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# Using Spending Monitor data as an indicator for households spending

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## Abstract

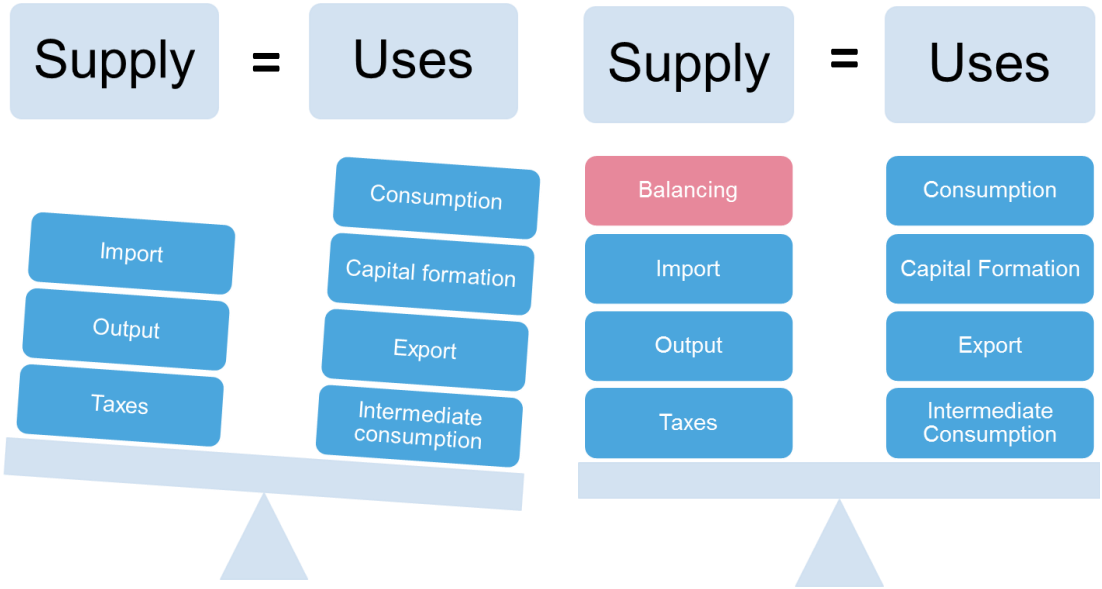
*Households continually change spending patterns and times of crisis are not an exemption of this. It is important, as a producer of quarterly national accounts statistics, to adapt to these changes to continuously enhance quality of the estimates and statistics hereof. In Denmark, COVID-19 significantly affected one of the key indicators for compiling quarterly household expenditure. Therefore, an alternative indicator, assisting current indicators, was examined in compiling contribution of household spending to gross domestic product. Spending Monitor data provided by a bank (of significant size, measured by market share) is both more frequent and a good indicator of final consumption expenditure of the households. The bank produces aggregated data per day in pre-defined consumption groups and makes the data available on a weekly basis. However, the work with the alternative indicator is in an early stage and the pre-defined groups of final consumption need to be compliant with the Classification of Individual Consumption According to Purpose in terms of calculation in national accounts. Still, it has been found that Spending Monitor data is a good indicator for a range of aligned consumption groups in the national accounts department. This especially applies to consumption groups as clothing, footwear, restaurant and hotel spending, and other services paid by households. In addition, these consumption groups are often undertaking revisions from flash to revised estimations in quarterly national accounts and until annual estimates, in Denmark. However, it should be considered what bank card data is suitable in measuring as not all final consumption by households is measurable by transactions from bank cards. This holds for e.g. purchase of vehicles, electricity, water etc. Above all, elaborating work with implementing Spending Monitor data as an indicator is found to be an advantage to enhance quality of estimates in relation to household spending.*

**Keywords:** Household expenditure, alternative indicator, bank card data

## 1. Introduction

In the process of producing national account statistics, and more specifically quarterly national accounts statistics in Denmark, several indicators are applied in the compilation of household expenditure. Household expenditure is an element of the demand side (contrary to supply) of the economy. In the compilation of GDP supply and demand side of the economy are balanced, thus indicating that household expenditure is an important element in the GDP estimate. The indicators are used for extrapolation of consumption in individual consumption groups by the indicator growth rates. The compilation is also important in measuring the contribution from households spending to gross domestic product. Currently, primary indicators measuring consumption in Denmark include VAT and retail trade statistics. Both of these are applied by incorporating individual growth rates in current prices on related consumption groups. Thus, the growth and not the amount in current prices is used in the calculation process. However, also barcode and administrative data[1] on specific consumption groups are applied in the compilation. The above also demonstrates that the data applied for measuring consumption is compiled by supply side indicators, like the sale of firms – and thus indicating a deficiency of source data compiled using information directly from the demand side of the economy, like data for the consumers.

**Figure 1: Compilation and balancing quarterly national accounts**




[1] Including e.g. detailed tax revenues collected on products by the Danish Ministry of Taxation.

Lately, it has been observed that (at least) three general concerns exist, especially from indicators. These concerns lead to uncertainties in the compilation of household spending and definitely affects the estimate of GDP, calling for identifying alternative indicators in relation to compiling household spending. This is aiming at using the alternative indicator either directly in extrapolation or as a supporting indicator for relevant consumption groups.

First, as time changes also spending patterns of households change. This is evident especially during times of crisis where expenditure possibilities might be limited and for that reason allocated differently. The COVID-19 crisis was an extreme case of this in relation to changes in consumption expenditure, because of behavioral changes, government restrictions and lockdowns during the pandemic (Hansen, 2020; Jacobi, 2021). Changes in spending patterns forces statisticians to consider which data is most accurate for extrapolation and if the existing data is still a good indicator for extrapolation in quarterly national accounts regarding individual consumption groups.

Second, times of crisis challenge already existing data and indicators in relation to accuracy. This especially relates to the COVID-19 crisis, where e.g. the Danish government implemented various schemes to counter significant and critical effects to companies and the national economy. In Denmark, companies specifically had the possibility of postponing periodic reporting and payment of VAT. Hence, enhancing the difficulties in compiling household expenditure as this is an important indicator in Danish quarterly national accounts. Additionally, due to general restrictions and various lockdowns in 2020 and 2021 even the reporting on VAT was difficult to interpret and was found to be less accurate. This again underlines the difficulties in the compilation of quarterly GDP estimates.

Third, as VAT and retail trade statistics are measured by firm revenues, this is only an approximation of households spending patterns. One cannot know from this data how large a share of revenue is generated by either household consumption or consumption of firms – or if this share is changing. The underlying assumption is that the share is constant when the growth in revenue is used as an indicator for the growth in household consumption. On the basis of the above described concerns, it has been found necessary to include supporting alternative indicators in the compilation of household expenditure to ensure the quality of extrapolation.

In addition to the above arguments to include alternative indicators in quarterly national accounts, also revisions of published data should be considered. Optimally, a supporting alternative indicator would give more insights into consumption and could therefore reduce revisions between the first and revised estimates of household consumption in quarterly national accounts. In particular, a series of services and specific retail goods are affected by more revisions between versions and this relates to the issue of accurate data available at the time of extrapolation. Considering the relevance of alternative indicators, bank card data of Danish consumption has been found relevant to examine to assess if the data would offer an applicable insight on households spending patterns. This is both considering total retail spending (thus, in a macroeconomic perspective) and for specific and aligned consumption groups. Thereby, observing if bank card data would serve as a good supporting indicator to already existing and applied indicators of consumption in households. Bank card data would in addition serve as a household spending indicator from the demand side of the economy.
The Danish bank card data is transactions measured by Danske Bank. Danske Bank is producing data on spending in aggregated consumption groups called Spending Monitor (Hansen, 2022). Spending Monitor was introduced during the COVID-19 pandemic to offer a fast indicator of consumption and how it was affected from governmental restrictions and lockdowns.

Assessing bank card data for compilation in quarterly national accounts is not only relevant in a Danish perspective. The data source could be found significant in more statistical institutions internationally as it would possibly enhance quality of statistics and estimates in national accounts. Currently, the Australian Bureau of Statistics has conducted similar examinations of bank card data finding that data could serve as a good indicator. However, assessments of accuracy on bank card data by the Australian Bureau of Statistics is in an early stage as well (Australian Bureau of Statistics, 2021).

## 2. About the study

What we in Statistics Denmark wanted to examine was if Spending Monitor data could serve as a supporting indicator, or even a better indicator, in extrapolation of quarterly household spending for the flash compilation in quarterly national accounts.

Currently, the quarterly growth rates of the indicators are used to extrapolate household consumption in detailed consumption groups[2]. Acknowledging general challenges in existing indicators, especially in relation to the number of VAT reports for the first compilation, examination of supporting indicator data was found relevant. In addition, initiatives of the Danish government during the COVID-19 pandemic, added an issue in relation to interpretation of existing data, as it was possible for companies to postpone the regular VAT reporting. If indicators do not give a true and fair measure of household's expenditure in the early compilation of quarterly national accounts, problems of revisions and maybe biased estimates may occur. This challenges the users of data in relation to reliability of published figures and thereby what they can use data for in analytical purposes. Thus, underlining the importance of accuracy of indicators.

In the assessment of whether bank card data is a good data source and qualifies to be implemented as an alternative indicator in relation to household consumption in quarterly national accounts, several issues should be considered.
First, expenditure by households distributed on various predefined consumption groups was made available by a bank in an aggregated form. Initially, this was a good starting point in observing distribution of consumption and examining how well data fit in a quarterly national accounts setting. The aim of the examination was to find what bank card data could be used for – e.g. which consumption groups are aligned between quarterly national accounts and bank card data, and how well does data describe consumption by households? Bank card data could not alone be assessed by the fit of aligned consumption groups, but should furthermore be considered in a statistical setup in relation to size of the bank and the sample, accuracy, etc. These considerations will be examined in the following paragraph.

### *2.1. Characteristics of bank card data*

Recognizing that expenditure data should be provided by a bank of significant size, measured by market share and customers, is essential, as the data should give a fair

[2] Hence, levels of the indicators are not directly incorporated. Thus, to extrapolate the consumption and expenditure by households, more indicators could be used in a combination.

and true insight of private customers and their expenditure pattern. From these characteristics it is possible to determine, whether the data is significant in describing household consumption and other economic activity. Furthermore, the accessibility of data is relevant, as it should be current and supplied frequently.

The availability of bank card data for this study is from Danske Bank, which is a bank of significant size in Denmark as it covers approximately one million customers and thereby represents roughly one out of five Danes[3]. The data measures average expenditure from transactions by bank cards and a Danish transaction service called MobilePay[4]. The bank produces the Spending Monitor data both in aggregated terms and by consumption in pre-defined consumption groups per day. The data is available to examine on a weekly basis and is thereby a useful insight for quarterly household expenditure both when estimating the total expenditure by households and for specific and aligned consumption groups.

Still, to properly know if the data is suitable for being included in extrapolation of household expenditure, considerations about the accuracy related to quarterly national accounts times series is needed. Specifically, one explicit drawback exists in the number of years the data has been available. To conduct a thorough examination of data on specific consumption groups, longer series of data is necessary. Nevertheless, it has only been possible to obtain data from January 2019 and onward. Even though data for a period of approximately three years could serve as a general overview and determine whether the transactions would serve as a good indicator, it is important to remember that at least one of the years was a special year all over the world[5]. COVID-19 made its entry in Denmark (and in most of Europe) in the beginning of 2020 (Sundhedsstyrelsen, 2020) and since then restrictions influenced habits of consumers in relation to purchases, behavioural patterns and possibilities of consuming. It might

[3] Statistics Denmark summed the population in Denmark to 5,873,420 persons primo 2022 (Statistics Denmark, N.D). To set up an account with associated bank card one must have the age of eight (Danske Bank, N.D). Including only persons from eight years old and upwards, the population in Denmark sums to 5,380,111 primo 2022 (Statistics Denmark, 2022).

[4] MobilePay is a private-to-private and private-to-retailers monetary transactions application. Customers are connected through their private bank account and thereby transactions are traceable in their individual statements of accounts (MobilePay, N.D.).

[5] Referring to COVID-19.

therefore be difficult to identify if bank card data was representative for Danish consumers in 2020.

In Denmark, digital payment methods are more frequently used for purchases in psychical trade compared to payments in cash. This underlines the fact that Denmark, in relation to payments, is ranging as one of the most digitalized countries in the world (Heisel & Brock, 2022). Because of this highly digitalized payment pattern the Spending Monitor data provides a good coverage of the spending activities in Denmark. Furthermore, e-commerce rapidly increase among all ages, which is naturally covered by bank card data. Due to of various government restrictions and lockdowns during the COVID-19 pandemic, Danish households increased purchases from e-commerce (Heisel & Brock, 2022) – indicating Spending Monitor data might be a good indicator. All the above-mentioned conditions are important in determining whether bank card data is appropriate and significant as an indicator of households spending.

Lastly, another advantage of Spending Monitor data is that it is complete when made available to Statistics Denmark. Thus, the data set will not be subject to revisions.

### *2.2. Examination of bank card data*

In the first and general assessment, it is important to consider the predefined consumption groups of expenditure by households. Statistics Denmark uses the Classification of Individual Consumption According to Purpose (COICOP) in the compilation of national accounts under the obligation of European System of Accounts 2010. This is in quarterly national accounts published on a 2-digit level of 11 final consumption groups – even though incorporated source data is on a more detailed level before compilation. Nevertheless, data from bank cards is grouped by the Merchant Category Code (MCC). This is the standard classification for credit card transactions to identify the merchant category by goods and services (Kagan, 2021). In the classification of MCC, the before mentioned Danish bank has made an aggregation of 27 consumptions groups containing 331 individual sub-consumption groups. Having said that, unsurprisingly, COICOP and MCC groups are not aligned and thereby the distribution of expenditure by households differ. The difference between consumption groups makes

more difficulties arise when comparing spending patterns by category. One of the issues relates to constructing a distribution of expenditure and hence converting the MCC level to COICOP classification. However, this is not immediately possible for all consumption groups, as some of the groups fundamentally differ in composition or are categorized in a different system making the transformation less insightful – or even directly wrong. Additionally, it is also important to consider what the individual consumption groups contain, because even if headings imply otherwise, the subgroups might be very different from COICOP subgroups. Moreover, even when compiling household consumption at a level of 64 consumption groups in quarterly national accounts, the aggregation of MCC is more detailed for specific goods and services still. This issue underlines that it should be considered how the MCC consumption groups fit in a national accounts context. However, the more detailed levels can serve for more insight and for that reason might be useful in specific contexts, e.g. during a crisis or when specific consumption groups are affected. Still, some consumption groups are designed such that direct comparison can take place between MCC and COICOP. This holds for e.g. clothing, footwear, and restaurants.

Notably, as work with bank card data is still in an early stage, another significant issue to consider for future work is if there is any seasonality in the data – or more specifically, how the seasonality is reflected in the spending patterns compared to aggregations in quarterly national accounts based on the current indicators. The data provided by the bank is naturally in current prices and not seasonally adjusted. Therefore, it is important to be aware what the data can be compared to in relation to statistical purposes in a national accounts department. This concern again calls for longer time series data to construct a pattern in consumption that is not affected by the COVID-19 crises either.

## 3. Results

The bank card data has been examined for the available period of approximately three years and on the basis of that, it has been found that Spending Monitor data is a good indicator when aligned consumption groups are compared. Furthermore, Spending Monitor data has been examined in more general terms, such as for total retail spending. Still, this has not changed the result.

Primarily, a new indicator, or a supporting indicator to already existing, should enhance accuracy in extrapolation in relation to compiling households spending in a quarterly national accounts department. Enhancing the accuracy of the estimates would, *ceteris paribus,* reduce revisions and in addition benefit users of the statistics. Here, it was found that bank card data could offer a reasonably good estimate of household expenditure for parts of final consumption. This is especially true, if one compares the published flash estimates for specific consumption groups and later revises estimates for the same consumption groups.

Observing the development in a more macroeconomic perspective, also total retail trade can be extrapolated using bank card data as an indicator. However, one must be aware that growth rate in total retail trade is an aggregation of all subgroups of retail consumption, hence still distribution of spending in individual subgroups is necessary to obtain the necessary data for quarterly national account. Besides serving as a good indicator for a selection of consumption groups, data is furthermore accessible early in the compilation process. Yet, enhancing the accuracy in quarterly national accounts.

Considering which consumption groups are directly aligned with COICOP classification on a 2- and 3-digit level, and thereby the consumption groups in the quarterly national accounts department, it has been found that it specifically holds for food, clothing materials[6], restaurants, hotels, jewelry, furniture, and hairdressing salons[7]. Yet, taking into account that these are some of the consumption groups often undertaking revision between versions of quarterly national accounts in Denmark. Thus, underlining the relevance of including Spending Monitor as a supporting indication on exactly these groups.

After recognizing which consumption groups are compatible to a quarterly national accounts compilation system, the growth rate in current prices has been examined. Notably, demonstrating the consumption groups below are the ones with the largest degree of alignment to quarterly national accounts for the 3-year period. The rest of the

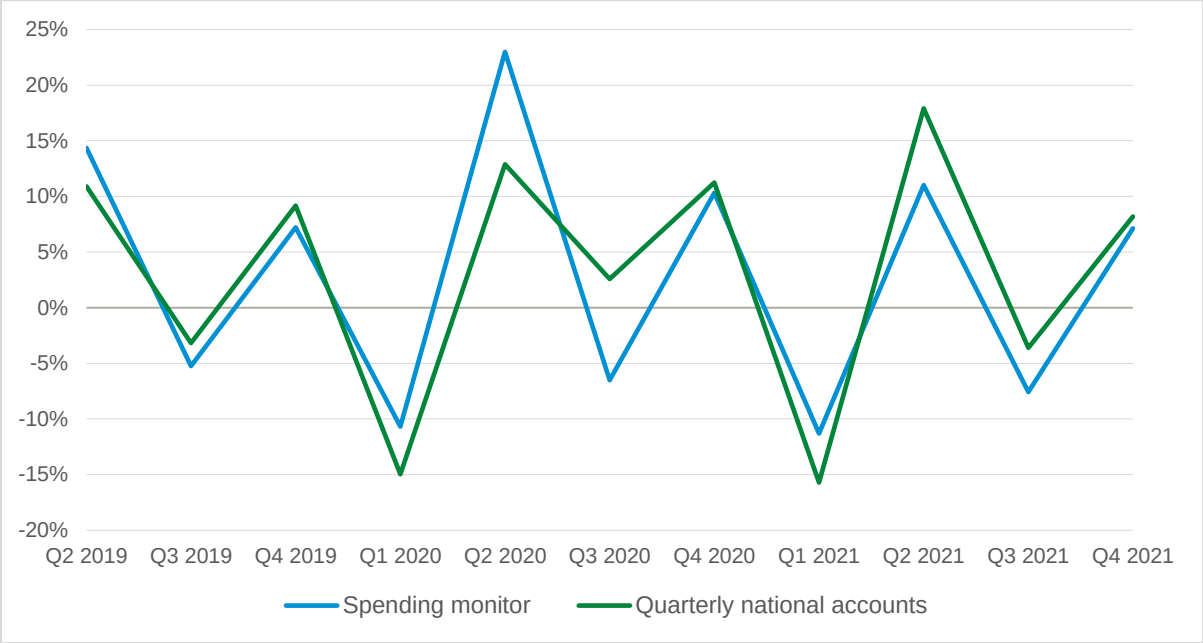
[6] Hence, including both clothing and footwear.

[7] Certainly, much more consumption groups are close to be aligned, however problems occur as some goods and services are included in different consumption groups at a 2-digit level (both from a COICOP to MCC and a MCC to COICOP perspective).

aligned consumption groups is at the best considered reasonable, nevertheless not included as they could still be improved.

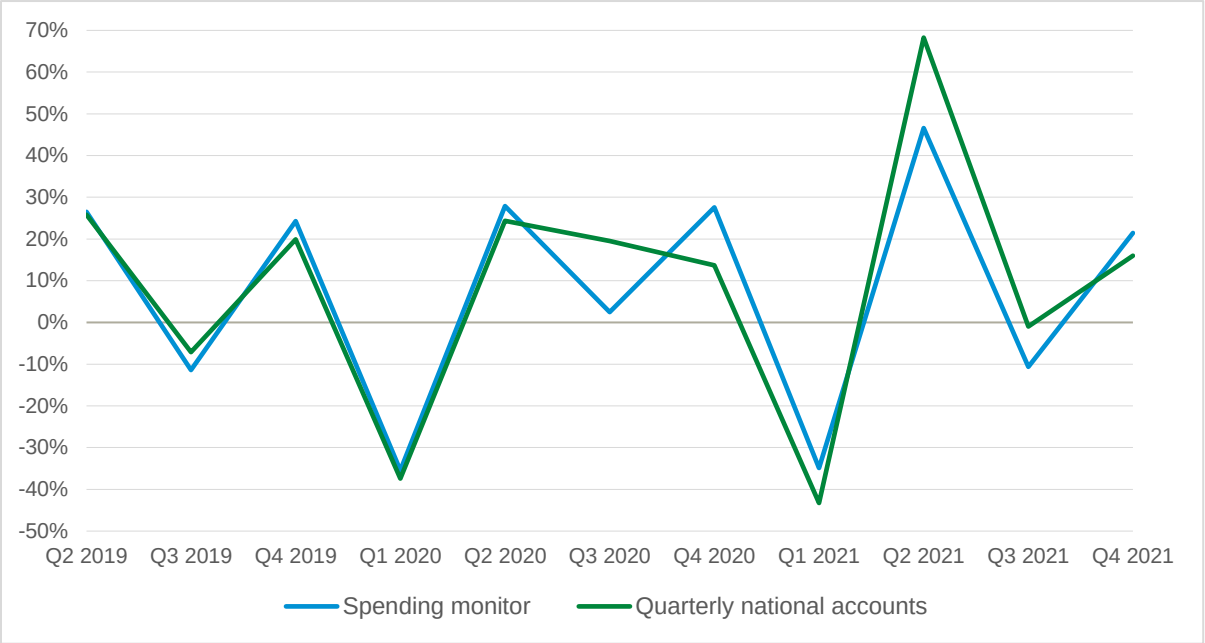
Retail trade (except of vehicles)*:* As regards to consumption of total retail trade (except of vehicles), Spending Monitor data offers a reasonably good insight of consumption. This is also evident in Figure 2. It is not completely accurate in terms of growth rate for the entire period, but still suggests an indication of the overall development. However, still expenditure of households should be distributed on detailed consumption groups in quarterly national accounts to obtain a similar growth rate as for Spending Monitor data.

**Figure 2: Retail trade (except of vehicles), growth rate, current prices**




Clothing materials*:* When combining expenditure of clothing and footwear in quarterly national accounts, bank card data is a good indicator for extrapolation. This is evident in observing the growth rate from revised estimates of quarterly national accounts and transaction data from Spending Monitor – the relationship can be observed from Figure 3. Moreover, this group of consumption is often subject to revisions from flash estimates for which bank card data could have been incorporated and hence countered some of the revisions in an early stage.

**Figure 3: Clothing materials, growth rate, current prices**

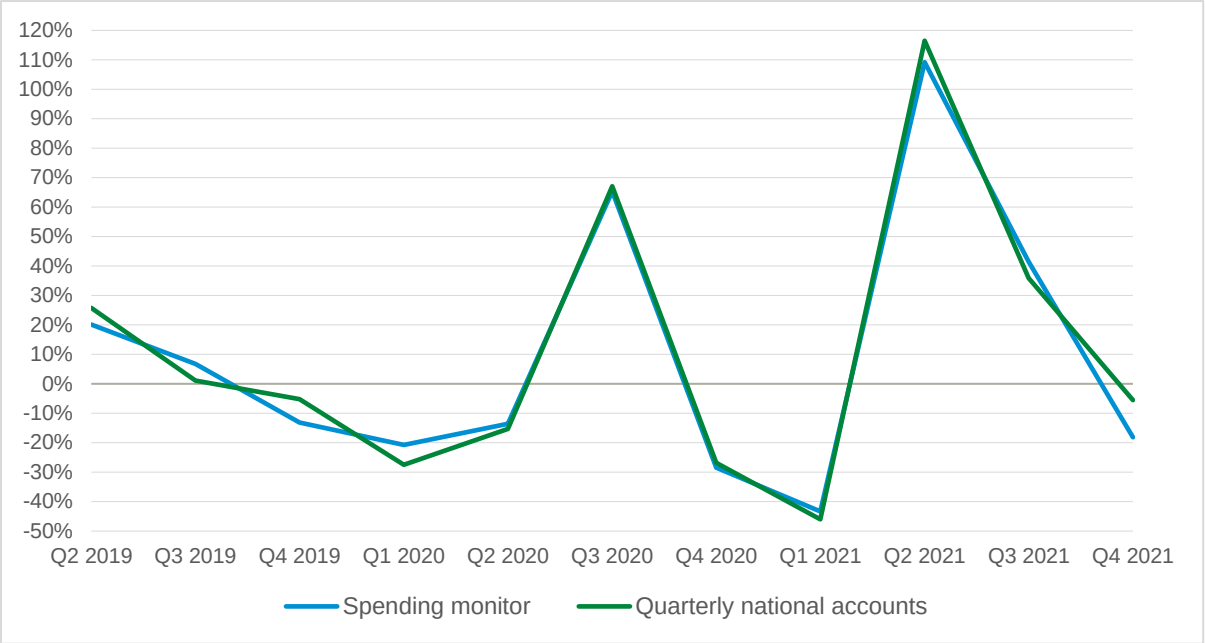



Restaurants: Again, Spending Monitor data is a good indicator of consumption by households. Hence, underlining the applicability of transaction data as a supporting indicator. The relation of growth rates can be observed from Figure 4. One reason that bank card data might be of great accuracy already for the first compilation could possibly be due to transactions via bank cards are measured within a couple of days. This is comparing it to the current indicator of VAT, where small firms reporting their sales have staggered deadlines. Among restaurants, there are a relatively high share of small firms which is why the VAT indicator is less accurate for usage in early versions of the quarterly national accounts.

Furthermore, especially for restaurants it might also be difficult to determine the distribution between household and firm consumption from the current VAT indicator. Thereby, an uncertainty arise in the compilation of household expenditure and thus in the extrapolation of GDP. Here Spending Monitor offers a special insight of only private demand suggesting a more accurate indicator.

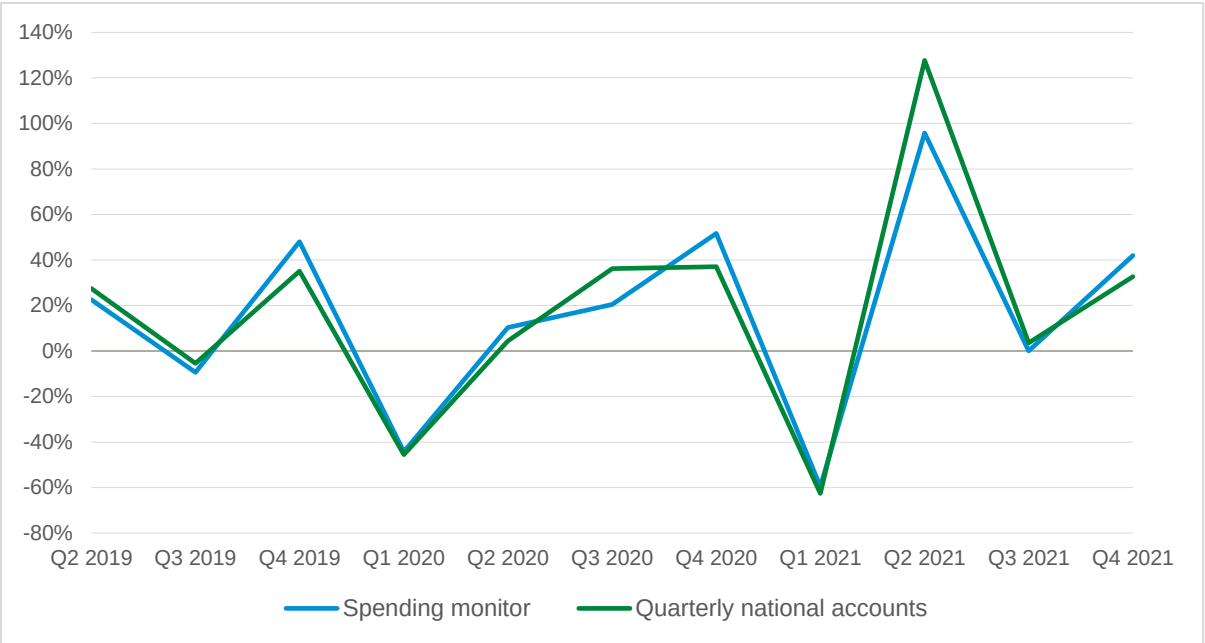
In addition, final consumption by households on restaurants in the MCC classification is aligned with COICOP and quarterly national accounts classification. Hence, Spending Monitor data is applicable in implementing as an alternative or supporting indicator.

**Figure 4: Restaurants, growth rate, current prices**



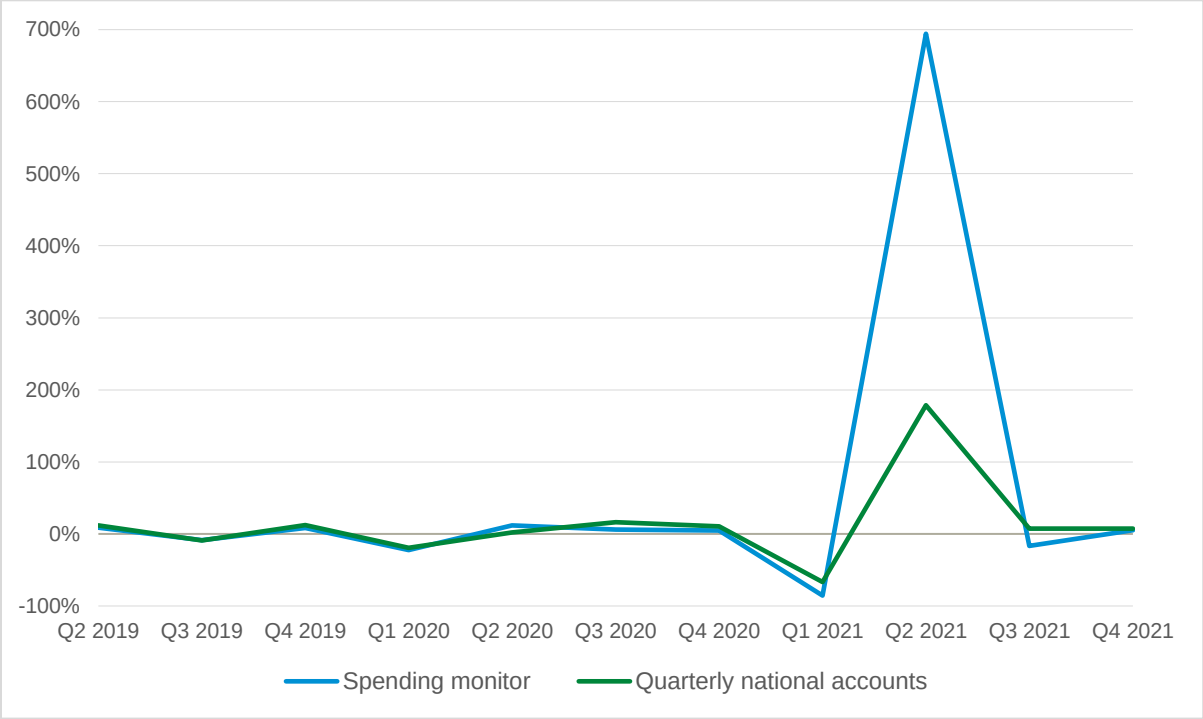

Jewelry*:* Expenditure by households in this consumption group is well captured by bank card transactions. This can be observed in Figure 5. On the basis of that, it is also considered a reasonably good indicator either to be incorporated directly in the compilation or as a supporting indicator.

**Figure 5: Jewelry, growth rate, current prices**



Hairdressing salons: Lastly, consumption of services in hairdressing salons is considered a good indicator of household expenditure when measured by bank card data. This relation is evident from Figure 6 when comparing growth rates of Spending Monitor data and revised quarterly national accounts estimates. However, second quarter of 2021 was a special quarter in Denmark, which can also be observed from the growth rate in Figure 6. This was due to hairdressers could re-open their salons to customers after lockdown in the first quarter, thus experiencing relatively large growth rates and a dissimilar relationship between Spending Monitor and quarterly national accounts. The current indicator for consumption in hairdressing salons might be characterized by the same implications as restaurants when it comes to reporting on sales from firms as they have staggered deadlines on VAT reporting. Thus, again making Spending Monitor a more accurate data source for extrapolation in quarterly national accounts. Additionally, expenditure in hairdressing salons in relation to MCC classification is aligned with COICOP and quarterly national accounts classification. Thus, making it possible to implement bank card data as a supporting indicator directly.

**Figure 6: Hairdressing salons, growth rate, current prices**



Generally, it was found that Spending Monitor data is offering a good insight of aligned consumption groups and therefore is applicable in quarterly national accounts in relation to compilation of household expenditure. This is especially the case when considering bank card data compared to accuracy of early VAT statistics and frequency of data. However, the examination of data includes special years of consumption, referring to COVID-19, which might have affected data.
Applying the bank card data could be done by directly incorporating it as a supplement to existing indicators. Otherwise, bank card data could be applied as a supporting indicator on a more permanent basis for aligned consumption groups and on total retail trade to enhance quality of extrapolation of household expenditure.

To conclude from another similar study, e.g. the Australian Bureau of Statistics found similar conclusions on specific consumption groups in households from bank card data. Likewise, banks provide bank card data in aggregated form and on a frequent basis. They found the data to be a good source for their compilation – either in form of a support or supplement to existing indicators (Australian Bureau of Statistics, 2021). Hence, underlining the applicability and results found in this study.

## 4. Discussion

Even though results have showed bank card data to be a good, or at least reasonably good, indicator for a selection of consumption groups, there is still important considerations related to using this kind of data.
One of the considerations relates to the issue of what the data is suitable in measuring. As transactions are from bank cards, data is hardly a good source of measuring consumption of energy goods such as electricity and water in households. Often this type of goods is paid from other payment agreements and with another time perspective of consumption. The same problem might occur in relation to rent for housing and purchase of vehicles. Thus, suggesting that bank card data cannot be applied to extrapolate all of household consumption.

A second consideration is that, as mentioned, consumption groups measured by MCC and COICOP are not completely aligned. Working with the bank card data is still in an

early stage and the MCC levels need to be converted into COICOP classifications. However, more consumption groups from bank card data are in a margin between different groups of COICOP (and hence quarterly national accounts), thereby still difficult to distribute in an accurate way and hence interpret. This is both as regards to what a group does measure and include and how reliable it is in measuring the type of good.

Internationally, bank card data could, *ceteris paribus,* also be found a good indicator of household spending. Therefore, the specific issue of converting MCC levels to COICOP classifications qualifies to be considered across more countries in cooperation. This is to share knowledge and insights across countries instead of locally performing the comprehensive work of the conversion in each country.

Lastly, incorporating private data like this on a regular basis where quarterly national accounts production system will be based on these data, the compilation becomes depended on delivery of data from a private bank that cannot be required to deliver these data.

Data from Spending Monitor has only been available for a short period and therefore cannot be used to obtain direct and flawless conclusions. To do that longer time series of data is necessary. This is to examine if the growth rates are also reliable in years without special events.

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