**Croatian Bureau of Statistics**

# 35th Voorburg Group Meeting

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## Mini-Presentation for Output on

## Warehousing and Storage (ISIC 52.10)

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# 1. INTRODUCTION

Since 2017, the Croatian Bureau of Statistics has supplemented the quarterly dynamics of conducting turnover survey with the monthly dynamics. The data is based on the Monthly Report on Service Activities and administrative data sources (databases of value added tax reports). The series are transmitted to Eurostat and nationally disseminated at the division level, for H 52 Warehousing and support activities for transportation within the t+60 days deadline, which is in line with the present requirement defined by the STS Regulation for small countries.

In Croatia, Warehousing and storage is a quite small service according to the share of turnover and the number of enterprises within non-financial services. In the group H 521, medium-sized enterprises earn the biggest share of the group turnover but according to the number of enterprises, micro and small-sized enterprises occupy the largest share of the group's total number of enterprises.

# 2. DESCRIPTIONS AND CHARACTERISTICS OF THE INDUSTRY

## 2.1 DEFINITION OF THE INDUSTRY

### Definition of Service

The Warehousing and Storage class is one of the components of ISIC section H - Transport and Storage, and it is closely connected to transportation and logistics services. Proper storage of goods is one of the most important processes in the field of logistics and distribution of goods.

This class includes the operation of storage and warehouse facilities for all kinds of goods (grain silos, general merchandise warehouses, refrigerated warehouses, storage tanks, etc.), the storage of goods in foreign trade zones, and blast-freezing.[1]

### Classification Issues

According to the International Standard Industrial Classification of All Economic Activities (ISIC), Rev. 4, class 5210 Warehousing and Storage includes the following:
- operation of storage and warehouse facilities for all kind of goods
- operation of grain silos, general merchandise warehouses, refrigerated warehouses, storage tanks, etc.

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[1] Eurostat OECD Methodological Guide for Developing Producer Price Indices for Services, 2014

This class also includes the following:
- storage of goods in foreign trade zones
- blast freezing.

This class excludes the following:
- parking facilities for motor vehicles, see 5221
- operation of self-storage facilities, see 6810
- renting of vacant space, see 6810.

For national purposes, the Croatian Bureau of Statistics uses the NKD 2007 – National Classification of Activities (Official Gazette of the Republic of Croatia, Nos 58/07 and 123/08). There are no differences between the NKD 2007, the Statistical Classification of Economic Activities in the European Community NACE Rev.2. and the ISIC classification for class H 5210 Warehousing and Storage.

In the Central Product Classification (CPC) Version 2.1, the products of Warehousing and Storage (ISIC 5210) are classified under group Storage and warehousing services (CPC 672), further divided into three subclasses. On the other hand, in the Statistical Classification of Products by Activity (CPA 2015), the products of Warehousing and storage (ISIC 5210) are classified under category Warehousing and storage services (CPA 52.10.1), further divided into four subcategories.

Table 1. CPC and CPA product classification for Warehousing and storage

| CPC Version 2 | CPA 2008 |
|---|---|
| **67210 Refrigerated storage services** | **52.10.11 Refrigerated storage services** |
| This subclass includes:<br>- storage and warehousing services for frozen or refrigerated goods, including perishable food products<br>- blast freezing services, associated with storage and warehousing<br><br>This subclass does not include:<br>- specialized freezing of food on a fee or contract basis, cf. corresponding subclass in group 881, based on type of good to be frozen | - similar to CPC 67210<br><br>- blast freezing services, associated with storage and warehousing, are not mentioned explicitly |
| **67220 Bulk liquid or gas storage services** | **52.10.12 Bulk liquid or gas storage services** |
| This subclass includes:<br>- bulk storage and warehousing services for liquids and gases, including oil and oil products, wine and the like | Exactly the same as CPC 67220 |
| **67290 Other storage and warehousing services** | **52.10.13 Grain storage services** |
| This subclass includes:<br>- storage services of grains | This subcategory includes:<br>- storage services of grains |

| | |
|---|---|
| - other storage or warehousing services | - operation services of grain silos |
| **67290 Other storage and warehousing services** | **52.10.19 Other warehousing and storage services** |
| This subclass includes:<br>- storage services of grains<br>- other storage or warehousing services | This subcategory excludes:<br>- parking facilities for motor vehicles, see 52.21.24<br>- self-storage facility services, see 68.20.12<br>- rental services of vacant space, see 68.20.12 |

There are minor differences between the CPA and the CPC classification. The CPA classification offers more detail by adding an own category for grain storage services, subcategory (CPA 521013) Grain storage services and by adding an exclusion for parking facilities for motor vehicles, self-storage facility services and rental services of vacant space in subcategory (CPA 521019) - Other warehousing and storage services.

## 2.2 MARKET CONDITIONS AND CONSTRAINTS

### Importance of the Industry

Activity H 52 is one of the five subsections (divisions) within the section H - Information and communication of the NACE Rev. 2 classification. In terms of turnover, in 2018, the strongest division in section H was H 49 (Land transport and transport via pipelines), producing 49.6% of turnover, and with the share of employment of 52.8% and the share of enterprises of 56.3%.
Division H 52 - Warehousing and support activities for transportation generated 32.2% of the total turnover in the section H, with the share of employment of 27.1% and the share of enterprises of 25.0%. The Croatian Bureau of Statistics does not publish the distribution of turnover for divisions H 51 and H 53 due to confidentiality.

Table 2. Distribution of turnover, enterprises and persons employed for section H in Croatia, 2018

| NACE Rev. 2 code | Activities | Turnover | Number of enterprises | Number of persons employed |
|---|---|---|---|---|
| | | In % | In % | In % |
| **H 49** | **Land transport and transport via pipelines** | **49.6** | **56.3** | **52.8** |
| H 50 | Water transport | 7.9 | 5.2 | 5.5 |
| H 51 | Air transport | c | 1.3 | 1.3 |
| **H 52** | **Warehousing and support activities for transportation** | **32.2** | **25.0** | **27.1** |
| H 53 | Postal and courier activities | c | 12.3 | 13.3 |
| **Total** | **Section H – Transportation and Storage** | **100.0** | **100.0** | **100.0** |

c – Confidential
Source: Structural Business Statistics, 2018, Croatian Bureau of Statistics

Table 3. Share of H 52 in non-financial services (sectors G, H, I, J, L, M, N and S, division 95, NACE Rev. 2), 2018

| NACE Rev. 2 code | Number of businesses | Turnover | Number of persons employed |
|---|---|---|---|
| **52.10 Warehousing and storage** | **0.1%** | **0.4%** | **0.3%** |
| **52.21 Service activities incidental to land transportation** | **0.4%** | **2.8%** | **2.7%** |
| 52.22 Service activities incidental to water transportation | 0.2% | 0.3% | 0.3% |
| 52.23 Service activities incidental to air transportation | 0.04% | 1.6% | 0.8% |
| 52.24 Cargo handling | 0.02% | 0.4% | 0.5% |
| **52.29 Other transportation support activities** | **0.6%** | **2.2%** | **1.2%** |
| 52 Warehousing and support activities for transportation | 1.3% | 7.7% | 5.8% |

Source: Structural Business Statistics, 2018, Croatian Bureau of Statistics

According to the Structural Business Statistics (2018), H 52 - Warehousing and support activities for transportation (NACE Rev.2) is quite a small industry within non-financial services (sectors G, H, I, J, L, M, N and S, division 95). Division H 52 generated 7.7% of the total turnover in non-financial services, with the share of employment of 5.8%. In terms of turnover and employment, the strongest class in division H 52 - Warehousing and support activities for transportation was 52.21 Service activities incidental to land transportation, with the contribution of 2.8% of turnover and 2.7% of employment, within non-financial services. Class H 5210 Warehousing and storage contributed with 0.4% of turnover and 0.3% of employment share.

## Market Situation Trends and Public Regulations

Croatia became a member of the EU in July 2013, in the middle of the six-year long recession. Joining the single market and being able to absorb EU grant funds helped the recovery a little bit. The logistics sector got a chance to develop and expand into new markets, but also found itself in a much stronger competitive environment, which significantly affected the growth of standards of available logistics services, including warehousing services. Only a few enterprises managed the whole situation well and took advantage of the single market. Most enterprises are committed to strengthening their competitiveness by cutting costs sharply and making the most of resources. The focus on reducing resources has led to a shortage of truck drivers and warehouse workers in the Croatian labour market.

Many warehousing and storage enterprises found the answer to the problem in increasing the level of automation of individual operations and digitalization of processes, which in return reduced the consequences of labour shortages. The increasing development of e-commerce and increased outsourcing of logistics will increase the pressure as well, so the optimization and digitalization of business will be the key to further development.

A good example of automation and digitalisation of processes in the warehousing and storage service is a Croatian robotics and artificial intelligence (AI) company Gideon Brothers. Gideon Brothers develops autonomous mobile robots for industry and logistics. These machines are a tool

that facilitates the work of employees in warehouses and increases the efficiency of operations of companies, thereby helping them accelerate growth in line with Industry 4.0 trends[2].

According to the Sector for Transport and Communications in the Croatian Chamber of Commerce, the estimation is that in Croatia about 30% – 40% of logistics services are allocated and given to logistics companies (outsourcing), while worldwide, this figure is about 70%. Having in mind world trends, it can be expected that logistics activities in Croatia will be directed towards outsourcing, i.e. given to specialized logistics companies, for which there are already good examples in practice, especially when it comes to warehousing and distribution logistics. The trend of outsourcing of logistics services opens additional potential for possible private investments in this sector.

Good logistics are very important for the success of a company, and according to the number of inhabitants, population density, geographical shape of Croatia and huge seasonal oscillations during the year, it can be expected the companies that will have efficient distribution will succeed in Croatian market.

The obligation of compliance with specific public regulations in the warehousing and storage service depends on the type of goods that are stored. In Croatia, the biggest number of legal acts are for the storage of gas and frozen goods because of their special treatment. There is also Law on storage and storage for cereals and industrial plants, Official Gazette of the Republic of Croatia, Nos 79/09, 124/11, 32/19 and Law on Flammable Liquids and Gases, Official Gazette of the Republic of Croatia, Nos 108/95, 56/10.

The Croatian Energy Regulatory Agency (Hrvatska regulatorna energetska agencija - HERA) is an autonomous, independent and non-profit public institution that regulates energy activities in the Republic of Croatia. HERA's obligations, authorities and responsibilities are based on the Act on the Regulation of Energy Activities, the Energy Act (Official Gazette of the Republic of Croatia, Nos 120/12, 14/14, 102/15, 68/18 – Amendments to the Act on the Regulation of Energy Activities (Official Gazette of the Republic of Croatia, Nos 120/12 and 68/18), the Gas Market Act (Official Gazette of the Republic of Croatia, Nos 18/18 and 23/20) and other acts regulating specific energy activities. The history of gas storage activities started in 1980s, and thanks to the increase in gas supply and consumption in the Republic of Croatia, there was an increasing need for gas storage. In Croatia, there is only one business entity that performs gas storage and it is state-owned.

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[2]The Fourth Industrial Revolution (or Industry 4.0) is the ongoing automation of traditional manufacturing and industrial practices, using modern smart technology. Large-scale machine-to-machine communication (M2M) and the internet of things (IoT) are integrated for increased automation, improved communication and self-monitoring, and production of smart machines that can analyze and diagnose issues without the need for human intervention.

Figure 1. Annual revenue growth of NACE class 5210 in Croatia, 2008 – 2018, thousand kuna
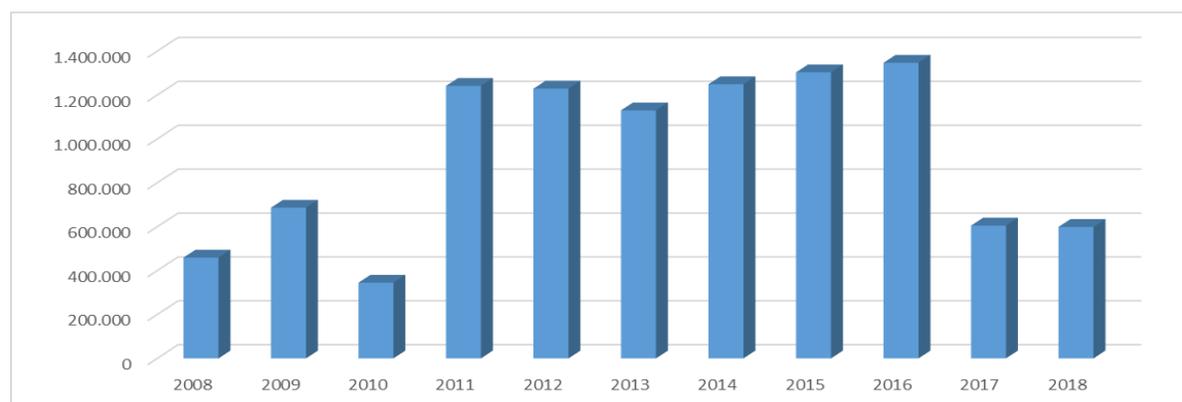


Source: Structural Business Statistics, 2008 – 2018, Croatian Bureau of Statistics

From 2014 to 2016, the turnover of NACE class 5210 - Warehousing and storage increased slowly, but in 2017, its turnover significantly decreased and fell below the level of 2009.

In 2017, a significant decline in turnover was caused by changing the main activity of one large enterprise with more than 1000 employees. This enterprise bought two business entities operating within the activity G 46 - Wholesale trade, except of motor vehicles and motorcycles, and focused its business on the wholesale trade service, which caused the change of the main activity from H 5210 - Warehousing and storage to 4690 - Non-specialized wholesale trade. The H 5210 - Warehousing and storage activity, together with H 5229 Other transportation support activities, became the secondary activity for this enterprise.

Table 4. Trends in NACE class 5210 in Croatia (2008 – 2018)

| Year | Number of enterprises | Turnover (thousand kuna) |
|------|----------------------|--------------------------|
| 2008 | 48 | 459.336 |
| 2009 | 55 | 686.622 |
| **2010** | **60** | **345.061** |
| 2011 | 61 | 1.241.717 |
| 2012 | 61 | 1.229.150 |
| 2013 | 64 | 1.130.098 |
| 2014 | 68 | 1.249.338 |
| 2015 | 66 | 1.303.430 |
| **2016** | **50** | **1.347.126** |
| 2017 | 51 | 605.100 |
| 2018 | 54 | 599.055 |

Source: Structural Business Statistics, 2008 – 2018, Croatian Bureau of Statistics

## Concentration within the Industry

Table 5 shows the actual distribution of turnover, enterprises and people employed for division H 52. In H 52, the highest share of turnover (36.8%) and employment (47.0%) was observed in the activity class H 5221 Service activities incidental to land transportation. The highest share of enterprises (45.5%) was recorded in the class H 5229 - Other transportation support activities, with the second highest share of turnover (28.8%) and employment (20.0%). The class H 5210 - Warehousing and storage contributed with 5.0% of turnover share, 5.3% of employment share and 5.4% of enterprises share.

Table 5. Distribution of turnover, enterprises and persons employed for division H 52 by classes, in Croatia, 2018

| NACE Rev. 2 code | Number of businesses | Turnover | Number of persons employed |
|---|---|---|---|
| **52.10 Warehousing and storage** | **5.4%** | **5.0%** | **5.3%** |
| **52.21 Service activities incidental to land transportation** | **31.3%** | **36.8%** | **47.0%** |
| 52.22 Service activities incidental to water transportation | 13.1% | 3.9% | 5.4% |
| 52.23 Service activities incidental to air transportation | 2.8% | 20.4% | 13.5% |
| 52.24 Cargo handling | 1.9% | 5.2% | 8.8% |
| **52.29 Other transportation support activities** | **45.5%** | **28.8%** | **20.0%** |
| 52 Warehousing and support activities for transportation | 100.0% | 100.0% | 100.0% |

Source: Structural Business Statistics, 2018, Croatian Bureau of Statistics

Table 6. Macroeconomic indicators according to NACE Rev 2. for group H 521, in Croatia, 2018

| Size classes by number of persons employed | Number of enterprises | | Turnover (thousand kuna) | | Number of persons employed | |
|---|---|---|---|---|---|---|
| | No. | % | Thousand kuna | % | No. | % |
| TOTAL | 54 | 100.0 | 599.055 | 100.0 | 1.172 | 100.0 |
| **0-1 persons** | **27** | **50.0** | **c** | **c** | **27** | **2.3** |
| 2-9 persons | 13 | 24.1 | 19.646 | 3.3 | 47 | 4.0 |
| 10-19 persons | 5 | 9.3 | 14.462 | 2.4 | 61 | 5.2 |
| 20-49 persons | 4 | 7.4 | 62.233 | 10.4 | 122 | 10.4 |
| **50-249 persons** | **4** | **7.4** | **367.924** | **61.4** | **405** | **34.6** |
| 250 and more persons | 1 | 1.9 | c | c | 510 | 43.5 |

c – Confidential
Source: Structural Business Statistics, 2018, Croatian Bureau of Statistics

Only turnover data for small and large-sized enterprises are marked as confidential. Aggregate data, for which confidentiality must be upheld (because of a small number of units, the dominance rule or secondary confidentiality rule), are treated as such and are not published, which is in line

with the Official Statistics Act (Official Gazette of the Republic of Croatia, Nos. 103/03, 75/09, 59/12 and 12/13) and the Regulation of the European Commission (250/2009/EC).

According to the number of enterprises[3], micro and small-sized enterprises (0 – 20 employees) occupy the largest share of the group's total number of enterprises, over 83%.

In the group H 521, medium-sized enterprises earn the biggest share of the group turnover, over 61% and according to the number of people employed, over 34%.

There is only one large enterprise in Croatia that employs more than 43% of the total persons employed[4] in the group H 521.

## Type of Consumers of the Services

Customers in the warehousing and storage service are comprised of units from B2B segments. The main consumers are manufacturers, wholesalers and retailers.

## Horizontal/Vertical Integration, Trends

Accompanied by modern technological solutions and the WMS system[5], warehousing and storage services are able to provide unloading, qualitative and quantitative control of consignments, receive and locate in pallet rack system, and provide container unloading of all standard dimensions, through technically prepared ramps for various vehicle types. At the same time, they also offer commissioning and order control services, i.e. pick & pack services, at the level of pieces, units smaller than packaging, original packaging or full palettes, with agreed reporting formats for all warehouse operations at a defined time level. In addition to the prepared conditions for storing the ADR category of products, temperature controlled and ambient products, the premises are provided with video surveillance 24/7, modern fire alarm systems, and with own and contracted security services.

Value added to the entire chain is given through the complete care of product organization from vendor to customer with systematic monitoring of key points in the process, with the possibility of system integration with various IT systems.

In Croatia the trend of outsourcing logistics operations is increasingly prevalent. The additional reasons for outsourcing are also costs and the importance of logistics is increasingly confirmed, as

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[3] The number of enterprises is the number of legal entities and natural persons registered in the Statistical Business Register that were active during at least a part of the reference period.

[4] The number of persons employed is defined as the total number of persons who work in an enterprise (including working proprietors, partners working regularly in the unit, unpaid family workers and voluntary workers), as well as persons who work outside the enterprise, but belong to it and are paid by the enterprise.

[5] A warehouse management system (WMS) is a software application designed to support and optimize warehouse functionality and distribution center management. These systems facilitate management in their daily planning, organizing, staffing, directing, and controlling the utilization of available resources, to move and store materials into, within, and out of a warehouse, while supporting staff in the performance of material movement and storage in and around a warehouse.

it affects each company's two main strategic objectives: reducing costs and increasing customer satisfaction. It is very important to find the right balance between these two goals.

## 2.3 SPECIFIC CHARACTERISTICS OF THE INDUSTRY

From a simple place to stock goods, warehouses have developed in many ways; function and form included. Affected by changes in production, procurement and distribution methods, warehousing has continually been pushed and pulled in different directions. With goods and materials coming in and out, the warehouse is also a vital hub in the centre of the supply chain.

In a perfect supply chain, warehouses would have no place, but the perfect supply chain does not exist, so warehousing is essential to maintain an efficient, uninterrupted flow of materials and goods from source to point-of-use.

Common characteristics for storage and warehousing are the time span/duration of storage, the type of goods, the type of storage/warehouse and the quantity/weight/volume of goods. In warehousing and storage, it is important to know what to store, where to store and how to store. Related to this, the most important is to know the type of product, the purpose and type of storage for each product and storage methods.

Basic storage tasks:
1. Store the product without loss of quality
2. Store the product without loss of quantity
3. Improve product quality
4. Reduce labour costs and resources per unit weight of the product as much as possible.

All types of warehousing industries have the same three major components of the services provided: storage services, handling services and value added services.

The specific goals of the **gas storage** company are managing, maintaining and developing a secure, reliable and efficient natural gas storage system, along with satisfying the requirements of users and other interested parties, as well as legal and other applicable requirements.

**In refrigerated warehouses**, temperature-controlled products require strict adherence to the cold chain. In order to manage this type of commodity, the right process, systems, and refrigerated warehouse facilities need to be used.

**Blast freezers and rapid air freezers** provide a high capacity to quickly freeze your products down to -18°C. They are held in temperature-controlled deep storage until needed. Tempering specialists then bring products back up to chilled or ambient temperatures, with constant monitoring to maintain food quality.

Warehouses are typically located in an area that is close to market and also near to highways, railways, airports and seaports.

Due to the special requirements for storage and the method of storage, companies in most cases specialize in and perform the storage of one type of product. The bundling of services has become

common for this service industry. Offering bundled services allows service providers to provide more attractive and effective services to the customer (e.g. cargo handling and warehousing or transportation and warehousing).

In an increasingly real-time economy, speed and timing are key factors. Efficiency, optimization, speed and timing have always been crucial in logistics and transportation. Logistics business requires seven rights: getting the right product, to the right customer, in the right quality, in the right condition, at the right place, at the right time and at the right cost.

The reality is that the Internet of Things has been present in logistics, transport, supply chains, warehousing, etc. since quite some time.

# 3. OUTPUT MEASUREMENT

## 3.1 GENERAL FRAMEWORK

### Objectives of key users

Since 2017, the Croatian Bureau of Statistics has supplemented the quarterly dynamics of conducting turnover survey with the monthly dynamics. The data are based on the Monthly Report on Service Activities and administrative data sources (databases of value added tax reports). The short-term indicator „turnover from activities of other services" encompasses sections from G to N. Warehousing and storage services are collected and disseminated nationally on the monthly basis at the two-digit level. The turnover data are also regularly sent to Eurostat, on the monthly basis (in the form of unadjusted, seasonally and working day adjusted indices on the basis of 2015). The series are transmitted to Eurostat within the t+60 days deadline, which is in line with the present requirement defined by the STS Regulation for small countries.

Turnover data from the Monthly Survey on Service Activities are used for the calculation of volume gross index (index of service production (ISP)). The volume of sales represents the value of turnover in constant prices and as such, it is a quantity index. It is normally calculated as turnover at current prices, deflated on the basis of sales. The primary aim of compiling an ISP is to measure short-term movements in the production activity of the services part of an economy.
The gross value added from SBS data will be used for the calculation of the structural weights. Since these data are available on the 4-digit Nace level, the procedure of calculation of the weights is quite straightforward. The value added from the 4-digit Nace level will only be summed into the 3-digit level, which is the first level of ISP calculation. Intention is to update the weights every year. For the current year of index calculation structural weights are originating from two years ago because of availability of structural data.

The quarterly index, obtained from the results of that Monthly Survey are effectively used in the National Accounts as inputs for the calculation of GDP.

## Concept of national accounts, measurement issues

The concept and the methodology used are consistent with the European System of National and Regional Accounts (ESA 2010). The classification of business entities by activities is in line with the NKD 2007, which is directly comparable to the NACE Rev. 2 classification. The product classification, which is used for the calculation of GVA in current and constant prices by activities, is harmonised with the National Nomenclature of Industrial Products and Services, which is comparable to the PRODCOM classification. The GDP estimates include all activities within the ESA 2010 production boundary and cover the total territory of the Republic of Croatia. The estimates are prepared on an accrual basis. The calculation of the GVA at current prices is based on data from regular surveys of the Croatian Bureau of Statistics, the Croatian National Bank, the Croatian Financial Services Supervisory Agency, the Croatian Regulatory Authority for Network Industries and the Croatian Pension Insurance Institute (Croatian Bureau of Statistics, 2017, GDP, Notes on methodology). The deflators used in the quarterly GDP calculation for H 52.1 Warehousing and storage are a combination of the CPI and the SPPI.

## Definition of output

The STS Regulation defines turnover as the totals invoiced by the observation unit during the reference period, and this corresponds to market sales of goods or services supplied to third parties. Turnover also includes all other charges (transport, packaging, etc.) passed on to the customer, even if these charges are listed separately in the invoice. Subsidies received from public authorities or the institution of European Union are also included. Turnover excludes VAT and other similar deductible taxes directly linked to turnover as well as all duties and taxes on the goods or services invoiced by the unit. Reduction in prices, rebates and discounts as well as the value of returned packing must be deducted. Price reductions, rebates and bonuses conceded later to clients, for example at the end of the year, are not taken into account. Turnover should be recorded exclusive of VAT and similar deductible taxes directly linked to turnover. In the Monthly Report on Service Activities, business entities report their total turnover (business revenue) generated from their main activity as well as from their secondary activities.

The closest approximation of turnover in VAT declarations is the value of goods and services (before taxation) delivered to third parties that are declared to Tax Authorities for the purpose of VAT payments. Total turnover is the sum of non-taxable deliveries and taxable deliveries. Adjustment of the variables declared to the Tax Administration for the purpose of taxation to the statistical variable of turnover was a difficult task to achieve. Deliveries recorded in the value added tax databases may differ from the definition of turnover applied in statistical survey, which affects the comparability of data.

## 3.2 MEASUREMENT ISSUES

## Sampling design

Methodology used for the compilation of Service Turnover in Croatia is based on the industry approach.

The whole statistical process can be divided in two parts. The first part present procedures that will be carried out once a year in order to select the set of observational units. The second part of the process present procedures which are carried out each month in order to process data and enable estimation and dissemination of monthly turnover indices.

The sample of units for Monthly Survey on Turnover of Service Activities for H 52 took into account market and other relevant characteristics of the studied activity. It is designed as a cut-off method according to the turnover in every NACE class for Warehousing and support activities for transportation industry. The total sample for H 52 consists of 245 units, of which 20 are included in the regular Monthly Report on Service Activities (USL-M form).

The sample is selected once a year through the IT application ("MTOS"), which has been established on client-server platform. The sample is based on size and on annual turnover of business entities for the previous year from the VAT and Annual Financial Report data from two years ago. The criterion for determining the size of a business entity is the number of persons in employment. In addition to the selection of the whole set of observational units, a sub-set of units for "classic" statistical survey is selected. Based on the results of the initial analyses, the Croatian Bureau of Statistics decided that one part of the largest units should still be observed in a classic way. The main reason is that, for the units that have a significant impact on the final results, it is desirable that a more detailed control and especially the possibility of a follow-up in the case of suspicious data is enabled.

The main steps of both selection procedures were designed as follows.

- o **Selection of the set of observational units**
    - All large and medium enterprises from the Statistical Business Register are included
    - Units that are in the Statistical Business Register denoted as small units, but according to the estimated annual turnover exceed the certain threshold, should also be included. The threshold is set to 3.5 million kuna
    - All the 'field units' that were detected during the year as out-of-scope units should be excluded from the set of observed units.

- o **Selection of the units to be observed in the field survey**
    - A subset of units that will be included into the regular survey (USL-M form) is selected from all units selected in the sample. The criterion for this selection is determined according to the target rate of the annual turnover that should be (among the selected units) "covered" by field units. It means that for each NACE division

(2-digit code) such number of largest units (according to the turnover) will be selected that they "cover" 50% of total turnover in division.

## Sample frame construction

The sample frame consists of all units from the Statistical Business Register satisfying the following criteria:

- their main activity is Warehousing and support activities for transportation activity (NACE code 52)

- they have at least one employee

- their turnover is not 0.

The above-stated threshold criteria provided that only a small part of the population was excluded from the frame and consequently from the sampling procedure.

## Other data sources

Deliveries recorded in the value added tax databases may differ from the definition of turnover applied in statistical survey, which affects the comparability of data but according to analyses made the VAT data has proved to be a good source for activity H 5210. There is no other potential data source for now.

## 3.3 DESCRIPTION OF METHODS FOR MEASUREMENT

## Frequency of collection and purposes

The Croatian Bureau of Statistics collects turnover data combining administrative source and regular survey. Turnover data have been collected quarterly, but since the beginning of 2017, these data are collected on the monthly basis. The data is collected via a web-based application (the so-called CAWI). The reporting units enter data directly into the USL-M form, which is available on the web site of the Croatian Bureau of Statistics at www.dzs.hr.

CBS has signed the Agreement on mutual cooperation with Tax Authorities. The crucial part of the Agreement is Catalogue with the list of data requested for statistical purposes in quarterly and annual periodicity. During the 2014 CBS undertook additional negotiation with Tax Authorities to start receiving regularly monthly records. Responsible department in CBS (Sector for Statistical Infrastructure) suggested to Tax Authorities an Annex to Agreement and Tax Authorities agreed to supply CBS with monthly records each month in t+45 days deadline, which is acceptable regarding the deadline for transmission monthly data series to Eurostat for small countries (t+60 days). These deliveries starts in March 2015 with the data for January 2015.

This data is used for the calculation of the monthly turnover index. The survey is mainly aimed at measuring turnover changes in service activities.

These turnover data will also be the basis for the derivation of the indices of services production, which will become compulsory for all EU Member States in the following years by FRIBS Regulation. Data for monthly volume index of service production (ISP) are transmitted to Eurostat,

for the first time at the end of EG project in April 2020. National dissemination is planned for 2022. The primary aim of compiling an ISP is to measure short-term movements in the production activity of the services part of an economy.

## Monthly data processing and index calculation

1. **Data collection and integration.** The data for all the observed units are gathered from the VAT database and inserted into the production database "MTOS". The data for "survey units" are collected in the field inserted in the survey processor for logical controls and then into the database "MTOS".
2. **Calculation of turnover from the VAT data.** For the units, for which the monthly VAT data are available, the turnover is calculated by the following formula:
   T = t1 + t2 +t3 + t4 + ….tn

   where:

   T = total turnover of the NACE activity (division level in the majority of the cases)
   t = turnover of the enterprise in the certain NACE activity
   Turnover is a sum of the taxable and non-taxable deliveries from VAT declaration.
3. **Determination of turnover.** For the field units that responded, the reported turnover is taken. For the units, which are not field units, the turnover, calculated from VAT data, is taken. Units, for which we have no source for turnover, are at this stage only designated and will be imputed at later stage.
4. **Correction of negative values.** Units for which a negative value of VAT turnover is calculated are only designated at this stage and will be imputed at a later stage.
5. **Comparison with field survey data.** For the units for which we have data from two sources (VAT data and field survey data), the comparison of turnover from two sources is carried out. The units with a significant difference will be written to the output (Excel sheet in the 'MTOS application'). Significant difference is defined with regard to the relative absolute difference, taking field turnover as the basis, and considering the following rules:

o For units for which both turnovers are positive and the field turnover exceeds 1 million kuna, the threshold is set to 30% of the field turnover
o For units for which both turnovers are positive and the field turnover is between 100 thousand and 1 million kuna, the threshold is set to 100%
o For units for which both turnovers are positive and the field turnover is under 100 thousand kuna, the threshold is set to 50.000 of absolute difference
o For units for which one of the turnovers is equal to or less than zero, the absolute difference to the zero value is considered. The threshold for significant difference in these cases is set to 100 thousand kuna.
6. **Detection of outliers.** With the procedure outliers of the growth of the turnover in current month, according to the same month of the previous year, are detected. The outliers are only designated at this stage; their value will be re-estimated at the next stage.

7. **Imputations.** The missing values and the values that were in the previous step designated as outliers are imputed.
8. **Calculation of quality indicators.** A few key quality indicators (e.g. response rate, imputation rate) are to be calculated.
9. **Estimation of indices.** Indices are estimated through the following steps:
o a) Indices according to the same month of the previous year are calculated directly from microdata. There are two types of indices:

> - indices calculated for all units observed
> - indices calculated only for the matched units, i.e. the units that have (reported or imputed) value of the turnover in both months. These indices are considered as "official" ones.

o b) All other indices are obtained by chaining procedures.

- Indicator of the turnover values (IT) with the following code list:

| Code | Description |
|------|-------------|
| 1 | Value obtained from field survey |
| 2 | Value derived out of the VAT data |
| 3 | Value imputed due to missing value |
| 4 | Value imputed due to negative value |
| 5 | Value imputed due to outlying value |
| 6 | Manually corrected value of survey data |
| 7 | Manually corrected value of VAT data |
| 8 | Manually corrected value of imputed data |

**Graphical presentation of the process**
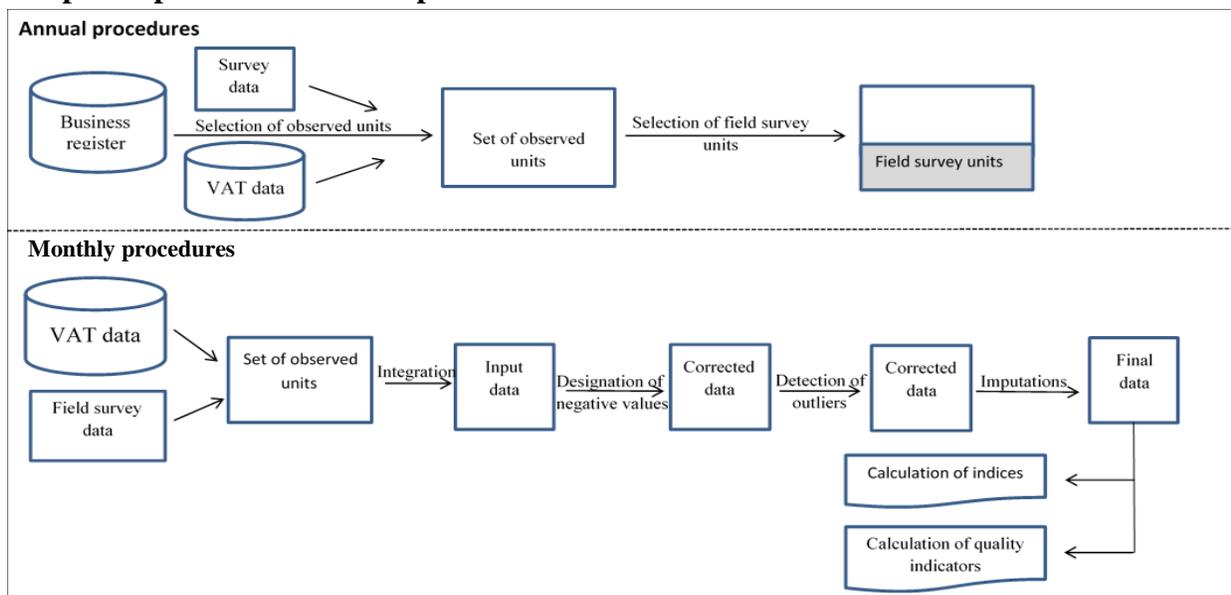
## Detection of outliers

Procedure that was designed in order to decrease the oscillations in the turnover, calculated from the VAT data, is based on the Hidiroglou-Berthelot method (HB method) that was designed exactly for the needs of detection of extreme values in periodic surveys. The outlying values of the growth of the turnover in current month, according to the same month of previous year, are searched. In other words, we are seeking for units that have too low or too high values according to the same month of previous year. In fact any previous period could be taken as a basis. The same month of previous year was selected since index according to this period is the one that is calculated directly from the micro-data.

The main steps of the procedure:

- Calculate ratio $r = T_t/T_{t-12}$ for all the units that have positive turnover for current and previous period
- Transform the ratios in such way that the transformed distribution is symmetrical.
- Based on the quartiles and interquartile range determine the lower and upper limit for outlying values.
- Designate the units for which the ratio is outside the limits as the outliers

The units that are at this stage designated as outliers are later in the process re-estimated by imputation methods.

## Imputation of missing and non-plausible values

The following two methods should be used for two different cases:

**Units with the missing value, for which we have a non-missing value from the previous period.** In this case we take the value from the previous period (historical value) and multiply it with the growth (change) of the donor. The donor is chosen among the units that have the date for current as well as for previous period by using the nearest neighbour approach. The donor is selected in the set of data from previous period. In this set of data our unit has information on Turnover and this information is used in order to find the most similar unit. Hence the donor is selected as the unit which is in the previous period by the turnover closest to the unit for which we intend to impute the value. When the donor is chosen we calculate the growth of this unit: $r_D = T_t^D/T_{t-1}^D$. Then the imputed value is calculated by taking the value from previous period and multiplying it with the growth of the donor.

$$T_t^{imp} = T_{t-1} \cdot r_D$$

In order to avoid the imputed result that would again have extreme growths, the set of possible donors should be limited to those units for which $r_D \in [0.5,2]$

**Units with the missing value, for which we don't have a value from the previous period.** We firstly calculate the average Turnover per employee inside each 2-digit Nace group among all the units that responded:

$$r = \frac{\sum T_i}{\sum e_i},$$

where $T_i$ is unit's turnover and $e_i$ number of employees. The imputed value is then calculated by taking the ratio from corresponding Nace group and multiplies it with the number of employees for the unit to be imputed:

$$T_i^{imp} = e_i \cdot r$$

# 3.4 EVALUATION OF COMPARABILITY OF OUTPUT DATA WITH PRICE DATA

The Croatian Bureau of Statistics started with the development of SPPI for class H 5210 Warehousing and storage in 2009. Warehousing and storage services are relatively small services in Croatia according to the number of enterprises, which were among the first services developed in Croatian SPPI. Initially, for a better understanding of the service, the Croatian Bureau of Statistics analysed data from transport statistics and CPA data. Over the years, the questionnaires have been changed a little and improved with new service groups. Indices are publish nationally in the STS database. Since the third quarter of 2011, series have been transmitted to Eurostat within the t+90 days deadline, which is in line with the present requirement defined by the STS Regulation for small countries. The sample is based on the cut-off method and covers 90% of the turnover. From 2020, these surveys are also conducted through the web-based application for SPPI. Currently, there are preparations for FRIBS (Framework Regulation Integrating Business Statistics) which will come into force in the near future. The whole 2-digit level industry ISIC 52 is part of FRIBS. For now in Croatia only SPPI for 5210 and 5224 was developed.

Methodology used for the compilation of SPPI in Croatia is based on the product approach. Product-based indices are created from service groups selected by sampled reporting units. In the questionnaire form, reporting units have to provide information on the prices of representative services for each of the service group, for which they reported data on the turnover share. Price movements for those services are then aggregated to form price indices for service groups. The price index for the activity as a whole is calculated by using price indices of service groups.

For calculation of ISP, when the deflation of the monthly turnover in service activities is in question, the fact is that most of the service price indices are available only at the quarterly level and if we use them for deflation purposes, there is a need to disaggregate them into three monthly indices. The Croatian Bureau of Statistics uses two methods for disaggregation, depending on the data availability. For a certain activity group, as well as for warehousing and storage for which the quarterly deflator is at disposal (SPPI for 5210), sufficiently correlated auxiliary index (CPI for 073 Transportation service), applying the model-based approach in using this auxiliary information, will be used.

# 4. EVALUATION OF MEASUREMENT

The main difficulties and challenges dealing with VAT data for statistical purposes were as follows:

- Changes in legal regulation of VAT
  - Certain articles in the Law on VAT have been continuously changed depending on monetary and financial policy. The rate of VAT could be changed and records are changed.
  - Changes in data records structure
  - Changes in the limitations of turnover for submission of VAT declarations
- Negative values (for example: cancellation account)
- Corrections of VAT data which are permitted in a period of a year for previous submissions
- Data records on deliveries of machinery and equipment (sale of own property) which are declared for taxation purpose by VAT but should be excluded as turnover.
- Misclassified units – code for NACE is not always in line with the code in SBR. This requires constant comparison and matching with SBR to take over correct NACE code.
- Deadline for receiving monthly data

Deliveries recorded in the value added tax databases may differ from the definition of turnover applied in statistical survey, which affects the comparability of data but according to comprehensive analyses made the VAT data has proved to be a good source for activity H 5210.

Business enterprises for which these activities are the dominant revenue earner should be classified under warehousing and storage. Other business enterprises providing these services but where the dominant revenue earner is an additional service such as transport, or a wider range of complimentary or transport related services, should be appropriately classified elsewhere. The market for warehousing and storage services has low barriers to entry for service providers and increasingly there are new or remodelled operations providing specialised services to cater to changed demands. Larger transport providers are increasingly likely to branch out into the provision of other modes of transport and services such as warehousing. Offering bundled services allows service providers to provide more attractive and effective services to the customer. [6]

Product approach for the compilation of Service Turnover in Croatia is challenging task for the future.

The increasing development of e-commerce and increased outsourcing of logistics will increase the pressure as well, so the optimization and digitalization of business will be the key to further development.

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