	Years	Production of feed ready for farm animals, thousand tons	Agricultural machinery at the beginning of the year, pcs.	Production of meat in live weight, ths. tons	Production of meat and meat products, ths tons	Wholesale turnover of goods produced in Ukraine				Retail turnover of goods produced in		
						ths. tons	UAH mln.	Indices of physical volume of wholesale turnover of retail trade enterprises (% to the previous year)	Trade turnover in prices of 2017, UAH mln.	UAH mln.	Indices of physical volume of retail trade turnover of retail trade enterprises (% to the previous year)	Turnover in prices of 2017, UAH mln.
Inputs, primary products and services	2017	6579	28225									
	2018	6633	25379									
	2019	6938	22212									
	2020	6945	20867									
Primary production												
	2017			2013,2								
	2018			2079,3								
	2019			2299,6								
	2020			2303,1								
Processing (semi-processed and processed and ready for consumption)												
	2017				1930,6							
	2018				2028,7							
	2019				2058,2							
	2020				2089,7							
Sales												
	2017					503,7	17420,7		17420,7	24991,09		24991,1
	2018					862,7	31894,5	1,7	29836,9	32270,53	1,1	27490,2
	2019					1048,8	38126,2	1,2	36273,2	37295,04	1,08	29689,4
	2020					1110,1	39200,7	1,1	38393,3	41954,41	1,11	32955,3

Source: IPG calculations

To assess supply / demand, the relevant data of each subsequent link in the supply chain is divided into the data of the previous link for each year of the analyzed period and the indicators are calculated, the values of which are given in Table. 2.4.12.

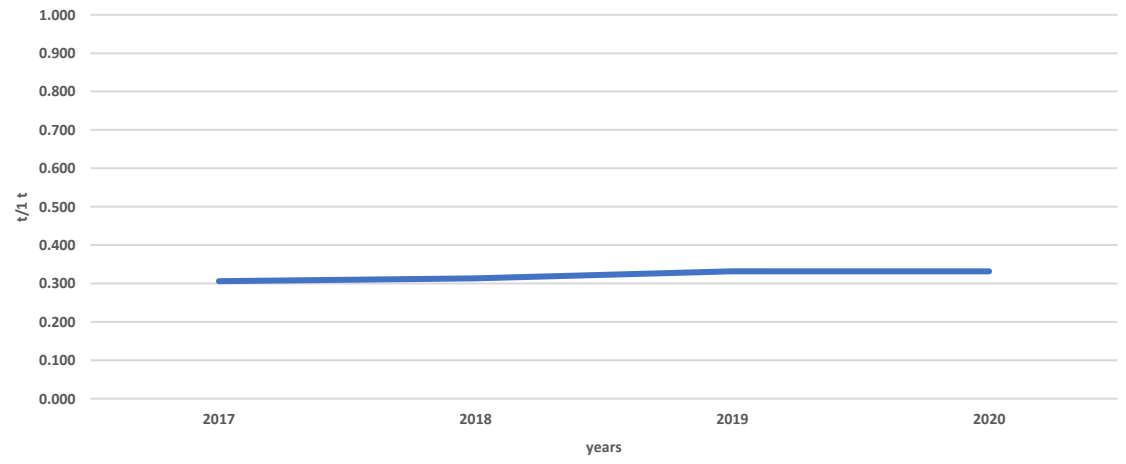
Table 2.4.12 Supply/demand assessment in the meat and meat products supply chain

Links of the meat and meat products supply chain	Years	Production of meat in live weight per 1 t of production of feed ready for farm animals, t/1 t	Production of meat in live weight per 1 unit of agricultural machinery in primary production, t	Production of meat and meat products per 1 t of meat production in live weight, t	Wholesale turnover of products produced in Ukraine in fixed prices in 2017 (physical volume) per 1 thousand tons of meat and meat products production, UAH mln.	Retail turnover of products produced in Ukraine in fixed prices in 2017 (physical volume) per 1 thousand tons of meat and meat products production, UAH mln.
Primary production						
	2017	0,306	71,33			
	2018	0,313	81,93			
	2019	0,331	103,53			
	2020	0,332	110,37			
Processing (semi-processed and processed and ready for consumption)						
	2017			0,959		
	2018			0,976		
	2019			0,895		
	2020			0,907		
Sales						
	2017				9,02	12,94
	2018				14,71	13,55
	2019				17,62	14,42
	2020				18,37	15,77

Source: IPG calculations

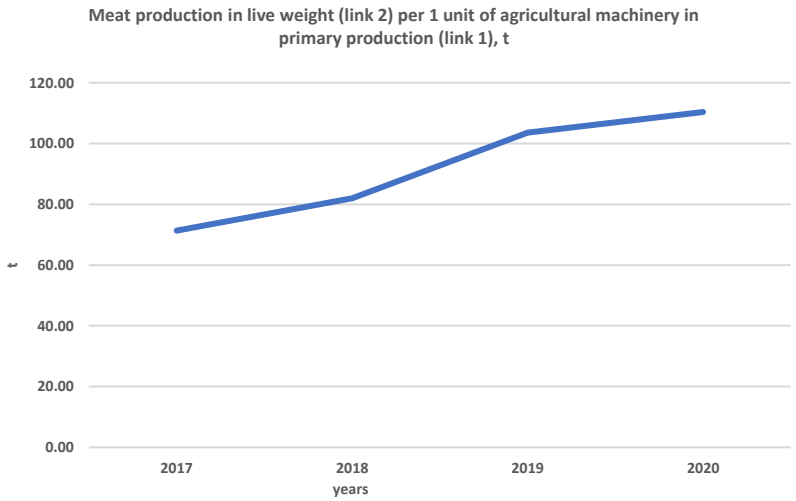
For further interpretation of the obtained data, it is advisable to present their dynamics clearly with the help of linear graphs (Fig. 2.4.15 – 2.4.19.).

Fig. 2.4.15. Production of meat in live weight (link 2) per 1 ton of feed production ready for farm animals (*link* 1), t/1 t



Source: IPG calculations

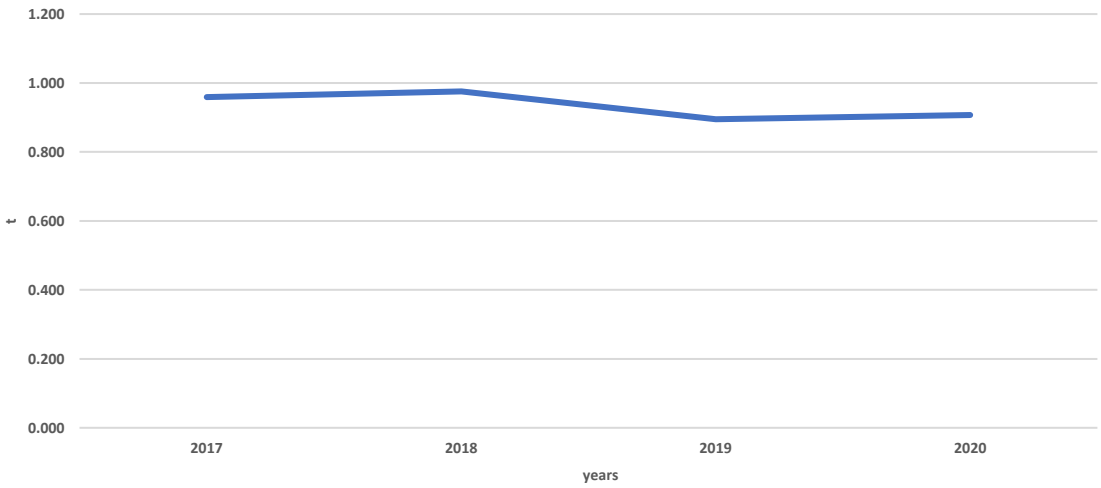
Fig. 2.4.16. Production of meat in live weight (link *2*) per 1 unit of agricultural machinery in the production of primary products (*link 1*)



Source: IPG calculations

Fig. 2.4.15 and Fig. 2.4.16 characterize the demand of the second link, Primary Production, and supply of the first link, Input Resources, Primary Products, and Services. These ratios are performance indicators, and their growing dynamics are desirable. The value of the indicator to produce meat in live weight (link 2) per 1 ton of feed production ready for farm animals (link 1) (Fig. 2.4.15) almost does not change during the period. To accelerate the growth rate with increasing feed production (denominator, link 1), a faster increase in meat production in live weight must be ensured (numerator, link 2). The demand in link 2 is unsatisfactory and needs to be increased. The indicator Production of meat in live weight (link 2) per 1 unit of agricultural machinery in the production of primary products (link 1), t (Fig. 2.4.16) has a satisfactory growth trend. However, the expected increase in Livestock Production (link 2) will require the involvement of a larger number of resources in the previous stage of the chain, particularly an increase in the amount of machinery used in link 1. Currently, the proposal for agricultural machinery in stage 1 is sufficient. But to ensure faster positive dynamics of meat production in live weight (numerator, link 2), it is necessary to increase the supply of agricultural machinery in stage 1.

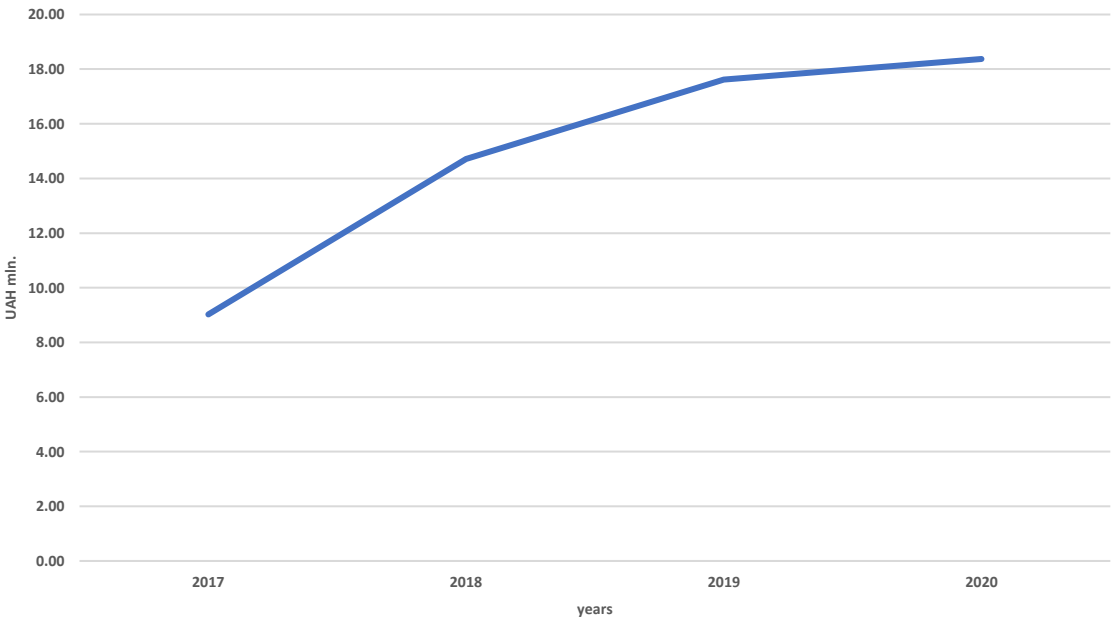
Fig. 2.4.17 Production of meat and meat products (*link 3*) per 1 ton of meat production in live weight (*link 2*)



Source: IPG calculations

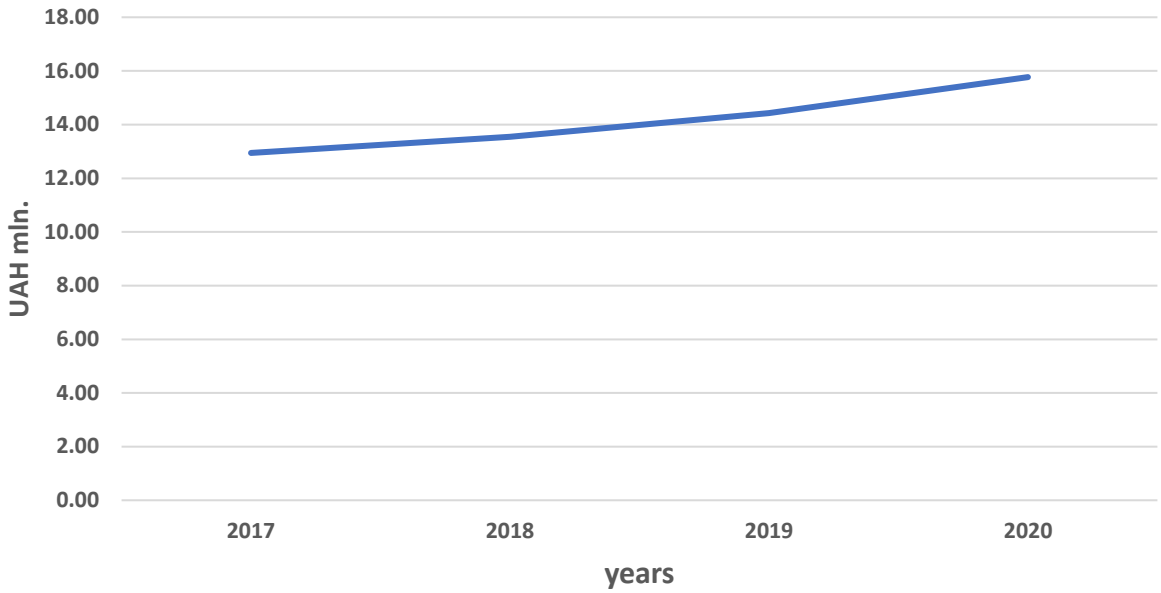
From Fig. 2.4.17 in the case that the dynamics of the ratio Production of meat and meat products (link 3) per 1 ton of meat production in live weight (*link 2*) is unsatisfactory (the stimulant indicator almost does not change, and in 2019 even decreases). The production of meat and meat products in *the third stage of the supply chain (in the processing of meat and meat products) should grow at a faster pace. The demand in link 3 is unsatisfactory.*

Fig. 2.4.18 Wholesale turnover of products produced in Ukraine in fixed prices in 2017 (physical volume) (*link 4*) per 1 thousand tons of meat and meat products production (*link 3*), million UAH.



Source: IPG calculations

Fig. 2.4.19. Retail turnover of products produced in Ukraine in fixed prices in 2017 (physical volume) (*link 4*) per 1 thousand tons of meat and meat products production (*link 3*), million UAH.



Source: IPG calculations

In fig. 2.4.18. and 2.4.19. show the demand/supply trend of the third and fourth links in the meat and meat supply chain. The indicator of wholesale turnover of products produced in Ukraine in fixed prices in 2017 (physical volume) (link 4) per 1 thousand tons of meat and meat products production (link 3) (Fig. 2.4.18). has a satisfactory growing dynamic. The increase in wholesale turnover (numerator) is greater than the increase in the production of meat and meat products in the Processing (denominator), which under these conditions is also sufficient. Thus, the *supply* of *products of the processing industry* at stage *3 and the demand in wholesale trade at stage 4 are satisfactory.* The line on the graph Fig. 6 has a slight slope. With the proper rate of supply growth in the *third industry, it is desirable to accelerate the growth of retail turnover. The positive dynamics of demand in link 4 from the retail trade in meat and meat products is insufficient.*

2.4.2.d. Supporting functions and infrastructure is necessary for meat and meat supply chain and their clusters work on the principles of EIP.

Table 2.4.13 Supporting functions and infrastructure is necessary for meat and meat products supply chain and their clusters work on the principles of EIP

Supporting functions of the chain and the necessary infrastructure	Input resources, primary products and services	Primary production	Processing (semi-processed and processed and ready for consumption)	Packing	Sales
Weather data monitoring and analytics, forecast.					

Phytosanitary monitoring					
Testing the soil, determining the productive moisture content and indicators of soil hardness. Modeling the calculation of the introduction of goodness					
Analysis of fertilizers for the content of the active substance					
Analysis of water and assessment of its suitability for spraying crops / irrigation.					
Introduction of saving technologies for tillage					
Evaluation and recommendations for drawing up technological maps of crop cultivation					
Use of irrigation systems and sprinkler equipment					
Services of agricultural machinery according to the agreed schedule					
Quality control of seed material and plant protection products					
Timely delivery of security resources and appropriate storage					
Improvement of zonal technologies for growing high-quality grain of grain, oilseeds, and fodder crops;					
Use of energy-efficient technologies for the production and supply					

of input resources and services					
Disposal of waste from the production and supply of input resources and services					
Agronomic support for the cultivation of forage crops (assessment and recommendations of the necessary technologies, selection of varieties / hybrids, fertilizers, protection systems with norms and methods of seeding application)					
Comprehensive or separate services of pre-sowing preparation of fields: sowing and planting of crops, processing of crops, spraying of crops, including from the air, pest control associated with agriculture, maintenance of land in proper agricultural and ecological condition					
Land resources, ownership and efficient use of land					
Harvesting forage crops					
Preparation of crops for initial implementation: cleaning, drying, sorting, packing in big bags, weighing, loading and shipment					
Determination of the chemical composition and nutritional value of feed					

Technologies for the preparation of animal feed, premixes, feed additives					
Transportation of feed to storage and distribution warehouses					
Organization of appropriate storage of animal feed					
Consultations on fattening animals					
Evaluation and recommendations for drawing up technological maps of fattening animals					
Activities to stimulate raising of and increase the productivity of animals survey the condition of the herd, provide services for the distillation and grazing of livestock, emasculation of poultry, cleaning and disinfecting livestock buildings, etc.					
Artificial insemination of animal's services for breeding insemination of animals, sheep shearing, maintenance and care of farm animals)					
A variety of veterinary services					
Expert services for the preparation, development, implementation, and adaptation of the HACCP food safety management system (HACCP), as well as its certification.					

Preparation and certification in accordance with ISO 14001, ISO 5000, ISO 37000, ISO 45001 in the past: OHSAS 18001, GRI, as well as religious schemes Halal+, Kosher+, Bio/Eco, Vegan+, ISO 9001, ISO 22000, FSSC 22000, IFS, QSGLOBAL G.A.P., etc.					
Organization of incoming control of raw materials for processing and output quality control of products in accordance with HACPP					
Conducting research on all necessary indicators of product quality using high-precision modern equipment					
Use of the latest energy-efficient processing technologies and modernization of existing ones to more productive ones					
Recovery (recycling) and disposal of waste for the circular economy, as well as ensuring maximum recycling					
Operational performance management					
Automation of resistance activities and increasing the level of timely response to deviations					
Services for the purchase and supply of means of production,					

material and technical resources necessary for processing					
Tolling operations					
Production of semi-processed, processed and ready-to-eat products, appropriate packaging and storage, compliance with temperature conditions					
Transportation of semi-processed, processed and ready-to-eat products, availability of specialized transport and the possibility of its operation					
Improvement and expansion of the range in accordance with the market demand based on marketing research					
Using the Internet platform for sales and promotion of products and services					
Training and raising the level of qualification of personnel. Development of incentives to work.					
Supply of electricity, gas, steam, and air conditioning					
Water supply; sewerage, waste management, other types of communication networks					
Expanding the ties of enterprises through the development of the "food chain" by attracting to it					

economic entities of the external (environmental) region as consumers and producers suitable for the use of by-products through the exchange of resources and disposal.					
Entering new markets for existing goods and services (in particular, by-product trade)					
Formation of a profitable business image for enterprises, which contributes to increasing competitiveness					
Attracting new customers (customers) of products (services) and concluding promising contracts					
Emergency Management					
Creation of environmental information systems					
Overall increase in energy efficiency, cascade energy use and cogeneration, including stimulating the development and use of alternative energy sources					
Financing of operating activities, grant support for the latest technologies, simplified lending procedures for small and medium-sized enterprises					
Private investment in the launch of modern technologies for					

storage and transportation of finished products					
Diversification of supply chains and development of logistics infrastructure facilities					
Investing in the development of inland waterways, in particular, the Danube River (P80), Dnipro (P40), Dniester (P90)					
Liberalization of railway transport. Integration of the country's railway infrastructure with the EU infrastructure with a parallel transition to a single standard of European track – 1435 mm					
Road management and investment in providing better access to roads connecting production sites with ports and railways.					

Source: IPG developments

2.4.2. e. Summarizing the rules and regulations related to meat and meat products supply chain.

Ukrainian companies producing the supply chain of meat and meat products in their activities comply with the requirements of regulatory legal acts that regulate the field of sanitary and phytosanitary measures, the subject of which is product safety and control over the spread of diseases and technical requirements (quality of labeling, product marketing).

Sanitary and phytosanitary measures usually include the control of products of (non)animal origin, the presence of contaminants, pesticide residues and veterinary preparations, as well as the tracking and transparency of the production and processing process.

In each of these cases, companies must prove their compliance with all the requirements of Ukrainian and international legislation through certification with the involvement of accredited laboratories. Depending on the destination country, additional requirements may be established – for example, testing product samples at the first checkpoint or preliminary approval of the list of specific processors (in particular, for products of animal

origin). In addition, the national legislation of certain countries may require compliance of food products with certain requirements for marketing and labeling.

A prerequisite for competitive activities in the meat and meat products market is compliance with its own legislation on the safety of production and circulation of food products.

For market operators

Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Procedure for Issuing an Operational Permit, the Form of Operational Permit and Invalidation of Certain Resolutions of the Cabinet of Ministers of Ukraine" dated 11.11.2015 No. 930[81]

The Law of Ukraine "On Environmental Impact Assessment" of 23.05.2017 No 2059-VIII (Edition of 13.05.2022)[82]

The Law of Ukraine "On the permitting system in the field of economic activity" of 06.09.2005 No 2806-IV (Revision 10.10.2022)[83]

The Law of Ukraine "On Waste" (Edition of 16.10.2020)[84]

The Law of Ukraine "On animal by-products not intended for human consumption" of 07.04.2015 No 287-VIII.[85]

Resolution of the Cabinet of Ministers of Ukraine "Some issues of implementation of planned measures of state control by the State Service for Food Safety and Consumer Protection" of 31.10.2018 No 896.[86]

Order of the Ministry of Agrarian Policy and Food of Ukraine dated "On approval of the Procedure for approval of export capacities, their entry and exclusion from the register of approved export capacities" of 10.02.2016 No38.[87]

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for state registration of capacities, maintaining the state register of capacities of market operators and providing information from it to interested entities" dated 10.02.2016 No39.[88]

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[81] Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Procedure for Issuing an Operational Permit, the Form of Operational Permit and Invalidation of Certain Resolutions of the Cabinet of Ministers of Ukraine"https://zakon.rada.gov.ua/laws/show/930-2015-%D0%BF#Text

[82] The Law of Ukraine "On Environmental Impact Assessment" https://zakon.rada.gov.ua/laws/show/2059-19#Text

[83] The Law of Ukraine "On the permitting system in the field of economic activity" https://zakon.rada.gov.ua/laws/show/2806-15#Text

[84] The Law of Ukraine "On Waste"https://zakon.rada.gov.ua/laws/show/187/98-%D0%B2%D1%80#Text

[85] The Law of Ukraine "On animal by-products not intended for human consumption" https://zakon.rada.gov.ua/laws/show/287-19#Text

[86] Resolution of the Cabinet of Ministers of Ukraine "Some issues of implementation of planned measures of state control by the State Service for Food Safety and Consumer Protection" https://zakon.rada.gov.ua/laws/show/896-2018-%D0%BF#Text

[87] Order of the Ministry of Agrarian Policy and Food of Ukraine dated "On approval of the Procedure for approval of export capacities, their entry and exclusion from the register of approved export capacities" https://zakon.rada.gov.ua/laws/show/z0381-16#Text

[88] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for state registration of capacities, maintaining the state register of capacities of market operators and providing information from it to interested entitieshttps://zakon.rada.gov.ua/laws/show/z0382-16#Text

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for maintaining the register of market operators and capacities for which an operational permit has been issued" of 10.02.2016 No40.[89]

Resolution of the Cabinet of Ministers of Ukraine "On approval of the Procedure for issuing an operational permit" dated 05.11.2008 No. 978, for capacities (facilities) in the case of conducting activities for the production and circulation of inedible products of animal origin or production, mixing and preparation of feed additives, premixes and feed.[90]

Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of professions, industries and organizations whose employees are subject to mandatory preventive medical examinations, the procedure for conducting these examinations and issuing personal medical books" of 23.05.2001 No559.[91]

Food safety and quality, legislation requirements for feed, animal by-products, animal health and welfare

The Law of Ukraine "On basic principles and requirements for food safety and quality" of 23.12.1997 No 771/97-VR (Revision 19.08.2022), which regulates the procedure for ensuring safety and individual indicators of food quality, including meat.[92]

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Instruction on commodity valuation and labeling of meat" of 01.11.2011 No 587.[93]

Order of the State Committee of Veterinary Medicine of Ukraine "On approval of the Instruction on the use of the expiration mark and veterinary stamps and amendments to the Instructions for stamping meat" of 02.02.2010 No46.[94]

Order of the Chief State Inspector of Veterinary Medicine of Ukraine "On approval of the Instruction on the procedure for veterinary stamping of leather and fur raw materials" of 03.07.2001 No52.[95]

The Law of Ukraine "On Protection of the Population from Infectious Diseases" of 06.04.2000 No 1645-III (Revision 10.12.2021).[96]

The Law of Ukraine "On State Control over Compliance with the Legislation on Food, Feed, Animal By-Products, Veterinary Medicine and Animal Welfare" of 18.05.2017 No. 2042-VIII

[89] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for maintaining the register of market operators and capacities for which an operational permit has been issued" https://zakon.rada.gov.ua/laws/show/z0383-16#Text

[90] Resolution of the Cabinet of Ministers of Ukraine "On approval of the Procedure for issuing an operational permit"https://zakon.rada.gov.ua/laws/show/978-2008-%D0%BF#Text

[91] Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of professions, industries and organizations whose employees are subject to mandatory preventive medical examinations, the procedure for conducting these examinations and issuing personal medical books" https://zakon.rada.gov.ua/laws/show/559-2001-%D0%BF#Text

[92] The Law of Ukraine "On basic principles and requirements for food safety and quality" https://zakon.rada.gov.ua/laws/show/771/97-%D0%B2%D1%80#Text

[93] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Instruction on commodity valuation and labeling of meat"https://zakon.rada.gov.ua/laws/show/z1317-11#Text

[94] Order of the State Committee of Veterinary Medicine of Ukraine "On approval of the Instruction on the use of the expiration mark and veterinary stamps and amendments to the Instructions for stamping meat" https://zakon.rada.gov.ua/laws/show/z0278-10#Text

[95] Order of the Chief State Inspector of Veterinary Medicine of Ukraine "On approval of the Instruction on the procedure for veterinary stamping of leather and fur raw materials https://zakon.rada.gov.ua/laws/show/z0855-01#Text

[96] The Law of Ukraine "On Protection of the Population from Infectious Diseases" https://zakon.rada.gov.ua/laws/show/1645-14#Text

(Revision 27.05.2022), which defines the principles of state control conducted in order to verify compliance by market operators with the Law.[97]

Order of the Ministry of Agrarian Policy "On approval of the Requirements for the development, implementation and application of permanent procedures based on the principles of the Food Safety Management System (HACCP) dated 01.10.2012 No. 590.[98]

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the form of the act drawn up as a result of the state control measure in the form of an audit of permanent procedures based on the principles of HACCP" dated 08.08.2019 No446.[99]

Order of the Ministry of Economy of Ukraine "On approval of the forms of acts drawn up as a result of planned (unscheduled) measures of state control (inspection) regarding compliance by market operators with the requirements of legislation on food, feed, animal by-products, animal health and welfare, and other forms of administrative documents" of 21.01.2022 No 143-22[100]

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for sampling and their transportation (shipment) to authorized laboratories for the purposes of state control and the Form of the act of sampling" dated 11.10.2018 No490.[101]

The Law of Ukraine "On Accreditation of Conformity Assessment Bodies" of 17.05.2001 No2407-III [102]

Resolution of the Cabinet of Ministers of Ukraine "On approval of general requirements for the processing, disposal, destruction or further use of low-quality and dangerous products withdrawn from circulation" of 24.01.2001 No50.[103]

The system of traceability of circulation of animals, products of animal origin, other objects of state veterinary and sanitary control

The Law of Ukraine "On Veterinary Medicine" (Revision 27.05.2022).[104]

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[97] The Law of Ukraine "On State Control over Compliance with the Legislation on Food, Feed, Animal By-Products, Veterinary Medicine and Animal Welfare"https://zakon.rada.gov.ua/laws/show/2042-19#Text

[98] Order of the Ministry of Agrarian Policy "On approval of the Requirements for the development, implementation and application of permanent procedures based on the principles of the Food Safety Management System (HACCP)https://zakon.rada.gov.ua/laws/show/z1704-12#Text

[99] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the form of the act drawn up as a result of the state control measure in the form of an audit of permanent procedures based on the principles of HACCP"https://zakon.rada.gov.ua/laws/show/z0980-19#Text

[100] Order of the Ministry of Economy of Ukraine "On approval of the forms of acts drawn up as a result of planned (unscheduled) measures of state control (inspection) regarding compliance by market operators with the requirements of legislation on food, feed, animal by-products, animal health and welfare, and other forms of administrative documents"https://zakon.rada.gov.ua/laws/show/z0151-22#Text

[101] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Procedure for sampling and their transportation (shipment) to authorized laboratories for the purposes of state control and the Form of the act of sampling"https://zakon.rada.gov.ua/laws/show/z1464-18#Text

[102] The Law of Ukraine "On Accreditation of Conformity Assessment Bodies" https://zakon.rada.gov.ua/laws/show/2407-14#Text

[103] Resolution of the Cabinet of Ministers of Ukraine "On approval of general requirements for the processing, disposal, destruction or further use of low-quality and dangerous products withdrawn from circulation" https://zakon.rada.gov.ua/laws/show/50-2001-%D0%BF#Text

[104] The Law of Ukraine "On Veterinary Medicine" https://zakon.rada.gov.ua/laws/show/2498-12#Text

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Rules for filling in, storing, writing off veterinary documents and requirements for their accounting" of 01.08.2014 No 288.[105]

Resolution of the Cabinet of Ministers of Ukraine "On approval of the Procedure for issuing veterinary documents" of 21.11.2013 No857.[106]

Order of the Ministry of Agrarian Policy and Food of Ukraine "On Approval of the Regulation on the Unified State Register of Animals" dated 25.09.2012 No578 (Revision 15.02.2022)[107]

Resolution of the Cabinet of Ministers of Ukraine "On approval of the Rules for the transportation of animals" of 16.11.2011 No1402.[108]

Order of the State Service of Ukraine for Supervision of Aviation Safety "On Approval of the Instruction on the Organization of Cargo Transportation by Air" dated 02.11.2005 No. 822 (Revision 25.02.2022)[109]

Order of the State Aviation Service of Ukraine "On Approval of the Aviation Rules of Ukraine "Rules of Air Cargo Transportation" dated 19.11.2021 No. 1795.[110]

Order of the Ministry of Transport of Ukraine "Rules for the transportation of animals, poultry and other goods subject to state veterinary and sanitary control" of 09.12.2002 No873. [111]

Order of the Ministry of Transport of Ukraine "On approval of the Rules of transportation of goods by road in Ukraine" of 14-10.1997 No363.[112]

Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of paid administrative services provided by the State Service for Food Safety and Consumer Protection, bodies and institutions belonging to the sphere of its management, and the amount of payment for their provision" of 09.06.2011 No641 (Revision 01.01.2021).[113]

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[105] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Rules for filling in, storing, writing off veterinary documents and requirements for their accounting" https://zakon.rada.gov.ua/laws/show/z1202-14#Text

[106] Resolution of the Cabinet of Ministers of Ukraine "On approval of the Procedure for issuing veterinary documents"https://zakon.rada.gov.ua/laws/show/857-2013-%D0%BF#Text

[107] Order of the Ministry of Agrarian Policy and Food of Ukraine "On Approval of the Regulation on the Unified State Register of Animals" dated 25.09.2012 No578 https://zakon.rada.gov.ua/laws/show/z1713-12#Text

[108] Resolution of the Cabinet of Ministers of Ukraine "On approval of the Rules for the transportation of animals"https://zakon.rada.gov.ua/laws/show/1402-2011-%D0%BF#Text

[109] Order of the State Service of Ukraine for Supervision of Aviation Safety "On Approval of the Instruction on the Organization of Cargo Transportation by Air" https://zakon.rada.gov.ua/laws/show/z1403-05#Text

[110] Order of the State Aviation Service of Ukraine "On Approval of the Aviation Rules of Ukraine "Rules of Air Cargo Transportation"https://zakon.rada.gov.ua/laws/show/z0029-22#Text

[111] Order of the Ministry of Transport of Ukraine "Rules for the transportation of animals, poultry and other goods subject to state veterinary and sanitary control" https://zakon.rada.gov.ua/laws/show/z1032-02#Text

[112] Order of the Ministry of Transport of Ukraine "On approval of the Rules of transportation of goods by road in Ukraine"https://zakon.rada.gov.ua/laws/show/z0128-98#Text

[113] Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of paid administrative services provided by the State Service for Food Safety and Consumer Protection, bodies and institutions belonging to the sphere of its management, and the amount of payment for their provision"https://zakon.rada.gov.ua/laws/show/641-2011-%D0%BF#Text

The Law of Ukraine "On the List of permits in the field of economic activity" of 19.05.2011 No3392-VI (Revision 01.01.2022)[114]

The Law of Ukraine "On Identification and Registration of Animals" of 04.06.2009 No1445-VI (Revision 27.10.2022)[115]

Order of the Ministry of Agrarian Policy of Ukraine "On approval of the Instruction on grading pigs, Instructions for breeding records in pig breeding and samples of forms of breeding accounting in pig breeding" of 17.12.2002 No396.[116]

Order of the State Department of Veterinary Medicine of the Ministry of Agrarian Policy of Ukraine "On approval of instructions for the prevention and control of African swine fever and instructions for the prevention and elimination of swine reproductive and respiratory syndrome" of 31.07.2007 No77 [117]

The Law of Ukraine "On Amendments to Certain Legislative Acts of Ukraine regarding the Reduction of the Number of Permits" of 09.04.2014 No. 1193-VII.[118]

Order of the Ministry of Agrarian Policy of Ukraine "On the Procedure for granting approval for the issuance of a license for certain types of meat and meat products, the export of which is subject to licensing in 2004" of 21.10.2004 No374.[119]

Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of special baby food products and the procedure for classifying such products as products of their own production" of 08.08.1997 No859.[120]

Order of the Ministry of Health of Ukraine "On approval of the Temporary procedure for conducting state sanitary and hygienic examination" of 09.10.2000 No247.[121]

The Law of Ukraine on Withdrawal from Circulation, Processing, Recycling, Destruction, or Further Use of Low-Quality and Dangerous Products of 14.01.2000 No1393-XIV.[122]

Veterinary and sanitary requirements

[114] The Law of Ukraine "On the List of permits in the field of economic activity" https://zakon.rada.gov.ua/laws/show/3392-17#Text

[115] The Law of Ukraine "On Identification and Registration of Animals"https://zakon.rada.gov.ua/laws/show/1445-17#Text

[116] Order of the Ministry of Agrarian Policy of Ukraine "On approval of the Instruction on grading pigs, Instructions for breeding records in pig breeding and samples of forms of breeding accounting in pig breeding"https://zakon.rada.gov.ua/laws/show/z1027-02#Text

[117] Order of the State Department of Veterinary Medicine of the Ministry of Agrarian Policy of Ukraine "On approval of instructions for the prevention and control of African swine fever and instructions for the prevention and elimination of swine reproductive and respiratory syndrome"https://zakon.rada.gov.ua/laws/show/z0928-07#Text

[118] The Law of Ukraine "On Amendments to Certain Legislative Acts of Ukraine regarding the Reduction of the Number of Permits"https://zakon.rada.gov.ua/laws/show/1193-18#Text

[119] Order of the Ministry of Agrarian Policy of Ukraine "On the Procedure for granting approval for the issuance of a license for certain types of meat and meat products, the export of which is subject to licensing in 2004"https://zakon.rada.gov.ua/laws/show/z1358-04#Text

[120] Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of special baby food products and the procedure for classifying such products as products of their own production"https://zakon.rada.gov.ua/laws/show/859-97-%D0%BF#Text

[121] Order of the Ministry of Health of Ukraine "On approval of the Temporary procedure for conducting state sanitary and hygienic examination" https://zakon.rada.gov.ua/laws/show/z0004-01#Text

[122] The Law of Ukraine on Withdrawal from Circulation, Processing, Recycling, Destruction, or Further Use of Low-Quality and Dangerous Products https://zakon.rada.gov.ua/laws/show/1393-14#Text

Resolution of the Cabinet of Ministers of Ukraine "On the list of anti-epizootics, therapeutic, laboratory-diagnostic, radiological and other veterinary-sanitary measures carried out by the bodies of state veterinary medicine at the expense of the relevant budget and other funds" of 15.08.1992 No478.[123]

Resolution of the Cabinet of Ministers of Ukraine "On approval of the procedure for using the funds provided in the state budget for the implementation of anti-epizootic measures and the list of services of veterinary specialists conducting veterinary practice for the implementation of mandatory or necessary anti-epizootic measures and the amount of their payment" dated 23.04.2008 No413 (Revision 12.10.2022).[124]

Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Regulation on the State Anti-Epizootic Commission under the Cabinet of Ministers of Ukraine and Model Provisions on Local State Emergency Anti-Epizootic Commissions" of 21.11.2007 No1350.[125]

Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of particularly dangerous (quarantine) diseases of animals" of 08.08.2007 No1006.[126]

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the unified form of the act drawn up as a result of a planned (unscheduled) measure of state supervision (control) regarding compliance by a business entity with the requirements of legislation in the field of veterinary medicine" dated 07.03.2018 No130.[127]

Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Rules for filling in, storing, writing off veterinary documents and requirements for their accounting" of 01.08.2014 No288.[128]

Resolution of the Cabinet of Ministers of Ukraine "On approval of the Procedure for issuing veterinary documents" of 21.11.2013 No857.[129]

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[123] Resolution of the Cabinet of Ministers of Ukraine "On the list of anti-epizootics, therapeutic, laboratory-diagnostic, radiological and other veterinary-sanitary measures carried out by the bodies of state veterinary medicine at the expense of the relevant budget and other funds"https://zakon.rada.gov.ua/laws/show/478-92-%D0%BF#Text

[124] Resolution of the Cabinet of Ministers of Ukraine "On approval of the procedure for using the funds provided in the state budget for the implementation of anti-epizootic measures and the list of services of veterinary specialists conducting veterinary practice for the implementation of mandatory or necessary anti-epizootic measures and the amount of their payment"https://zakon.rada.gov.ua/laws/show/413-2008-%D0%BF#Text

[125] Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Regulation on the State Anti-Epizootic Commission under the Cabinet of Ministers of Ukraine and Model Provisions on Local State Emergency Anti-Epizootic Commissions"https://zakon.rada.gov.ua/laws/show/1350-2007-%D0%BF#Text

[126] Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of particularly dangerous (quarantine) diseases of animals"https://zakon.rada.gov.ua/laws/show/1006-2007-%D0%BF#Text

[127] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the unified form of the act drawn up as a result of a planned (unscheduled) measure of state supervision (control) regarding compliance by a business entity with the requirements of legislation in the field of veterinary medicine"https://zakon.rada.gov.ua/laws/show/z0366-18#Text

[128] Order of the Ministry of Agrarian Policy and Food of Ukraine "On approval of the Rules for filling in, storing, writing off veterinary documents and requirements for their accounting"https://zakon.rada.gov.ua/laws/show/z1202-14#Text

[129] Resolution of the Cabinet of Ministers of Ukraine "On approval of the Procedure for issuing veterinary documents" https://zakon.rada.gov.ua/laws/show/857-2013-%D0%BF#Text

Order of the Ministry of Agrarian Policy of Ukraine "On approval of veterinary and sanitary rules for slaughterhouses, slaughter and sanitary points of farms and yard slaughter of animals" of 14.01.2004 No4.[130]

The Law of Ukraine "On Protection of Animals from Ill-Treatment" of 21.02.2006 No3447-IV.[131]

Order of the State Department of Veterinary Medicine "On approval of the Rules for the transportation and storage of veterinary drugs, substances, finished feed, feed additives and veterinary medicine in veterinary pharmacies, their structural divisions, bases, warehouses, etc." of 13.08.2002 No44.[132]

Order of the State Department of Veterinary Medicine "On approval of the Rules of pre-slaughter veterinary examination of animals and veterinary and sanitary examination of meat and meat products" of 07.06.2002 No28.[133]

Order of the Chief State Inspector of Veterinary Medicine of Ukraine "On approval of veterinary and sanitary rules for poultry farms and requirements for their design" of 03.07.2001 No53[134]

Order of the Chief State Inspector of Veterinary Medicine of Ukraine "On approval of veterinary and sanitary rules for business entities (enterprises, workshops) for poultry processing and production of egg products, Rules of veterinary and sanitary examination of poultry eggs" dated 07.09.2001 No70.[135]

Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of paid administrative services provided by the State Service for Food Safety and Consumer Protection, bodies and institutions belonging to the sphere of its management, and the amount of payment for their provision" of 09.06.2011. №641.[136]

Order of the Chief State Inspector of Veterinary Medicine of Ukraine "On approval of the Rules for the arrangement and maintenance of existing (existing) livestock breeders and

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[130] Order of the Ministry of Agrarian Policy of Ukraine "On approval of veterinary and sanitary rules for slaughterhouses, slaughter and sanitary points of farms and yard slaughter of animals"https://zakon.rada.gov.ua/laws/show/z0121-04#Text

[131] The Law of Ukraine "On Protection of Animals from Ill-Treatment" https://zakon.rada.gov.ua/laws/show/3447-15#Text

[132] Order of the State Department of Veterinary Medicine "On approval of the Rules for the transportation and storage of veterinary drugs, substances, finished feed, feed additives and veterinary medicine in veterinary pharmacies, their structural divisions, bases, warehouses, etc."https://zakon.rada.gov.ua/laws/show/z0719-02#Text

[133] Order of the State Department of Veterinary Medicine "On approval of the Rules of pre-slaughter veterinary examination of animals and veterinary and sanitary examination of meat and meat products"https://zakon.rada.gov.ua/laws/show/z0524-02#Text

[134] Order of the Chief State Inspector of Veterinary Medicine of Ukraine "On approval of veterinary and sanitary rules for poultry farms and requirements for their design" https://zakon.rada.gov.ua/laws/show/z0565-01#Text

[135] Order of the Chief State Inspector of Veterinary Medicine of Ukraine "On approval of veterinary and sanitary rules for business entities (enterprises, workshops) for poultry processing and production of egg products, Rules of veterinary and sanitary examination of poultry eggs"https://zakon.rada.gov.ua/laws/show/z0849-01#Text

[136] Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of paid administrative services provided by the State Service for Food Safety and Consumer Protection, bodies and institutions belonging to the sphere of its management, and the amount of payment for their provision"https://zakon.rada.gov.ua/laws/show/641-2011-%D0%BF#Text

biothermal pits for the disposal of animal corpses in the settlements of Ukraine" dated 27.10.2008 No. 232.[137]

Resolution of the Cabinet of Ministers of Ukraine from "On approval of the Procedure for sampling products of animal, plant and biotechnological origin for research" of 14.06.2002 No833.[138]

Market stimulation

The Law of Ukraine "On Cooperation" 1087-IV 10.07.2003 (Revision 10.10.2022).[139]

The Law of Ukraine "On State Support of Agriculture of Ukraine" of 24.06.2004 No1877-IV (Revision 27.10.2022).[140]

The Law of Ukraine "On Agricultural Cooperation" of 17.07.1997 No469/97-VR.[141]

Tax Code of Ukraine dated 02.12.2010 No2755-VI (Revision 28.10.2022)[142]

Resolution of the Cabinet of Ministers of Ukraine dated 19.01.2022 No 25 "On approval of the Procedure for consideration of documents on the inclusion of an industrial (industrial) park in the Register of industrial (industrial) parks".

Trade and consumer protection

The Law of Ukraine "On Information for Consumers regarding Food Products" of 06.12.2018 (Revision 01.10.2022)[143]

Order of the Ministry of Agro-Industrial Complex of Ukraine "On approval of the Requirements for the import (shipment) into the customs territory of Ukraine of live animals and their reproductive material, food products of animal origin, feed, hay, straw, as well as by-products of animal origin and products of their processing, processing" dated 16.11.2018 No 553[144]

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[137] Order of the Chief State Inspector of Veterinary Medicine of Ukraine "On approval of the Rules for the arrangement and maintenance of existing (existing) livestock breeders and biothermal pits for the disposal of animal corpses in the settlements of Ukraine" dated 27.10.2008 No. 232.https://zakon.rada.gov.ua/laws/show/z0085-09#Text

[138] Resolution of the Cabinet of Ministers of Ukraine from "On approval of the Procedure for sampling products of animal, plant and biotechnological origin for research" https://zakon.rada.gov.ua/laws/show/833-2002-%D0%BF#Text

[139] The Law of Ukraine "On Cooperation" https://zakon.rada.gov.ua/laws/show/1087-15#Text

[140] The Law of Ukraine "On State Support of Agriculture of Ukraine"https://zakon.rada.gov.ua/laws/show/1877-15#Text

[141] The Law of Ukraine "On Agricultural Cooperation"https://zakon.rada.gov.ua/laws/show/469/97-%D0%B2%D1%80#Text

[142] Tax Code of Ukraine dated 02.12.2010 No2755-VI https://zakon.rada.gov.ua/laws/show/2755-17#Text

[143] Resolution of the Cabinet of Ministers of Ukraine dated 19.01.2022 No 25 "On approval of the Procedure for consideration of documents on the inclusion of an industrial (industrial) park in the Register of industrial (industrial) parks"https://zakon.rada.gov.ua/laws/show/2639-19#Text

[144] Order of the Ministry of Agro-Industrial Complex of Ukraine "On approval of the Requirements for the import (shipment) into the customs territory of Ukraine of live animals and their reproductive material, food products of animal origin, feed, hay, straw, as well as by-products of animal origin and products of their processing, processing"https://zakon.rada.gov.ua/laws/show/z0346-19#Text

Order of the Ministry of Agro-industrial Complex of Ukraine, Chief State Inspector of Veterinary Medicine of Ukraine "On Approval of Veterinary and Sanitary Rules for Markets" of 04.06.1996 No 23.[145]

The Law of Ukraine "On Protection of Consumer Rights" of 12.05.1991 No1023-XII (Revision 10.10.2022).[146]

Order of the Ministry of Economy and European Integration of Ukraine "On Approval of the Rules of Retail Trade in Food Products" 11.07.2003 No 185 [147]

2.4.2. f. Outlining any regulation gaps in the meat and meat products supply chain.

In recent years, the laws of Ukraine in the areas of ensuring safety and individual indicators of food quality, veterinary medicine and animal welfare, as well as state control in these areas, have undergone significant changes. In many aspects, they were brought in line with the requirements of acts of EU law. At the same time, the practice of applying such laws has exposed a number of aspects that currently remain unregulated or regulated in a way that has significant drawbacks. This situation leads to unpredictability in relations between authorities and market operators, and also creates obstacles to the development of relevant sectors of the economy. Including:

Primary manufacturers

- Incomplete mechanism of state regulation in the field of animal welfare, the process of training relevant persons in the field of compliance with the requirements of legislation on animal welfare;
- Obstacles that regularly arise among market operators when they receive international certificates for goods with food products due to the absence and impossibility of approving at present the procedure for issuing these documents;
- Imperfect ordering of relations in the field of circulation, storage, transportation, as well as the use and accounting of veterinary medicines;
- Low quality of veterinary medicines and vaccines for animals, inability to control raw materials for their manufacture, which is dangerous or prohibited for use in Ukraine;
- Insufficient control over the implementation of the rules for keeping pets that carry various diseases, and irresponsibility of pet owners, because of which the number of stray animals increases, especially on the outskirts of the city, in the territories of other settlements, summer cottages, local areas; irresponsibility of pet owners who do not want to vaccinate animals; absence or non-fulfillment of their functions by teams for catching stray animals;
- Incomplete accounting and imperfection of the system of identification and registration of all farm animals to ensure the tracking of livestock products in accordance with international obligations of Ukraine, assistance in protecting the territory of Ukraine from the introduction and spread of pathogens and optimizing the planning of veterinary and sanitary measures;

[145] Order of the Ministry of Agro-industrial Complex of Ukraine, Chief State Inspector of Veterinary Medicine of Ukraine "On Approval of Veterinary and Sanitary Rules for Markets"https://zakon.rada.gov.ua/laws/show/z0314-96#Text

[146] The Law of Ukraine "On Protection of Consumer Rights"https://zakon.rada.gov.ua/laws/show/1023-12#Text

[147] Order of the Ministry of Economy and European Integration of Ukraine "On Approval of the Rules of Retail Trade in Food Products"https://zakon.rada.gov.ua/laws/show/z0628-03#Text

- Increasing the threats of the spread of infectious diseases of animals due to improper handling of products imported (sent) to the customs territory of Ukraine as trade (exhibition) samples or objects of scientific research.

Capacity operators

- The lack of a traceability system for all market operators, as a result, the insufficiently fast reaction of the food market operator to a certain problem can both harm the enterprise itself and pose a danger to the entire food industry sector.
- Low level of trust in market operators by consumers
- The existing cases such as the detection of melamine in baby food and severe food poisoning, have led to an increase in the attention of the public and scientists around the world to the possibility of preventing food safety problems and the need to clearly identify the source of the problem.
- Lack of information about what happens to the product during the production process, what materials have been used or should be used in its production;
- Violation of production technology, failures in the planning of procurement of raw materials and, as a result, production stoppages, or overstocking of warehouses and an increase in cost;
- Failure to complete the process of implementing the requirements of European legislation in the field of agriculture, which will lead to the recognition (by European partners) of the Ukrainian labeling of beef and veal as inequivalent, and Ukrainian meat products – uncompetitive;
- There is a difference in letter marks when labeling beef and veal with letter stamps by age from the requirements of European legislation.
- Inconsistency of the nomenclature, terminology and other requirements for meat used in domestic production and market practice.

Market and consumer protection

- Lack of an adequate level of protection of health and interests of consumers, their awareness, establishment of means of guaranteeing the right of consumers to information and procedures for providing information about food products;
- Shadowing and the corresponding risk of violation of legislation in the areas of safety and certain indicators of food quality, veterinary medicine, which will ensure the observance of the rights and interests of citizens;
- Impossibility of application by the authorities and business entities of the requirements of the current legislation, in particular the laws of Ukraine "On veterinary medicine", "On state control over compliance with the legislation on food, feed, animal by-products, animal health and welfare", "On animal by-products not intended for human consumption";
- Consumption of low-quality products by the population.
- The use by a person or to a person of deliberately forged (falsified) food products pose no less threats to his life and health than the use of counterfeit drugs. However, criminal liability for falsification of these goods in Ukraine is not provided;

- The existence of a high level of factor in the transmission of pathogens of infectious diseases through food, food raw materials, blood and other biological preparations, medical instruments, household items, etc.), as well as living organisms infected with pathogens of infectious diseases, with the participation of which the pathogens of infectious diseases are transferred from the source of infection to other persons;
- The risks associated with food poisoning of consumers are for the improvement of food products and their production processes, and not only for compliance with legal requirements.

Environmental impact

- Significant amounts of waste accumulated in Ukraine, the lack of effective measures aimed at preventing their formation, recycling, restoration, and disposal, deepen the environmental crisis and become a braking factor in the development of the national economy.
- Low regulation at the legislative level of waste management issues, lack of an effective mechanism for managing certain types of waste, low institutional capacity of state bodies, duplication of powers of state and local authorities, insufficient level of interdepartmental interaction, lack of strategic planning leads to an increase in the number of unauthorized landfills and overloaded landfills, landfills that do not meet environmental safety standards;
- Exceeding the powers of the authorized bodies of executive power, eliminating unnecessary regulatory procedures in the implementation of environmental impact assessment of the planned activities;
- Imperfect organizational procedure for holding public hearings, which is mandatory in the process of environmental impact assessment at the stage of consideration of the Environmental Impact Assessment Report and other documentation necessary for environmental impact assessment of the planned activities.

2.4.2.g. SWOT—analysis of the meat and meat products supply chain

IPG has conducted a SWOT analysis of the meat and meat products supply chain in Table 2.4.2.

Table 2.4.15. SWOT analysis of the meat and meat products supply chain.

Strengths	Weaknesses
1. Availability of favorable natural and climatic conditions. 2. Close location of sales markets. 3. Qualified and cheap labor force.	1. Dependence of the industry on imported equipment for pig farms. 2. Dependence of domestic enterprises on imported veterinary drugs. 3. Large amount of waste in the absence of satisfactory treatment facilities. 4. Low quality of livestock, production culture and non-compliance with new legal requirements for processing. Low purchase prices for cattle. 5. High production costs and lack of financing for operating activities. 6. Significant dependence on intermediaries in the commodity market and the corresponding pricing policy. 7. Short shelf life of products. 8. Low level of use of modern technologies of processing and production of meat products. 9. Significant wear and tear of equipment and facilities. 10. Growing costs due to rising energy prices and high energy and resource dependence of the industry.

	11. Low level of application of modern technologies and significant wear and tear of fixed assets.
Opportunities	**Threats**
1. Increase in pork production volumes. 2. Development of selection and genetic direction of pig breeding. 3. Development of beef consumption culture. 4. Increasing the range of products. 5. State support for agricultural and rural development programs. 6. Further development of agricultural cooperation.	**1.** Increase in the cost of investment resources due to the devaluation of the hryvnia. **2.** Decline in real incomes of the population. **3.** Decrease in pork consumption. **4.** Crisis of overproduction. **5.** Intensification of the military conflict. **6.** Lack of motivation of producers in the industry. **7.** Insufficient financial support and lack of budget funds for livestock development.

Source: IPG developments

The conducted SWOT-analysis illustrates that it is quite difficult for most enterprises of the industry to overcome the gap with the world and our domestic agrarian leaders who are engaged in the production and processing of meat and meat products. A significant number of agribusiness enterprises find it difficult to ensure competitive production without state support.

2.4.2.h Recommendations for meat and meat products supply chain

» **At the first stage "Product selection, provision of resources and services for production" we propose.**

a. Conducting training on meat and meat production, familiarization with modern technologies and equipment used in production.
b. Search for options for cooperation with the main companies-suppliers of resources.
c. Identify domestic or foreign breeding farms in order to purchase highly productive livestock.
d. Assist in organizing cooperation with input suppliers either through a cooperative or directly with farmers.
e. Involvement of financial institutions for financial support in the purchase of inputs.

» **In the second stage "Primary production" we recommend:**

a. Further, consulting support on meat and meat production and processing.
b. Advice to improve producers' understanding and use of improved production systems, improved livestock management (animal health,

improvement of breeding and productive qualities of breed populations and artificial insemination).

c. Advice on raising consumer awareness of the occurrence and prevention of animal and poultry diseases.
d. Develop training programs based on the knowledge and experience of producers and input suppliers.

» **In the third stage "Processing or storage" we propose:**

a. Advisory support on storage and marketing of finished products.
b. Coordination to establish links between primary producers and the processing industry, which should ensure the stability of primary producers in terms of market and continuity of production of raw materials of domestic origin.
c. Investments in slaughterhouses and cold storage to increase capacity for slaughtering animals and poultry, production of chilled chicken, including fully automated slaughterhouses.
d. Expanding access to short-term credit to improve capacity for immediate payments to producers.
e. Organization of cooperation with suppliers of storage equipment, and meat and meat processors.

» **In the fourth stage "Pre-sale preparation and sales" we recommend:**

a. Consultations on the introduction of new modernized packaging and labeling technologies that meet the requirements of high-end buyers and extend the shelf life of new products.
b. Promotion of local products by assisting in the registration of products with geographical indication with the observance of a certain production scheme, careful selection of raw materials, quality control at all stages of production.
c. Promote branding activities, promotional activities such as assistance in developing websites and promotional materials.

After conducting a thorough analysis of the meat product supply chain, including aspects such as level-cluster analysis, cost and profit dynamics, marketing and demand, identification of supporting functions and infrastructure, and research of rules and regulations, it is evident that there is significant potential for cluster cooperation in eco-industrial parks.

The regions of Lviv, Vinnytsia, Khmelnytskyi, Rivne, Volyn, Chernivtsi, Ivano-Frankivsk, and Zakarpattia have high potential for cluster development. Creating eco-industrial parks within these clusters can help address common challenges, increase competitiveness, and stimulate innovation. International experience and expertise should be utilized to implement advanced technologies and environmentally sustainable approaches to production.

Developing connections between supply chain participants, while considering supporting functions and infrastructure, is an essential aspect. It is also crucial to ensure policy and regulation compatibility at both the state and regional levels to promote harmonious cluster development that fosters sustainable economic growth and environmental stability.

The results of the SWOT analysis of the meat product supply chain indicate the need to reduce threats, address weaknesses, and leverage opportunities to ensure stable cluster development. Establishing a favorable investment environment to attract public and

private investments is essential. Attracting investments and developing effective business plans are crucial tasks to ensure cluster development, competitiveness, and sustainable growth. Business plans should incorporate the adaptation of legislative policy, regulation of interaction processes between cluster participants, promotion of innovative solutions, and provision of a favorable environment for the development of small and medium-sized enterprises.

International experience should be utilized to implement advanced technologies and environmentally sustainable approaches to production.

The implementation of an effective system of environmental certification for meat products is crucial to ensuring high quality, safety, and competitiveness on the international market. To achieve success in the development of the meat cluster, coordination and support from government bodies and public organizations are necessary. The state can aid in the growth of the industry by creating the necessary infrastructure and regulatory framework to support it.

The development of the meat cluster plays a pivotal role in the sustainable growth of the industry and the country's economy. The success of the cluster depends on the effective collaboration among supply chain participants, attracting investments, using advanced technologies, and adopting an environmentally sustainable approach to production.

By establishing a cluster and an eco-industrial park, interaction and collaboration between enterprises can be fostered, leading to the growth of small and medium-sized businesses and increasing the competitiveness of the industry. The implementation of an environmental certification system will guarantee the high quality and safety of the meat products.

To facilitate the harmonious development of the cluster, it is necessary to ensure compatibility between state and regional policies and regulations, promoting favorable conditions for the sustainable growth of the industry. By addressing threats, compensating weaknesses, and seizing opportunities, a stable development of the cluster can be ensured. The creation of a cluster and eco-industrial park can play an instrumental role in the sustainable growth of the meat industry and the country's economy as a whole.

Collaboration between scientists, producers, suppliers, and authorities, as well as the adoption of principles of industrial symbiosis, can significantly contribute to the development of the meat cluster. Innovative technologies and job creation will be additional benefits.

The adaptation of technology and legislation to meet the needs of the ecological industry is vital to ensuring safety and minimizing waste, which will positively impact the meat industry cluster. By addressing threats, minimizing weaknesses, and seizing opportunities, sustainable growth of the cluster can be ensured.

Applying the principles of eco-industrial parks and cooperation between public and private structures can help support cluster development and ensure efficient use of resources. Attracting investments and developing business plans are important tasks to ensure the development of the cluster and its competitiveness.

It is also important to ensure the adaptation of legislative policy and legal regulation of interaction processes between cluster participants, including stimulation of innovative solutions and provision of a favorable environment for the development of small and medium-sized enterprises. Constant monitoring and evaluation of the results of the implementation of new solutions and technologies is a necessary step to ensure the sustainable growth of the cluster and increase its competitiveness. In addition, it is important to pay attention to staff training and technology adaptation to ensure safety

and minimize waste. Informational support for projects and initiatives in the field of cluster development also plays an important role in attracting new participants and partners to cooperation and popularizing the principles of sustainable development.

Considering the above, for the successful implementation of the first pilot projects of cluster cooperation in the meat segment based on eco-industrial parks, we recommend the following roadmap:

1. Establish a working group for the project consisting of representatives from manufacturers, suppliers, distributors, scientists, and authorities (as outlined in section 2.4.2.b, "Key participants in the supply chain of meat products who can become the first members of the initiative").
2. Develop the pilot cluster concept, including defining its purpose and tasks, analyzing opportunities and resources, and creating and implementing cooperation mechanisms between cluster participants to solve joint tasks, including the development of innovations.
3. Study the material flow of raw materials from cluster participants to identify opportunities for synergy and optimization of operational processes, energy and water use, increase safety in working with hazardous substances, improve waste management, and determine optimal technologies and standards for the production of meat products.
4. Develop the cluster's infrastructure, in particular, the development and implementation of energy-efficient and environmentally friendly technologies for meat processing and ensuring its quality and storage, including:
    - Using IoT and other modern technologies to improve monitoring and control of meat production, storage, and transportation processes;
    - Developing and implementing waste reduction and recycling programs at meat processing plants to reduce the negative impact on the environment;
    - Using waste processing to produce biogas and other useful products for energy supply and waste reduction;
    - Improving waste management systems and optimizing production processes to reduce the negative impact on the environment and preserve resources;
    - Exploring alternative sources of protein to create environmentally sustainable animal feed and improve development conditions to ensure animal health and welfare;
    - Developing and implementing biological pest control systems and applying agro-ecological approaches to ensure ecologically clean production and other ideas presented in section 2.4.2.d ("Support functions").
5. Attracting financial resources for the implementation of the project, in particular, from the state, investors and other sources.
6. Development and implementation of education and personnel training programs to ensure effective provision of access to the latest knowledge and technologies, as well as implementation of mechanisms for attracting talented specialists who will be able to work in the cluster and implement innovations.
7. Evaluation of the effectiveness of the implementation of the pilot project of cluster cooperation of the chain of food products of the plant group of goods based on the principles of eco-industrial parks. Analysis of results and determination of possible directions for further development of the cluster.
8. Development of a strategy and road map for the further development of the cluster, including definition of tasks and goals, development of innovative projects and attraction of new participants to the cluster.

9. Expansion of the network of contacts and partnerships with other clusters, institutions and organizations that can become potential partners for the development of the cluster.
10. Attracting public and private investments for the implementation of cluster development projects and ensuring its financial stability.
11. Increasing the level of information support and popularization of projects and initiatives in the field of cluster development by organizing conferences, seminars and other events involving participants and partners.
12. Regular monitoring and evaluation of cluster performance, including analysis of competitiveness and environmental impact. Implementation of measures to solve problems that arise in the process of cluster development.
13. Cooperation with authorities and institutions to ensure support and stimulation of cluster development, including the development and implementation of state support programs for clusters.
14. Conducting marketing research to determine consumer demand for the cluster's products and developing a marketing strategy for its promotion on the market.
15. Implementation of a pilot project of cluster cooperation based on the meat industry to produce high-quality and environmentally friendly products.
16. Development and implementation of a system for monitoring environmental and economic indicators of the cluster's activity for continuous improvement and improvement of the environmental efficiency of production.
17. Development and implementation of mechanisms for disseminating information about the cluster's successes on the market and in the field of sustainable development.
18. Development and implementation of programs to increase environmental awareness among consumers and the population.
19. Attracting new participants to the cluster and expanding the network of cluster cooperation.
20. Increasing the competitiveness of cluster products on the market by improving quality and reducing production costs.

These actions will help ensure ecologically clean and high-quality products of the meat food chain, promote them on the market, attract new participants and increase the competitiveness of the cluster.

The Business Case for the 'Recovery of Low Commercial Value Protein from By-products of Pig Slaughter' Project of the INNOVACC Cluster"

The INNOVACC cluster brings together innovative enterprises in the pig industry in Catalonia. It has joined efforts with the Catalan government to minimize the impact of climate change and promote the energy transition. At the First Catalan Climate Change Summit in January 2020, which brought together 100 representatives from the meat industry, pig feed producers, support services, universities, and R+D+I, INNOVACC proposed an initiative to reduce the negative impact on the environment of its participants by maximizing the use of low commercial value products obtained from meat processing plants.

One of the projects implemented by INNOVACC was the "Recovery of Low Commercial Value Protein from By-products of Pig Slaughter." The goal of the project was to develop a system for maximum use of products of low commercial value as a source of proteins and ingredients of high biological value. As a result, INNOVACC participants learned how to extract and wash protein fractions from different parts of pigs, such as the liver, heart, and spleen, and use them as ingredients in the food industry. Optimal conditions

for the formation of Zn-protoporphyrin from pig liver to obtain two types of ingredients with coloring properties were also determined.

In addition, the "Recovery of Low Commercial Value Protein from By-products of Pig Slaughter" project has a positive impact on the environment, reducing waste and reusing materials. The use of these new ingredients makes it possible to reduce the consumption of resources and energy that are usually used to make traditional ingredients such as soy, wheat, and others. Moreover, the reduction of nitrates and nitrites in meat products made using these new ingredients is good for human health because nitrates and nitrites can be harmful to consumers.

It is also important to note that the "Recovery of Low Commercial Value Protein from By-products of Pig Slaughter" project stimulates innovation in the meat industry, increasing the competitiveness of the industry as a whole. The INNOVACC cluster continues to develop new projects aimed at improving environmental sustainability and increasing the competitiveness of products, which contributes to its status as a leader in innovation in the meat industry.

2.4.3. Forest Products Supply Chain.

2.4.3.a. Forest Products Supply Chain Mapping.

The path of the forest industry supply chain begins with wood (wood) and additional components or, in the case of reusable materials, from the moment the material is recycled, pass to the place where this product is consumed or disposed of for further processing through effective recovery and the creation of valuable secondary resources for consumption. In the forestry industry, wood and its residues can be used in several different ways, creating a complex system of dependencies: an industrial ecosystem with numerous industrial symbiosis that share a mutual interest in the efficiency of resource use. The material flow of the chain goes from left to right. However, some products consist of more than one previous product. This whole long-term process can be depicted using mapping (Fig. 2.4.20.).

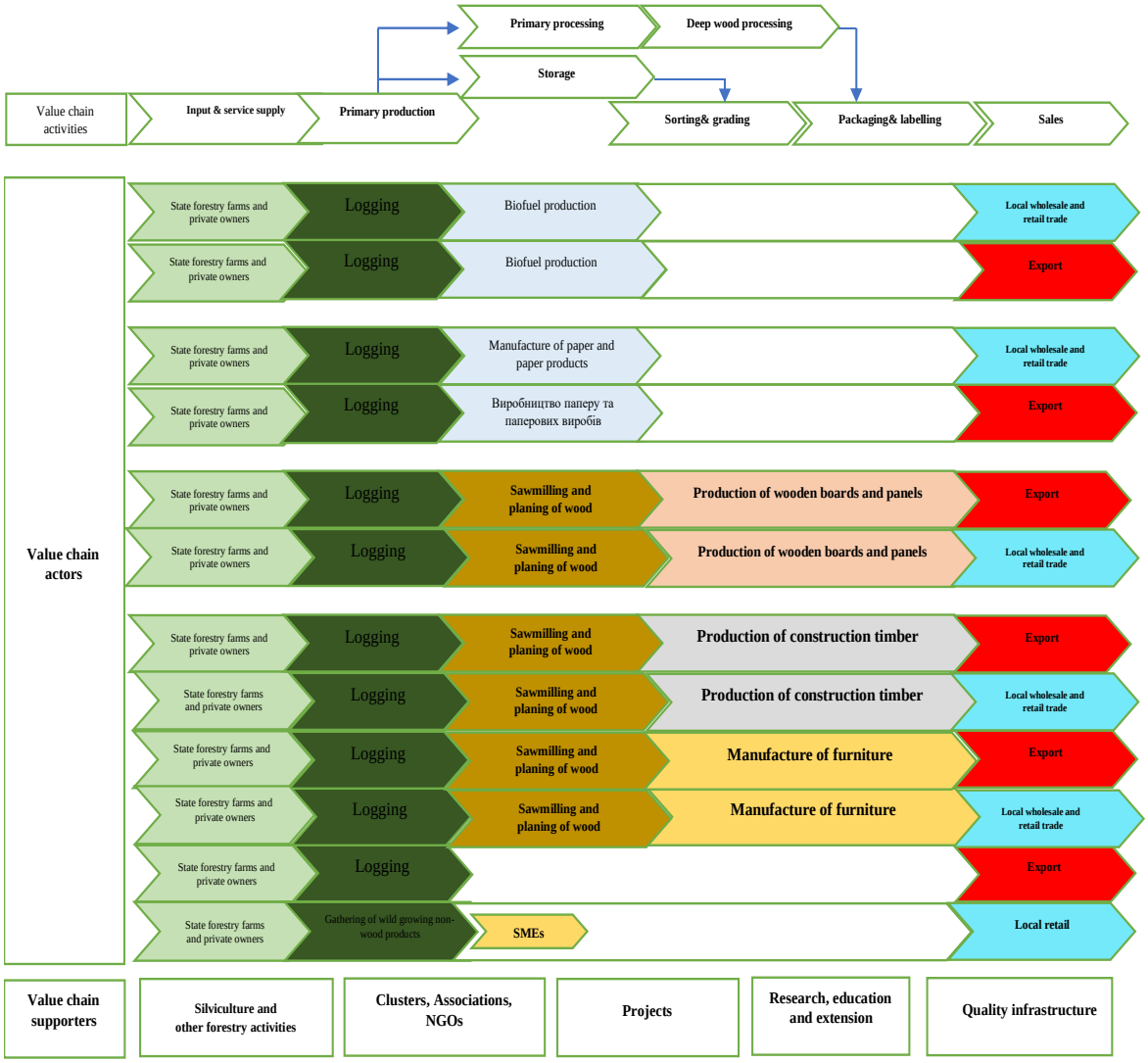

Fig. 2.4.20. Forest Products Supply Chain Mapping. (Source: IPG developments)

Based on the mapping of the forest industry chain, the study will highlight the following links:

- **1st link – Raw material segment** Raw material segment. It includes forest resources and forestry (growing forests and conducting forest protection measures). Other input resources which used in woodworking production, have been left out to simplify analysis.
- **2nd Link – Logging (**unprocessed timber or fuel wood) and collection of wild non-wood products (mushrooms, truffles, berries, nuts, cork bark, shellac (natural varnish) and resin, balms, vegetable pile, other secondary forest materials and products of secondary forest use);
- **3rd Link – Primary processing** (sawmill and planing production, paper and paper production, bioenergy industry);
- **4th Link – Secondary processing (**timber, boards (chipboard, fiberboard, MDF, OSB, etc.) and containers, furniture);
- 5th **link – Trade** (wholesale, retail and export).

1. The market for the provision of forest resources and services (raw material segment) is the first link in the supply chain of the forest industry.

In view of the above, the first link in the chain reflects its main components: forestry lands, cultivation and reproduction of forests, soils. The largest forest cover of Ukraine in terms of total area is recognized - in Zakarpattya (51.4%), Ivano-Frankivsk (41%), Rivne (36.4%), Zhytomyr (33.6%), Volyn (31%), Chernivtsi (29.2%), Lviv (28.5%) and others.

First-level services

- forestry and logging provide:
  - growing wood by root: planting, transplanting, diving, thinning and preservation of forests and massifs;
  - cultivation of saplings and balance wood in forested areas;
  - functioning of forest nurseries.
- logging: felling timber and producing raw timber such as props, split poles, pickets or firewood;
- activities of the forestry service: inventory of forests, assessment of wood, fire protection;
- other activity: transportation of logs in the forest.

Certification of forests.

Supply chain certification tracks certified material throughout the entire production process from forest to consumer, including all successive stages of processing, transformation, production, and distribution. Most often, it is customary for all participants in the production process to be marked and certified in accordance with one system.

Today there are more than 50 different forest certification programs. The most popular international forest certification schemes are:

- FSC (Forest Stewardship Council – Forest Supervisory Board);
- PEFC (Program for Endorsement of Forest Certification Schemes – Program for approval of forest certification systems);
- SFI (Sustainable Forest Initiative);
- CSA (Canadian Standards Association Sustainable Forest Management Program - Canadian Program of the Association for Sustainable Forest Management Standards);
- AFTS (The American Tree Farm System – American Forest Plantation System).

There are two volunteer certification systems in Ukraine: FSC and PEFC International. Under the FSC system, 3.83 million hectares were certified in 95 enterprises. According to the PEFC system (began to operate in Ukraine in 2019) - for forestry.[148][149]

Despite its advantages, forest certification is not one hundred percent safeguard against illegal timber entering the market.

Features of the functioning of the market of the first link

[148] Certification systems in Ukraine as of October 8, 2022 https://ua.fsc.org/ua-uk/fsc-facts-figures-in-ukraine

[149] Certification systems in Ukraine http://woodcertification.com.ua/PEFC-International

The use of forest resources is conducted in the order of general and special use. In the order of general use of forest resources, citizens have the right to freely stay in forests, to collect wild grass plants, flowers, berries, nuts, and other fruits for their own consumption free of charge, except in cases stipulated by legislative acts. Special use of forest resources has its own classification, which is based on the purpose of forest management.

According to Art. 65 LCU types of special forest use are timber harvesting during felling of the main use and other types of special use. Planning of the size and places of logging should be conducted on the basis of forest management materials (Forestry Organization and Development Project), which are developed by specialized forestry organizations for a 10-year period]. The restriction (limit) of timber harvesting is the calculated logging (for felling of the main use) and the plan for conducting sanitary and recreational measures in the forests.

Plans for sanitary and recreational measures are drawn up annually by permanent forest users with the participation of forest protection specialists based on forest management materials, sanitary and forestry surveys.

The legislation provides for a complex procedure for coordinating the volume of logging with public authorities. For example, forestry organizations take into account the size of the recommended calculated forestry for each forest owner during the next forest management cycle, which occurs once every 10 years. This assessment is done at a forestry meeting that involves representatives from various entities, including the executive body on forestry of the Autonomous Republic of Crimea, regional forestry and hunting departments, the executive body on environmental protection of the Autonomous Republic of Crimea, territorial bodies of the Ministry of Environment, executive authorities, and local self-government bodies (with their consent). Additionally, other stakeholders, such as local communities and activists from public organizations, are given the opportunity to participate in discussions regarding the size of deforestation in the relevant territory.

Upon thorough consideration, the proposals are forwarded to the OULMG for approval by the regional bodies of the Ministry of Environment and regional state administrations. Subsequently, the State Forestry Agency reviews the proposals and sends them to the Ministry of Environment for final approval along with their recommendations.

Link risks

Forests face a few threats such as storms, droughts, fires, pests and diseases, as well as air pollution. Climate change (e.g., global warming), changes in rainfall patterns, and the frequency and intensity of extreme weather conditions can potentially affect forest areas in a variety of ways.

Modern forest areas can be lost due to: desertification; the number of forest fires can be affected by changes in the frequency and strength of drought; areas affected by diseases and pests may die off; Geographical zones suitable for growing individual tree species may change due to changes in climatic and soil conditions.

Logistics and infrastructure

All built forest roads play an important role in the harvesting, transportation, and subsequent shipment of wood to consumers. They facilitate the work of forest protection, and in the event of a fire, significantly increase the chances of its prompt detection and localization.

The creation of a network of forest roads in forestry and production activities provides:

- development of the forestry fund in hard-to-reach wetlands;
- arrangement of a grid of upper intermediate warehouses, which makes it possible to simultaneously reduce the volume of work at lower warehouses;
- use of large-sized vehicles and vehicles with hydromanipulators in the export of wood, which, in turn, will reduce the cost of wood transportation.

Currently, the Ukrainian State Forest Agency's AUU "Ukrderzhlisproekt" is working on providing GPS tracks of forest highways for electronic mapping purposes.

Opportunities for small and medium-sized businesses

Forest users constantly purchase the following types of services:

- Logging work (felling of forest crops, sorting, packing, cleaning of logging).
- Transportation of harvested wood (trilling whips, pruning knots, transporting whips to lower warehouses)
- Lower warehouse work (spinning whips, sorting assortments)

1. Logging (unprocessed timber or fuel wood) and harvesting wild non-wood products (mushrooms, truffles, berries, nuts, cork bark, shellac (natural varnish) and resin, balms, vegetable pile, other secondary forest materials and products of secondary forest use) are the second link in the supply chain of the forest industry.

An illustration of the second link in the forest-based supply chain summarizes the production stages for further variations in the direction of flow of goods for their intended purpose. That is why logging is a key area that determines the development of the forestry industry, which means:

- harvesting round timber for the wood processing industry;
- harvesting round timber that is used in its raw form, such as slats, fences, poles and others;
- harvesting and harvesting of fuel wood;
- collection and processing of fuelwood waste left after its harvesting;
- charcoal harvesting in the forest (traditional method).

The result of this activity is unprocessed timber or fuel wood.

It is logging that falls under the concept of a natural monopoly. But the harvesting of wild non-wood products is an example of an industry dominated by small businesses. The activities of business entities are limited to the approved limits of regional councils, the control of which is provided by permanent forest users. [150]

[150] Decree of the Cabinet of Ministers of Ukraine from April 23, 1996 N 449 «On approval of the Procedure for harvesting secondary forest materials and the implementation of secondary forest uses in the forests of Ukraine» https://zakon.rada.gov.ua/laws/show/449-96-%D0%BF#Text , paragraph 22 of Article 43 of the Law of Ukraine "On local self-government in Ukraine»

Also, state forestry enterprises form more than 90% of all employment in the field of logging. In the first half of 2022, the number of people employed at state forestry enterprises is 37.4 thousand people. (-9.3% by 2021), as opposed to 41.27 thousand people in 2021. (-3.24% by 2020) and in 2020 – 42.65 thousand people.

Features of the functioning of the market link

The use of forest resources in the allocated forest area is conducted under a special permit - a logging or forest ticket, issued free of charge. A logging ticket is issued for a period of 1 year by the executive body on forestry of the Autonomous Republic of Crimea, by the territorial bodies of the State Forest Agency for timber harvesting during felling of the main use based on the calculated logging approved in accordance with the established procedure. Forest users, after transferring forest plots to them and receiving a logging or forest ticket, conduct on them, and, if necessary, in adjacent areas, in the prescribed manner, the relevant work.[151][152][153]

The reforms of the industry in 2019-2020 changed the outdated and corrupt ways of selling timber, which were characterized by the conclusion of direct contracts. They accounted for more than 50% of contracts.[154]

According to the head of the State Forest Agency Yuriy Bolokhovets dated 12.05.2022, all unprocessed and processed wood will be sold only through transparent auction auctions - licensed exchanges. Direct agreements concluded at the beginning of martial law will be valid until the end of May. In addition to electronic auctions, the exchange will provide a transparent electronic tool – a bulletin board. Without auctions, wood is sold exclusively to the population, the social sphere and is supplied for the needs of the Armed Forces of Ukraine and the territorial defense.[155]

As of 31.12.2021, 567 permanent forest users are connected to the electronic wood accounting system, of which 328 are state forestry enterprises, 30 are state organizations (institutions), 153 are communal enterprises and institutions, 56 are forest users belonging to other organizational and legal forms of management.

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https://zakon.rada.gov.ua/laws/show/280/97-%D0%B2%D1%80#Text , paragraph 5 of Article 30 of the Forest Code of Ukraine https://zakon.rada.gov.ua/laws/show/3852-12#Text , Act of the Cabinet of Ministers of Ukraine from May 23, 2007 N 761 «On the settlement of issues related to the special use of forest resources»

[151] Resolution of the Cabinet of Ministers of Ukraine of May 23, 2007, No. 761 "On settlement of issues related to the special use of forest resources."

[152] Every year more than 40,000 logging tickets and 110,000 certificates of origin of timber are issued in Ukraine. There are 2 things inherent in these business processes: support with documentation in paper format and outdated licensing procedures, which creates conditions for corruption risks and makes it impossible to exercise proper state control over deforestation.

[153] As of the end of 2021The regulatory requirements will apply only to 850 business entities that harvest wood and must receive logging tickets. In accordance with the criteria for determining the size of enterprises in Ukraine, which are established by Art. 55 of the Commercial Code of Ukraine, 619 business entities belong to small enterprises and 231 – to medium-sized enterprises.

[154] Resolution of the Cabinet of Ministers of Ukraine dated 04.12.2019 No. 1178, the Law of Ukraine "On Amendments to Certain Legislative Acts of Ukraine on Simplification of Attracting Investments and the Introduction of New Financial Instruments" dated 19.06.2020 No. 738-IX, a new version of the Law of Ukraine "On Capital Markets and Organized Commodity Markets" and "On Commodity Exchanges".

[155] The social sphere and is supplied for the needs of the Armed Forces of Ukraine and the territorial defense https://forest.gov.ua/news/prozori-rinkovi-torgi-derevinoyu-zaminili-korumpovani-pryami-dogovori

2. Primary processing (sawmill and planing production, paper and paper production, bioenergy industry) is the third link in the supply chain of the forest industry.

The incoming flow of the main goods of the second link forms the market for primary processing of forestry.

Sawmill and planing lumber, or related side flows, for this reason are commonly used for a wide range of products such as wood-based panels, solid wood products, construction products (such as window beams and doors), wood chips and sawdust for bioenergy. For example, wood waste obtained from sawmill wood in the production of lumber can be a source of raw materials for manufacturing particleboard or chipboard, or for the production of cellulose. The amount of wood waste directed to the side streams will depend on the type of sawmill wood and on the structure of the sawmills where such raw materials are processed.

Production of paper and paper products: paper pulp, paper and cardboard, paper and cardboard products, corrugated paper and cardboard, paper and cardboard containers, household and sanitary products, stationery, wallpaper, etc.

Bioenergy industry processes residues and sideflow raw materials such as wood chips, sawdust and bark, which can be used to produce bioenergy or converted into biofuels.

3. Secondary processing (timber, boards (chipboard, fiberboard, MDF, OSB, etc.) and containers, furniture) is the third link in the supply chain of the forest industry.

- Construction timber: production of plywood, wooden boards and panels, veneer and other wooden construction structures and carpentry products;
- Wooden containers and panels;
- Furniture.

Trade (wholesale, retail and export) is the fifth link in the supply chain of the forest industry.

- activities of intermediaries in the sale of wood, building materials and sanitary products;
- installation of joinery;
- activities of intermediaries in the sale of furniture, household goods, iron and other metal products;
- wholesale of furniture, carpets and lighting accessories;
- wholesale of office furniture;
- retail sale of furniture, lighting and other household goods in specialized stores;
- repair of furniture and household utensils.

Forestry is more associated with activities such as the woodworking industry and the production of furniture, which can form one macro cluster with a full cycle of the production process – from growing forests to producing final products (furniture). Thus, considering the empirical and econometric approaches to the analysis of the information obtained during the study, it is possible to determine such ratings of the formation of forest clusters in the regions of the relocation program (Table 2.4.15). All assigned ranks are averaged by regions and indicators.

Table 2.4.15. Rating of forest supply chain cluster formation by region (Source: IPG calculations)

Relocation region	Investment attractiveness *	Rational placement **	Job creation***	Concentration of enterprises****	Rating
Lviv	9	5	8	8	1
Zakarpattya	8	9	6	7	2
Ivano-Frankivsk	5	7	6	8	3
Rivne	6	8	6	5	4
Volyn	6	7	6	5	5
Vinnytsya	7	3	4	4	6
Khmelnytskiy	3	2	4	4	7
Chernivtsi	2	4	5	3	8
Ternopil	2	2	3	1	9

*Investment attractiveness – the average rank of the point monetary assessment of capital investments in the manufacture of wood products, paper production and printing activities, the production of furniture and other products for 2020-2021.

** Rational placement (constancy of forest resources) - the average rank of the point estimate of the area covered with forest vegetation of forest areas and by forest cover.

***Job creation is the average rank of the point estimate of the number of employed populations along all parts of the chain for 2017-2022.

****The concentration of enterprises is the average rank of the point estimate of the number of enterprises along all links in the chain for 2017-2020.

For grouping regions by level clustering (Fig. 2.4.20) is carried out according to the following definitions:

1st level of the cluster: the regions that have the greatest attractiveness in forest clustering on the principles of EIP in favor of building the industry and creating conditions for business relocation, increasing jobs to attract internally displaced persons;

2nd level of the cluster: districts that have a good attractiveness for forest clustering on the principles of EIP in favor of building the industry and creating conditions for business relocation, increasing jobs to attract internally displaced persons;

3rd level of the cluster: districts that have sufficient attractiveness for forest clustering on the principles of EIP in favor of building the industry and creating conditions for business relocation, increasing jobs to attract internally displaced persons;

4th level of the cluster: areas that have the least attractiveness in forest clustering on the principles of EIP in favor of building the industry and creating conditions for business relocation, increasing jobs to attract internally displaced persons.

Fig. 2.4.21 Level-cluster analysis of forest cluster development by regions

Source: IPG developments

Level-cluster analysis of forest cluster development the regions of 9 relocation regions in terms of priority activities showed that the first level of the cluster includes: Lviv, Zakarpattya, Ivano-Frankivsk regions, to the second level: Rivne, Volyn, region, to the third level: Vinnytsya region, to the fourth level: Khmelnytskiy, Chernivtsi, Ternopil regions.

2.4.3. b Key stakeholders in the forest products supply chain

- Forest users and forest owners.
- State forestry enterprises.
- Enterprises owned by forest equipment.
- Contractors of forest fund managers.
- Utilities responsible for park facilities and green spaces.
- Local governments coordinate the activities of forestry and hunting departments, allocate for permanent use, transfer ownership of forest areas, set a limit on the use of forest resources.
- **The State Forest Agency** implements the state policy in the field of forestry and hunting.

The only state forestry organization in the state is the State Forest Resources Agency of Ukraine (PA "Ukrderzhlisproekt").

Regional departments of forestry and hunting implement the powers of the State Forest Agency in the territories of the relevant administrative-territorial units in the field of forestry and hunting.

- **Ministry of Economy of Ukraine** - is the main body in the system of central executive bodies that ensures the formation and implementation of state policy of economic, social development and trade,
- **The State Service of Ukraine for Food Safety and Consumer Protection (hereinafter referred to as SSUFSCP**) is the competent authority that implements the state policy in the field of safety and individual indicators of food and feed quality, animal health and welfare and veterinary medicine. The powers of the Main Department of the State Food and Consumer Service extend to the territory of the relevant region, the city of Kyiv, and the district.

- **The Ministry of Environmental Protection and Natural Resources of Ukraine is the main body in the field of forest relations, ensures the formation and implementation of state policy in the field of forestry, as** well as in the field of environmental protection, in the field of forest relations.

- **The State Forest Guard** monitors compliance with forest legislation, protection of forests from fires, illegal logging, pests.

- State Environmental Inspectorate (Ministry of Environment) implements the state policy on supervision (control) in the field of forest relations.

- **The State Emergency Service** performs a protective function (counteraction to forest fires).

- Scientific support of the industry:
  - 2 research institutes
  - 1 Project forestry production association
  - 1 training center
  - 2 state design and survey institutes
  - 7 state specialized forest protection enterprises (detection of cases of forest pathology)
  - Shatsk National Nature Park
  - 1 breeding center
  - 1 Forestry
  - 1 SE "Forestry Innovation and Analytical Center
- **The National Accreditation Agency of Ukraine (NAAU**) provides accreditation of conformity assessment bodies and further control over the compliance of accredited bodies with accreditation requirements. NAAU is a member of the International Cooperation on Laboratory Accreditation and a signatory to the Agreement on Mutual Recognition.
- **The Ukrainian Agency for Standardization** (State Enterprise "Ukrainian Research and Training Center for Standardization Problems") determines the conditions for harmonization of the national standardization system with international and European criteria, as well as the implementation of the Association Agreement between Ukraine and the European Union, in particular on the implementation of the necessary administrative and institutional reforms.
- **The State Enterprise "Ukrmetrteststandard"** is an all-Ukrainian state research and production center of metrology, certification, testing and consumer protection. Responsible for scientific metrology and for the coordination of industrial and legislative metrology. In the field of metrology, there are four designated institutes, which in national legislation are called scientific metrological centers. These scientific metrological centers are in Kyiv, Kharkiv, Lviv and Ivano-Frankivsk.
- The State Research Institute of Building Structures is the basic organization of scientific and technical activities in construction in the areas of creating a national regulatory framework integrated into the international regulatory space of technical regulation in construction, improving the reliability and safety of buildings and structures, ensuring energy efficiency, and improving the energy characteristics of buildings and structures. At their landfill in Kyiv, they check, for

example, building elements such as beams and wall elements, windows and doors, including atmospheric, sound and breathability.

- Technical standardization committees play a key role in standardization, as they have the responsibility to develop and compile standards, considering the proposals and comments of stakeholders. The project will then be ratified by national standardization organizations.
- Supporting chain organizations at the national level

  Stakeholders are made up of experts in a particular field who represent national committees, industry, professional associations, government, trade unions, as well as other stakeholders and national standardization bodies, including:

- **The state-owned company Forest Innovation and Analytical Center** is responsible for the implementation of electronic tracking of wood, forest auctions, certificates and mobile applications (in particular, the project "Forest in a Smartphone"). It issues a quarterly bulletin on the demand and supply of wood, prices and trends.
- **The Export Promotion Office** provides service to Ukrainian businesses to enter international markets, developing their competencies, partnership and cooperation, promotes Ukrainian goods and services abroad.
- **The Ukrainian Association of Furniture Manufacturers is** a voluntary, independent, non-profit association of enterprises created on the basis of equality, self-determination and community to protect the economic, legal, social and other interests of its members. The purpose of the Association is to unite the efforts of furniture manufacturers to protect and expand their rights and interests, as well as to promote the development of the domestic furniture business.
- **Association of furniture and woodworking enterprises of Ukraine "MEBLIDEREVPROM"** unites leading enterprises to produce furniture and other wood products. Member companies of the Association annually use more than 5 million cubic meters of wood. The enterprises that are members of the Association produce for domestic consumption and for export. The main purpose of the Association is to develop domestic production, increase the competitiveness of wood products and expand it sales in the domestic and foreign markets. "Mebliderevprom" actively cooperates with the Verkhovna Rada and the Government of Ukraine and other state authorities. The Association is a member of the European Federation of Furniture Manufacturers (UEA) and the World Furniture Confederation.
- **The Union of Ukrainian Entrepreneurs** unites more than 500 companies from various industries, protects the interests of members in the field of entrepreneurship and a favorable business environment in Ukraine. One of its goals is to support the export of Ukrainian-made goods, and one of the committees deals, in particular, with furniture.
- **The Ukrainian Association of Window Systems (UAWS)** unites manufacturers of all types of windows, including wooden windows. She also chairs the 300 Doors and Window Technical Committee.

- There are the first cluster groups and neoplasm promising associations, such as:
  - Cluster "Woodworking Industry" as part of the Lviv Industrial Hub;
  - Cluster of woodworking and furniture production (Lviv);
  - Wood processing cluster of Cherkasy region;
  - Ukrainian Association of Woodworking Equipment;

- Association "Wood processors of Ukraine" in Vinnitsa
- Wood processing associations of district or regional level, including in Zakarpattya; Khmelnytskiy region; Volhynia; Nadvirna district, Lviv region; Kiev; Bukovina; Prykarpattya; The Lviv Union of Woodworkers and Loggers are just a few of them.

Their activities are mostly situational and often associated with lobbying for access to raw materials and improving the regulation of access to them.

» Import Facilitation Service (IPD)

The German Import Promotion Agency is funded by the German Federal Ministry for Economic Cooperation and Development. IPD has been operating in Ukraine for many years and recently has also been focusing on the timber sector. They are a valuable resource for solving all issues related to the promotion of demand for the export of Ukrainian wood.

» **The German-Ukrainian agro-policy initiative** provides for advising Ukrainian business and supports, among other things, a transparent forest policy and increasing the competitiveness of Ukrainian exports in view of the EU-Ukraine Association Agreement.

» **Chambers of Commerce and Industry are** non-governmental, non-profit, self-governing organizations that unite legal entities and citizens from Ukraine who are registered as entrepreneurs, as well as their associations, on a voluntary basis.

2.4.3. c. Assessing the cost, profit, marketing, and supply and demand dynamics.

The cost structure of forestry supplies is calculated by grouping the costs of production of enterprises by type of economic activity, calculating the average for the period 2017-2020. shares of material costs, depreciation, labor costs, buckets of social protection and other expenses for each link of the supply chain and its components (Table 2.4.16).

Table 2.4.16. Phased costs of the forest supply chain for 2017-2020 in %

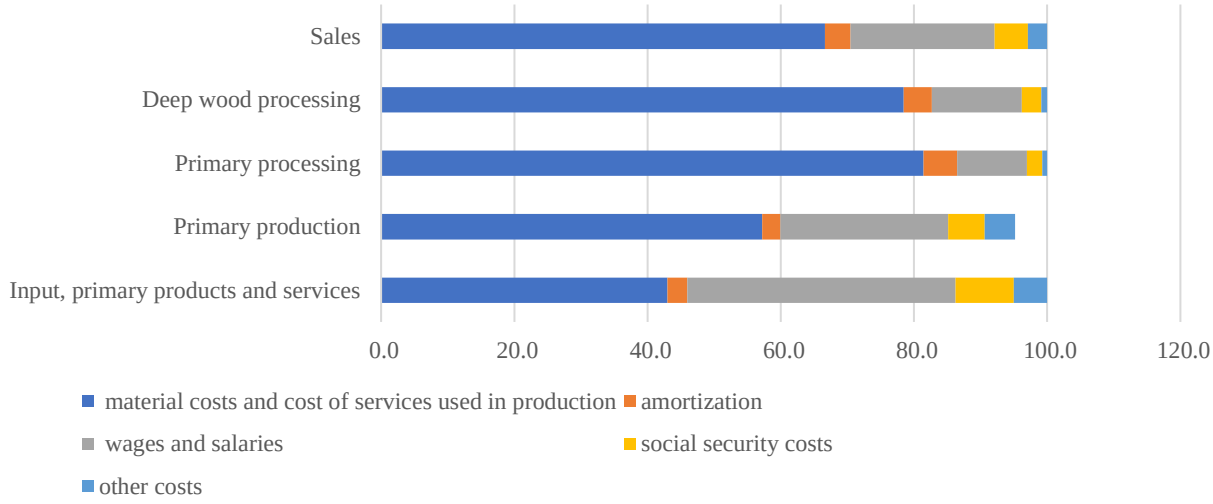
Links in the forest products supply chain	material costs and costs of services used in production	amortization	wages and salaries	Social Security Costs	other costs
Input resources, primary products and services	**43,0**	**3,0**	**40,3**	**8,7**	**5,0**
silviculture and other forestry activities	43,3	3,1	38,6	8,3	6,7
support services to forestry	42,7	2,8	42,1	9,2	3,3
Primary production	**57,2**	**2,7**	**25,2**	**5,5**	**4,6**
gathering of wild growing non-wood products	74,6	2,2	13,5	3,1	1,4
logging	44,2	3,3	36,8	7,9	7,8
Primary processing	**81,4**	**5,0**	**10,5**	**2,3**	**0,7**
manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	79,2	5,4	11,9	2,7	0,8
manufacture of paper and paper products	85,2	3,6	8,8	1,9	0,5
sawmilling and planing of wood	79,9	6,0	10,8	2,4	0,9
Deep wood processing	**78,5**	**4,2**	**13,5**	**3,0**	**0,9**
manufacture of other builders' carpentry and joinery	80,6	3,5	12,3	2,7	1,0
manufacture of furniture	76,2	3,3	16,4	3,4	0,6
Manufacture of veneer sheets and wood-based panels	81,5	5,9	10,2	2,1	0,4
Manufacture of assembled parquet floors	77,0	4,2	14,3	3,3	1,1
Sales	**66,7**	**3,8**	**21,6**	**5,0**	**2,9**
Agents involved in the sale of timber and building materials	85,9	2,2	6,7	1,5	3,8
Agents involved in the sale of furniture, household	79,6	3,2	12,3	3,0	1,9

goods, hardware and ironmongery					
Wholesale of furniture, carpets and lighting equipment	62,1	8,0	22,9	5,3	1,8
Wholesale of office furniture	53,3	5,4	32,3	6,7	2,4
Repair of furniture and home furnishings	45,7	2,1	36,0	9,2	7,1
Retail sale of furniture, lighting equipment and other household articles in specialized stores	52,9	4,4	32,6	7,5	2,7
Joinery installation	87,2	1,5	8,5	2,1	0,8

Source: State Statistics Service of Ukraine

Fig. 2.4.22 shows the structure of phased costs of the forest supply chain in 2017-2020.

Fig.2.4.22. Structure of phased costs of the forest supply chain (average indicators for the period 2017-2020)



Source: State Statistics Service of Ukraine

According to the table 2.4.16 and Fig. 2.4.22., the first link Input resources and primary products of the supply chain of forest products is labor-intensive. Almost half of the costs of its sectors are labor costs with social charges (49%), which is explained by the features of the activity associated with high involvement of human labor (forestry, provision of services, etc.). All other links of this chain can be classified as material-intensive since the majority in the structure of their costs are material costs and payment for production services. The most material-intensive stage is the stage of primary wood processing with an average share of material costs of 81.4%, in which the share of material costs in the Paper and paper products sector reaches 85.2%. The sector with the largest share of

material costs in the supply chain of forest products is Installation of carpentry products (87.2%), which belongs to the Sales link.

Accrued labor costs are the second most important cost element in all links of the forest product supply chain, except for link 1, in which they are the main one and which was discussed above. The types of activities where this group of expenses has a large share in the total amount are Forestry in the Primary production chain (44.7%), Repair of furniture and household utensils (45.2%) and Wholesale of office furniture (39%) in the Sales chain.

The share of amortization costs in the supply chain is insignificant. The largest structural share of amortization costs is provided at the stage of primary processing (5%).

The profitability assessment of all individual supply chains of forest products was carried out according to the indicator of the profitability of the operational activities of large, medium and small enterprises. Average values of profitability indicators are given in the table. 2.4.17.

At the first stage Input resources, primary products and services of this supply chain, the level of profitability is low (about 3-4%) and is provided within the limits of medium and small businesses. At the stage of Primary production in the field of harvesting wild non-wood products, the profitability exceeds the average level (11.2% against the average of 7.4%) and is achieved by small enterprises. Large sawmill and planning enterprises achieved a level of profitability of 15.1% in the chain of primary processing. This number is significantly higher than the average at this stage of the supply chain (5.5%). At the next stage of Deep wood processing, the average level of profitability is 16.2%. The maximum level of 20.2% is provided by large enterprises in the production of plywood, wooden boards and panels, veneer. The Sales line is the most profitable in the supply chain of forest products with an average level of profitability of 16.2% and the maximum level - at medium-sized enterprises of wholesale trade in furniture, carpets and lighting accessories (38.2%), which is the highest indicator of profitability in the entire chain.

Table 2.4.17. The level of profitability (unprofitability) of the operational activities of the chain of forest products for 2017-2021

Supply chain links	Medium	large enterprises	medium enterprises	small enterprises	of which microenterprises
Input resources, primary products and services	**2,9**		**3,2**	**2,4**	**2,9**
silviculture and other forestry activities	4,0		4,1	3,3	3,3
support services to forestry	1,8		2,3	1,6	2,4
Primary production	**7,4**		**3,6**	**7,7**	**3,9**
gathering of wild growing non-wood products	11,2			11,2	5,9
logging	3,6		3,6	4,1	1,8
Primary processing	**5,5**	**11,6**	**4,9**	**3,6**	**3,4**
manufacture of other products of wood; manufacture of articles of cork, straw	4,2		4,1	3,7	5,3

and plaiting materials"	8,1	8,1	8,8	4,2	2,6
manufacture of paper and paper products	4,3	15,1	5,3	2,9	2,3
Deep wood processing	**6,5**	**17,1**	**6,0**	**6,7**	**9,3**
Manufacture of wooden containers	4,4		5,6	3,4	2,3
manufacture of other builders' carpentry and joinery	3,9		4,3	3,3	1,9
manufacture of furniture	6,7	14,0	7,1	4,0	3,0
Manufacture of veneer sheets and wood-based panels	13,7	20,2	10,6	10,4	6,2
Manufacture of assembled parquet floors	3,6		6,1	15,0	32,9
Sales	**16,2**		**27,8**	**13,8**	**17,6**
Agents involved in the sale of timber and building materials	25,2		11,0	26,4	27,2
Agents involved in the sale of furniture, household goods, hardware and ironmongery	11,5			11,4	19,9
Wholesale of furniture, carpets and lighting equipment	26,6		38,2	21,7	19,5
Wholesale of office furniture	28,3			29,1	35,5
Repair of furniture and home furnishings	7,0			7,0	6,6
Retail sale of furniture, lighting equipment and other household articles in specialized stores	11,8		15,5	6,1	11,8
Joinery installation	2,9		4,8	2,8	3,0

Source: State Statistics Service of Ukraine

The calculation of the intensity coefficients, which characterize the ratio of individual links as suppliers and/or buyers of products of previous and/or subsequent participants in the chain, makes it possible to assess the dynamics of supply and demand in the supply scheme of forest products. In the table 2.4.18. shows the initial indicators for calculating the dynamics of supply and demand (Table 2.4.18.).

Table 2.4.18. Initial data for calculating supply/demand indicators (intensity factors) for links in the forest products supply chain

Links of the supply chain of food products of plant group of goods	Years	Forestry and other forestry activities, UAH ths.	Timber harvesting, ths. UAH	Sawmilling and planing production, UAH ths.	Furniture production, UAH ths.	Wholesale of furniture, carpets and lighting accessories, UAH ths.
Input resources, primary products and services						
	2017	3867396,5				
	2018	4450497,8				
	2019	4163505,4				
	2020	4408292,5				
Primary production						
	2017		13401166,1			
	2018		16674822,2			
	2019		15345962,1			
	2020		14679256,5			
Primary processing						
	2017			16910006,3		
	2018			22013480,8		
	2019			20551327,5		
	2020			22174595,3		
Secondary processing	2017				20450057,9	
	2018				25304042,8	
	2019				28232966,7	
	2020				32473655,2	
Sales	2017					4687387,4
	2018					6156658,0
	2019					6572889,3
	2020					8513592,0

Source: IPG calculations

The assessment of demand/supply is carried out based on the coefficients obtained as a result of dividing the relevant statistical data of each subsequent link of the supply chain by the data of the previous link for each year of the analyzed period, the values of which are given in the table. 2.4.19.

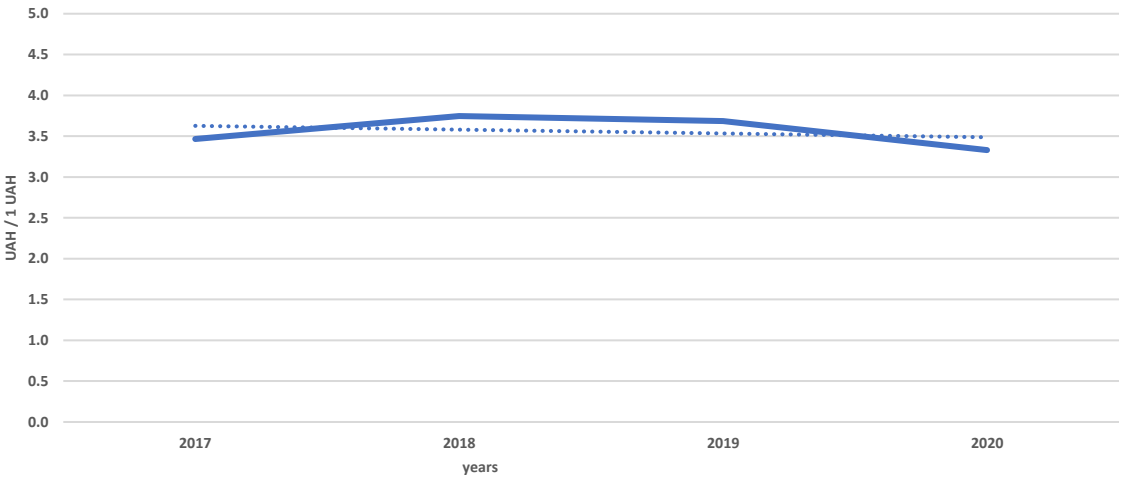
Table 2.4.19. Assessment of demand/supply in the supply chain of forest products

Links in the supply chain of food products of the plant group of goods	Years	Volume of logging per 1 UAH of forestry and other forestry activities, UAH / 1 UAH.	Volume of sawmilling and planing production per 1 UAH of logging, UAH / 1 UAH	Volume of furniture production per 1 UAH of sawmill and planing production, UAH / 1 UAH.	Volume of wholesale trade in furniture, carpets and lighting accessories per 1 UAH of furniture production, UAH / 1 UAH.
Primary production					
	2017	3,5			
	2018	3,7			
	2019	3,7			
	2020	3,3			
Primary processing					
	2017		1,26		
	2018		1,32		
	2019		1,34		
	2020		1,51		
Secondary processing	2017			1,21	
	2018			1,15	
	2019			1,37	
	2020			1,46	
Sales	2017				0,23
	2018				0,24
	2019				0,23
	2020				0,26

Source: IPG calculations

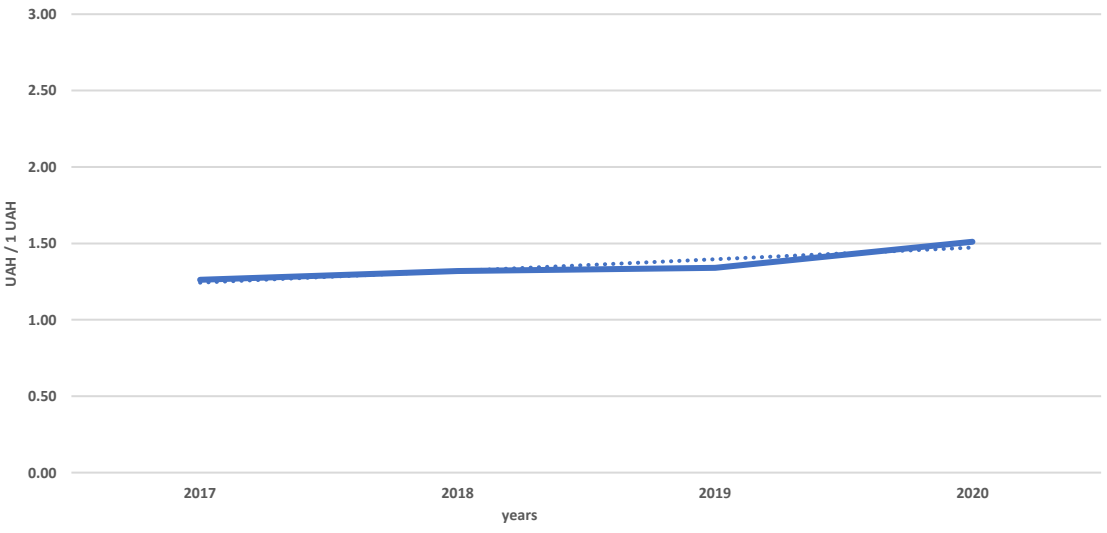
For the interpretation of the obtained data and the analysis of supply / demand in the supply chain of forest products, the dynamics of the calculated coefficients is shown clearly on the line graphs (Fig.2.4.23.-Fig.2.4.26.).

Fig.2.4.23. The volume of logging for 1 UAH. forestry and other forestry activities, UAH. / 1 UAH



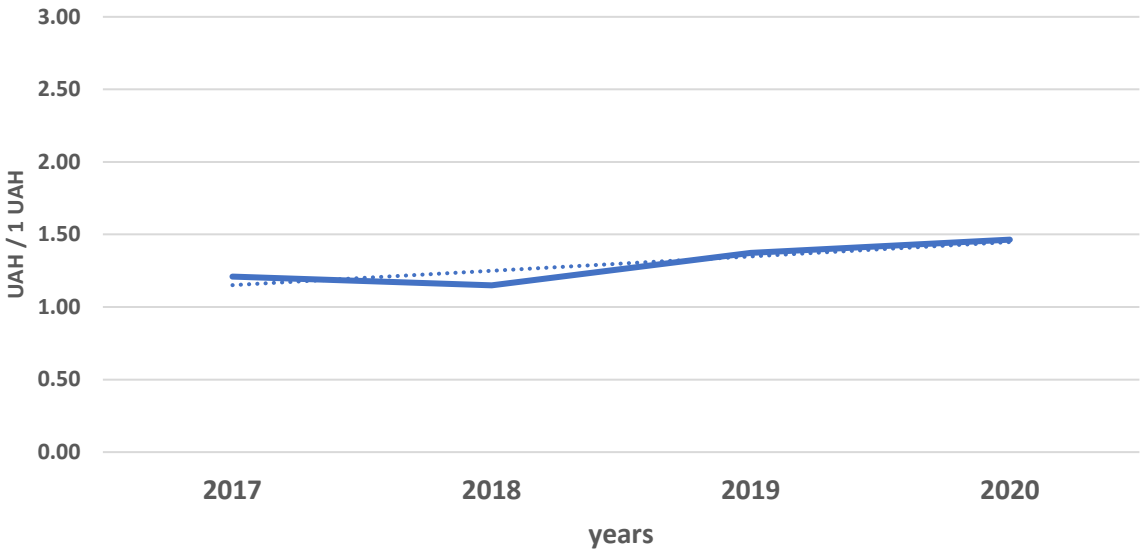
Source: IPG calculations

Fig.2.4.24. The volume of sawmill and planing production for 1 UAH. logging, UAH. / 1 UAH



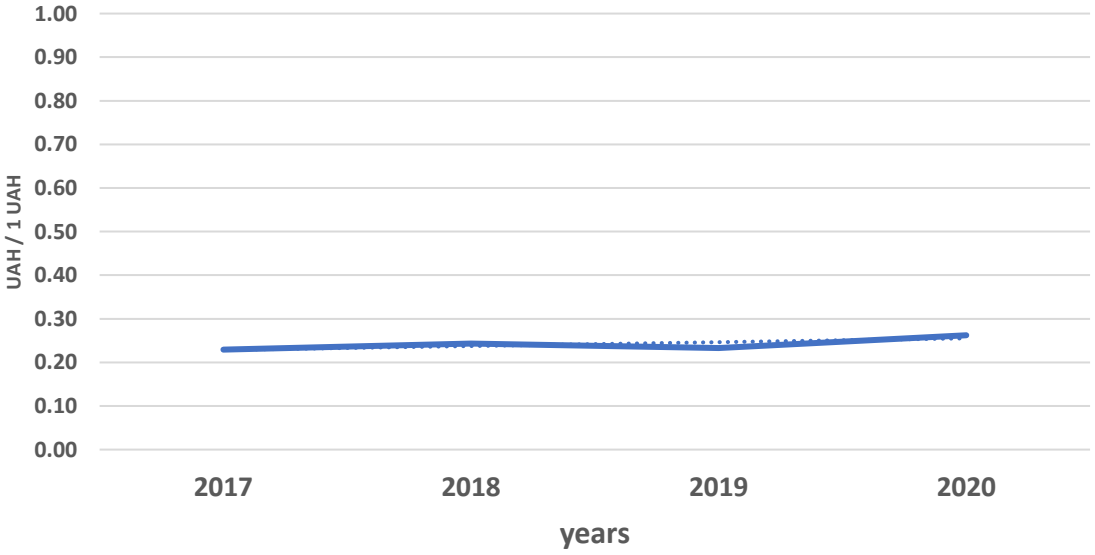
Source: IPG calculations

Fig.2.4.25. The volume of furniture production for 1 UAH. sawmill and planing production, UAH. / 1 UAH



Source: IPG calculations

Fig.2.4.26. The volume of wholesale trade in furniture, carpets and lighting equipment for 1 UAH. furniture production, UAH. / 1 UAH



Source: IPG calculations

On all figs 2.4.22.-Fig.2.4.25., there is almost no dynamics of intensity coefficients during the analyzed period. For each indicator, the rate of change of the numerator and denominator is the same. Therefore, at all adjacent stages of the supply chain of forest products, supply and demand match. The demand of each subsequent link is ensured by the adequate supply of the previous link of the supply chain.

2.4.3. d. Supporting functions and infrastructure is necessary for forest products supply chain and their clusters work.

Table 2.4.20. Supporting functions and infrastructure is necessary for forest products supply chain and their clusters work

Supporting functions of the chain and the necessary infrastructure	Input resources, primary products and services	Primary production	Processing (semi-processed and processed and ready for consumption)	Sales
Weather data monitoring and analytics, forecast.				
Phytosanitary monitoring of forests				
Testing the soil and carrying out other activities for planting the forest or promoting its natural renewal				
Analysis of fertilizers in forestry for the content of the active substance				
Analysis of water and assessment of its suitability for spraying crops / irrigation.				
The organization of full and timely reforestation works includes growing trees from seed: planting, transplanting, dividing, thinning, and preserving forests and wooded areas; growing seedlings and maintaining a balance of wood on forested lands; and functioning of forest nurseries, among other tasks.				
Forest taxation				
Advising on forest management				
Fire protection of forests				
Introduction of saving technologies for tillage of forests				
Forest grading				
Services for renting special equipment for the forest				
Forest Inventory Services				

Forest land resources, ownership and efficient use of land				
Timely delivery of security resources and appropriate use				
Disposal of waste from the production and supply of input resources and services				
Expert services for the preparation, development, implementation and adaptation according to the forest chain certification system: FSC, PEFC and others				
Logging work (felling of forest crops, sorting, packing, cleaning of logging).				
Transportation of harvested wood (trilling whips, pruning knots, transporting whips to lower warehouses)				
Lower warehouse work (spinning whips, sorting assortments)				
Organization of appropriate forest storage				
Organization of wood accounting				
Development of the forestry fund in hard-to-reach, wetlands				
Arrangement of the upper intermediate warehouses				
The use of large-sized cars and cars with hydromanipulators in the export of wood, which in turn can reduce the cost of not transporting wood.				
Use of the latest energy-efficient processing technologies and modernization of existing ones to more productive ones				
Recovery (recycling) and disposal of waste for the circular economy, as well as ensuring maximum recycling				
Operational performance management				

Automation of resistance activities and increasing the level of timely response to deviations				
Services for the purchase and supply of means of production, material and technical resources necessary for processing				
Disposal of waste from the production and supply of primary and secondary products				
Production of semi-processed, processed, and ready-to-eat products, appropriate packaging, storage, transportation				
Transportation of semi-processed, processed and ready-to-eat products, availability of specialized transport and the possibility of its operation				
Improvement and expansion of the range in accordance with the market demand based on marketing research				
Using the Internet platform for sales and promotion of products and services				
Training and raising the level of qualification of personnel. Development of incentives to work.				
Supply of electricity, gas, steam, and air conditioning				
Water supply; sewerage, waste management, other types of communication networks				
Expanding the ties of enterprises through the development of the "food chain" by attracting to it economic entities of the external (environmental) region as consumers and producers suitable for the use of by-products through the exchange of resources and disposal.				

Entering new markets for existing goods and services (in particular, by-product trade)				
Formation of a profitable business image for enterprises, which contributes to increasing competitiveness				
Attracting new customers (customers) of products (services) and concluding promising contracts				
Emergency Management				
Creation of environmental information systems				
Overall increase in energy efficiency, cascade energy use and cogeneration, including stimulating the development and use of alternative energy sources				
Financing of operating activities, grant support for the latest technologies, simplified lending procedures for small and medium-sized enterprises				
Private investment in the launch of modern technologies for storage and transportation of finished products				
Diversification of supply chains and development of logistics infrastructure facilities				
Investing in the development of inland waterways the Danube River (P80), Dnipro (P40), Dniester (P90)				
Liberalization of railway transport. Integration of the country's railway infrastructure with the EU infrastructure with a parallel transition to a single standard of European track – 1435 mm				
Managing forest roads and investing in providing better access to roads connecting				

production sites with ports and railways.				

Source: IPG developments

2.4.3. e. Summarizing the rules and regulations related to the forest supply chain.

The central act in the system of regulation of forest relations is the Forest Code of Ukraine, which regulates relations relating to the possession, use and disposal of forests and aimed at ensuring the reproduction, protection and sustainable use of forest resources, considering the economic, social, environmental and other interests of society[156]

In addition to the Forest Code, the Constitution of Ukraine regulates forest relations. They are further outlined in the Law of Ukraine "On Environmental Protection", the Land Code and other normative legal acts.[157][158]

Rational use, reproduction, protection and protection of forests

Order of the Cabinet of Ministers of Ukraine of December 21, 2021, No. 1777-p "On Approval of the State Forest Management Strategy of Ukraine until 2035". Among the key indicators for 2035 is an increase in the level of forest cover to 18%, and the total reserve – up to 2.5 billion m3.

Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Rules for Improving the Quality of Forests" of 12.05.2007 No724 (Edition of 26.05.2022).

Resolution of the Cabinet of Ministers of Ukraine "On Approval of Sanitary Rules in the Forests of Ukraine" of July 27, 1995 No. 555 (Edition of 12.12.2020).

The Law of Ukraine "On Amendments to Certain Legislative Acts on Forest Conservation dated 20.06.2022 No. 2321-IX.

Resolution of the Cabinet of Ministers of Ukraine dated 21.04.2021 No 392 "On approval of the Procedure for conducting a national forest inventory and amending the annex to the Regulation on data sets to be published in the form of open data". In the direction of forest inventory, on October 5, 2022, the Cabinet of Ministers and United Nations Development Program (UNDP) Ukraine signed a memorandum . The document laid out plans to carry out digitalization of the forest industry. Thanks to the introduction of modern technology, calculating how much wood can be harvested in a particular area with high accuracy is now possible. In addition, the plans included significant modernization on the wood accounting system. Further, it sets out strategies to digitalize the control chain for wood movement spanning from the origin of the batch to the final consumer. The elements of the accounting system will be interconnected electronic logging ticket, consignment note and certificate of origin of wood.

Resolution of the Cabinet of Ministers of Ukraine dated 09.06.2021 No 602 "On Amendments to the Procedure for using the funds provided in the state budget to finance measures for forestry and hunting, protection and protection of forests in the forest fund, creation of protective forest plantations and field-protective forest strips".

Resolution of the Cabinet of Ministers of Ukraine dated 16.06.2021 No 628 "On approval of the criteria by which the degree of risk from conducting economic activity is assessed and

[156] The Forest Code of Ukraine https://zakon.rada.gov.ua/laws/show/3852-12#Text
[157] The Constitution of Ukraine https://zakon.rada.gov.ua/laws/show/1264-12#Text
[158] the Law of Ukraine "On Environmental Protection"https://zakon.rada.gov.ua/laws/show/2768-14

the frequency of planned measures of state supervision (control) over compliance with regulations on forest management by the State Agency of Forest Resources is determined".

On July 14, 2021, the Cabinet of Ministers of Ukraine issued Resolution No. 718, which introduces amendments to Paragraph 1 of the Procedure for Deduction to the State Budget of a Part of Net Profit (Income) by State Unitary Enterprises and Their Associations. This resolution mandates the allocation of 30 percent of net profit (income) from activities towards acquiring non-current assets essential for the implementation of measures aimed at protecting, utilizing, and regenerating forests.

The main tasks and powers of state forest protection workers, which include safeguarding against fires, illegal logging, and protection from pests and diseases, are defined by Articles 90-92 of the Forest Code of Ukraine, along with the Regulation on State Forest Protection. This regulation was approved by the Resolution of the Cabinet of Ministers of Ukraine on September 16, 2009, under No. 976, and it operates within the existing legislative framework.

In accordance with the Resolution of the Cabinet of Ministers of Ukraine dated September 7, 2022 No. 1003, a single state specialized forestry enterprise "Forests of Ukraine" will be formed in Ukraine with its further transformation into a joint-stock company. The new enterprise will assume the legal succession of the property, rights, and obligations of specialized state forestry enterprises currently undergoing reorganization. This includes the right of permanent land use for forestry purposes, approved forest management materials, calculated forests, and forest divisions categorized as especially protective areas from the aforementioned enterprises. Additionally, the new enterprise will also inherit certificates of forest management from PEFC and FSC that were obtained by the specialized state forestry enterprises.

Furthermore, agreements on long-term temporary use of state-owned forests, forest easements, and hunting conditions established by these enterprises will also be transferred to the new entity. Moreover, any permits for the special use of forest resources, as well as licenses for conducting economic activities and environmental impact assessment approvals, will remain valid until their expiration under the new enterprise's management.

Pricing and market transparency

Resolution of the Cabinet of Ministers of Ukraine dated 04.12.2019 No 1178 "On the implementation of a pilot project for electronic auctions for the sale of unprocessed wood" (Edition 20.05.2022).

Resolution of the Cabinet of Ministers of Ukraine of April 23, 1996 N 449 "On approval of the Procedure for harvesting secondary forest materials and the implementation of secondary forest uses in the forests of Ukraine"[159]

Paragraph 22 of Article 43 of the Law of Ukraine "On Local Self-Government in Ukraine"[160]

Resolution of the Cabinet of Ministers of Ukraine of May 23, 2007 N 761 "On settlement of issues related to the special use of forest resources."

Resolution of the Cabinet of Ministers of Ukraine dated 04.12.2019 No. 1178, the Law of Ukraine "On Amendments to Certain Legislative Acts of Ukraine on Simplification of

[159] Resolution of the Cabinet of Ministers of Ukraine https://zakon.rada.gov.ua/laws/show/449-96-%D0%BF#Text

[160] Paragraph 22 of Article 43 of the Law of Ukraine "On Local Self-Government in Ukraine"https://zakon.rada.gov.ua/laws/show/280/97-%D0%B2%D1%80#Text

Attracting Investments and the Introduction of New Financial Instruments" dated 19.06.2020 No. 738-IX, a new version of the Law of Ukraine "On Capital Markets and Organized Commodity Markets" and "On Commodity Exchanges".

Electronic accounting of wood is carried out in accordance with the Resolution of the Cabinet of Ministers of Ukraine dated 04.12.2019 No 1142 "On approval of the Procedure for monitoring the internal consumption of domestic unprocessed timber and control over not exceeding the volume of domestic consumption of domestic unprocessed timber".

Order of the Ministry of Ecology and Natural Resources of 27.09.2021 No 621 "On approval of the Instruction on the maintenance of electronic accounting of wood".

Systematization of information on the origin, harvesting and sale of timber is carried out by the Unified State System of Electronic Accounting of Wood.

Economic stimulation of production of value-added wood products

The Law of Ukraine "On peculiarities of state regulation of the activities of business entities related to the sale and export of timber" of 24.10.2020.

Order of the State Forestry Committee of Ukraine dated 07.09.2007 N 528 "On approval of the form of the Certificate of origin of timber and lumber made from them for export operations and instructions for filling out the form of the Certificate of origin of timber and lumber made from them for export operations" (Revision 29.07.2022)

The Law of Ukraine of 19.06.2020 No 25-VIII, "On Amendments to the Law of Ukraine "On Peculiarities of State Regulation of The Activities of Business Entities Related to the Sale and Export of Timber". The law outlines a temporary ban on the export of timber in unprocessed form. It prohibits export of unprocessed timber outside the customs territory of Ukraine in the customs regime for a period of 10 years (code 4403 UKTZED).

Technical rules and standards for wood products vary from country to country. Since the beginning of 2019, Ukraine has switched from the old Soviet GOSTs to new ones, harmonized with European standards for the classification and measurement of business wood. For example, regarding emissions, the following testing standards are often used to evaluate carcinogenic agents, such as formaldehyde, which is often present in adhesives used in the woodworking industry:

- Indoor Air Pollution ISO 16000
- EN 717-1 Formaldehyde emissions
- The following standard applies to wooden slabs: EN 13986 Wooden slabs for use in construction.

Challenges and opportunities related to the existing quality infrastructure are aimed at what measures will reveal the export potential of the value-added wood product sector in Ukraine through specific implementation:

- EU Technical Regulations (on product safety)
- Voluntary social/environmental forestry standards, such as FSC and PEFC, which end users consider "de facto" market requirements.
- EU regulations on construction products that explain the CE marking on construction products and define clear rules for the evaluation and verification of sustainability systems (AVCP) applicable to construction products, etc.

2.4.3. f. Outlining any regulatory gaps in the forest products supply chain.

The last time forests were surveyed was in 2011. Due to the failure of the state forest Cadastre, there is no reliable information on the qualitative and quantitative composition of the forest fund of Ukraine, which makes it impossible to clearly certify and transparently trace wood.

Reform of forest legislation has begun, but there are still gaps that make possible abuses and illegal logging, facts of non-compliance with environmental legislation, including:

In logging:

- Illegal logging and timber trafficking;
- Land fraud;
- Discrepancy between official maps and actual boundaries of harvesting sites;
- Cutting down trees other than those specified in the permit;
- Cutting down more trees than defined in the permit;
- Sale at auction of still unprepared wood. The winner of the auction can harvest wood directly in the forest, which means that he can harvest more than was agreed;
- Logging in protected areas;
- Logging in former protected areas that have lost their status due to corruption;
- Illegal receipt of logging tickets or official ones;
- Sanitary felling and felling of the main use without scientific substantiation;
- Incorrect marking of trees;
- Movement of timber by water flows;
- Underestimation of the size of the diameter during the removal of forests;
- Understatement of the level of technical quality of wood during the removal of forests;
- Changing the boundaries of the cutting area;
- Replacement of types of forest management (for example, under the guise of clearing forests from dry branches, commercial wood is harvested, healthy trees are cut down during selective sanitary felling, and continuous sanitary felling and continuous reforestation felling are used to gain access to forest resources);
- Abuse of the procedure for implementing forestry activities (for example, felling dangerous trees that may be outside the cutting areas during the preparation of felling sites);
- Use of documents for obtaining and legalizing illegally obtained timber (for example, logging licenses are used to legalize illegal timber, especially at borders with other regions;
- Cutting down the necessary wood without the necessary documents;
    - Cutting down wood before the cutting site is transferred to the entrepreneur for cutting;
    - Felling trees by forest protection for their own needs outside the cutting area cut down by businessmen.

During transportation:

- Minor offenses of the procedure for registering wood in forest warehouses are: lack of stamping, inscriptions on logs, inaccuracies in accounts;
- Invoices indicate significantly larger volumes of wood than a vehicle can take out;
- Understatement of the quality of wood in the documents;
- The records in the documents are absolutely accurate and suitable for supervisory authorities and remote transportation, but after the wood is shipped, the invoices and invoices are returned back to the forest warehouse with the driver and used to transport the next batch of wood. There may be several such trips per day. This is a method of illegal legalization of wood;
- The records in the documents are absolutely accurate and suitable for supervisory authorities and for remote transportation, but after the wood is shipped, invoices and invoices are destroyed, and new ones are written out according to documents received from the forest. Numbering is restored;
- Delivery of illegally obtained timber over short distances to the processing sites by vehicles without registration numbers and documents;
- Registration is carried out for the shipment of wood from unauthorized logging, for example, instead of registering and receiving unauthorizedly felled wood for storage, the forest guard simply sells it as products;
- There are cases of "losses on paper" of timber from forest warehouses due to natural disasters, especially floods.

When paying taxes and fees

- Falsely declaring timber as low-quality to avoid high taxes or circumvent national legislation;
- Violation of auction procedures (DLG should sell cobblestone only to Ukrainian registered companies and only through auctions);
- Sanitary felling is more profitable than felling of the main use, since forestry enterprises do not pay taxes on wood harvested because of sanitary felling (with the exception of continuous sanitary felling and reforestation felling).

In trading

- Holding auctions in violation of the regulations;
- Non-fulfillment by state forestry enterprises of obligations for the supply of raw materials in accordance with the concluded contracts based on the results of auctions, which leads to the actual disruption of the production programs of enterprises and non-fulfillment of obligations to supply products to customers;
- Forgery of certificates of origin. Forged documents serve to legalize timber exports through controlled commercial structures. Thus, illegal timber can be exported by land or sea transportation;
- The types of documented illegal actions at the export stage are varied: from shipments of wood for which key documents for export were forged or absent, to incomplete declaration of the weight, species, length, and origin of wood;
- Export without valid or all necessary documentation;

- False declaration of wood as firewood, to circumvent/violate the export ban;
- Partial processing of wood by removing bark or cutting the log in half to circumvent/violate the export ban;
- The management personally directs the sale of wood to the largest foreign buyers;
- It is estimated that this illegal wood is processed by 12,000 unlicensed sawmills, mainly for its export. As a result, the export of lumber exceeds all legal products of the country by 75%: *1.2 million* m³ of timber are exported annually (Earthsight 2018).

Market participants expect the adoption of a balanced Law of Ukraine "On the Timber Market" (reg. No. 4197-d of 10.09.2021) and the Law of Ukraine "On Amendments to Certain Legislative Acts on Forest Conservation" (reg. No. 5650 of 11.06.2021). Currently, these draft laws of the Law are being prepared for the second reading, which need to be finalized in terms of the functioning of the market, the creation of competitive conditions for the sale of wood, and transparent pricing. The document provides for a mechanism for the sale of wood on the terms of an offer in parity with auction auctions. At the same time, the price of wood on the terms of such contracts will be set considering the results of auction bidding, as well as liability for violation of bidding rules for both buyers and sellers-state forestry enterprises.

2.4.3.g. SWOT—analysis of the forest products supply chain

IPG has conducted a SWOT analysis of the forest products supply chain in Table 2.4.22.

Table 2.4.21. SWOT analysis of the forest products supply chain.

Strengths	**Weaknesses**
1. Availability of significant natural and plantation forests for raw material supply. 2. High diversity of wood products and well-developed value-added network. 3. Qualified and cheap labor force. 4. Established professional associations and cluster organizations. 5. Sufficient capacity for EUTR compliance and sustainability certification. 6. High competitiveness due to relatively low labor costs.	1. Lack of transparent forest inventory. 2. Limited forest resources. Low productive forest plantations. 3. Very weak and unsystematic coordination between all levels (forestry, primary and secondary wood processing), which makes their effective and coordinated work impossible. 4. Old processing technologies. Lack of innovative means of testing wood. 5. Many small processors, poor coordination between them, high fragmentation of the industry. 6. Limited quality management. 7. Limited strategic orientation and planning. 8. Limited awareness of quality and compliance with standards.
Opportunities	**Threats**
1. Formation and implementation of a balanced state industrial policy in the forestry sector 2. Use of modern information technologies for forest management	1. lack of proper control over users of forest by-products. Illegal logging and timber turnover.

and public education on the multipurpose role of forests. 3. Energy policy of the state to create additional demand for firewood and fuel pellets. 4. The emergence of new technologies in the furniture industry. 5. Advanced training of employees using foreign technologies. 6. Access to consumers abroad.	2. A significant number of unregistered sawmills and the corresponding high shadowing of the market. 3. Fraud in the field of falsification of documents for logging. 4. High level of corruption. 5. Underestimation of the cost of taxation of wood and wood products. 6. High lending rates of commercial banks limit investments and innovations of companies. 7. Unreliable Forest chain certification system. 8. Highly competitive EU market. 9. Limited availability of Ukrainian testing bodies with appropriate infrastructure for testing and protection according to EU standards.

Source: IPG developments

The conducted SWOT-analysis illustrates that for most enterprises of the industry, it is quite difficult to overcome the gap with the world leaders who are engaged in the production and processing of the forest products supply chain. A significant number of enterprises without state support find it difficult to ensure competitive production.

2.4.3.h Recommendations for the forest products supply chain

The forestry development scenario should focus on the following issues as a priority:

a. Improvement of the legal framework in the forest sector and its harmonization with international principles of sustainable development and forest management.
b. Development of national criteria and indicators for sustainable forest management.
c. Broad participation of communities in the development, adoption and implementation of decisions on forest use.

At the first stage "Product selection, provision of resources and services for production" we propose:

a. Conducting training on the production of forest products supply chain, familiarization with modern technologies and equipment used in production.
b. Search for options for cooperation with the main companies-suppliers of equipment.
c. Involvement of financial institutions for financial support in the purchase of resources.

At the second stage "Primary production" we offer:

a. Further consulting support on the production of forest products supply chain.
b. Consultation on improving producers' understanding and use of improved production systems, improved management.
c. Develop training programs based on the knowledge and experience of producers and resource suppliers.

At the third stage "Processing or storage" we propose:

a. Advisory support on storage and marketing of finished products.
b. Coordination to establish links between primary producers and the processing industry, which should ensure the stability of primary producers in terms of market and continuity of production of raw materials of domestic origin.
c. Expanding access to short-term credit to improve the capacity for immediate payments to producers.
d. Organization of cooperation with suppliers of storage and production equipment.

At the fourth stage "Pre-sale preparation and sales" we propose:

a. Consultations on the introduction of new modernized packaging and labeling technologies that meet the requirements of high-end buyers.
b. Facilitate branding and promotional activities, such as assistance in developing websites and promotional materials.

After conducting a comprehensive analysis of the forest products supply chain, it is evident that cluster cooperation holds tremendous potential for the development of forest clusters. This conclusion stems from a thorough examination that encompassed

various aspects, including the calculation of a level-cluster analysis involving nine areas of the state relocation program. Additionally, it involved the assessment of cost dynamics, profitability, marketing, and demand, along with the identification of supporting functions and infrastructure.

Specifically, the regions of Lviv, Zakarpattia, and Ivano-Frankivsk oblasts exhibit high potential for creating first-level clusters, while Volyn and Rivne oblasts demonstrate potential for second-level clusters. Furthermore, Vinnytsia oblast shows promise for third-level clusters, and Khmelnytskyi, Chernivtsi, and Ternopil oblasts hold potential for fourth-level clusters.

The creation of forest clusters will help to jointly solve challenges, increase competitiveness, and stimulate innovations in the forest industry. The development and implementation of environmentally sustainable technologies and production approaches, the use of renewable energy sources, and support for the efficient use of forest resources can contribute to the development of forest clusters.

To ensure the harmonious development of forest clusters and contribute to sustainable economic growth and environmental stability, it is necessary to ensure the compatibility of policy and regulation at the state and regional levels. In addition, it is important to focus on neutralizing threats, minimizing weaknesses, and using opportunities to ensure the sustainable development of forest clusters.

Overall, the analysis of forest chains in nine regions of Ukraine allows us to conclude that cluster cooperation in the forestry complex can contribute to economic development and reduce the negative impact on the environment. To achieve these goals, it is crucial to promote effective cooperation between scientists, manufacturers, suppliers, and authorities, and facilitate the exchange of knowledge and experience between different actors of the cluster.

In particular, it is important to pay attention to the informational support of projects and initiatives in the field of forest cluster development. The development and popularization of informational materials, holding conferences and seminars will help attract new participants and partners to cooperation and create a favorable atmosphere for the development of innovations and interaction in the cluster. It is necessary to create a platform for the exchange of knowledge and experience between scientists, manufacturers, suppliers and authorities, which will facilitate the development of new ideas and initiatives. It is also important to involve other sectors of the economy in cooperation, such as tourism and forestry, which can stimulate the development of innovative projects and the creation of new jobs.

One of the key components of the success of the forest cluster is the promotion of innovative development and the use of the latest technologies. For this, it is necessary to create favorable conditions for research and development, support innovative start-ups and involve highly qualified specialists in cooperation. In addition, it is important to develop the export potential of the cluster and promote the entry of Ukrainian manufacturers into world markets.

In order to ensure the successful development of the forest cluster, it is necessary to solve important problems, such as the insufficient availability of credit resources and the lack of effective project financing mechanisms, as well as the instability of the legislative environment and high barriers to market entry. Solving these problems requires joint efforts of cluster participants, authorities and other interested parties.

In general, the forest cluster can become an important factor in the development of the economy of Ukraine and ensuring the sustainable use of forest resources. To achieve this goal, it is necessary to take into account the need for effective management of forest

resources, preservation of forest ecosystems, creation of new jobs and ensuring sustainable economic growth.

An important element of the successful development of the forest cluster is the support of the state in creating the necessary infrastructure, providing access to loans and other resources, promoting scientific research and innovative solutions. It is also important to ensure cooperation between different sectors of the economy, in particular the forestry, woodworking and furniture industries.

In order to increase the competitiveness of forest cluster participants, it is necessary to ensure the constant improvement of technologies and increase the quality of production. The use of innovative technologies and the implementation of energy-efficient solutions can help reduce energy consumption and production costs. It is also important to improve the qualifications of employees and ensure safe working conditions.

Taking into account the requirements of environmental safety and ensuring the sustainable use of forest resources is an important element of the successful development of a forest cluster. Implementing the principles of ecological management and reducing the impact of production on the environment can help preserve forest resources and ensure their sustainable use.

Therefore, the development of the forest cluster in Ukraine can become an important factor in sustainable economic growth and ensuring environmental sustainability. To achieve these goals, it is necessary to develop and implement a set of measures aimed at creating conditions for effective interaction between cluster participants.

Considering the above, for the successful development of the forest cluster in Ukraine, the following roadmap is recommended:

1. Creation of a project working group of representatives of producers, suppliers, scientists, and authorities (see point 2.4.3.b Key participants in the supply chain of forest products who can become the first members of the initiative).
2. Development of the concept of a pilot forest cluster, including definition of its purpose and tasks, analysis of opportunities and resources. Creation and implementation of cooperation mechanisms between cluster participants in order to solve joint tasks, including the development of innovations.
3. Study of the material flow of raw materials of the cluster participants to find opportunities for synergy and optimization of operational processes, energy and water use, increasing safety in working with hazardous substances, improving waste management, as well as determining optimal technologies and standards for the production of forest products.
4. Development of the infrastructure of the cluster, in particular, development and implementation of energy-efficient and environmentally friendly technologies for forest processing and its storage, in particular:
    - Use of renewable energy sources, such as biomass, to provide heat and power generation in processing enterprises;
    - Development and implementation of innovative technologies to optimize production processes and reduce waste in the process of forest processing;
    - The use of new materials based on forest raw materials to provide more environmentally sustainable and energy-efficient solutions in construction and other industries;
    - Implementation of a waste management and recycling system to reduce waste and negative impact on the environment;

- » Use of high-tech equipment and tools to ensure effective and sustainable forest processing.

5. Attracting financial resources for the implementation of the project, in particular, from the state, investors and other sources.
6. Provide sufficient financial resources for project implementation by attracting funds from the state, investors and other sources.
7. Develop and implement training and training programs to ensure the effective use of the latest knowledge and technologies, as well as mechanisms for attracting talented specialists who will be able to work in the cluster and implement innovations.
8. To evaluate the effectiveness of the implementation of the pilot project of the forest cluster based on the principles of eco-industrial parks. Analyze the results and determine possible directions for further development of the cluster.
9. Develop a strategy and roadmap for the further development of the cluster, including defining tasks and goals, developing innovative projects, and attracting new participants to the cluster.
10. Expand the network of contacts and partnerships with other clusters, institutions and organizations that can become potential partners for the development of the cluster.
11. Attract public and private investments to implement cluster development projects and ensure its financial stability.

Increase the level of information support and popularization of projects and initiatives in the field of cluster development by organizing conferences, seminars and other events attracting the attention of the public, media and potential investors.

3.Gaps and opportunities

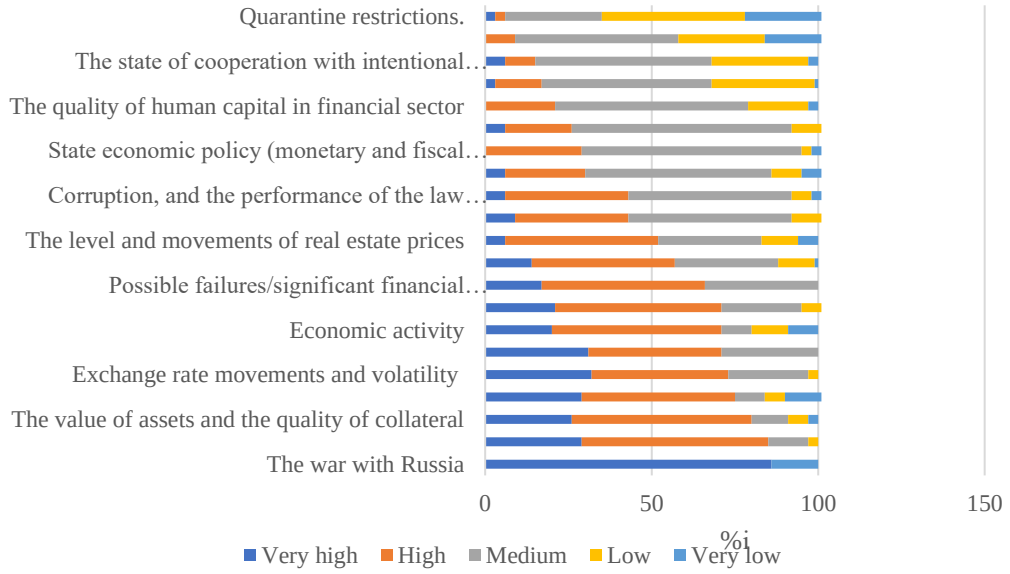
3. Gaps and Opportunities for Investments

This chapter will provide information on the gaps and opportunities for investment. It will include assessment on risk appetites and the desire for financial intermediaries to develop products and services in Ukraine for post-conflict conditions.

In the NBU survey[161]Top managers of financial institutions called the war against Russia the main source of risk. The overall level of corruption, the effectiveness of law enforcement agencies and the judicial system, which have been the overall leaders since the beginning of the study, did not even make it into the top ten risk factors. In May, inflation, exchange rate dynamics, changes in the inflow of foreign capital (investments), the value of assets and the quality of collateral were added to the main sources of risk. Among the main threats remain fraud and cyber-attacks. The risks of economic activity and the risks of bankruptcy of financial institutions have increased the most. The least important were the risks associated with quarantine restrictions and climate change.

The general increase in risks forces Ukrainian financial institutions to be more cautious: respondents noted that the risk appetite of their financial institutions has significantly decreased and was the lowest since the second half of 2020.

Fig. 3.1. Level of risk in the financial sector by specific factors, May 2022*



Effective risk management is the basis for attracting financing at the expense of achieving the strategic goals of sustainable development of the country's economy, taking into account all types of risks that it may face.

Basic, but not exhaustive, risk management measures:

1. Development and implementation of IT programs for operational business management, provides opportunities to better manage physical risks through accurate application of input resources and technologies.
2. The creation of EIP clusters and other cooperative groups can bring market participants closer to more sustainable development and rational use of production resources.

[161] The NBU survey https://bank.gov.ua/admin_uploads/article/Risk_Survey_2022-H1_eng.pdf?v=4

3. A financing strategy aimed at using the possibilities of fixing interest rates will stimulate market participants to establish and strengthen business competitiveness and market position.
4. A balanced sales strategy will provide the business with timely financing, diversify the product portfolio and client base.
5. The development of new climate-resistant products will allow to expand the assortment taking into account global trends and scenario analysis.
6. Strategic and financial assessment of current activities and quick response to deviations from the set goals. Analysis of benefits and costs in the process of making an investment decision to assess all potential costs and revenues that a company or government can receive from a project.

International experience shows that one important tool for attracting private investment is the creation of eco-industrial parks with the necessary infrastructure to provide participants with connections to utilities: electricity grids, water supply and drainage, logistical opportunities (such as access to highways and/or railways), etc.

In addition, they promote cross-sectoral cooperation and community collaboration for shared economic, social and environmental benefits, improve the cycling of resources critical to industrial processes (water, energy, materials and waste, etc.), significantly reducing dependence on depleting resources such as fossil fuels. They promote recycling and reuse of resources and waste, as well as industrial symbiosis and renewable energy/biological resources. In this process, tenant firms can achieve more cost-effective production that is also resilient to price fluctuations and resource scarcity. Ultimately, EIP can support greening and decarbonizing supply chains and improve resource management and conservation.

Industrial parks can provide businesses with the essentials they need the most: suitable sites, purpose-built premises, resource-efficient and dependable engineering infrastructure, access to a skilled workforce, educational institutions, and relevant services. This enables investors to concentrate on their core business: producing goods that adhere to national and international quality standards, are in demand in their respective markets, and enhance the skills of their employees.

Integrating the principles of the circular economy into the development and operation of industrial parks requires new technologies and business models that provide state-of-the-art infrastructure and services at optimized costs. For example, a zero liquid discharge (ZLD) system built into wastewater treatment and reuse systems uses reverse osmosis and ultrafiltration to direct wastewater back into industry. Waste heat (steam) can also be recovered from steelmakers and transported through the steam pipeline. It can be further and reused in the chemical or textile industries. Investments in industrial symbiosis technology and infrastructure generate revenue and cost savings for both tenant firms and local authorities, creating a new business model for industrial production.

Ukraine has taken a significant step in the development of industrial parks in recent years, thanks to the efforts of the government and the adoption of a number of laws and regulations. The legislation of Ukraine on industrial parks includes such normative acts as the Land Code of Ukraine, the Customs Code of Ukraine, and the Tax Code of Ukraine, as well as specific laws like "On Industrial Parks" and "On Amendments to the Law of Ukraine 'On Industrial Parks'."

In 2022 and 2023, several new laws were enacted to foster the further development of industrial parks. Notably, these laws include the Resolution of the Cabinet of Ministers of Ukraine that approves the procedure for considering documents for the inclusion of an industrial park in the Register of Industrial Parks. It serves as another resolution that outlines the procedure for maintaining the Register of Industrial Parks, and a third

resolution that governs the procedure for importing and using new equipment and components in the customs territory of Ukraine, particularly for participants of an industrial park.

Moreover, the authorities also approved new forms of contracts and reports to facilitate the efficient functioning of industrial parks. These legislative advancements aim to create a conducive environment for industrial park growth and encourage investments in Ukraine's industrial sector.

On February 24, 2023, the Government of Ukraine approved the Strategy for the Development of Industrial Parks until 2030[162] to accelerate their transformation into drivers of economic growth, considering the principles of sustainable development and the eco-industrial park model. Applying this model involves reducing the negative impact on the environment, increasing the efficiency of the use of resources and waste, improving the social component and effective management. The strategy includes a set of measures aimed at improving the legal framework, optimization and development of the network of industrial parks, cooperation with international and national partners, the introduction of best global practices and institutional development of the state policy system related to the creation and operation of industrial parks.

In March 2023, the Government of Ukraine approved a priority action plan for 2023, which includes the implementation of the model of eco-industrial parks through changes to the relevant laws. This initiative is being implemented with the support of the GEIPP Ukraine project, financed by the Government of Switzerland.[163]

According to the information available from the Ministry of Economy, at the beginning of 2023, 61 industrial parks have been registered, which is an increase of eight compared to the beginning of 2022, when only 52 parks were registered. During 2022, 14 new parks were created, of which nine were successfully added to the Register, and one was removed from the Register. Management companies were selected for only 40 out of the 61 industrial parks, which delays the development of this industry and does not allow potential participants to access quality offers for locating their production facilities.

According to the Law on Industrial Parks, management companies and/or initiators of the creation of IPs are obliged to submit reports on the functioning of the IPs to the authorized state body every six months. Such reports must be submitted in the specified form and procedure, which were approved by the order of the Ministry of Economy dated 07/26/2022 and registered with the Ministry of Justice of Ukraine on 09/08/2022. Failure to submit reports on the operation of the IP during two reporting periods in a row is grounds for excluding the industrial park from the Register, as provided for in Clause 2 of Part One of Article 161 of the Law on Industrial Parks. For the second half of 2022, reports on the functioning of 46 private equity entities were submitted, but 19 of them were submitted in violation of the submission deadline. It should also be noted that 3 reports were submitted using an unapproved form.

[162]The Strategy for the Development of Industrial Parks until 2030 https://me.gov.ua/News/Detail?lang=uk-UA&id=250a7eca-f524-4ec7-a584-056bc54c1a90&title=IndustrialniParki

[163]The support of the GEIPP Ukraine project, financed by the Government of Switzerland https://geipp-ukraine.org/kabinet-ministriv-ukrainy-opryliudnyv-rozporiadzhennia-221-r-iakym-vyznacheno-rozroblennia-ta-podannia-zmin-do-deiakykh-zakoniv-ukrainy-shchodo-zaprovadzhennia-modeli- eko-industrialnoho-parku-sered-pr/

So, according to the submitted reports for 2022[164], only 8 industrial parks have a high level of provision of engineering and transport infrastructure, while others, especially in the West of Ukraine, are at the stages of starting work on the development of the territory and the creation of the necessary infrastructure. Only one participant of the industrial park Vinnytsia cluster of refrigeration engineering is engaged in actual economic activity, although there is a high readiness to carry out such activities in IP Korosten and Myrotsk. Some initiators of creation, such as the Rivne and Dnipropetrovsk regional state administrations, do not have the right to dispose of the land transferred as part of the decentralization reform.

According to the reports on the functioning of industrial parks in 2022, 116 new jobs were created, of which 6 were created by management companies, 78 by private equity participants, and 32 by other private equity entities. In total, 935 jobs have been created since the beginning of the creation of industrial parks.

In 2022, products worth UAH 271,169 million were produced, and products worth UAH 234,367 million were exported. However, only one participant of one industrial park carries out production and export of products.

In 2022, 262.8 million hryvnias were involved in the development of the territory of industrial parks, including funds from local budgets - 9 million hryvnias and funds from other sources. This funds are mainly from initiators of the private industrial parks and management companies of industrial parks amounting to UAH 253.8 million. Since the beginning of the establishment of the private sector, their arrangement has been financed in the amount of UAH 1,644.41 million. Out of that amount, UAH 1,432.22 million are the funds from the initiators of the private industrial parks and the managing companies of the private sector, and the rest (UAH 212,186 million) are local and state funds budgets

In 2022, there were no planned expenditures from the state budget for the development of industrial parks. At the same time, the participants and other entities of the private enterprise have attracted investments in the amount of almost UAH 7.5 million in 2022 and more than UAH 460.5 million since the start of acquisition of the respective statuses by business entities. Most of the industrial parks included in the Register have a low level of readiness and lack the necessary infrastructure and territory arrangement. These measures require significant amounts of resources and a long time for their implementation. Therefore, without the appropriate infrastructure and arrangement, it is impossible to ensure a quick and large-scale result from the operation of industrial parks.

In general, a significant obstacle to the provision of adequate state stimulation of industrial parks is the inconsistency of initiatives for their creation and inclusion in the Register with socio-economic development priorities at the local and regional levels, as reflected in the relevant strategic documents and plans for their implementation.

Some industrial parks in Ukraine are already in operation, but most of them are still at an early stage of development. A number of systemic deficiencies in the preparation and implementation of industrial parks initiatives caused this situation. Imperfect legislative regulation of certain aspects of the establishment and operation of industrial parks hinders the development process. Minimum investment sources in infrastructure and the lack of experience of the initiators of the industrial parks creation and management companies has contributed to a significant delay in their implementation.

[164]Industrial Park Reports for 2022https://www.me.gov.ua/Documents/Detail?lang=uk-UA&id=47454ed4-b60a-4f37-bb77-b7f3127742f8&title=IndustrialniParkiVUkraini2022-Rik

These circumstances also have a negative impact on the investment climate, as there is no ability to provide potential participants of industrial parks with a quality offer to locate their production facilities in such parks.

In addition, there are no mechanisms for ensuring that industrial parks created in Ukraine, not included in the Register, comply with the basic attributes and conditions of their creation and operation, as defined by the Law. This situation can be a factor of negative impact on the understanding and perception of industrial parks in Ukraine in the domestic and foreign business environment.

The low level of funding for regional development projects related to the creation of the infrastructure of industrial parks is primarily caused by the low activity of communities, their involvement in the consideration of relevant initiatives and the lack of relevant priorities in the development of regions.

Based on the information presented, we propose the following suggestions for the advancement of industrial parks:

1. Strengthening cooperation between public and private structures to support industrial symbiosis, implementation of environmental technologies and practices.
2. Adoption of a legislative act to regulate the creation and functioning of eco-industrial parks with the involvement of all interested parties.
3. Development and implementation of special funding programs to support eco-industrial parks and their participants. This may include the following areas:
    - Creation of special funds at the level of the state and local authorities to promote the development of eco-industrial parks by providing subsidies, grants or loans on favorable terms for enterprises implementing ecologically oriented projects and technologies.
    - Involvement of international financial institutions and investors to support projects in the field of eco-industrial parks. This may involve cooperation with international banks, investment funds, as well as international organizations that have relevant programs and initiatives.
    - Expansion of state guarantee and risk insurance programs for enterprises participating in the development of eco-industrial parks, which will reduce their financial risks and stimulate private investment in environmentally sustainable industrial development.
    - Development and implementation of public-private partnership mechanisms to ensure co-financing of eco-industrial park projects and involvement of the private sector in their implementation.
4. Introduction of benefits and initiatives for enterprises operating in eco-industrial parks to promote their development and increase competitiveness.
5. Creation of mechanisms for monitoring compliance with environmental standards in eco-industrial parks aimed at improving self-regulation.
6. Raising awareness and developing the potential of market participants regarding the creation and functioning of eco-industrial parks through training, seminars and conferences.
7. Ensuring the exchange of knowledge and experience between eco-industrial parks, local and state bodies, scientific institutions and international experts for the development of best practices in the field of ecological industrial production and sustainable development. This may involve:
    - Establishment of joint research projects and programs with scientific institutions and higher educational institutions for the creation and

implementation of new technologies and methods in the field of eco-industrial parks.

- Ensuring participation in international programs and projects aimed at supporting the development of eco-industrial parks, which will allow access to global experience, financing and new opportunities for cooperation.
- Organization and holding of regular conferences, seminars and webinars that will help raise awareness and promote cooperation between stakeholders in the field of eco-industrial parks.

8. Development and implementation of information and communication tools to ensure transparency and exchange of information between participants of eco-industrial parks and interested parties.

Considering these recommendations, Ukraine can contribute to the creation and development of eco-industrial parks that ensure sustainable development, environmental protection and improvement of the competitiveness of the national economy.

4. Potential Development Intervention

4. Potential Development Interventions.

The post-war recovery of Ukraine's economy has great potential for the development of industrial parks according to the principles of EIP by implementing resource efficiency and circular economy approaches, attracting investments, increasing the employment of the population, in particular internally displaced persons, and ensuring balanced regional and local development. The transformation of ordinary industrial parks into EIPs provides an opportunity to achieve inclusive and sustainable industrial development and achieve the goal of the Industrial Parks Development Strategy for the period up to 2030.

Based on the analysis of key industrial supply chains with the highest potential for growth, profitability, job creation, and ability to accommodate internally displaced persons, their intersectoral relations were studied to create new EIP clusters. Additionally, the investigation covered necessary supporting functions and infrastructure, legislative aspects of their regulatory activities, and identified gaps and opportunities for improvement. An assessment of cost, profit, marketing, dynamics of demand and supply along the chain, as well as supply competitiveness during the relocation of production enterprises from eastern regions to western regions of Ukraine, was conducted. Using this comprehensive analysis, a Matrix of priority interventions was developed, aimed at benefiting the internally displaced population.

Since the expenditure (investment) budget depends on the measures that will be selected in one or another part of the intervention matrix, the final determination of the expenditure budget is beyond the scope of this study.

Table 4.1. Matrix of priority interventions.

Support level	Intervention prioritization	Interested parties
COUNTRY	Support for the innovative policy of creating industrial parks based on EIP principles, preparation of proposals or direct legislative activity on improving the institutional framework for the functioning of industrial parks based on EIP principles, expanding incentives for entrepreneurs participating in the park, forming clear requirements for work standards	Ministry of Economy of Ukraine, Ministry of Development of Communities and Territories of Ukraine, Local self-government bodies, participants of industrial parks, public organizations and associations, Scientific institutions UNIDO, GIZ, IFC
	Initiation and direct participation in dialogues at the state level regarding the creation and operation of eco-industrial parks	
	Organization of thematic trainings, seminars with a focus on raising awareness about the creation and operation of industrial parks based on the principles of EIP (for example, the concept and methodology of carbon footprint measurement; definition, evaluation and feasibility study of projects for the use of residual heat in industrial parks; identification, evaluation and technical -economic substantiation of solar energy projects in industrial parks; current environmental regulations applicable to industrial parks and tenant companies; determination, evaluation and analysis of the feasibility of resource efficiency projects)	
	Development, testing, improvement of the national EIP guidelines for the operation of industrial parks with the participation of stakeholders	
	Analysis of compliance with the principles of EIP by industrial parks according to the criteria of the International Framework Regulations on EIP	
	Preparation of informational materials for SMEs regarding the best practices of using clean and low-carbon technologies, energy-efficient and general optimization of business processes that affect the economy and competitiveness of enterprises.	
	A Guide to Prevention, Preparedness and Response to Environmental Accidents and a Compilation of Relevant Policy Documents to Support Communities Living Near Eco-Industrial Parks	

INDUSTRIAL PARK	Exchange of knowledge and experience for the participants of the eco-industrial park (e.g., on the following topics: current norms and laws applicable to industrial parks and tenant companies in Ukraine; operation and management of treatment facilities; parameters of eco-industrial parks for measuring the carbon footprint; identification, assessment and feasibility analysis of energy efficiency projects; features of ISO 26000 implementation in an eco-industrial park; introduction to corporate governance for industrial parks; application of human rights concepts and ethical practices in business and communication with the surrounding community; impact of industry, innovation and infrastructure on sustainable development; training workshops on the management and treatment of wastewater and hazardous waste in the eco-industrial park; implementation of the health protection program, safety techniques and methods of pest control; familiarisation with the environmental management of eco-industrial parks and tenant companies; methodologies and technologies of efficient use of rainwater in an eco-industrial park.	Cabinet of Ministers of Ukraine Consulting companies Associations Certification centers
	Study of the material flow of raw materials of participants of the eco-industrial park to find opportunities for synergy and optimization of operational processes, use of energy and water, increased safety in working with hazardous substances, improvement of waste management.	
	Assessment of opportunities for synergy or symbiosis[165]. In the field of public services (e.g. street lighting with solar energy, a shared sewage treatment plant), in the field of services (e.g. mobile toilets, centralized transportation of workers), in the use of by-products of	

[165]Industrial symbiosis involves the physical exchange of materials, energy, water and/or by-products.

	production between the EIP and the surrounding communities (e.g. the use of wood waste for biofuel for the general boiler plant of the park).	
	Support for the implementation of industrial symbioses at the EIP level	
	Conducting trainings and seminars for the participants of industrial parks to present the technical and economic feasibility study and discuss the results in order to use the opportunities of industrial symbiosis, to build and increase the synergistic relationship between the relevant stakeholders.	
	Analysis of smart solutions for the sustainable development of the eco-industrial park, their implementation	
	Training and advanced training of engineering personnel regarding the use of new energy-efficient technologies	
	Development of a park management assessment tool and strategy for better involvement in park management	
	Assessment of the state of the common infrastructure of the park (e.g. sewage treatment plant)	
	A compilation of good practice examples of centralized services and an overview of shared services at park level that need to be strengthened	
	Development of an inventory of solid household waste to identify and assess the possibilities of its processing and reuse of waste at the EIP level[166].	
	Evaluation of the park's central sewage treatment plants in order to support their improvement	

[166]exchange of waste and by-products (e.g. biomass, scrap steel, waste paper/cardboard), energy (e.g. a shared biomass boiler for steam generation for several tenant companies), water (e.g. a water storage tank at a centralized treatment plant to facilitate reuse of industrial wastewater between companies), as well as shared services (for example, coordination of the company's joint activities in the park by the board, waste collection and transportation, training).

	Development of protocols, procedures or regulations for the maintenance and operation of equipment, installation of electricity meters for each production line in order to separately monitor the benchmark of electricity consumption for production lines	
	Security organizations for life from crime, giving employees a greater sense of safety and security. Construction of modern bomb shelters.	
INDUSTRIAL PARK PARTICIPANT COMPANY	Assessment of the current state of the company's business process management. Determination of opportunities for optimization of consumption of raw materials, energy and water, as well as chemical safety and waste management. Preparation of (pre)technical and economic justification and mechanisms for implementing solutions (for example, CAPEX, OPEX, return on investment). Development of priority areas of development, action plan, monitoring, control and adjustment.	Communities Associations International organizations
	Capacity-building measures aimed at strengthening the capacity to implement the GEIPP [167]	
	Development of material saving options that help companies recycle and reuse by-products as materials in the production process, helping to reduce the use of materials subject to environmental discharge	
	Chemicals Management Strategy concerning the process and technology modifications to reduce the amount of chemicals emissions into the environment and improve product quality.	

[167] GEIPP considers three dimensions of sustainable development in a synergistic way: (a) increasing economic indicators due to improving the productive use of resources; (b) environmental protection by conserving resources and minimizing the industry's impact on the natural environment; c) social improvement by providing jobs and protecting the welfare of workers and local communities.

SUPPLY CHAIN	Conducting training on the production of food products of the plant group of goods and products of their processing, meat and meat products, forest industry, familiarization with modern technologies and equipment used in production.	Public unions Chambers of Commerce and Industry Associations
	Conducting training and consultations for the correct selection of technologies (soil research, selection of varieties and PPE, regulation of fertilizer application, selection of equipment and production technologies).	Resource providers. Equipment suppliers
	Search for options for cooperation with the main companies supplying resources (hybrid seeds, fertilizers, pesticides, equipment, etc.).	Public unions Chambers of Commerce and Industry Associations
	» Consulting on improving producers' understanding and use of improved production systems, improving crop, livestock and forestry management.	Resource providers. Equipment suppliers Certification organizations and institutions
	» Support in the certification procedures of the main production.	Certification organizations and institutions
	» Financing of capital investments.	International organizations, banking institutions
	» Consulting support on issues of storage and sale of finished products. » Coordination on the establishment of links between primary producers and the processing industry, which should ensure the stability of primary producers from the point of view of the market and the continuity of production of raw materials of domestic origin.	Resource providers. Equipment suppliers
	» Organization of cooperation with suppliers of storage and processing equipment. Joining efforts for consolidated storage, ensuring conditions for storage.	Resource providers. Equipment suppliers

	» Consultations on the implementation of new modernized packaging and labeling technologies that meet the requirements of high-end buyers and extend the shelf life of new products. » Promotion of local products through the help of registration of products with a geographical indication in compliance with a certain production scheme, careful selection of raw materials, quality control at all stages of production.	Equipment suppliers. Consulting companies. Trade networks of corporate type.

Annex

Annex 1.

1. Methodology

To map the demand and supply of services in the target areas (west and south-west of Ukraine) and to identify market dynamics and opportunities, the IPG team analyzed key industrial supply chains with the highest potential for growth, profitability, increase and job creation, and able to accommodate internally displaced persons, based on the following methods.

1.1. Supply Chains survey using "Inter-sectoral balance" method

To inspect supply chains, we plan to carry out an assessment based on the inter-sectoral balance method or input–output balance tables method (IOT method)[168]. It includes an economic and mathematical balance sheet model that characterizes inter-sectoral production relationships in the national economy – the relationship between output in one industry and inputs (costs), the consumption of products of all participating industries necessary to ensure this output.

Calculations will be based on the Gross Regional Product data prepared by the State Statistics Service of Ukraine, balance of payments and input-output tables. The original national table input-output table will be constructed based on the division of the economy of each of the 25 regions of Ukraine into 16 sectors. Observed output flows from each sector (as a producer and/or seller) to each sector (as a consumer and/or buyer) within one sector for 2019 are modelled, i.e., the monetary value of transactions between pairs of production sectors and from production sectors to final buyers (households, government, foreign economies).

The "input–output" table (IOT) is used to study the state and interrelationships of the sectors branches of the national economy across by the regions of Ukraine. The columns and rows of the table are 16 sectors of the economy, represented in by 25 regions. In mathematical terms symbols, the "input-output" table has the form shown in Fig. 1.1.1.

[168] Asian Development bank "Economic Insights from Input–Output Tables for Asia and the Pacific Publication", July 2022 https://www.adb.org/publications/economic-insights-input-output-tables-asia-pacific

Fig.1.1.1. Basic structure of a national input-output table

		INPUT																									
		R01	R01	...	R01	R02	R02	...	R02	...	R25	R25	...	R25	HOUSEHOLDS				...	GROSS FIXED CAPITAL FORMATION				FOREING EXPORTS	GROSS OUTPUT (X)
		S01	S02	...	S16	S01	S02	...	S16	...	S01	S02	...	S16	S01	S02	...	S16	...	S01	S02	...	S16		
OUTPUT	R01 S01	z_{11}	z_{12}	...	...	...	...	...	...	...	...	...	...	$z_{1\,400}$	y_{11}	y_{12}	...	...	...	...	...	...	$y_{1\,80}$	e_1	x_1
	R01 S02	z_{21}	z_{22}	...	...	...	...	...	...	...	...	...	...	$z_{2\,400}$	y_{21}	y_{22}	...	...	...	...	...	...	$y_{2\,80}$	e_2	x_2
	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	R01 S16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	R02 S01	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	R02 S02	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	R02 S16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	R25 S01	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	R25 S02	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	R25 S16	$z_{400\,1}$	$z_{400\,2}$	...	...	...	...	...	...	...	...	...	...	$z_{400\,400}$	$y_{400\,1}$	$y_{400\,2}$	...	...	...	...	...	...	$y_{400\,80}$	e_{400}	x_{400}
	V	v_1	v_2	...	...	...	...	...	...	...	...	...	...	v_{400}											
	INPUT (X)	x_1	x_2	...	...	...	...	...	...	...	...	...	...	x_{400}											

I quadrant

II quadrant

III quadrant

The first quadrant of the table presents observed product flows z_{ij} from each i-sector of a certain area (as a supplier and/or seller) to each j-sector of a separate area (as a consumer and/or buyer) for 2019. The second quadrant represents final product y_{ij} by consumption areas (households, nonprofit organizations and institutions serving households, government, gross fixed capital formation and exports) in regions.

The figures in the first and second quadrants are based on the monetary value of transactions between pairs of productive sectors and from productive sectors to specified end buyers. Adding the value added $v_j$of all sectors (III quadrant) or final demand in the economy leads to the gross domestic product (GDP), $x_i = x_{j,} \forall i = j$.

Since the IOT system combines production-based and input-based measures of GDP, it is possible to directly examine and compare the structure of the economy according to these two methods of accounting.

1.1.1. Basic economic indicators sectors of the economy.

The structure of the economy of each region of Ukraine in terms of final demand is defined as the aggregate of shares constituting the components of final consumption for each region:

$$w_{ik} = \frac{y_{ij}}{\sum_j y_{ij}} * 100\%, ;; ...;. (1) k = 1, j = \overline{1,16} k = 2, j = \overline{17,32} k = 5, j = \overline{65,80}$$

where

w_{ik} – the structural share of a separate element of the final product;

y_{ij}– the value of a separate element of the final product.

The structure of value added of regions by sectors of the economy is made up of shares of sectoral value-added *n* in the total amount of value added of each region *m*:

$$r_{mn} = \frac{v_n}{\sum v_n} * 100\%, ;; ...;. (2) m = 1, n = \overline{1,16} m = 2, n = \overline{17,32} m = 25, n = \overline{385,400}$$

where

r_{mn} - structural share of sectoral value added;

v_n - the amount of sectoral value added.

The structure of intersectoral production linkages is determined separately by consumption and output. For consumption, the shares of intersectoral flows of each sector in the total amount of flows are calculated according to the columns of the I quadrant of the IOT matrix:

$$q_m = \frac{\sum_j \sum_i z_{ij}}{\sum_i \sum_j z_{ij}}, ; ; \ldots; m = 1, j = 1{,}17{,}33{,}49, \ldots, 384 m = 2, j = 2{,}18{,}34{,}50, \ldots, 385$$

$$m = 25, j = 16{,}32{,}48{,}64, \ldots, 400; . \; i = \overline{1{,}400} \qquad (3)$$

where

q_m – structural share of intersectoral flows of each sector;

z_{ij} - the value of intersectoral flows of each sector.

The structure of the output is calculated similarly to the rows of the IOT matrix:

$$q_n = \frac{\sum_i \sum_j z_{ij}}{\sum_i \sum_j z_{ij}}, ; ; \ldots; n = 1, i = 1{,}17{,}33{,}49, \ldots, 384 n = 2, i = 2{,}18{,}34{,}50, \ldots, 385$$

$$n = 25, i = 16{,}32{,}48{,}64, \ldots, 400; . \; j = \overline{1{,}400} \qquad (4)$$

where

q_n - the structural share of intersectoral flows of each sector

z_{ij} - the value of intersectoral flows of each sector.

1.1.2. Economic sector sensitivity analysis.

One of the main indicators that are calculated from the input-output matrix are multipliers. Multipliers show what changes in total output or value added could be generated by sectors if their final demand changed by a unit of value. They characterize the sensitivity of the economy to a particular sector, thus providing information on which sectors should be developed to stimulate greater economic growth through the so-called multiplier effect.

a) Simple output multipliers

The overall production effect (*simple output multiplier*) can be broken down into initial effects, first-round effects, and industrial support effects. *The initial effect* is the magnitude of the exogenous change in demand, which is considered one unit of output for a particular sector, therefore it is always equal to 1: $M_{X\,\text{поч}} = 1$.

The first-round effect provides the number of input flows (resources) needed to achieve the initial effect, that is, to ensure an increase in the final product by 1 monetary unit. This multiplier is calculated as the sum of the technical coefficients on the column of matrix A, which corresponds to a specific sector in a particular region.

In this case, the elements of the square matrix of technical coefficients (direct cost ratios) A dimension of 400 x 400 are determined by the formula:

$$a_{ij} = \frac{z_{ij}}{x_j}, \; i, j = \overline{1{,}400} \quad (5)$$

where

a_{ij} – coefficients of direct costs;

z_{ij} – value of intersectoral flows;

x_j - the total output of the jth sector.

So, the output multiplier that characterizes the first-round effect for *the j-th* sector is:

$M_{fre\ j} = \sum_i a_{ij}$. (6)

where

$M_{fre\ j}$ - the output multiplier that characterizes the effect of the first round for the jth sector;

a_{ij} – coefficients of direct costs.

A simple output multiplier is equal to the sum of the elements of the Leontief inverse matrix B in a column corresponding to a specific sector in a particular region. In this case, the matrix B is calculated by the formula in matrix form:

$B = (E - A)^{-1}$ (7)

where

B - Leontief inverse matrix;

E - a single matrix with dimensions (400 x 400);

A - matrix of technical coefficients.

The formula for a simple output multiplier for *the* j-th sector:

$M_{soj} = \sum_i b_{ij}$,(8)

where

M_{soj} – a simple output multiplier for the jth sector;

b_{ij} – the elements of the Leontief inverse matrix.

The industrial support effect applies to all subsequent rounds of production due to changes in unit demand after the first round. This effect includes all production in all sectors to meet additional input resource needs (first-round effect) to increase the final demand for the sector's product by one unit (initial effect). It is calculated as the difference between a simple output multiplier, initial effect, and first-round effect:

$M_{ise\ j} = M_{soj} - 1 - M_{fre\ j}$. (9)

where

$M_{ise\ j}$- effect of industrial support;

M_{soj} - a simple output multiplier for the jth sector;

$M_{fre\ j}$ – the effect of the first round.

b) Value-added multipliers

A *simple value-added multiplier* can be used to determine part of the increase in the value added of a particular sector of the economy, subject to the expected increase in final demand in this sector by one unit. Simple value-added multipliers are calculated by the formula:

$M_{sv\ ik} = 1 - \sum_j a_{ij}$, (10)$k = 1, j = \overline{1{,}16}; k = 2, j = \overline{17{,}32}, \dots, k = 25, , j = \overline{385{,}400}.$

where

$M_{sv\,ik}$ - a simple multiplier of value added;

a_{ij} - an element of the matrix of technical coefficients.

The type I value-added multiplier is a measurement of the impact of changes in final demand on value added growth in a particular sector of the economy, if we consider both direct and indirect effects:

$M_{tipe1v\,ik} = M_{sv\,ik}: K_{vj}$,(11)$i = j$,

where

$M_{tipe1v\,ik}$ - the type I value-added multiplier;

$M_{sv\,ik}$ - a simple multiplier of value-added;

K_{vj} - the coefficient of added value, which is calculated by dividing the amount of added value by the total output:

$K_{vj} = \frac{v_j}{x_j}$. (12)

where

v_j- values of the added value of the jth sector;

x_j- the total output of the jth sector.

1.1.3. Overview of intersectoral linkages of Ukrainian regions.

In the input–output structure, each sector of the regions of Ukraine supplies (produces) to other producers and attracts (buys) resources from other manufacturers on the market. Such interactions of supply and demand are considered a measure of the economic interconnectedness of certain sectors. By comparing all sectors, the main ones for each region are determined, which have the maximum impact on the entire structure through respectively input and output relations with other sectors.

a) Backward Linkages

Direct backward linkage is defined as the first round of general economic impacts caused by changes in final demand in the sector. They are measured as the links between the procurement sector and the suppliers with whom it directly cooperates. Direct backward linkage is calculated as the sum of the direct input requirements of the procurement sector or the sum of the technical coefficients of the procurement sector (according to the columns of matrix A):

$K_{d-bl\,j} = \sum_i a_{ij}$ (13)

where

$K_{d-bl\,j}$ - direct backward of the jth sector;

a_{ij} – elements of the matrix of technical coefficients.

The indicator *of total backward linkages* considers both direct and indirect links between sectors. This is a simple output multiplier. It shows the impact of changes in demand not only on one particular sector, but on the economy as a whole, and is calculated by the formula (8).M_{soj}

The complete hypothetical extraction backward linkage eliminates the autodependence of sectors. When measuring its contribution to the total production of the entire economy, only exogenous impulses are detected. This indicator is calculated by the formula:

$M_{che-bl\,j} = M_{soj}\,/b_{jj}$ (14)

where

$M_{che-bl\,j}$ - the backward coefficient of the complete hypothetical extraction of the jth sector;

M_{soj} - a simple output multiplier for the jth sector;

b_{jj} - the jth diagonal element of the Leontief inverse matrix.

The partial hypothetical extraction backward linkage index excludes not only the auto-dependence of the sector, but also eliminates its interaction on the supply side. The formula for its calculation:

$M_{phe-bl\,j} = (M_{soj} - 1)/b_{jj}$(15)

where

$M_{phe-bl\,j}$ – backward coefficient of the partial hypothetical extraction of the jth sector;

M_{soj} - a simple output multiplier for the jth sector;

b_{jj} – the jth diagonal element of the Leontief inverse matrix.

b) Direct forward linkage

Direct forward linkage is analogous to direct backward linkages. Direct forward linkage is defined as the first round of general economic impacts of sectors that acquire resources from a given supplier. Direct forward linkage is calculated as the sum of the distribution coefficients of the supply sector (in the rows of matrix C):

$K_{d-fl\,i} = \sum_j c_{ij}$. (16)

where

$K_{d-fl\,i}$ – direct backward coefficient of the ith sector;

c_{ij} - distribution coefficients of the supply sector.

In this case, the elements of the matrix of distribution coefficients C are determined by the formula:

$c_{ij} = \frac{z_{ij}}{x_i}$, $i, j = \overline{1,400}$ (17)

where

c_{ij} - distribution coefficients of the supply sector;

z_{ij} – value of intersectoral flows;

x_i – the total output of the i-th sector.

Total forward linkages consider both direct and indirect relationships between sectors and is a combination of direct links and step-by-step effects caused by changes in sector resources. The indicator of total forward linkages is calculated as the sum of the rows of the Ghosh inverse matrix.

The Ghosh inverse matrix is calculated by the formula in matrix form:

$G = (E - C)^{-1}$(18)

where

where

G – the Ghosh inverse matrix;

E - a single matrix with dimensions (400 x 400);

C - a matrix of distribution coefficients.

The indicator of *total forward linkages* is determined by the formula:

$M_{t-fl\,i} = \sum_j g_{ij}$(19)

where

$M_{t-fl\,i}$ – coefficient of complete direct connections of the i-th sector;

g_{ij} - the elements of the Ghosh matrix.

The direct link index of *complete hypothetical extraction forward linkage* measures the full direct relationship of a sector adjusted for its autodependence. This indicator is calculated by the formula:

$M_{che-fl\,i} = M_{t-fl\,i}/g_{ii}$ (20)

where

$M_{che-fl\,i}$ - the index of complete hypothetical extraction forward linkage of the ith sector;

$$M_{t-fl\,i} - \text{ coefficient of complete forward linkage of the i} - \text{th sector}$$

g_{ii} - the i-th diagonal element of the Ghosh inverse matrix.

The indicator *of the partial hypothetical extraction forward linkage* excludes not only the autodependence of the sector, but also eliminates its interaction on the consumption side. The formula for its calculation:

$M_{phe-fl\,i} = (M_{t-fl\,i} - 1)/g_{ii}$. (21)

where

$M_{phe-fl\,i}$ - index of the partial hypothetical extraction forward linkage of the ith sector;

$M_{t-fl\,i}$- coefficient of complete hypothetical extraction of the i-th sector

g_{ii} - the i-th diagonal element of the Ghosh inverse matrix.

1.1.4. Study of the hypothetical industry extraction from the occupied regions.

The method of hypothetical extraction consists in the complete exclusion from the economy of a particular industry of a particular region both from the consumption side (the input-output matrix column corresponding to this industry) and from the supply side (the corresponding row of the matrix). It also includes the recalculation of a new, hypothetical output (GDP) without the intermediate links and the final product generated by it. As supplies in this sector stop, other sectors lose their respective resources and end users cannot meet their demand for the extracted product. In addition, since the sector's demand is also eliminated, the economy loses cross-sectoral demand from the extracted sector itself (that is, the sectors producing resources are experiencing a reduction in sales). The assumption that the sector "disappears" from the economy allows us to estimate the conditional losses for the region and for the country in absolute and relative terms. This makes it possible to establish a measure of importance of the sector, which is especially relevant for Ukraine in the conditions of hostilities and temporary occupation of certain territories, when certain regional sectors are cut off from the country's economy.

The calculation algorithm for excluding the industrial sector of a particular region is as follows.

1. In the original matrix, 25 rows and 25 columns are crossed out, which correspond to this sector in all regions.
2. The elements of the matrix of technical coefficients A1 of the obtained initial matrix are determined by the formula (5).
3. The Leontief inverse matrix B1 is calculated by the formula (7).
4. Subject to the reduced as a result of the crossing out through of the rows and columns of the volume of the final product Y1 and the new matrix of technical coefficients, we calculate the total output according to the formula in matrix form:

$X1 = Y1 * B1$. (22)

where

Y1 - a transformed column vector of the volume of the final product, obtained after the sector has been drawn;

B1 - the transformed Leontief inverse matrix.

5. The results of the extraction of the region's economy are calculated and compared with the initial values (the indicators by industry, region and entire economy before and after the extraction of the sector are summed up).

1.1.5. Determining the attractiveness of the Western regions of Ukraine regarding business relocation.

The method of determining the relocation attractiveness of regions is based on the statement that the movement of business from one region to another causes a potential change in the final demand of a particular industry of the respective recipient region and generates changes in production or value added in the economy. These changes are characterised by multipliers of total backward and forward linkages, as well as a simple value-added multiplier. Based on the comparison of the regions determined by the State Relocation Program, these multipliers determine the most suitable regions for the relocation of business of certain industries in order to stimulate the greatest growth of the economy.

To determine the relocation attractiveness, the method of rating the regions according to the three specified multipliers is used in accordance with the following algorithm:

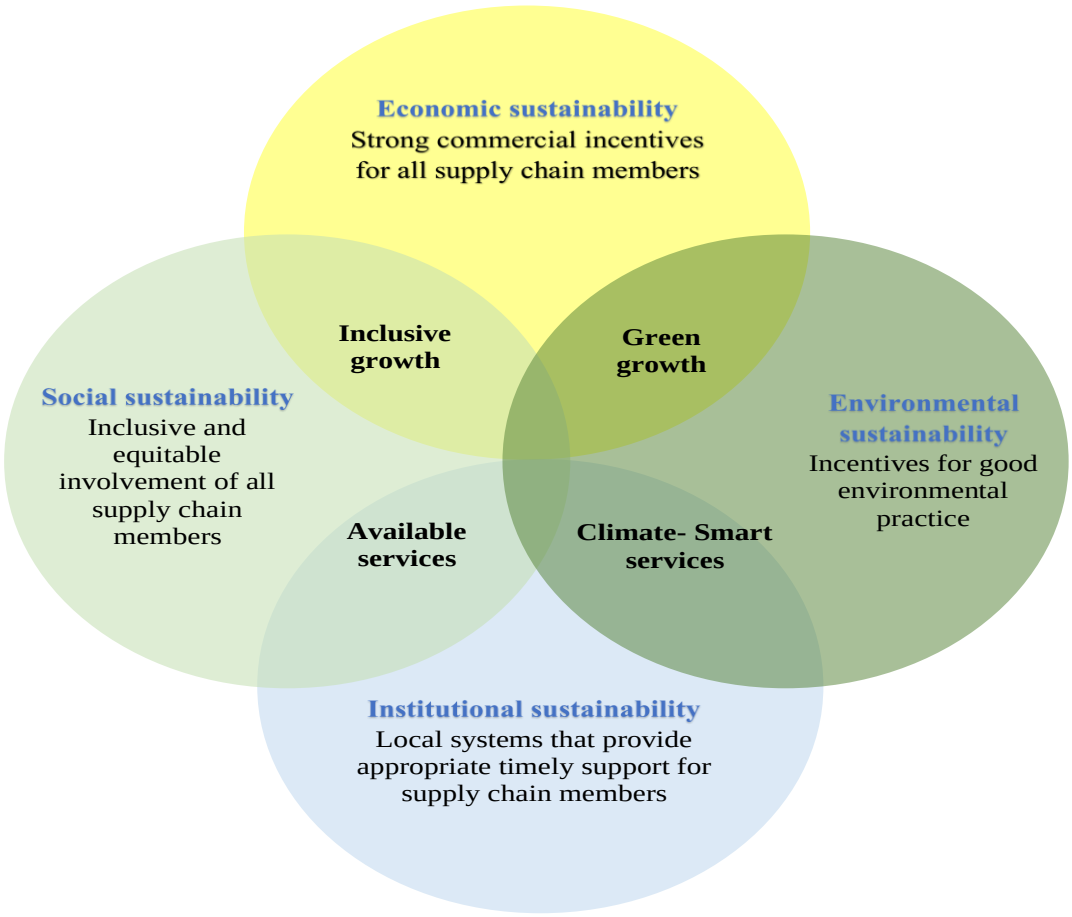
1. Multipliers are calculated using formulas (8, 10, 19) for each region in all sectors of the economy.
2. Regions are ranked by three defined multipliers.
3. For each region, the sum of the ranks is determined.
4. A conclusion is made regarding the expediency of relocating enterprises-representatives of individual sectors depending on the total point assessment of the regions.

» A similar methodology is used to assess the attractiveness of regions for the relocation of manufacturing enterprises. For this purpose, the original IOT table is transformed, in which, instead of the rows and columns corresponding to the S02 sector "Manufacturing", 24 rows and columns are entered with the names of its subsectors and distributed data of intermediate, final product, value added and total output. Based on the data of the new table, multipliers are calculated, regions are ranked, and the level of attractiveness of regions for the relocation of representatives of individual sub-sectors of the manufacturing is established.

1.2. Evaluation and selection of supply chains based on the construction of product supply chains scoring matrix by subsectors

The supply chain evaluation and selection methodology combine the best practices from respected international organizations as IFAD, USAID, GIZ and others to provide a fast and meaningful analysis of the value chain. In addition, to maintain long-term competitiveness and fair economic growth, the methodology adheres to the “quadruple bottom line” principle, to systematically address the four pillars of sustainability – economic, social, institutional, and environmental. (Fig.1.2.1.)

Fig.1.2.1. Quadruple bottom line approach.



Source: IPG Developments based on USAID approach[169]

Economic sustainability. Bringing customers together with manufacturers, producer organizations and / or member associations to meet their needs to strengthen the ability of cluster members to work efficiently, improve product quality and trade operations. Manufacturers and companies that receive assistance will gain practical experience in attracting customers to target markets. This will increase the flow of information on supply chain targets related to purchasing criteria and price targets and help ensure competitiveness orientation. Using a market-based approach to the supply chain to enter into agreements and remove bottlenecks that hold them back will increase the flexibility of producers and firms in the cluster to respond to new opportunities and changing conditions and ensure the participation of small producers.

Institutional sustainability. To avoid crowding out local players, this approach is based on facilitation rather than direct development services. In this regard, the cluster works through existing (although in some cases only nascent) member organizations, as well as commercial, non-governmental and public institutions to implement activities. The cluster will use partnerships to promote strong vertical and horizontal links between local players, which will use new resources and technologies and support key infrastructure investments.

[169] Developed by IPG for current report using USAID approach from report of Value chain assessment and selection of Moldova high value agriculture activity, March 17, 2017

Social sustainability. All activities are expected to address local contexts and priorities, including gender, youth, people with disabilities, IDPs and military families. The cluster intends to expand successful initiatives, which it now supports to strengthen networks and mentoring among producers and business owners. The cluster will also use initiatives from other donors to help create employment opportunities by ensuring that workforce programs provide training in the latest technologies and market skills needed in the industry.

Environmental sustainability. The approach aims to prioritize green opportunities, including environmentally friendly business methods, energy-efficient technologies, water conservation, best sector practices to improve environmental management, and minimizing potential negative impacts.

1.2.1. Criteria and sub-criteria of the supply chains evaluation model

Compliance and focus on the UNIDO Project meta-objectives to achieve target KPIs:

- Increasing the economic activity of communities of Western Ukraine by providing access to markets and services;
- Development of Small and medium-sized enterprises (SMEs) activities in connection with wider eco-industrial parks possibility use;
- Increasing profits of SMEs producers due to the growth of sales of products with value added among end users;
- Increasing the number of IDPs, women and military families participating in EIP clusters who report increased profits and / or market access through project intervention;
- Creation of new jobs as a result of intervention that will generate income in the form of personal income tax;
- Meeting domestic demand for the products of the selected network (high-consumption goods, the demand for which is now largely met by imports);
- Strengthen chain integration (production links);
- Increasing national value added (Support for domestic production).

Each criterion is part of the "quadruple bottom line" approach (economic, social, environmental, and institutional) and examines data on 14 sub-criteria: five on economic criteria, six on social criteria, two on institutional criteria and one on environmental criteria. The criteria are listed and defined in Table 1.2.1.

Table 1.2.1. Criteria and sub-criteria of the supply chains evaluation model

Economic (30%)
Market size: The size of the world market (global imports) according to UN COMTRADE data.
Market growth: (annual growth rate in value, %): Annual growth rate (2017-2021) in the number of imported goods based on UN COMTRADE/USDA data as an indicator of potential future demand.
Ukraine/Western Region Market Share in the World: Ukraine's current position in the world market (percent of total exports) according to UN COMTRADE data.
Current exports: The current value of Ukraine's exports as per UN COMTRADE data.

Current imports: The current value of Ukraine's imports as per UN COMTRADE data.
Social (30%)
Scalability: There is an opportunity to intensify or expand production (which has been shown to be effective on a small scale in similar conditions) through technologies, including irrigation, to benefit a significant part of the target population – at affordable costs and economic returns. The target population may include suppliers of goods and services, manufacturers, producers, and other supply chain players, including vulnerable groups such as war victims, women, IDPs and others. **Labor demand of 9 oblasts for 2021-8m 2022 by sectors.** There are opportunities to involve FDIs to work and income-generating opportunities in a broad sense, at the industry level. **Labor supply of 9 oblasts for 2021-8m 2022 by sectors**. There are opportunities to engage FDIs to new level work and expand to improve living standards in a broad sense, at the industry level. **Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector.** There are opportunities to involve FDIs to work and income-generating opportunities in a broad sense, at the industry level. **Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector.** There are opportunities to engage FDIs to new level work and expand to improve living standards in a broad sense, at the industry level. **Index of the load of the unemployed per vacancy in the sub-sector** shows relative industry activity, undersaturation, saturation, and oversaturation
Institutional (20%)
Private sector / government and / or donor investments: There is positive interest from the private sector, government or donors, and existing programs can provide synergies and additional measures to implement a long-term program to develop industries in Western Ukraine. **Institutional capacity to sustain value chain development,** their ability to implement a competitive policy aimed at developing an effective competitive environment, stimulating fair and honest competition in the context the number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry
Environment (10%)
Impact of the environment, including climate change, on the value chain: Activities have a neutral impact on the environment or potential adverse environmental impacts (soils, water, air, biodiversity, human heath) can easily be mitigated by adopting good manufacturing and environmental practices.

Source: IPG Developments based on USAID approach[170]

1.2.2. Final chain selection process, ranking of chains and building a matrix of simplicity and attractiveness of supply chains

Data collection and industry analysis.

For quantitative data, IPG team used United Nations (UN) COMTRADE data available through the ITC Trade map, official government statistics for 2012-2022, reports from international organizations, customs databases, and other relevant reports.

Annex 2

The final selection processes.

Using all available information, each product was assigned a score for each sub-criterion using the five-point Likert scale with large/strongly positive scored (as 5), moderate or neutral (as 3), or small or limited value or non-positive (as 1), which is presented below in Table 2.3.1.

Table 2. 3. 1. Methodology for Weighting and Scoring the Selection Criteria

Criteria	Data source	Weight of the indicator	Counting points				
			1	2	3	4	5
Economic (30%)							
Market size (USD), 2021	ITC Trade map	10%	< U.S.$100 million	U.S.$100 million – U.S.$1 billion	U.S. $1 billion – U.S. $3 billion	U.S.$ 3 billion – U.S.$ 6 billion	> U.S. $6 billion
Market growth (annual growth rate in value (%) during 2017-2021	ITC Trade map	5%	Less than 1%	from 1% to 5%	from 5% to 10%	from 10% to 15%	More than 15%
Ukraine's market share in the world (percent of total exports in quantity), 2021	ITC Trade map	5%	from 0% to $0.10%	from 0.1% to 0.2%	from 0.2% to 0.3%	from 0.3% to 0.4%	> 0.4%
Current exports from Ukraine	ITC Trade map	5%	Low, < U.S $1 million	From U.S $1 million to U.S $2 million	U.S $2 million to U.S $5 million	U.S $5 million to U.S $10 million	> U.S. $10 million
Current imports to Ukraine	ITC Trade map	5%	Low, < U.S $1 million	From U.S $1 million to U.S $2 million	U.S $2 million to U.S $5 million	U.S $5 million to U.S $10 million	> U.S $10 million
Social (30%)							

[170] Developed by IPG for current report using USAID approach from report of Value chain assessment and selection of Moldova high value agriculture activity, March 17, 2017

Scalability of 9 oblasts	State Statistics Service of Ukraine	5%	<20 producers	20-100 producers	100-200 producers	200-500 producers	> 500 producers
Labor demand of 9 oblasts for 2021-8m 2022 by product groups, units	State Employment Service of Ukraine	5%	< 4500	4500 - 9000	9000 - 15000	15000 - 20000	>20 000
Labor supply of 9 oblasts for 2021-8m 2022 by product groups, units	State Employment Service of Ukraine	5%	< 4500	4500 - 9000	9000 - 15000	15000 - 20000	>20 000
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector, units	State Employment Service of Ukraine	5%	<1500	1500 - 3000	3000 - 4500	4500 - 6000	> 6000
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector, units	State Employment Service of Ukraine	5%	<1500	1500 - 3000	3000 - 4500	4500 - 6000	> 6000
Labor index	IPG calculations	5%	>1; 0 - 0,5	0,5-0,6	0,6-0,7	0,7-0,8	0,80-1
Institutional (20%)							
Capital investments by types of economic activity of industry by 9 oblasts, bln.UAH (2021)	State Statistics Service of Ukraine	10%	< 1,5 billion	1,5-2,5 billion	2,5 - 3,5 billion	3,5 - 4,5 billion	> 4,5 billion
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic	State Statistics Service of Ukraine	10%	<20 producers	20-100 producers	100-200 producers	200-500 producers	> 500 producers

activity of industry in 2020, units							
Environment (20%)							
Share of global greenhouse gas emissions (%)	Climate Watch, the World Resources Institute (2020)	20%	> 10%	7,5% - 10,0%	5,0%- 7,5%	2,5% - 5,0 %	< 2,5%

Source: IPG Developments based on USAID approach[171]

Weighing and scoring the selection of supply chains.

The research team identified quantitative and qualitative data sources for use in assessing value chain. Quantitative data were used in the economic part of the analysis to assess the potential for long-term competitiveness and increase sales. The sub-criteria were also weighed to reflect our judgment and relative importance. For quantitative data, the IPG team used United Nations (UN) COMTRADE data available through the ITC trade map, official state statistics for 2012-2022, reports from international organizations, customs databases and other relevant reports.

As shown (Table 2.3.1), 30 percent of the weight was given to economic criteria (long-term export potential and import substitution), which can trigger growth in individual supply chains. Another 30 percent of the weight was given to social scalability criteria so that production using new technologies could be expanded to numerous producers, processors, service providers and other participants in the supply chain, as well as the involvement of IDPs. The weight for environmental and institutional criteria is 20 percent each.

[171] Developed by IPG for current report using USAID approach from report of Value chain assessment and selection of Moldova high value agriculture activity, March 17, 2017

Annex 3

Sub-sector	Data source	Bicycles and other cycles, incl. delivery tricycles, not motorised	Aircraft, spacecraft, and parts thereof	Motor vehicles for the transport of >= 10 persons	Articles of apparel and clothing accessories, knitted or crocheted	Men's or boys' underpants, briefs, nightshirts, pyjamas, bathrobes, dressing gowns and similar
Product group (eng)		other transport facilities excluding railway	other transport facilities excluding railway	ground and pipeline transport	apparel	apparel
Economic						
Market size (USD), 2021	ITC Map trade	11,485	162,207	13,195	233,924	8,206
Market growth (annual growth rate in value (%) during 2017-2021	ITC Map trade	8,00	-11,00	-6,00	1,00	3,00
Ukraine's market share in the world (percent of total exports in quantity), 2021	ITC Map trade	0,01%	0,05%	0,06%	0,05%	0,03%
Current exports from Ukraine, 2021	ITC Map trade	786	66 749	6 971	133 268	2 554
Current imports to Ukraine, 2021	ITC Map trade	32 344	341 453	56 983	443 150	13 543
Economic Score		**9**	**12**	**12**	**18**	**16**
Market size (USD), 2021 Score	IPG calculations	5	5	5	5	5
Market growth (annual growth rate in value (%) during 2017-2021 Score	IPG calculations	-3	-4	-3	2	2
Ukraine's market share in the world (percent of total exports in quantity), 2021 Score	IPG calculations	1	1	1	1	1
Current exports from Ukraine Score	IPG calculations	1	5	4	5	3
Current imports to Ukraine Score	IPG calculations	5	5	5	5	5
Social						
Scalability of 9 oblasts	State Statistics Service of Ukraine	23	426	205	640	640
Labor demand of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	793	793	12654	5613	5613
Labor supply of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	705	705	12013	4545	4545
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	63	469	3212	2800	416
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	63	238	2283	2262	465
Labor index	IPG calculations	1,00	0,51	0,71	0,81	1,12
Social Score		**11**	**10**	**19**	**17**	**11**
Scalability of 9 oblasts Score	IPG calculations	2	4	4,0	4	4
Labor demand of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	1	1	3	2	2
Labor supply of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	1	1	3	2	2
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	3	2	1
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	2	2	1
Labor index Score	IPG calculations	5	2	4	5	1
Institutional						
Capital investments by types of economic activity of industry by 9 oblast, bln.UAH (2021)	State Statistics Service of Ukraine	1,47	1,47	1,47	0,49	0,49
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020, units	State Statistics Service of Ukraine	25	25	25	14	14
Institutional Score		**3**	**3**	**3**	**2**	**2**
Capital investments by types of economic activity of industry by 9 oblasts Score	IPG calculations	1	1	1	1	1
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020 Score	IPG calculations	2	2	2	1	1
Environment						
Share of global greenhouse gas emissions (%)	Climate Watch, the World Resources Institute (2020)	0,5	0,5	11,9	10,6	11,6
Environment Score		**5**	**6**	**1**	**1**	**2**
Share of global greenhouse gas emissions (%) Score	IPG calculations	5	6	1	1	2

Sub-sector	Data source	Women's or girls' slips, petticoats, briefs, panties, nightdresses, pyjamas, négligés, bathrobes	Babies' garments and clothing accessories, knitted or crocheted (excluding hats)	Brassieres, girdles, corsets, braces, suspenders, garters and similar articles and parts thereof	Tracksuits, ski suits, swimwear and other garments, n.e.s. (excluding knitted or crocheted)	Mineral or chemical nitrogenous fertilisers
Product group (eng)		apparel	apparel	apparel	apparel	chemicals and chemical products
Economic						
Market size (USD), 2021	ITC Map trade	13,652	8,226	12,434	11,904	38,789
Market growth (annual growth rate in value (%) during 2017-2021	ITC Map trade	2,00	1,00	-1,00	1,00	12,00
Ukraine's market share in the world (percent of total exports in quantity), 2021	ITC Map trade	0,07%	0,20%	0,11%	0,11%	1,69%
Current exports from Ukraine, 2021	ITC Map trade	12 097	16 925	15 065	16 132	625 418
Current imports to Ukraine, 2021	ITC Map trade	29 893	25 569	21 089	13 611	507 421
Economic Score		**18**	**20**	**15**	**19**	**24**
Market size (USD), 2021 Score	IPG calculations	5	5	5	5	5
Market growth (annual growth rate in value (%) during 2017-2021 Score	IPG calculations	2	2	-2	2	4
Ukraine's market share in the world (percent of total exports in quantity), 2021 Score	IPG calculations	1	3	2	2	5
Current exports from Ukraine Score	IPG calculations	5	5	5	5	5
Current imports to Ukraine Score	IPG calculations	5	5	5	5	5
Social						
Scalability of 9 oblasts	State Statistics Service of Ukraine	640	640	640	640	312
Labor demand of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	5613	5613	5613	5613	1389
Labor supply of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	4545	4545	4545	4545	1526
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	416	416	416	1236	380
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	465	465	465	816	325
Labor index	IPG calculations	1,12	1,12	1,12	0,66	0,86
Social Score		**11**	**11**	**11**	**13**	**13**
Scalability of 9 oblasts Score	IPG calculations	4	4	4	4	4
Labor demand of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	2	2	2	2	1
Labor supply of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	2	2	2	2	1
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	1	1	1
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	1	1	1
Labor index Score	IPG calculations	1	1	1	3	5
Institutional						
Capital investments by types of economic activity of industry by 9 oblast, bln.UAH (2021)	State Statistics Service of Ukraine	0,49	0,49	0,49	0,49	0,22
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020, units	State Statistics Service of Ukraine	14	14	14	14	48
Institutional Score		**2**	**2**	**2**	**2**	**3**
Capital investments by types of economic activity of industry by 9 oblasts Score	IPG calculations	1	1	1	1	1
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020 Score	IPG calculations	1	1	1	1	2
Environment						
Share of global greenhouse gas emissions (%)	Climate Watch, the World Resources Institute (2020)	12,6	13,6	14,6	15,6	3,6
Environment Score		**3**	**4**	**5**	**6**	**4**
Share of global greenhouse gas emissions (%) Score	IPG calculations	3	4	5	6	4,00

Sub-sector	Data source	Paper and paperboard, coated on one or both sides with kaolin	Footwear	Electrical energy	Pile fabrics	Arms and ammunition; parts and accessories thereof
Product group (eng)		paper and paper products	leather and leather products	Electrical energy	textiles	fabricated metal products
Economic						
Market size (USD), 2021	ITC Map trade	27,132	53,290	64,766	5,426	14,761
Market growth (annual growth rate in value (%) during 2017-2021	ITC Map trade	-2,00	-1,00	15,00	8,00	7,00
Ukraine's market share in the world (percent of total exports in quantity), 2021	ITC Map trade	0,17%	0,04%	0,39%	0,01%	0,00%
Current exports from Ukraine, 2021	ITC Map trade	44 127	24 012	241 504	472	0
Current imports to Ukraine, 2021	ITC Map trade	198 602	153 171	86 170	25 246	0
Economic Score		**15**	**15**	**24**	**14**	**8**
Market size (USD), 2021 Score	IPG calculations	5	5	5	4	5
Market growth (annual growth rate in value (%) during 2017-2021 Score	IPG calculations	-2	-1	5	3	3
Ukraine's market share in the world (percent of total exports in quantity), 2021 Score	IPG calculations	2	1	4	1	0
Current exports from Ukraine Score	IPG calculations	5	5	5	1	0
Current imports to Ukraine Score	IPG calculations	5	5	5	5	0
Social						
Scalability of 9 oblasts	State Statistics Service of Ukraine	221	143	972	138	742
Labor demand of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	1658	1346	8772	2454	2786
Labor supply of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	1352	1723	9595	1600	2823
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	685	861	1669	644	243
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	397	964	879	336	80
Labor index	IPG calculations	0,58	1,12	0,53	0,52	0,33
Social Score		**10**	**8**	**15**	**9**	**10**
Scalability of 9 oblasts Score	IPG calculations	4	3	5	3	5
Labor demand of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	1	1	2	1	1
Labor supply of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	1	1	3	1	1
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	2	1	1
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	1	1	1
Labor index Score	IPG calculations	2	1	2	2	1
Institutional						
Capital investments by types of economic activity of industry by 9 oblast, bln.UAH (2021)	State Statistics Service of Ukraine	1,78	0,49	3,06	0,49	0,79
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020, units	State Statistics Service of Ukraine	10	3	15	9	40
Institutional Score		**3**	**2**	**4**	**2**	**3**
Capital investments by types of economic activity of industry by 9 oblasts Score	IPG calculations	2	1	3	1	1
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020 Score	IPG calculations	1	1	1	1	2
Environment						
Share of global greenhouse gas emissions (%)	Climate Watch, the World Resources Institute (2020)	1	11	25	11	7
Environment Score		**5**	**1**	**1**	**1**	**3**
Share of global greenhouse gas emissions (%) Score	IPG calculations	5,00	1,00	1,00	1,00	3,00

Sub-sector	Data source	Packing cases, boxes, crates, drums and similar packings, of wood	Sauces And Preparations Therefor, Mixed Condiments And Mixed Seasonings; Mustard Flour And Meal And Prepared Mustard	Ships, boats and floating structures	Gypsum; anhydrite; plasters consisting of calcined gypsum or calcium sulphate, whether or not	Wire of iron or non-alloy steel, in coils (excluding bars and rods)
Product group (eng)		wood and of products	food products	other transport facilities excluding railway	non-metallic mineral products	basic metals
Economic						
Market size (USD), 2021	ITC Map trade	4,991	15,835	89,572	1,901	9,029
Market growth (annual growth rate in value (%) during 2017-2021	ITC Map trade	8,00	7,00	-3,00	6,00	5,00
Ukraine's market share in the world (percent of total exports in quantity), 2021	ITC Map trade	2,50%	0,28%	0,13%	0,14%	0,80%
Current exports from Ukraine, 2021	ITC Map trade	140 442	47 547	158 826	2 097	84 441
Current imports to Ukraine, 2021	ITC Map trade	7 651	76 302	28 684	1 168	19 049
Economic Score		**22**	**21**	**15**	**15**	**23**
Market size (USD), 2021 Score	IPG calculations	5	5	5	5	5
Market growth (annual growth rate in value (%) during 2017-2021 Score	IPG calculations	3	3	-2	3	3
Ukraine's market share in the world (percent of total exports in quantity), 2021 Score	IPG calculations	5	3	2	2	5
Current exports from Ukraine Score	IPG calculations	5	5	5	3	5
Current imports to Ukraine Score	IPG calculations	4	5	5	2	5
Social						
Scalability of 9 oblasts	State Statistics Service of Ukraine	1570	1383	23	919	90
Labor demand of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	6544	16352	793	8105	513
Labor supply of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	6435	21900	705	11141	877
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	277	342	0	151	8
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	292	176	18	120	20
Labor index	IPG calculations	1,05	0,51	18,00	0,79	2,50
Social Score		**12**	**18**	**6**	**16**	**7**
Scalability of 9 oblasts Score	IPG calculations	5	5	1	5	2
Labor demand of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	2	4	1	2	1
Labor supply of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	2	5	1	3	1
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	1	1	1
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	1	1	1
Labor index Score	IPG calculations	1	2	1	4	1
Institutional						
Capital investments by types of economic activity of industry by 9 oblast, bln.UAH (2021)	State Statistics Service of Ukraine	1,78	5,70	1,47	3,44	0,79
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020, units	State Statistics Service of Ukraine	17	152	25	40	19
Institutional Score		**3**	**8**	**3**	**5**	**2**
Capital investments by types of economic activity of industry by 9 oblasts Score	IPG calculations	2	5	1	3	1
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020 Score	IPG calculations	1	3	2	2	1
Environment						
Share of global greenhouse gas emissions (%)	Climate Watch, the World Resources Institute (2020)	1	1	0,5	11	7
Environment Score		**5**	**5**	**5**	**1**	**3**
Share of global greenhouse gas emissions (%) Score	IPG calculations	5,00	5,00	5	1,00	3,00

Sub-sector	Data source	Ball or roller bearings	Coal; briquettes, ovoids and similar solid fuels manufactured from coal	Lignite, whether or not agglomerated (excluding jet)	Peat	Meat and edible meat offal
Product group (eng)		machinery and equipment n.e.c.	mining of coal and lignite	mining of coal and lignite	other mining and quarrying	food products
Economic						
Market size (USD), 2021	ITC Map trade	37,344	154,245	9,364	2,011	151,596
Market growth (annual growth rate in value (%) during 2017-2021	ITC Map trade	1,00	-1,00	13,00	9,00	6,00
Ukraine's market share in the world (percent of total exports in quantity), 2021	ITC Map trade	0,24%	0,00%		0,06%	0,54%
Current exports from Ukraine, 2021	ITC Map trade	84 071	150	7	1 073	827 763
Current imports to Ukraine, 2021	ITC Map trade	143 920	2 403 966	136	6 666	206 189
Economic Score		**20**	**8**	**11**	**13**	**23**
Market size (USD), 2021 Score	IPG calculations	5	5	5	3	5
Market growth (annual growth rate in value (%) during 2017-2021 Score	IPG calculations	2	-2	4	3	3
Ukraine's market share in the world (percent of total exports in quantity), 2021 Score	IPG calculations	3			1	5
Current exports from Ukraine Score	IPG calculations	5		1	2	5
Current imports to Ukraine Score	IPG calculations	5	5	1	4	5
Social						
Scalability of 9 oblasts	State Statistics Service of Ukraine	343	11	11	403	1383
Labor demand of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	2304	927	927	1874	16352
Labor supply of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	1817	695	695	2153	21900
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	574	921	6	142	733
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	136	690	5	102	855
Labor index	IPG calculations	0,24	0,75	0,83	0,72	1,17
Social Score		**9**	**9**	**10**	**12**	**17**
Scalability of 9 oblasts Score	IPG calculations	4	1	1	4	5
Labor demand of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	1	1	1	1	4
Labor supply of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	1	1	1	1	5
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	1	1	1
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	1	1	1
Labor index Score	IPG calculations	1	4	5	4	1
Institutional						
Capital investments by types of economic activity of industry by 9 oblast, bln.UAH (2021)	State Statistics Service of Ukraine	0,13	1,25	1,25	1,25	5,70
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020, units	State Statistics Service of Ukraine	67	17	17	17	152
Institutional Score		**3**	**2**	**2**	**2**	**8**
Capital investments by types of economic activity of industry by 9 oblasts Score	IPG calculations	1	1	1	1	5
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020 Score	IPG calculations	2	1	1	1	3
Environment						
Share of global greenhouse gas emissions (%)	Climate Watch, the World Resources Institute (2020)	1	2	2	2	1
Environment Score		**5**	**5**	**5**	**5**	**5**
Share of global greenhouse gas emissions (%) Score	IPG calculations	5,00	5,00	5,00	5,00	5,00

Sub-sector	Data source	Animal or vegetable fats and oils and their cleavage products	Bread, pastry, cakes, biscuits and other bakers' wares	Pasta, whether or not cooked or stuffed with meat or other substances or otherwise prepared	Prepared foods obtained by the swelling or roasting of cereals or cereal products	Animal fodder
Product group (eng)		food products	food products	food products	food products	food products
Economic						
Market size (USD), 2021	ITC Map trade	151,312	44,016	12,062	7,432	104,567
Market growth (annual growth rate in value (%) during 2017-2021	ITC Map trade	9,00	6,00	8,00	4,00	8,00
Ukraine's market share in the world (percent of total exports in quantity), 2021	ITC Map trade	4,65%	0,57%	0,55%	0,18%	1,73%
Current exports from Ukraine, 2021	ITC Map trade	6 897 683	248 478	691 783	13 589	1 727 153
Current imports to Ukraine, 2021	ITC Map trade	433 296	127 187	56 731	28 792	340 280
Economic Score		**23**	**23**	**23**	**19**	**23**
Market size (USD), 2021 Score	IPG calculations	5	5	5	5	5
Market growth (annual growth rate in value (%) during 2017-2021 Score	IPG calculations	3	3	3	2	3
Ukraine's market share in the world (percent of total exports in quantity), 2021 Score	IPG calculations	5	5	5	2	5
Current exports from Ukraine Score	IPG calculations	5	5	5	5	5
Current imports to Ukraine Score	IPG calculations	5	5	5	5	5
Social						
Scalability of 9 oblasts	State Statistics Service of Ukraine	1383	1383	1383	1383	1383
Labor demand of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	16352	16352	16352	16352	16352
Labor supply of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	21900	21900	21900	21900	21900
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	874	692	139	643	161
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	639	688	88	354	67
Labor index	IPG calculations	0,73	0,99	0,63	0,55	0,42
Social Score		**20**	**21**	**19**	**18**	**17**
Scalability of 9 oblasts Score	IPG calculations	5	5	5	5	5
Labor demand of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	4	4	4	4	4
Labor supply of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	5	5	5	5	5
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	1	1	1
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	1	1	1
Labor index Score	IPG calculations	4	5	3	2	1
Institutional						
Capital investments by types of economic activity of industry by 9 oblast, bln.UAH (2021)	State Statistics Service of Ukraine	5,70	5,70	5,70	5,70	5,70
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020, units	State Statistics Service of Ukraine	152	152	152	152	152
Institutional Score		**8**	**8**	**8**	**8**	**8**
Capital investments by types of economic activity of industry by 9 oblasts Score	IPG calculations	5	5	5	5	5
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020 Score	IPG calculations	3	3	3	3	3
Environment						
Share of global greenhouse gas emissions (%)	Climate Watch, the World Resources Institute (2020)	1	1	1	1	1
Environment Score		**5**	**5**	**5**	**5**	**5**
Share of global greenhouse gas emissions (%) Score	IPG calculations	5,00	5,00	5,00	5,00	5,00

Sub-sector	Data source	Tobacco and manufactured tobacco substitutes	Other made-up textile articles	Carpets and other textile floor coverings	Pharmaceutical products	Wood and articles of wood
Product group (eng)		tobacco products	textiles	textiles	pharmaceuticals	wood and of products
Economic						
Market size (USD), 2021	ITC Map trade	44,188	82,862	17,093	853,036	189,297
Market growth (annual growth rate in value (%) during 2017-2021	ITC Map trade	0,00	15,00	2,00	10,00	5,00
Ukraine's market share in the world (percent of total exports in quantity), 2021	ITC Map trade	1,15%	0,22%	0,15%	0,04%	1,05%
Current exports from Ukraine, 2021	ITC Map trade	448 283	197 477	27 606	301 376	1 939 864
Current imports to Ukraine, 2021	ITC Map trade	559 150	356 087	48 798	2 985 069	414 778
Economic Score		**20**	**24**	**19**	**20**	**23**
Market size (USD), 2021 Score	IPG calculations	5	5	5	5	5
Market growth (annual growth rate in value (%) during 2017-2021 Score	IPG calculations		5	2	4	3
Ukraine's market share in the world (percent of total exports in quantity), 2021 Score	IPG calculations	5	4	2	1	5
Current exports from Ukraine Score	IPG calculations	5	5	5	5	5
Current imports to Ukraine Score	IPG calculations	5	5	5	5	5
Social						
Scalability of 9 oblasts	State Statistics Service of Ukraine	10	138	138	24	1570
Labor demand of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	45	2454	2454	109	6544
Labor supply of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	14	1600	1600	393	6435
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	45	1106	196	109	354
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	14	867	60	393	474
Labor index	IPG calculations	0,31	0,78	0,31	3,61	1,34
Social Score		**6**	**11**	**8**	**7**	**12**
Scalability of 9 oblasts Score	IPG calculations	1	3	3	2	5
Labor demand of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	1	1	1	1	2
Labor supply of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	1	1	1	1	2
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	1	1	1
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	1	1	1	1
Labor index Score	IPG calculations	1	4	1	1	1
Institutional						
Capital investments by types of economic activity of industry by 9 oblast, bln.UAH (2021)	State Statistics Service of Ukraine	5,70	0,49	0,49	0,22	1,78
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020, units	State Statistics Service of Ukraine	1	9	9	33	17
Institutional Score		**6**	**2**	**2**	**3**	**3**
Capital investments by types of economic activity of industry by 9 oblasts Score	IPG calculations	5	1	1	1	2
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020 Score	IPG calculations	1	1	1	2	1
Environment						
Share of global greenhouse gas emissions (%)	Climate Watch, the World Resources Institute (2020)	1	11	11	4	1
Environment Score		**5**	**1**	**1**	**4**	**5**
Share of global greenhouse gas emissions (%) Score	IPG calculations	5,00	1,00	1,00	4,00	5,00

Sub-sector	Data source	Paper and paperboard	Radiators for central heating, non-electrically heated, and parts thereof	bridges and bridge-sections, lock-gates, towers, lattice masts, roofs, roofing frameworks, doors and windows and their frames and thresholds	Electrical machinery and equipment and parts thereof
Product group (eng)		paper and paper products	fabricated metal products	fabricated metal products	computer, electronic and optical products
Economic					
Market size (USD), 2021	ITC Map trade	182,855	4,470	54,088	3 590,767
Market growth (annual growth rate in value (%) during 2017-2021	ITC Map trade	1,00	4,00	3,00	5,00
Ukraine's market share in the world (percent of total exports in quantity), 2021	ITC Map trade	0,24%	0,73%	0,17%	0,09%
Current exports from Ukraine, 2021	ITC Map trade	453 543	30 215	102 729	3 167 277
Current imports to Ukraine, 2021	ITC Map trade	921 490	42 756	157 234	6 153 301
Economic Score		**20**	**21**	**19**	**19**
Market size (USD), 2021 Score	IPG calculations	5	4	5	5
Market growth (annual growth rate in value (%) during 2017-2021 Score	IPG calculations	2	2	2	3
Ukraine's market share in the world (percent of total exports in quantity), 2021 Score	IPG calculations	3	5	2	1
Current exports from Ukraine Score	IPG calculations	5	5	5	5
Current imports to Ukraine Score	IPG calculations	5	5	5	5
Social					
Scalability of 9 oblasts	State Statistics Service of Ukraine	221	742	742	112
Labor demand of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	1658	2786	2786	788
Labor supply of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	1352	2823	2823	1100
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	6544	199	229	161
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	6435	170	183	151
Labor index	IPG calculations	0,98	0,85	0,80	0,94
Social Score		**21**	**14**	**14**	**12**
Scalability of 9 oblasts Score	IPG calculations	4	5	5	3
Labor demand of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	1	1	1	1
Labor supply of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	1	1	1	1
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	5	1	1	1
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	5	1	1	1
Labor index Score	IPG calculations	5	5	5	5
Institutional					
Capital investments by types of economic activity of industry by 9 oblast, bln.UAH (2021)	State Statistics Service of Ukraine	1,78	0,79	0,79	0,13
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020, units	State Statistics Service of Ukraine	10	40	40	34
Institutional Score		**3**	**3**	**3**	**3**
Capital investments by types of economic activity of industry by 9 oblasts Score	IPG calculations	2	1	1	1
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020 Score	IPG calculations	1	2	2	2
Environment					
Share of global greenhouse gas emissions (%)	Climate Watch, the World Resources Institute (2020)	1	7	7	1
Environment Score		**5**	**3**	**3**	**5**
Share of global greenhouse gas emissions (%) Score	IPG calculations	5,00	3,00	3,00	5,00

Sub-sector	Data source	Electric motors and generators	Trailers and semi-trailers; other vehicles, not mechanically propelled	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings	Toys, games and sports requisites
Product group (eng)		electrical equipment	transport equipment, trailers and semi-trailers	furniture	other products
Economic					
Market size (USD), 2021	ITC Map trade	67,746	33,352	289,866	161,821
Market growth (annual growth rate in value (%) during 2017-2021	ITC Map trade	4,00	3,00	4,00	6,00
Ukraine's market share in the world (percent of total exports in quantity), 2021	ITC Map trade	0,04%	0,09%	0,31%	0,06%
Current exports from Ukraine, 2021	ITC Map trade	24 904	31 327	1 029 121	111 357
Current imports to Ukraine, 2021	ITC Map trade	151 717	216 731	565 785	394 846
Economic Score		**18**	**18**	**21**	**19**
Market size (USD), 2021 Score	IPG calculations	5	5	5	5
Market growth (annual growth rate in value (%) during 2017-2021 Score	IPG calculations	2	2	2	3
Ukraine's market share in the world (percent of total exports in quantity), 2021 Score	IPG calculations	1	1	4	1
Current exports from Ukraine Score	IPG calculations	5	5	5	5
Current imports to Ukraine Score	IPG calculations	5	5	5	5
Social					
Scalability of 9 oblasts	State Statistics Service of Ukraine	171	84	426	190
Labor demand of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	1829	3754	2947	660
Labor supply of 9 oblasts for 2021-8m 2022 by product groups	State Employment Service of Ukraine	1853	6557	3513	1135
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	577	3754	2947	158
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector	State Employment Service of Ukraine	778	6557	3513	245
Labor index	IPG calculations	1,35	1,75	1,19	1,55
Social Score		**8**	**14**	**12**	**8**
Scalability of 9 oblasts Score	IPG calculations	3	2	4	3
Labor demand of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	1	1	1	1
Labor supply of 9 oblasts for 2021-8m 2022 by product groups Score	IPG calculations	1	2	1	1
Labor demand of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	3	2	1
Labor supply of 9 oblasts for 2021-8m 2022 by sub-sector Score	IPG calculations	1	5	3	1
Labor index Score	IPG calculations	1	1	1	1
Institutional					
Capital investments by types of economic activity of industry by 9 oblast, bln.UAH (2021)	State Statistics Service of Ukraine	0,10	1,47	0,82	3,44
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020, units	State Statistics Service of Ukraine	38	21	20	13
Institutional Score		**3**	**3**	**3**	**4**
Capital investments by types of economic activity of industry by 9 oblasts Score	IPG calculations	1	1	1	3
Number of industrial enterprises that implemented innovations (products and/or technological processes) by type economic activity of industry in 2020 Score	IPG calculations	2	2	2	1
Environment					
Share of global greenhouse gas emissions (%)	Climate Watch, the World Resources Institute (2020)	1	1	1	11
Environment Score		**5**	**5**	**5**	**1**
Share of global greenhouse gas emissions (%) Score	IPG calculations	5,00	5,00	5,00	1,00

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