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Cross-cutting topic

**Croatian Experience in How admin data are used to derive the output
measurement for short term accommodation**

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1. Introduction

In Croatia, the service sector is a vital part of the economy, with tourism being one of its most significant components. Tourism, particularly accommodation services, is a major contributor to Croatia's GDP. In 2024, tourism accounted for approximately 22.35% of the GDP, with projections indicating an increase to 25.87% by 2028. This substantial contribution underscores the sector's role in driving economic growth.

Prior to 2011, the Croatian Bureau of Statistics (CBS) conducted a quarterly survey that only partially covered service activities, specifically limited to Sections G and I of NACE Rev. 2. In 2011, the CBS began conducting quarterly surveys on service activities turnover using the paper-based Quarterly Report on Trade and Other Services. Since January 2017, the frequency of these surveys has increased to a monthly basis, and in 2018, a web-based questionnaire was introduced. To collect data, the CBS now combines the Monthly report on Services Activities with administrative data sources, such as VAT records.

The aim of this paper is to outline the procedures employed by the Croatian Bureau of Statistics (CBS) in utilizing administrative data to derive output measurements for short-term accommodation.

2. Descriptions and characteristics of the industry

2.1 Definition of the industry

The Croatian Bureau of Statistics (CBS) is the central authority responsible for the collection, processing, and dissemination of official statistics in Croatia. It operates under the legal framework of the Official Statistics Act and collaborates with other institutions such as the Tax Administration and the Croatian National Tourist Board.

The new classification version of the Statistical Classification of Economic Activities in the European Community - NACE Rev. 2.1 applies from 1 January 2025 in the European Union, while in the statistical system of the Republic of Croatia, the new national version, i.e. National Classification of Activities, 2025 version - NKD 2025, entered into force. Since NKD 2025 is fully aligned with NACE Rev. 2.1, classification changes in NKD 2025 in relation to NKD 2007 are identical up to the fourth level, i.e. the class level.

The Decision on the National Classification of Activities, 2007 version – NKD 2007, will be applied in our surveys until 31 December 2027 in line with the transitional provision from Article 6 of the Decision on the National Classification of Activities, 2025 version – NKD 2025 (NN, No. 47/24) and the Regulation (EU) 2019/2152 of the European Parliament and of the Council of 27 November 2019 on European business statistics, repealing 10 legal acts in the field of business statistics.

The industry division I 55 Accommodation is classified according to NACE Rev. 2.1 classification as follows:

I 55 Accommodation

55.10 Hotels and similar accommodation

This class includes the provision of accommodation, typically on a daily or weekly basis, for short-term stays. It also includes the provision of furnished accommodation in hotels rooms and suites. Services provided include daily cleaning and bed-making. A range of additional services may be provided (for example, food and beverage services, laundry services, recreational facilities as well as conference and convention facilities). These activities are generally characterized by the provision of on-the-spot customer service.

This class includes accommodation provided by, for example:

- hotels
- resort hotels
- suite/apartment hotels

55.20 Holiday and other short-stay accommodation

This class includes the provision of short-term accommodation, typically on a daily or weekly basis, in self-contained furnished rooms or areas for living/dining and sleeping. Typically, no on-the-spot customer service and minimal complementary services, if any, are provided.

This class includes accommodation in, for example:

- holiday homes and apartments
- visitor flats and bungalows
- cottages and cabins without housekeeping services
- hostels
- bed and breakfast units
- guest rooms provided by private households
- mountain huts and lodges

55.30 Camping grounds and recreational vehicle parks

This class includes:

- provision of short-term accommodation in camping grounds (e.g. recreational camps, fishing and hunting camps)
- provision of space and facilities for recreational vehicles

This class also includes:

- glamping accommodation
- accommodation provided by protective shelters or plain bivouac facilities

55.40 Intermediation service activities for accommodation

This class includes the intermediation of all types of accommodation by bringing clients and service providers together for a fee or commission. These intermediation activities can be carried out on digital platforms or through non-digital channels (phone, post, and so on). The fee or commission can be received from either the client or the provider of the accommodation. Revenue for the intermediation activities can include other sources of income (for example, revenues from the sale of advertising space).

This class also includes:

- timeshare exchange services
- reservation services for accommodation

55.90 Other accommodation

This class includes the provision of temporary accommodation in homes, flats or apartments, as well as single or shared

rooms or dormitories for students, seasonal workers and other individuals.

This class includes accommodation in:

- homes and furnished or unfurnished flats or apartments, for a period shorter than a year
- dormitories for workers
- boarding houses
- student accommodation provided for less than one year at a time
- railway sleeping cars when not operated by railway companies

2.2 Market conditions

The following analysis highlights the economic relevance of division 55 Accommodation within the Croatian business environment over the period from 2021 to 2023, based on data sourced from the Statistical Business Register (SBR), 2024

Figure 1. Employee Share by Sector (G-N)

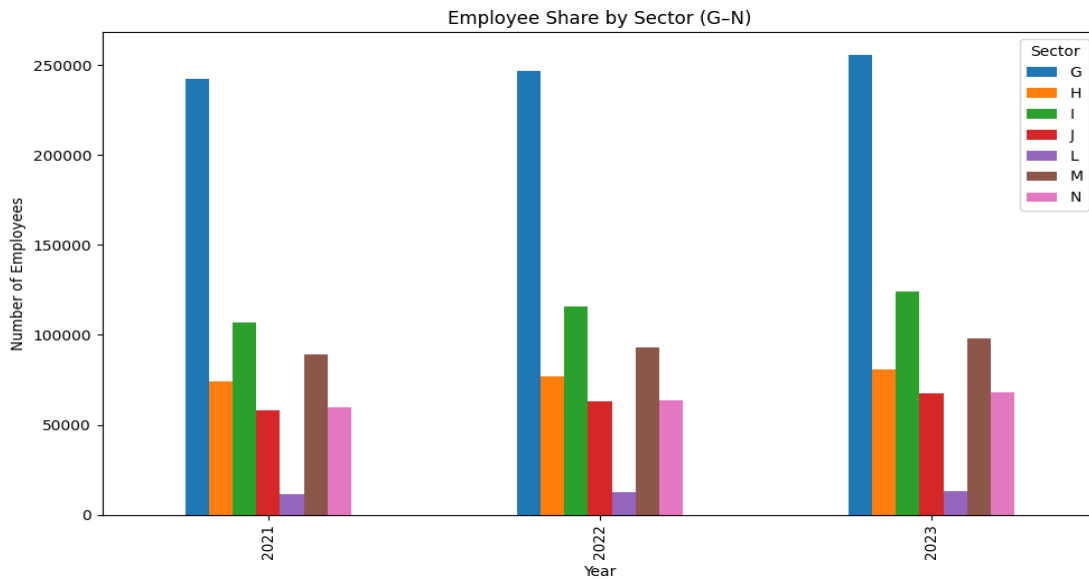
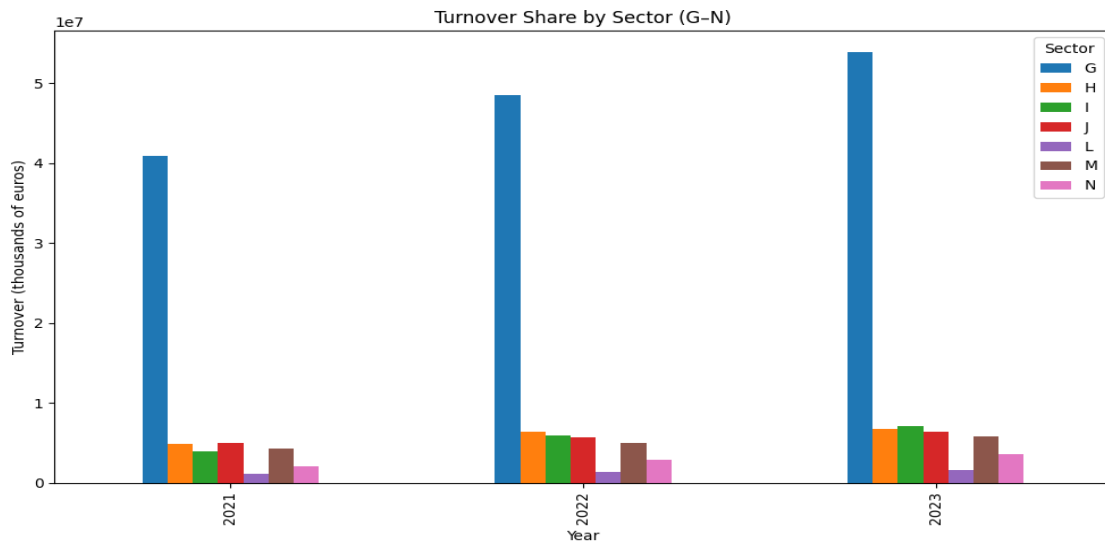


Figure 2. Turnover Share by Sector (G-N)



In the period from 2021 to 2023, Sector I Accommodation and Food Service Activities accounted for 16.7% of total employees in 2021, 17.3% in 2022, and 17.6% in 2023 within G-N Sectors. Regarding turnover, Sector I contributed 6.3% in 2021, 7.8% in

2022, and 8.3% in 2023. This indicates a stable and significant role of the Accommodation and food service sector in the overall business landscape.

Figure 3. Employee Share in Sector I

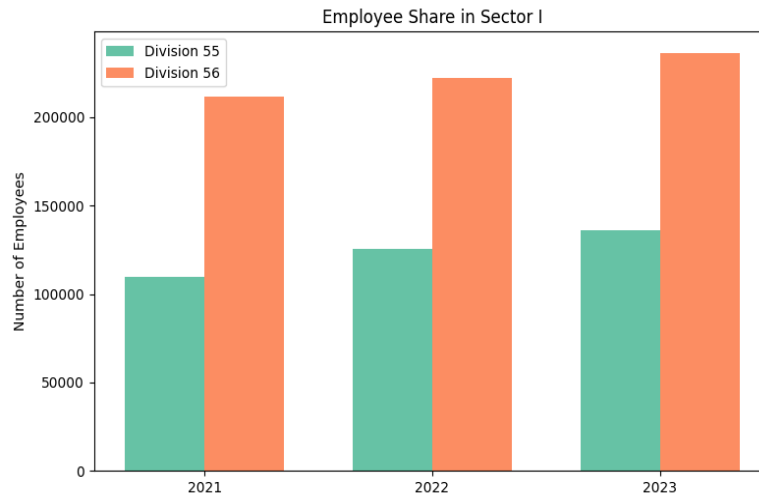
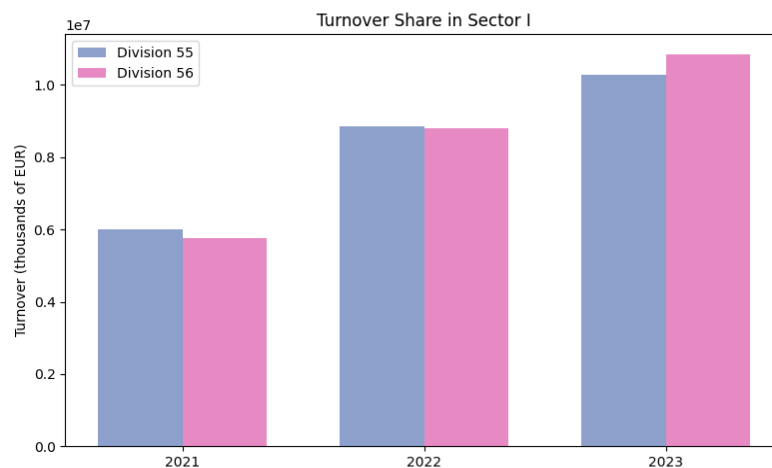


Figure 4. Turnover share in Sector I



Figures 3. and 4. presents the significance of Divisions 55 and 56 within Sector I Accommodation and Food Service Activities in Croatia from 2021 to 2023, based on data from the Statistical Business Register (SBR), 2024. Division 55 (Accommodation) consistently represents a significant portion of Sector I in terms of both employment and turnover. The impact of the COVID-19 pandemic is evident in 2021, with a noticeable decline in turnover. However, the subsequent years show a recovery and growth in turnover, indicating resilience and renewed demand in the accommodation industry.

Table 1. Share of Classes 5510–5590 within Division I55 (2021–2023)

Class	2021			2022			2023		
	Number of Employees	Turnover	Value Added	Number of Employees	Turnover	Value Added	Number of Employees	Turnover	Value Added
5510	80.2	81.9	86.5	81.5	82.4	86.5	82.0	83.6	87.1
5520	10.0	7.7	5.3	8.7	7.2	5.0	8.2	6.3	4.4
5530	3.9	6.8	6.1	4.4	7.1	6.6	4.6	6.7	6.4
5590	5.9	3.6	2.0	5.4	3.3	1.9	5.2	3.4	2.2
I55	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The analysis reveals the internal structure of Division I55. Class 5510 (Hotels and similar accommodation) consistently holds the largest share across all variables, indicating its dominant role in the accommodation sector. Class 5520 (Holiday and other short-stay accommodation) and 5530 (Camping grounds, recreational vehicle parks and trailer parks) show moderate contributions, while 5590 (Other accommodation) has the smallest share. These proportions remained relatively stable over the observed period, with slight variations reflecting market dynamics and seasonal trends.

3. Turnover/output measurement

3.1 General Framework

In the domain of short-term accommodation (NKD I 55), CBS employs a combination of survey and administrative data to ensure comprehensive and timely output measurement. The statistical production process is supported by internal IT systems and methodological guidelines aligned with Eurostat recommendations.

3.2 Measurement methods

The survey is carried out by using the sampling method. The sample is selected once a year and it is based on the size and on the annual turnover of business entities. The survey covers enterprises and parts thereof (business units) registered in the Statistical Business Register with their main activity classified under sections G (except division 47) to N of the NACE Rev. 2.1 (excluding group 70.1, divisions 72 and 75 and section K). The statistical unit of the services turnover index is a kind-of-activity unit. The most significant multi-industry enterprises have been divided into kind-of-activity units to improve the homogeneity of the results of statistical surveys by activity, as well as their international comparability.

The sample includes all large and medium-sized enterprises and a random sample of small enterprises.

A subset of units that will be included into the regular survey (USL-M form) is selected from all units selected in the sample. A selection criterion has been determined according to a particular turnover threshold, which has to be covered by these units.

Additionally, administrative data from the Tax Administration (VAT forms) are used for units not included into the regular survey, primarily covering smaller units to reduce response burden. The survey results are comparable with previous periods and are harmonized with EU regulations.

3.2.1 VAT data

Definition of turnover by STS Regulation is that turnover comprises the totals invoiced by the observation unit during the reference period, and this corresponds to market sales of goods and services supplied to third parties. Turnover should be recorded exclusive of VAT and similar deductible taxes directly linked to turnover. 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 nontaxable deliveries and taxable deliveries.

Based on the Croatian Law on Official Statistics, CBS has the right to use all administrative data sources and 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 monthly periodicity.

Due to the nature of VAT data, which may include prepayments and sales of own assets, it is not always aligned with the methodological requirement of capturing only business revenue. Therefore, the subset of units included in the regular survey for division I 55 (Accommodation) is slightly larger than for other service activities, in order to ensure sufficient coverage and data quality. This is particularly important because, in this activity, VAT records often contain prepayments, which do not reflect actual business revenue. As a result, relying solely on administrative data may lead to inconsistencies, making it necessary to include more units in the direct survey to maintain methodological accuracy.

3.2.2 Combining Survey and Administrative Sources in MTOS for Monthly Turnover Index Calculation

Turnover Index Calculation

The MTOS (Monthly Turnover of Services) system is a comprehensive application developed by the Croatian Bureau of Statistics (CBS) to integrate survey and

administrative data for the calculation of monthly turnover indices. It serves as a central tool for processing, analyzing, and reporting service activity data, combining inputs from VAT records and statistical surveys. Built in Microsoft Excel and connected to SQL databases, MTOS enables automated data loading, outlier detection, imputation, and final index calculation.

System Overview and Functionality

MTOS is designed to streamline the integration of multiple data sources, including monthly VAT files and survey responses. The system begins with annual sample selection based on the previous 12-month VAT turnover and NKD classification. Selected units are categorized into subsets for direct survey collection or administrative data usage, depending on their turnover and activity type.

The application supports automated data loading from VAT files, which are formatted and cleaned before import. During this process, legal and physical entities are matched with the Statistical Business Register (SBR) to ensure accurate identification. Duplicate records are resolved through aggregation or distribution, and each unit is enriched with attributes such as region, employment size, and NACE code.

Outlier Detection and Imputation

To maintain data quality, MTOS applies the Hidioglou-Berthelot method for outlier detection. This method compares current month values with the same month from the previous year, flagging anomalies for further review. Imputation is then performed using two algorithms: one based on average turnover per employee within NKD divisions, and another using donor-based matching for similar units.

Final Dataset and Index Calculation

The final dataset prioritizes data sources in the following order: survey responses, imputed values, and VAT records. Each data point is tagged with its origin, allowing traceability and manual corrections when necessary. Monthly turnover indices are calculated from this final dataset, with archived base indices preserved to prevent recalculation of published data.

Application Features and Reporting

MTOS includes dashboards for final turnover, VAT-only, survey-only, and imputed data. Users can generate reports, update data manually, archive indices, and analyze quarterly aggregates and time series.

For I 55 – Accommodation, MTOS plays a critical role in managing the complexity of VAT data and ensuring robust output measurement.

3.2.3 Using Tourism Microdata to Enhance Turnover Index Accuracy in Accommodation Services

To improve data quality and validation, the Croatian Bureau of Statistics (CBS) utilizes micro-level data from the Tourism Statistics Department. These data include the number of tourist nights per enterprise and serve multiple purposes: cross-checking turnover indices derived from VAT data, imputation when reliable data are unavailable for the current or reference month, and detecting inconsistencies in reported figures.

The primary data source for tourism activity statistics, including tourist arrivals and nights, is the eVisitor system. This system, managed by the Croatian National Tourist Board, has been the central electronic platform for checking in and checking out tourists in Croatia since January 1, 2016. All legal entities and natural persons providing overnight accommodation services, including those operating in households and on private family farms, are required to register tourist stays via eVisitor, in accordance with the Ordinance on the eVisitor System (NN, No. 43/20).

CBS receives monthly data from eVisitor and processes them statistically. These data are instrumental in validating turnover indices, particularly for NKD I 55 – Accommodation. Comparisons between indices of tourist nights and turnover indices have shown a high degree of similarity, which significantly aids in quality control and verification of statistical outputs.

However, the turnover index cannot be fully replaced by the tourist nights index due to several limitations. Firstly, the tourist nights index does not cover the 'Other Accommodation' class, which includes worker accommodations and other non-tourist lodging types. Secondly, there are occasional timing discrepancies between the recording of tourist nights and the actual business revenue, which can affect the alignment of data across sources. These factors necessitate the continued use of turnover indices derived from survey and administrative data for comprehensive and accurate measurement.

Additional methodological context from the eVisitor system and tourism statistics - Summary:

- Since 2017, data on tourist arrivals and nights and accommodation capacities are sourced from the eVisitor system, managed by the Croatian National Tourist Board.
- eVisitor is the central electronic system for checking in and checking out tourists in Croatia. It covers legal entities and natural persons providing accommodation services, including households and private family farms.
- The system replaced previous reporting via TU-11 forms and tourist boards, improving coverage and timeliness.

- The survey includes accommodation establishments categorized into Hotels, Camping sites, and Other accommodation establishments, as defined by relevant ordinances.
- Other accommodation includes types such as worker housing, hostels, mountain lodges, and Robinson-type accommodations, which are not fully captured in tourist nights statistics.
- Non-commercial tourist traffic (e.g., stays with relatives or in uncharged accommodations) is excluded and covered by a separate survey.
- Tourist nights reflect registered overnight stays, but may include re-registrations due to changes in location, leading to potential ambiguities in arrival counts.

4. Challenges and Solutions

One of the primary challenges in using VAT data for output measurement in the accommodation sector (NKD I 55) is the inclusion of non-operational revenue components such as prepayments and sales of own assets. These elements can distort the measurement of actual business turnover, leading to inconsistencies in statistical outputs.

Additionally, VAT data may not fully align with the methodological requirement of capturing only business revenue. This is particularly problematic in the accommodation sector, where prepayments are common and can significantly affect the accuracy of monthly turnover indices. Moreover, timing discrepancies between VAT declarations and actual economic activity further complicate the use of administrative data.

Survey limitations also pose challenges. While CBS conducts monthly surveys using the USL-M form, the sample size must be carefully managed to balance coverage and response burden. Smaller units not included in the survey are covered using VAT data, but this introduces variability in data quality.

To address these challenges, CBS has implemented several solutions through the MTOS (Monthly Turnover of Services) system:

- The survey sample for NKD I 55 is expanded to include a larger subset of units, ensuring better coverage and data quality.
- CBS integrates micro-level data from the eVisitor system, which includes the number of tourist nights per enterprise. These data are used for cross-checking turnover indices, imputing missing values, and detecting inconsistencies.
- Statistical techniques such as the Hidioglou-Berthelot method are applied for outlier detection, and imputation algorithms based on employment and donor matching are used to fill gaps in data.
- Data prioritization is enforced within MTOS, where survey responses take precedence over imputed values and VAT records. Each data point is tagged with its source,

allowing for traceability and manual corrections.

Despite the usefulness of eVisitor data, it cannot fully replace turnover indices. The tourist nights index does not cover the 'Other Accommodation' class (e.g., worker housing), and timing discrepancies may occur between tourist registrations and actual revenue. Therefore, CBS continues to rely on a combination of survey and administrative data to ensure comprehensive and accurate output measurement in the short-term accommodation sector.

5. References

- Croatian Bureau of Statistics (2025). Monthly Report on Services Activities – June 2025.
- MTOS – User Manual and System Description Documents.
- Croatian National Tourist Board. eVisitor System Overview.
- Eurostat Methodological Guidelines on Short-Term Business Statistics.