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The Contribution of Electronic Invoicing Data to the survey of Turnover in Services

Focus on selected service sectors

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1. Introduction

The use of administrative data by National Statistical Institutes (NSIs) has become increasingly central in the production of official statistics. The use of these data, originally collected for administrative or fiscal purposes, and not for statistical use, makes it possible to integrate information obtained through direct surveys. In particular, combining survey data with administrative sources, makes it possible to develop a robust system of economic statistics that can provide users with detailed and timely information, while keeping the response burden at an acceptable level.

The recent introduction of the rules on electronic invoicing has opened up new scenarios in Italy with regard to the compilation of official economic statistics. Data acquired by the Revenue Agency and used for statistical purposes by ISTAT could represent one of the main sources of administrative quantitative information on economic variables of enterprises. The practice of using administrative data is also strongly recommended by the European legislation on official statistics with the aim to reduce the statistical burden on businesses, especially for small economic units.

The focus of the paper is to show the first experimental results concerning the use of electronic invoicing data as a source for the compilation of monthly short-term economic statistics on services' turnover. The analysis focuses on a selection of specific service sectors, chosen for their representativeness and relevance, in terms of data coverage and statistical quality, and also to highlight potential challenges and critical issues related to their unique characteristics.

2. Short term business statistics and e-invoicing

The Italian survey of turnover on services (FAS) is a well-established direct survey that produces, on a regular monthly basis, quality economic indicators, in compliance with Regulation (EU) 2019/2152 and within the strict deadlines provided for. The produced indicators are useful for measuring the intra-annual trend of the value and the volume of services sold by companies operating in the sectors of the considered economic activities.

The direct survey produces turnover indices (unadjusted, seasonally adjusted, and calendar-adjusted, in both value and volume) within 60 days from the reference period, at the NACE Rev. 2 division/group level of economic activity. The enterprises covered by the survey are those whose main activity falls within the section G (excluding Division G47), sections H, I, J, L, M (excluding Group M70.1 and Divisions M72 and M75) and Section N. In total, about 25,000 enterprises are involved in the surveys and then requested to provide information via an e-questionnaire about their total monthly turnover. The production process of the survey, however, is not without operational costs,

especially for the contacted enterprises, which have to spend time and resources to provide the required information.

Starting from 2019, following the provisions of the 2018 Budget Law (Provision No. 89757/2018 issued by the Italian Revenue Agency), Italy introduced the obligation to issue and receive electronic invoices for all transactions between businesses (BTOB), professionals, and consumers (BTOC). The system, which operates through the Italian Revenue Agency's platform known as the Exchange System (Sistema di Interscambio), increases fiscal transparency, reduce VAT evasion, and simplify administrative processes related to accounting and document storage. Makes, also possible to set up a continuous data flow and a database with a huge amount of information. Such information, always respecting the confidentiality of the data, can be available for the institutional purposes of other administrations.

The process of finalizing the agreement on regular transmission of data collected by the Revenue Agency, required significant time and effort, and involved the institute's top management. However, at the present, the data flow can be received on a systematic basis. Preliminary researches and analyses, relying on data covering the twelve-month period from June 2024 to May 2025, have been carried out to evaluate the practical feasibility of employing invoicing data within the monthly survey of turnover in service.

3. Methodological approach

In order to use electronic invoicing data in the estimation of service sector turnover, it is first necessary to explain how the sample of the Service Turnover Survey (FAS) is constructed. The reference universe is given from all enterprises recorded in the Statistical Business Register (ASIA), which represents the official and updated database of active economic units in Italy. The enterprises are identified through the ASIA code, the unique key assigned to each enterprise in the register and the ATECO code which is the Italian version of NACE classification of economic activities. For the services sector, estimation domains mostly correspond to groups of economic activity.

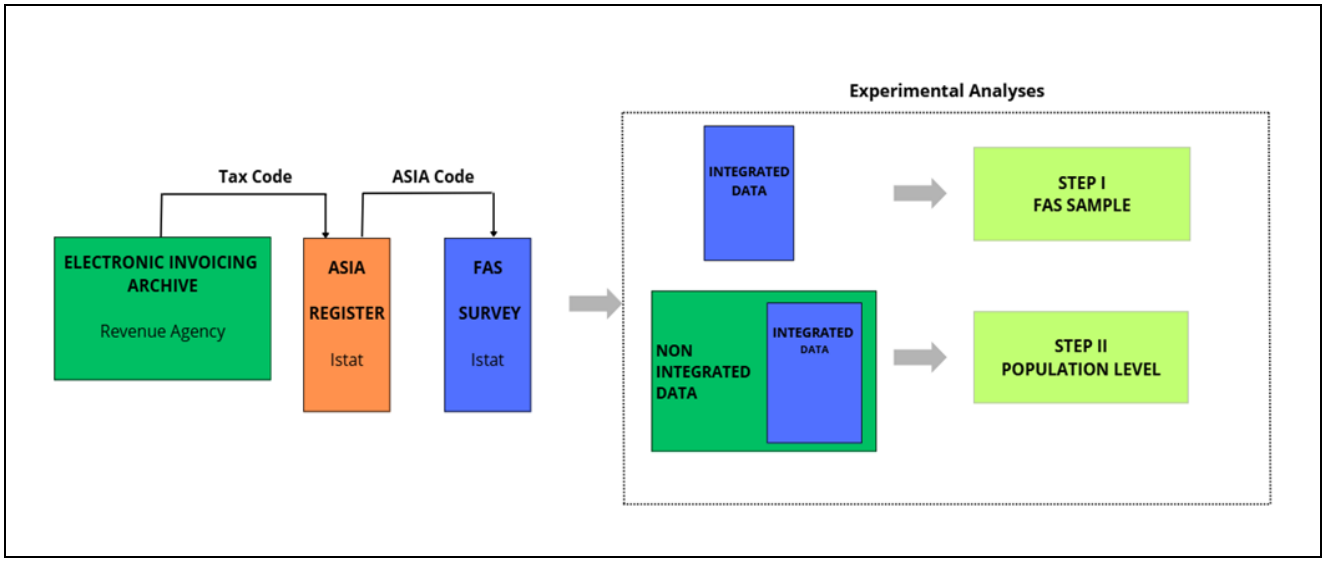
The heterogeneity of structural characteristics across the sectors under examination necessitated the adoption of various methods for selecting enterprises to participate in the survey. In particular:

- In sectors dominated by a few large enterprises (e.g., water and air transport, postal services, telecommunications, employment activities), a cut-off method was adopted, selecting the largest units until covering over 80% of total turnover.
- In sectors with many homogeneous enterprises, stratified simple random sampling was used, based on economic activity and enterprise size (number of employees or turnover).
- In other cases, a random sample selection of enterprises was performed, specifying a threshold (measured in terms of number of employees) to identify the reference subpopulation of enterprises.

3.1. Data Integration

The simulation covers a twelve-month period, from June 2024 to May 2025, with monthly observations.

The main objective is to match the enterprises recorded in the Electronic Invoicing (EI) system with those included in the FAS samples, in order to integrate administrative and survey data into a single coherent framework. The integration process is carried out in two successive steps:



1. **Identification through Tax Code.** Each enterprise in the EI database is identified by its Tax Code. The Tax Codes are linked to the 2023 ASIA register, obtaining the corresponding ASIA code. This step ensures the alignment of EI data with the official statistical business register.
2. **Linkage with FAS samples.** Once matched to ASIA, EI enterprises are connected to the FAS 2024 and 2025 samples using the ASIA code as the common key.

3.2. Analysis phases

Following the data integration process, the analysis is also divided into two phases. The first step concerns only the integrated enterprises, namely those simultaneously present in both the FAS and the EI administrative archive. The second step, instead, considers both integrated and non-integrated enterprises, those which, according to the 2023 ASIA register, fall within the scope of the FAS survey.

The details relating to the two phases of the analysis are described below.

3.2.1. Step I of the analysis → AT SAMPLE LEVEL

Integrated data are analysed at the FAS sample level, using the original survey strata, for each period between June 2024 and May 2025. In total have been analysed 295,000 “enterprise-period” records from the FAS sample, of which 230,000 records were respondents within the reference period. Then the FAS and e-invoicing totals have been aggregated according to the strata that characterise the survey.

The aim is to highlight the accuracy between FAS and EI data. Also, in a short- to medium-term perspective, this exercise is aimed at evaluating the potential of the administrative source to complement or replace the survey source in three main areas:

(i) the imputation of non-response;
(ii) the quality check of the survey data (already partially in use);
(iii) the substitution of survey data with administrative information.

3.2.2. Step II of the analysis → AT THE POPULATION LEVEL

For integrated and non-integrated data of the reference population, the strata are defined on the base on the 2023 ASIA register. The analysis has been carried out on the set of enterprises which, according to the 2023 ASIA register, fall within the scope of the FAS survey. Overall, the simulation has been conducted on approximately 12.0 million “enterprise-period” records.

The EI turnover totals, at the level of the “enterprise-period” association, have been aggregated by strata — a combination of employment size classes and turnover classes — constructed according to the stratification criteria adopted in the FAS survey. This situation may lead to potential inconsistencies with FAS. Since, as already mentioned several times the FAS sample is based on the provisional 2023 ASIA register and other internal sources, whereas EI data are more up to date.

Regarding the second step, this is an experimental exercise aimed at assessing what would happen to the Services Turnover Index if the survey were to be replaced by the full universe of e-invoicing data. It is clear that this is only a simulation study, intended to provide findings into the potential implications of such a methodological shift rather than to propose an immediate change in the official production process.

4. Description of Results

Prior to presenting the results, it is important to specify that, given the non-perfect stability of the fields related to amounts expressed in foreign currency, the accuracy measures were calculated not only on the “*totals*” (277 strata) but also on the subset of “*national turnover*” (255 strata) records. Moreover, the records were subjected to a preliminary procedure for the elimination of potential

outliers. Finally, for ease of presentation, the results are summarised at an aggregated level (by size and turnover class), while the full set of disaggregated results by stratum remains available.

4.1. Measures of accuracy

The quality of the alignment was assessed on the basis of several statistical indicators and at different levels of data aggregation. At the maximum level of disaggregation (ASIA code), scatter plots were analysed. Graphical analysis, making use of both scatter plots and short-term variation trends, was carried out to visually explore the consistency between the two data sources.

At the stratum level, were applied diagnostic tests and accuracy measures, such as:

1) Diagnostic tests on aggregates by stratum, including equality tests and tests to assess the statistical significance of the coefficients of a linear regression of the form:

   FAS = *F*(EI)

   under the assumption of perfect proportionality between the two sources.

2) Indicators of alignment for month-on-month variations. These indicators are based on the differences between the month-on-month variations derived from FAS and the month-on-month variations obtained from EI. Specifically:

$$ME = \frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)$$ *Mean Error*

$$MAE = \frac{1}{n}\sum_{i=1}^{n}|y_i - \hat{y}_i|$$ *Mean Absolute Error*

$$RMAR = \sqrt{\frac{1}{n}\sum_{1=1}^{n}(y_i - \hat{y}_i)^2}$$ *Root Mean Squared Error*

$$SD = \sqrt{\frac{1}{n-1}\sum_{1=1}^{n}\left[\left[(y_i - \hat{y}_i) - \overline{(y_i - \hat{y}_i)}\right]\right]^2}$$ *Standard Deviation*

$$SC = \frac{1}{n}\sum_{i=1}^{n} I(sign(y_i - y_{i-1}) - sign(\hat{y}_i - \hat{y}_{1-1}))$$ *Sign Concordance*

$$r = \frac{\sum_{i=1}^{n}(y_i - \overline{y})\left(\hat{y}_i - \overline{\hat{y}}\right)}{\sqrt{\sum_{i=1}^{n}(y_i - \overline{y})^2}\sqrt{\sum_{i=1}^{n}\left(\hat{y}_i - \overline{\hat{y}}\right)^2}}$$ *Correlation Coefficien*

Where y_i are month-on-month variations calculated on survey data and $\hat{y}_i$ are month-on-month variations calculated on EI data.

Finally, although the accuracy measures, graphs, and tests are available for all strata covered by the survey, it was decided to present only those referring to four specific sectors. Two of these sectors were selected because they are considered *virtuous*, due to the high degree of alignment between survey data and e-invoicing data. The other two sectors, by contrast, were chosen to highlight particular critical issues.

In particular, the first two sectors, selected as examples of virtuous cases, are the following:

- *Sale, maintenance and repair of motorcycles and related parts and accessories* (2_454)
- *Placement agency activities* (1_781)

The other two sectors, selected instead to highlight specific characteristics, are:

- *Accommodation* (1_55A), which includes:
  - *Holiday and other short-stay accommodation* (sector 552)
  - *Camping grounds and recreational vehicle parks* (sector 553)
  - *Other accommodation* (sector 559)
- *Restaurants and mobile food service activities* (1_561)

For all the economic sectors, strata 1 and 2 were selected. These strata are characterised by small sized enterprises, with the number of employees, respectively, between two and five and up to twenty. Therefore these enterprises are the ones most affected by the statistical burden of reporting the data required by Istat.

Tab. 1 - Diagnostic tests (*), Coefficients, Indicators of alignment

STRATA	2_454	1_781	1_55A	1_561
n. observation	254	23	102	119
% share of sales receipts	7,790	0,000	63,94	80,73
Correlation	0,903	0,966	0,945	0,958
Test diff. between means = 0	-	*	*	*
Test β = 1	*	-	-	-
Pearson correlation	0,990	0,990	0,920	0,95
Spearman correlation	0,990	0,910	1,000	1
ME	-1,81	-0,93	0,620	1,2
SD	5,04	5,51	7,78	3,04
MAE	3,3	3,5	6,30	2,3
RMAR	5,2	5,4	7,0	3,0
SC	91,7	91,7	100	100

Note: (*) diagnostic tests significant at 5%-level

For the two sectors 2_454 and 1_781 the diagnostic test, the correlation and the measures of alignment are calculated on monthly data referred to the period from January 2024 to May 2025, while for the sectors 1_55A and 1_561 they refer to a shorter period (January – May 2025). Indeed, starting from this period Istat was able to rely on a new data source represented by the Electronic Receips (RE).

Before commenting on the results, it should be noted that the correlation, the test for equality of means, and the regression test are calculated based on the stratum totals, whereas the remaining measures of alignment are computed on the differences of the month-on-month changes derived from the survey data and the e-invoicing data.

The following section presents these results, highlighting that the correlation coefficients for all strata are highly significant, over 90%. Diagnostic tests confirm the assumptions underlying the linear relationships. Equality tests for means are accepted for all sectors except for 2_454 stratum, indicating greater consistency between FAS and EI data in these sectors. Similarly, the test for the slope coefficient β = 1—which implies proportionality between the variables—is accepted for sectors 2_454, reinforcing the hypothesis of regular and standardised invoicing practices.

Conclusions are further supported by the analysis of month-on-month variations. The lack of a systematic patterns in the signs of mean deviations between survey data and e-invoicing data, for instance the overestimation of survey data compared to EI data for the sectors 1_55A e 1_561, and *vice versa* for the sectors 2_464 and 1_781, provides reassurance regarding the likely absence of bias.

The other indicators show small variability, moderate deviations and highly level of precision. Finally, the percentages of sign concordance further highlight the results described above.

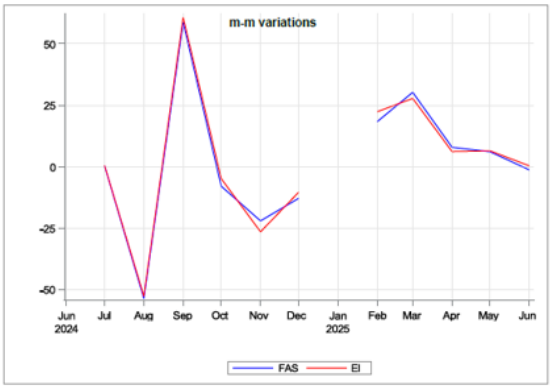
The scatter plots for the two sectors 2_454 and 1_781 show a very strong correlation between the two variables, with points closely aligned along the diagonal, likely due to the nature of the sector represented—more traditional and regulated—where invoicing practices are standardized and consistently applied, resulting in a near one-to-one match between FAS and EI. Conclusions are further supported by the analysis of month-on-month variations, which shows astronger alignment between FAS and EI time series in the more traditional sectors.

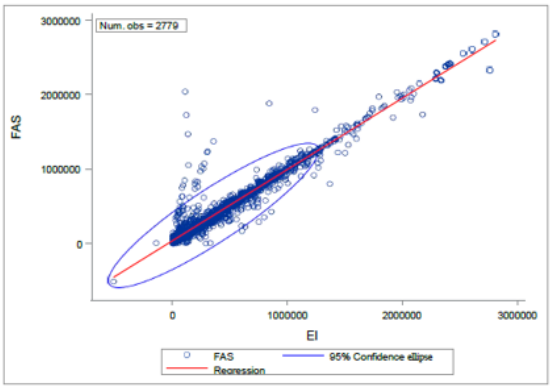
With regard to sectors 1_55A and 1_561, these were specifically chosen to highlight a particular feature. Both sectors are characterized by a high incidence of electronic receipts. As previously mentioned, the fiscal receipts — transmitted electronically by enterprises to the Italian Revenue Agency — represent a new data source that Istat has begun acquiring in recent months, starting with data from January 2025. Therefore, the results are presented with reference to two datasets: month-on-month changes excluding electronic receipts and month-on-month changes including the ER.

The scatter plots of month-on-month variations calculated without ER exhibit a concentration of data points near the origin for EI, indicating that a substantial share of observations report lower values for EI compared with Fas.

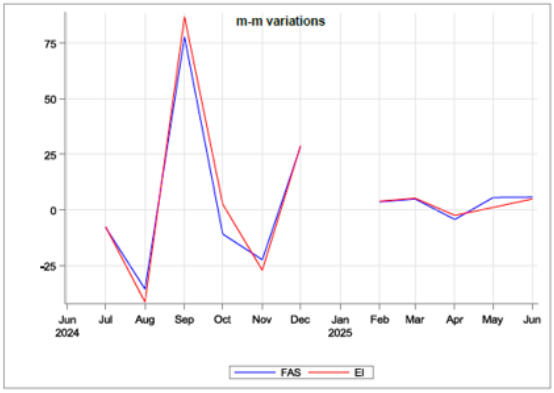
This pattern is due to administrative factors: in these sectors, a substantial share of transactions is recorded via receipts, which are not included in the EI data transmitted to ISTAT. The importance of the new data source is highlighted by the scatter plots of month-on-month variations calculated on the data including receipts, which show an almost perfect alignment of the data along the diagonal. The introduction of the ER component reduces, in both sectors, the discrepancy between month-on-month variations calculated from survey data and those calculated from administrative data.

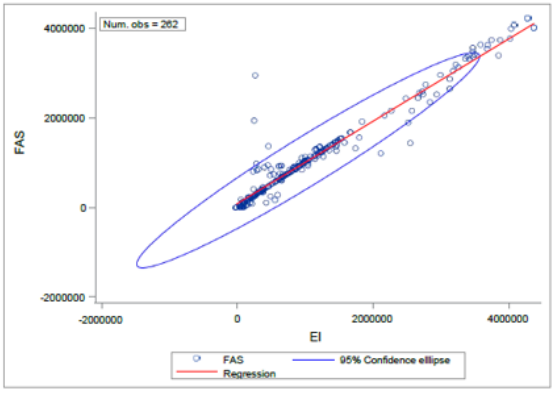
Sale, maintenance and repair of motorcycles and related parts and accessories (2_454)



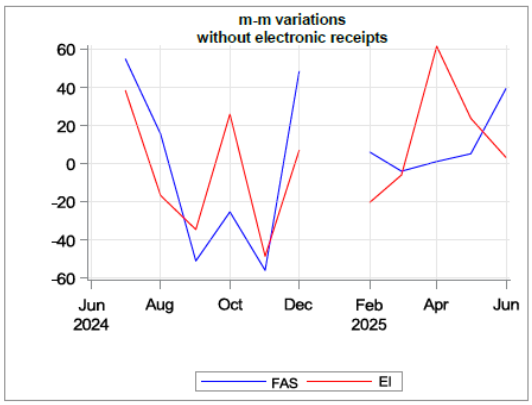


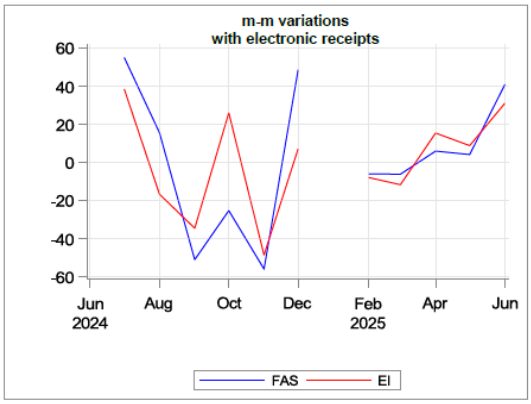
Placement agency activities (1_781)

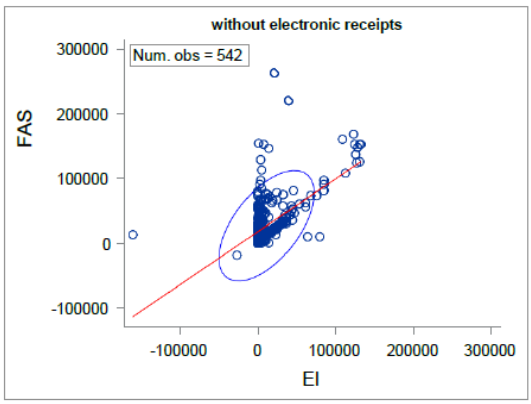


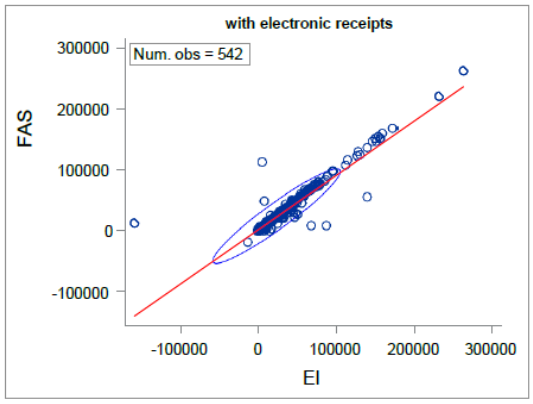


Accommodation (1_55A)

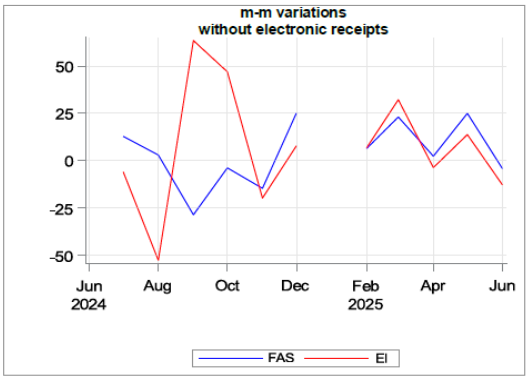


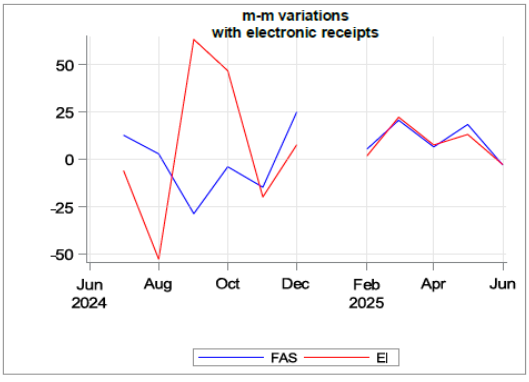


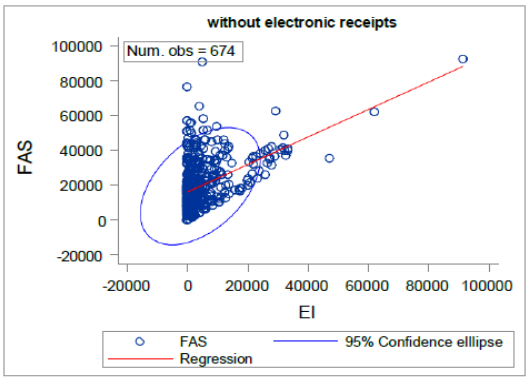


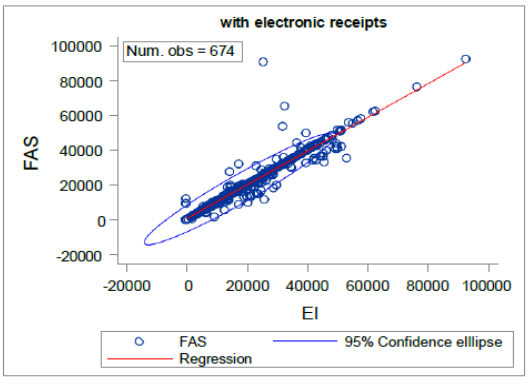


Restaurants and mobile food service activities (1_561)









5. Conclusions

The consistency between FAS survey data and administrative e-invoicing data was investigated at both aggregated and disaggregated levels across 227 survey strata. The findings indicate a high degree of alignment for several sectors, suggesting that administrative data could effectively replace survey-based information over the short- to medium-term. Starting from the January 2026 releases, survey data will be replaced by administrative data for the identified sectors, while for the residual sectors, the administrative source will be used to validate the quality of the collected data and to integrate missing information.

The use of administrative data in these sectors brings several advantages. Its timeliness and continuity not only reduce the statistical burden on enterprises and lower data collection costs, but also improve the overall quality of the resulting estimates. E-invoicing data are more comprehensive and unaffected by non-response issues, thereby ensuring greater accuracy and reliability of the derived indicators.

In the longer term, the analysis leaves room for further developments. There is potential for extending the approach to the full population. Once technically and methodologically feasible. Despite these encouraging results, the analysis remains ongoing. Additional methodological research is required to assess the representativeness of administrative data at the domain level and to define robust statistical quality criteria for their systematic integration into official statistics.

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