Developing New Retail Trade Indicators Using Bank Card Data: Evidence from Malta

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Abstract

This paper explores the use of bank card transaction data at the National Statistics Office of Malta, to develop additional monthly retail trade indicators beyond the detail currently available through the Short-term Business Statistics (STS) framework. The analysis focuses on three applications within NACE Division 47. NACE 47.11 is used as a validation case, where a bank-card-based indicator is compared with an unpublished monthly STS series. The results show that the bank-card-based indicator generally tracks the month-to-month movements of the STS indicator well, with a strong correlation between monthly percentage changes and directional agreement of 80.9%. The methodology is then extended to NACE 47.41, for which no equivalent monthly STS indicator is currently produced, and to the development of a regional monthly retail trade indicator for Gozo using transaction locality information. These applications illustrate how bank card data can support greater activity-level and geographical detail in monthly retail trade statistics. The findings also underline the need for careful population selection, treatment of missing observations and assessment of representativeness. Overall, the results support the further development of bank-card-based indicators as experimental monthly retail trade statistics.

Keywords: Short-term Business Statistics; bank card transactions; monthly retail trade; experimental statistics; early monthly indicators; alternative data sources; official statistics

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1. Introduction

Short-term Business Statistics (STS) provide timely information on developments in retail trade, but established production systems are generally designed around predefined aggregates and publication requirements. Increasing demand for more detailed information can therefore present challenges, particularly where monthly indicators are required for specific economic activities or geographical areas that are not covered by existing outputs. Expanding traditional survey-based systems to meet such requirements may also increase collection and maintenance requirements.

Bank card transaction data provide a potential alternative for extending the detail and flexibility of retail trade statistics. In addition to being available at high frequency, the data provide information at business level across a relatively broad population of retail business units and do not require additional reporting by businesses. Previous work by the National Statistics Office of Malta (NSO Malta) examined their potential for producing earlier retail trade turnover indicators and reducing response burden. The present paper considers a different application of the same source: its use in developing additional monthly retail trade indicators beyond those normally available through the existing STS framework.

The paper presents NSO Malta's experience in developing bank-card-based indicators within NACE Division 47. A monthly indicator for NACE 47.11 (retail sale in non-specialised stores with food, beverages or tobacco predominating) is first constructed and compared with the corresponding STS unpublished series, providing a case through which the approach can be assessed against an existing benchmark. The methodology is subsequently applied to selected NACE classes where bank card data provide sufficient coverage of economic activity. The potential for greater geographical detail is also explored through the development of a monthly retail trade indicator for Gozo. In producing these indicators, particular attention is given to coverage, missing observations, outlier treatment, VAT-based validation and imputation procedures.

The paper therefore examines how bank card transaction data can be used in practice to extend the range and granularity of monthly retail trade statistics. In addition to presenting the resulting indicators, it discusses the methodological choices, practical limitations and lessons arising from their development. The following sections describe the statistical context and data, the methods used to construct and quality-assure the indicators, the results from the different applications, and the implications for their potential future use in statistical production.

2. Statistical context and data

NSO Malta produces monthly retail trade turnover statistics within the STS framework. These statistics are based primarily on survey data and are designed to support established aggregates. While this framework provides the required monthly indicators, producing additional indicators at a more detailed NACE or geographical level is less straightforward. The STS sample is periodically redesigned and requires ongoing maintenance to account for business openings and closures.

The bank card source used in this paper is the same monthly micro-level dataset examined in previous NSO Malta work (Sacco & Lia, 2026). Transaction data are received from card acquirers through the Central Bank of Malta and subsequently processed and linked to business information by NSO Malta (Sacco & Mifsud, 2026). The data provide information at individual business level and cover a substantially larger set of retail trade units than those included in the corresponding STS sample. However, bank card transactions are not conceptually equivalent to business turnover, since they capture only sales settled by card. Differences in card acceptance and payment behaviour across businesses and retail activities therefore remain important when constructing and interpreting bank-card-based indicators (Sacco & Mifsud, 2026).

Several supporting data sources are used alongside the bank card data. Business Register (BR) information is used to identify the economic activity of businesses and to assess the extent to which the units available in the bank card source represent economic activity within the relevant NACE activity. BR turnover is also used to identify the economically most significant units when determining the population to be retained for individual indicators. STS data provide an existing monthly benchmark where an appropriate series is available, most notably for NACE 47.11. VAT information is used as an additional validation source and, where appropriate, to support the treatment of missing or problematic bank card observations. For the regional application, however, VAT data cannot provide the required geographical split since a business return represents the activity of the enterprise as a whole rather than turnover generated at individual locations (local units).

The empirical analysis is organised around three applications of bank card transaction data. First, NACE 47.11 is used as a validation case, where a bank-card-based monthly indicator is constructed and compared with the corresponding unpublished STS series. Second, the methodology is applied to NACE 47.41 (retail sale of computers, peripheral units and software in specialised stores), for which no equivalent monthly STS indicator is currently produced, providing a case for the development of a new indicator at NACE class level. Third, the potential for greater geographical detail is explored by constructing a monthly retail trade

indicator for Gozo using locality information available in the bank card data for 2024 and 2025. Together, these applications assess the potential of bank card data to support both more detailed activity-level indicators and new regional monthly statistics.

3. Methods

3.1 Analytical design and selection of units

The methodology was developed around the three empirical applications described in the previous section. For each application, the available bank card population was first assessed using BR turnover and data availability. The purpose was to retain the units accounting for the largest share of economic activity while avoiding the inclusion of large numbers of very small units with limited bank card sales and substantial missing information.

For NACE 47.11, 416 business units were identified in the bank card data. The units were ranked using BR turnover, and the 50 largest units were retained for the construction of the indicator. These units accounted for approximately 90% of the BR turnover represented by the bank card population in this NACE class. The remaining units individually accounted for only a very small proportion of turnover and generally contained lower bank card sales and more incomplete time series. The resulting bank-card-based indicator was subsequently compared with the unpublished STS NACE 47.11 series.

A similar approach was applied to NACE 47.41, although in this case the purpose was to construct a new monthly indicator rather than reproduce an existing STS series. The bank card dataset contained 41 units classified under NACE 47.41, compared with 8 currently active units in the corresponding STS sample. The STS sample, however, is designed to support broader published aggregates and is not specifically constructed to ensure representativeness at this level of NACE detail. The bank card units were subjected to additional quality and coverage checks before being retained for the calculation of the indicator. Since no equivalent monthly STS indicator is currently produced at this level, the exercise provides a practical application of bank card data for extending the level of activity detail available in monthly retail trade statistics.

For the regional application, bank card transactions containing locality information for 2024 and 2025 were classified between Malta and Gozo. A total of 308 business units classified within NACE Division 47 had at least one bank card observation attributed to Gozo during this period. The units were ranked by BR turnover, with the 49 largest units accounting for approximately 90% of the turnover represented by this bank card population. These units

formed the basis of the regional indicator, while the remaining units generally had small economic weights and a higher incidence of missing observations.

3.2 Data preparation and quality treatment

The bank card microdata required additional validation and treatment prior to indicator construction. VAT data were used, where applicable, as an independent source for assessing the plausibility and continuity of bank card sales. Units for which sufficient supporting information was not available could be excluded where their inclusion would introduce substantial uncertainty. Very small units were also excluded where they contributed minimally to BR turnover and contained a high proportion of missing bank card observations.

For NACE 47.41, units accounting for 0.1% or less of the BR turnover represented by the bank card population were also excluded because their sales values were relatively negligible and/or their time series contained several missing periods. Isolated missing monthly observations among retained units were imputed using a donor approach. A suitable donor unit with similar economic characteristics was identified and its monthly bank card growth rate was used to estimate the missing movement.

A similar donor approach was applied to isolated missing observations in the Gozo dataset. However, the regional nature of the indicator introduced an additional constraint. VAT information could not be used to derive missing Gozo sales because VAT returns relate to the total activity of the enterprise and do not distinguish between sales generated by outlets in Malta and Gozo. Units with more than eight consecutive missing periods at the beginning of the 2024 series were therefore excluded.

3.3 Indicator compilation

Following the selection and treatment of the underlying units, monthly bank-card-based sales indicators were constructed for each scenario. NACE 47.11 and NACE 47.41 series cover the period from January 2022 to December 2025, while the Gozo indicator covers January 2024 to December 2025 due to the availability of locality information. The indices were expressed with the first month of the respective analysis period set equal to 100 and monthly growth rates were calculated from the resulting series.

For the NACE 47.11 validation exercise, the unpublished STS series was re-referenced to the same starting period as the bank-card-based index to allow direct comparison of movements between the two series. For NACE 47.41, an unweighted bank card sales index was constructed from the retained units. An unweighted monthly index was also constructed for retail trade in Gozo using the bank card sales attributed specifically to the region.

3.4 Assessment framework

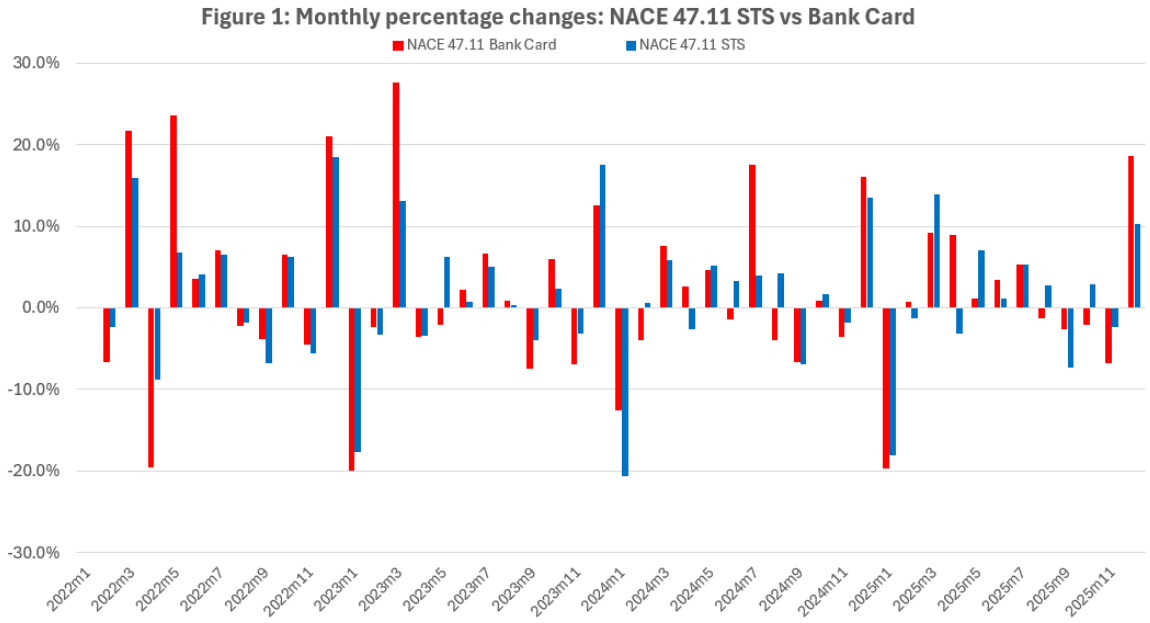
The assessment differs according to whether an existing monthly benchmark is available. For NACE 47.11, monthly percentage changes in the bank-card-based indicator are compared with those of the unpublished STS series using graphical comparison, Pearson correlation and directional agreement. For NACE 47.41 and Gozo, no directly equivalent monthly STS benchmark is available.

The assessment therefore focuses on whether the available bank card population provides sufficient economic coverage and data continuity to support a meaningful monthly indicator, together with the plausibility and interpretability of the resulting movements. For the Gozo application, additional representativeness checks are undertaken using BR information. Particular caution is required in interpreting these checks because the BR records the main registered address of an enterprise, which does not necessarily identify all geographical locations in which that enterprise operates.

4. Results and discussion

4.1 NACE 47.11: validation against the STS series

NACE 47.11 provides the validation case because a corresponding unpublished monthly STS series is available. As described in Section 3.1, the bank-card-based indicator is constructed using the 50 largest business units in the bank card population, accounting for approximately 90% of the BR turnover represented by that population. The underlying bank card population is broader than the current STS sample, which contains 23 business units in NACE 47.11, compared with 416 units identified in the bank card data. The comparison focuses on whether the resulting indicator reproduces the short-term monthly movements observed in the STS benchmark.



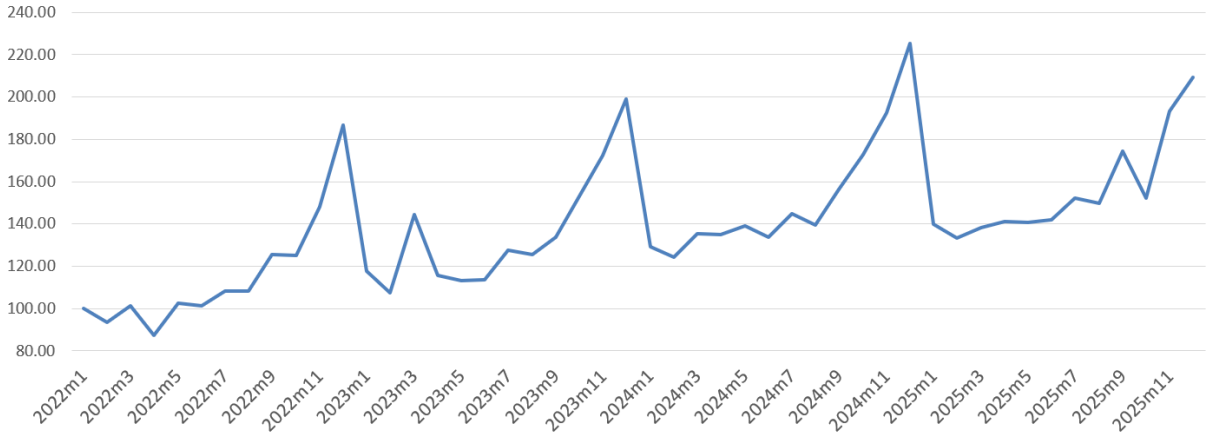
Monthly percentage changes in the two indicators are strongly positively correlated *(r = 0.839)*. The indicators moved in the same direction in 38 of the 47 monthly comparisons, corresponding to a directional agreement rate of 80.9% (Figure 1). The combination of strong correlation and high directional agreement indicates substantial coherence in the short-term movements of the two series.

Differences remain in the magnitude of movements and, in some months, in their direction. Nevertheless, the results indicate that, following the population selection and quality treatments described in Section 3, the bank-card-based indicator generally captures the short-term monthly developments observed in the STS series.

4.2 NACE 47.41: development of a new NACE class-level indicator

NACE 47.41, retail sale of computers, peripheral units and software in specialised stores, provides an application where no equivalent monthly STS indicator is currently produced. The bank card source identified 41 units within this activity, compared with 8 currently active units in the corresponding STS sample. Following the coverage and quality treatments described in Section 3, an unweighted monthly bank card sales index was constructed for the period 2022 to 2025.

Figure 2: NACE 47.41 Bank-Card-Based Index



The resulting index displays a clear and recurring seasonal pattern across the four-year period. Sales increase markedly towards the end of each year, reaching their highest levels around December, followed by a sharp decline at the beginning of the subsequent year. This pattern is consistent with what would be expected a priori for this retail activity. Its recurrence across successive years provides additional support for the plausibility of the movements captured by the indicator.

Since no directly equivalent monthly benchmark is available, NACE 47.41 cannot be validated in the same way as NACE 47.11. The exercise instead demonstrates the feasibility of using bank card data to produce a monthly indicator at a level of activity detail not currently available through the STS framework. The results also highlight the potential value of the broader bank card population for extending monthly retail trade statistics to more detailed NACE classes.

4.3 Regional retail trade indicator for Gozo

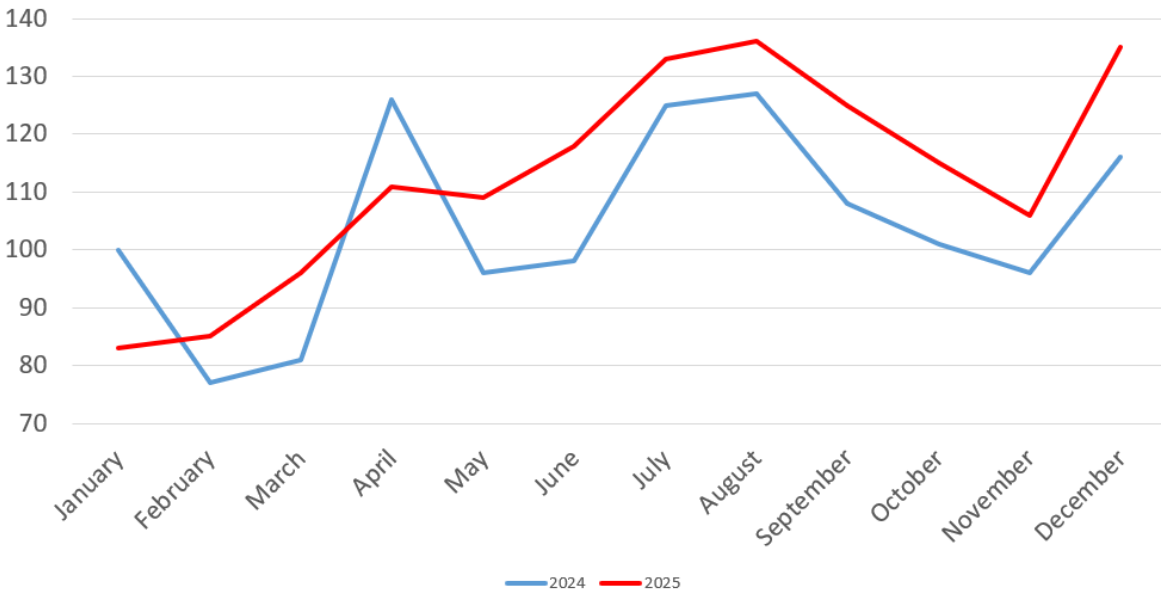
The Gozo application explores whether bank card transaction data can support the production of monthly retail trade statistics at regional level. The starting population was identified directly from the bank card dataset. A total of 308 business units classified in NACE Division 47 recorded at least one bank card transaction attributed to a Gozo locality during 2024 and 2025. These units were linked to BR information and ranked according to BR turnover. The 49 largest units accounted for approximately 90% of the total BR turnover represented by these 308 bank-card units and were retained for the construction of the regional indicator. This 90% refers to coverage within the identified bank card population and should not be interpreted as 90% coverage of total retail turnover in Gozo.

Representativeness was assessed separately. A first turnover-based check considered the active BR population of NACE Division 47 businesses whose registered BR address is located in Gozo. For 2025, total bank card sales attributed to Gozo represented approximately 57% of the BR turnover of this population. This measure should be interpreted with caution because

the BR records the main registered address of the enterprise rather than the location of individual outlets. Businesses registered in Malta may therefore operate outlets in Gozo and generate transactions captured in the Gozo bank card data without being included in the Gozo-addressed BR population. In addition, BR turnover reflects the activity of the enterprise as a whole rather than turnover generated specifically in Gozo.

A further check focused on the most economically significant businesses registered in Gozo. The businesses accounting cumulatively for the top 80% of BR turnover were identified, resulting in 59 units. Of these, 44 were present in the bank card data, corresponding to 74.6%. This provides additional evidence that the bank card source captures a substantial proportion of the economically important businesses identified through the Gozo-addressed BR population.

Figure 3: Gozo Retail Trade Bank-Card-Based Index



As seen in Figure 3, the monthly NACE 47 retail trade index for Gozo shows a clear seasonal pattern consistent with what would be expected a priori for retail activity, with stronger levels during the summer months and a further increase in December.

5. Conclusion

This paper examined the use of bank card transaction data to develop more detailed monthly retail trade indicators. For NACE 47.11, the bank-card-based monthly indicator showed strong short-term coherence with the STS benchmark, with $r = 0.839$ and directional agreement of

80.9%. NACE 47.41 demonstrated the feasibility of producing a new class-level monthly indicator, while the Gozo application showed the potential for developing regional monthly retail trade statistics using transaction locality information.

Overall, the results provide sufficient confidence for NSO Malta to move towards the production of experimental bank-card-based monthly retail trade statistics, while continuing to monitor coverage, stability and data quality.

References

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