IDENTIFICATION OF KEY CONSUMER CATEGORIES OF GOODS AND SERVICES AS FACTORS IN THE FORMATION OF PERCEIVED INFLATION

Akpanov A.

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Akpanov Arman[1]

Abstract

Inflation expectations play a significant role in shaping the economic behavior of the population and represent an important indicator for monetary policy. The formation of inflation expectations among households is driven not only by macroeconomic indicators but also by subjective observations of price changes in everyday life. In this context, salient goods are particularly important, as they largely shape the perception of current inflation and are reflected in expectations about future price developments. This study attempts to identify which categories of the consumer basket are perceived by the population as salient goods and exert the strongest influence on perceived inflation.

Several complementary quantitative approaches are applied in this study. First, a method of automatic enumeration of various combinations of consumer basket categories is used, taking into account the official weighting scheme. This allows for the identification of indices that exhibit the highest correlation with the dynamics of perceived inflation. Second, a regularized ElasticNet regression is employed, incorporating additional variables that reflect price dynamics in the housing market.

The results indicate that some of the most frequently identified categories include food products, fuel and lubricants, and housing and communal services. In addition, when forming inflation assessments, households also take into account changes in housing prices, despite the fact that these indicators are not reflected in the consumer price index (CPI).

Additionally, using a vector autoregression model (VAR), an asymmetry was identified in the response of perceived inflation to price changes in salient goods: an acceleration in price growth elicits a more pronounced reaction than a deceleration. The findings provide a deeper understanding of the structure of households' inflation perceptions and the mechanisms underlying their formation.

Keywords: inflation expectations, perceived inflation, salient goods.

JEL-Classification: E31, C82, C43

[1] Akpanov A.K. – Leading analyst, Macroeconomic Research and Forecasting Division, Monetary Policy Department, National Bank of the Republic of Kazakhstan. E-mail: Arman.Akpanov@nationalbank.kz

CONTENT

1. INTRODUCTION

Inflation expectations have a direct impact on households' consumption and saving behaviour, on price-setting processes, and on the effectiveness of monetary policy. A central element in the formation of such expectations is perceived inflation a subjective assessment of price dynamics held by the population. Despite its high practical relevance, this area remains relatively understudied. International evidence indicates a persistent gap between official inflation measures, such as the Consumer Price Index (CPI), and households' subjective assessments of price growth (Abildgren, 2021; Takahashi, 2022). One of the key factors behind this discrepancy is that consumers rely not on aggregated statistical indicators like the CPI, but rather on goods and services that are individually important and most noticeable in everyday life. As a result, certain categories of the consumer basket may exert a disproportionately large influence on inflation perceptions – these are the so-called salient goods.

Identifying those categories of goods and services that exert the greatest influence on households' perception of inflation represents an important analytical task. Understanding the structure of the "subjective basket" provides deeper insight into the mechanisms underlying the formation of inflation expectations. The aim of this study is to identify the categories of goods and services that form the basis of the subjective perception of inflation and to develop an index of salient goods. To achieve this objective, statistical and econometric methods are employed, enabling the identification of the most significant determinants of perceived inflation.

The structure of the paper is organized as follows. Section 2 presents a review of the relevant literature, while Section 3 describes the data and methodology employed in the analysis. Section 4 provides the empirical results, including the identification of key categories of goods and services that exert the greatest influence on perceived inflation, as well as the construction of the salient-goods index. Section 5 concludes with the main findings of the study.

2. LITERATURE REVIEW

In the modern economic context, inflation expectations are shaped by a variety of factors, including macroeconomic indicators, changes in prices for key goods and services, actions and statements by central banks, the news background, etc. The expectations of economic agents, especially households, influence inflationary processes: it is on what level of inflation they expect in the future that their choice between consumption and saving depends, which ultimately creates corresponding pressure on prices.

When assessing current inflationary trends and forming inflation expectations, individuals often rely on price changes they observe in their own everyday experience. In the study by Stefanie J. Huber et al. (2022), the authors conclude that households' perception of inflation is a decisive factor shaping their short-term inflation expectations. Specifically, a one percentage point increase in perceived inflation is associated with a 0.74 percentage point increase in expected short-term inflation.

Prices of goods and services that change frequently or that households encounter regularly when making payments exert a particularly strong influence on the formation of inflation expectations. These prices are more salient and may be perceived as indicative of what is happening to prices in the economy as a whole. This may be explained by the fact that collecting and processing price information requires effort and resources; therefore, economic agents most often rely on frequently purchased goods to form an impression of the overall price level (Coibion O., 2020). A number of international studies have been devoted to identifying such goods.

In the study by Francesco D'Acunto (2019), based on a sample of more than 90 000 U.S. households, the authors conclude that changes in the prices of everyday purchases particularly food products are the primary factor shaping households' inflation expectations. The authors construct a household-specific consumption basket index composed of short-lived goods, which serves as a significant indicator of inflation expectations over the subsequent 12 months. They find that respondents rely mainly on their own grocery shopping experiences rather than on the overall Consumer Price Index. This can be explained by the cognitive constraints individuals face when collecting and processing information about inflation, as monitoring price changes for food items represents a more accessible source of information.

But why do food prices systematically raise inflation expectations? Food prices are more volatile than those of other goods, and their changes typically occur more rapidly. In a related study by D'Acunto (2021), it was found that households experiencing the highest inflation in their grocery baskets exhibit higher inflation expectations than others.

In another study, Richhild Moessner (2022) analyzes the factors determining short-term inflation expectations in the euro area, based on surveys of professionals using dynamic cross-country panel estimation for 16 euro area member states. The authors find that food inflation in a given country has a significant positive effect on inflation expectations. Oil prices and global commodity prices also exert a substantial positive influence.

In the study by the Federal Reserve Bank of Cleveland (Campos C. et al., 2022), the authors conclude that consumers and professional forecasters have historically assigned different weights to various components of inflation. Consumer inflation expectations typically changed in response to price changes in food, apparel, and new vehicles, while professional forecasters' inflation expectations appear to account for different price categories roughly in line with their weights in the CPI. Thus, the findings suggest that, when forming their perception of inflation, households rely on a different basket of goods and services than the one used in the official CPI calculation.

In another study conducted by the Bank of England (Bonciani D. et al., 2024), the authors found that price shocks on food products have a more significant and persistent impact on consumer expectations compared to general inflation shocks.

In a study conducted by the National Bank of Poland (Stanislawska E., 2019), the author concludes that consumers form their perceptions of inflation based solely on specific groups of goods and services, which make up about half of their consumer basket. These categories include food and non-alcoholic beverages, housing, utilities, as well as clothing and footwear. The author also notes that consumers are more sensitive to price increases than to price decreases.

In the study by the Central Bank of Ireland (Zekaite Z., 2020), it is shown that several goods and services from the consumer basket significantly influence the perceived inflation of consumers in the euro area. Together, these categories account for about 22% of the total CPI. Consumers may assign different weights to certain goods and services compared to their actual share in the inflation calculation or may overestimate or underestimate the price changes of these goods. The analysis also indicates that housing prices are taken into account by consumers when forming their perception of inflation.

In another study conducted by the Bank of Japan (Takahashi Y. et al., 2022), the impact of price changes in individual goods and services on perceived inflation is analyzed. The findings indicate that a substantial share of fluctuations in perceived inflation can be explained by changes in food prices and petroleum products. In addition, the results show that housing prices, which are not included in the CPI, also contribute to explaining perceived inflation.

As a result, a wide range of studies indicate that the formation of consumers' perceived inflation is driven primarily by a specific set of goods and services (salient goods). This study focuses on the role of personal consumption experience, namely the regular observation of price dynamics for these goods and services. Thus, examining the mechanisms underlying the perception of price signals and consumer behaviour makes it possible to gain a deeper understanding of how distortions in households' inflation perceptions are formed.

3. METHODOLOGY

This study employs several methodological approaches. At the first stage, a salient goods index is constructed using an automated enumeration of combinations of price growth rates across different categories of goods and services, based on the official weighting scheme (Grishchenko, 2023). The objective of this approach is to identify an index whose dynamics are most closely aligned with changes in perceived inflation, based on the following formula:

$$\text{Index} = \sum_{i=1}^{N}\left(\frac{w_i}{\sum_{j=1}^{N} w_j}\right) * \Delta p_i,$$

where $\frac{w_i}{\sum_{j=1}^{N} w_j}$ *– denotes the normalized weight of category i,*
Δp_i *– price growth rate.*

It is important to note that the price dynamics of individual goods and services may differ substantially from the dynamics of perceived inflation. However, this does not imply that households do not take these prices into account when forming their assessments. Rather, perceived inflation reflects the combined influence of multiple categories therefore, analyzing individual prices is less appropriate than constructing an index, which may also include goods and services exhibiting weak correlation with perceived inflation.

On the other hand, households may form their perception of inflation based on their own experiences, which may differ from the weights used in the calculation of official inflation. In studies conducted by central banks, the LASSO method (Yusuke Takahashi et al., 2022; Chris Campos et al., 2022) and ElasticNet regularization (Zivile Zekaite, 2020) are commonly applied. In this study, the ElasticNet regularization method is employed. This method is particularly useful when explanatory variables are highly correlated or when their number exceeds the number of observations (Zivile Zekaite, 2020). ElasticNet makes it possible to identify the most important factors and shrinks the coefficients of less relevant variables to zero. To this end, the model minimizes the mean squared error with an added penalty for model complexity:

$$min_\beta J = \frac{1}{2N} \sum_{i=1}^{N} \left(y_i - c - \sum_{j=1}^{p} x_{ij}\beta_j\right)^2 + \lambda\left(\frac{(1-\alpha)}{2} \sum_{j=1}^{p} \beta_j^2 + \alpha \sum_{j=1}^{p}|\beta_j|\right),$$

where N – the number of observations,
y_i – the i-th observation of the dependent variable,
x_{ij} – the i-th observation of the j-th independent variable,
c – the intercept term,
α – the parameter controlling the balance between Ridge and LASSO regularization,
β – the model coefficients,
λ – the regularization parameter.

In addition, it is important to account for the fact that, when forming their perception of inflation, households may rely not only on consumer prices but also on price dynamics in the housing market. Accordingly, the model additionally incorporates indices reflecting changes in housing prices, including prices for existing home resales and new housing sales.

Alongside this, a vector autoregression model (VAR) is also considered, which allows the dynamics of several interrelated variables to be examined simultaneously. The model is based on the assumption that the current value of each variable depends on its own past values and on the lagged values of other variables in the system. This approach makes it possible to identify causal relationships between variables and to obtain quantitative estimates of the effects under study. One of the most commonly used tools in VAR analysis is the impulse response function, which allows the response of perceived inflation to price changes in different categories of goods to be assessed. In general form, the VAR model can be represented as follows:

$$y_t = \sum_{i=1}^{p} A_i \, y_{t-i} + B x_t + c + \varepsilon_t$$

where y_t – vector of endogenous variables,
A_i – the coefficient matrix associated with lag i,
x_t – vector of exogenous variables,
B – coefficient matrix corresponding to x_t,
c – vector of intercept terms,
ε_t – vector of random error terms.

Within this study, the VAR framework is applied to analyze asymmetric effects. To assess the asymmetry in the response of perceived inflation to shocks in the salient-goods index, an approach based on comparing impulse responses to increases and decreases in the salient-goods index is employed:

$$\text{Positive shock} = \begin{cases} \Delta index, & if \ \Delta index > 0 \\ 0, & if \ \Delta index \leq 0 \end{cases}$$

$$\text{Negative shock} = \begin{cases} \Delta index, & if \ \Delta index < 0 \\ 0, & if \ \Delta index \geq 0 \end{cases}$$

Thus, it is hypothesized that perceived inflation is characterized by an asymmetric response to price changes in goods and services. In particular, perceived inflation is expected to respond more strongly to an acceleration in inflation than to its deceleration. In addition, it is anticipated that households are more sensitive to price changes in salient goods than to movements in overall inflation.

The analysis is based on official inflation data from the Bureau of National Statistics, using the corresponding weighting scheme, as well as housing market price indices expressed in year-on-year terms, which ensures comparability with perceived inflation. In addition, survey-based measures of inflation expectations are employed, in particular the median assessment of perceived inflation over the past 12 months. The data cover the period from January 2016 to June 2025.

4. RESULTS

At the first stage, goods and services that are most frequently mentioned by respondents in response to the question, "In your opinion, the prices for what types of goods and services grew faster in the past month?", were identified. Next, an automated enumeration of all possible combinations of 24 categories of goods and services was implemented in order to identify indices that exhibit the strongest correlation with perceived inflation. This procedure was carried out using an expanding window approach, with the initial window covering the period from January 2016 to January 2020. As a result, approximately 16.7 million unique combinations of goods and services, differing in both composition and length, were constructed for each window. Figure 1 presents one such distribution of indices by the frequency of correlation over the period from January 2016 to June 2025. Correlation values range from -0.28 to 0.937. The figure shows that a substantial share of the indices exhibits a positive and relatively strong relationship with perceived inflation. This confirms that households' inflation perceptions do reflect price dynamics in specific groups of goods and services, although sensitivity to these categories is heterogeneous.

Figure 1. Distribution of the frequency of correlation values of the indices over the period from January 2016 to June 2025.
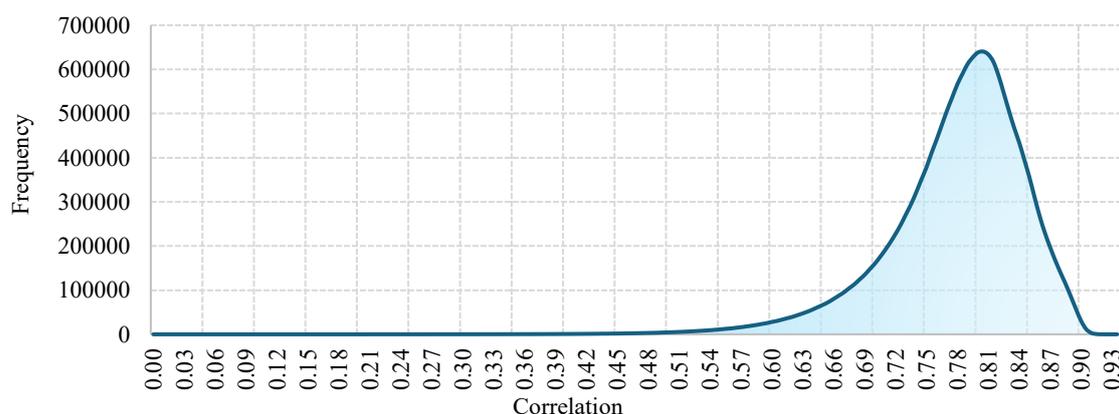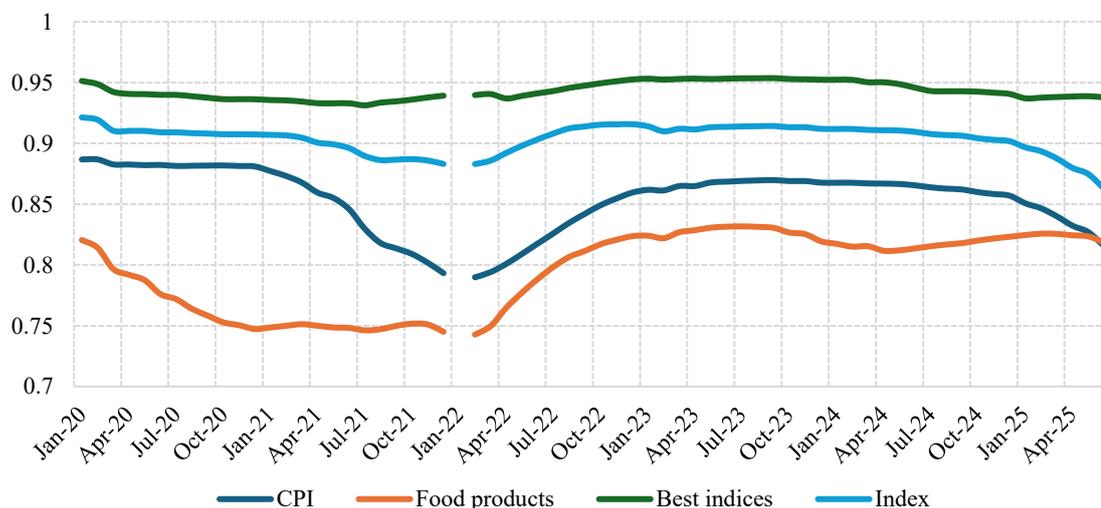

Source: author's calculations.

The next step involved examining the correlation between the best performing indices and perceived inflation. Figure 2 presents the dynamics of correlation coefficients for various indicators using an expanding window approach. As shown, the "Best indices" line, which reflects the values of the indices with the highest

correlation, exhibits not only higher levels of correlation but also greater stability over time compared to the official CPI and food inflation. Nevertheless, the correlation with the CPI remains at a relatively high level, indicating that households generally capture inflationary trends correctly, despite distortions in their assessment of the absolute level of inflation.

Figure 2. Dynamics of correlation coefficients between various inflation indicators and perceived inflation using an expanding window approach.

Source: author's calculations.

It is important to emphasize that the composition of the best-performing indices varies across periods. In total, 19 different categories of goods and services were included in the best combinations at least once.

However, for a more robust and generalized analysis, it is preferable to rely not on a single index composition but on a set of indices, such as the top 10 000 best performing indices (Appendix, Table 1). This approach reduces the risk of overfitting and provides a more reliable and stable understanding of the composition of indices that most accurately reflect perceived inflation.

An analysis of the composition of these indices shows that food products exhibit the highest inclusion frequency, including fruits and vegetables, sugar, soft drinks, vegetable oil, bakery products and cereals, eggs, and other items. Among non-food categories, fuel and lubricants stand out, while among paid services, housing and communal services, education, and housing rent are most frequently included.

The next step was to analyze the price growth rates of goods and services without using the official weighting scheme, assuming that households may form their perception of inflation based on subjective weights. For this purpose, the ElasticNet model was used a regularized regression method combining the properties of Ridge and Lasso methods. This approach allows for the selection of significant variables while minimizing or excluding less important ones.

In the model, the parameters λ and α were selected using 10-fold cross-validation. The criterion for choosing the optimal combination of parameters was the minimization of the mean squared error. Additionally, a constraint was imposed

on the sign of the coefficients. The regression parameters were estimated under the condition that all coefficients are non-negative. This reflects the logical assumption that price increases in goods and services cannot reduce perceived inflation.

To account for potential instability in the relationships between price dynamics of goods and services and perceived inflation over time, the ElasticNet model was constructed in an expanding window format. Starting with the base training sample size (48 months), the model was recalculated sequentially with the addition of each new month. At each step, the regularization parameters were reselected, and the set of variables was determined, based on which the most stable salient goods were identified.

As a result of the modeling, 17 variables were identified, which were included in at least one of the 65 models (Appendix, Table 2). A significant number of mentions were related to food products: fruits and vegetables, tobacco products, soft drinks, sugar, vegetable oil, as well as fuel and lubricants, housing and communal services, education, etc. The analysis also showed that when forming their perception of inflation, households also take into account the price dynamics in the housing market, primarily in the resale segment of apartments.

Thus, based on these methods, a salient goods index was constructed using the official weighting scheme. In terms of dynamics, the resulting index has a stronger correlation with perceived inflation and exhibits greater stability of correlation values over time compared to actual inflation (Figure 2).

The next step was to build an autoregressive model to assess the impulse response of perceived inflation to shocks in the salient goods index.

The endogenous variables used were: perceived inflation, the calculated salient goods index, the producer price index for industrial products, and the nominal effective exchange rate of the tenge. Additionally, the following endogenous variables were used: food inflation in Russia and the FAO cereal price index.

The optimal number of lags in the model was determined using the standard procedure with information criteria. To verify the correctness of the specification, tests for unit roots, autocorrelation of residuals, and heteroscedasticity were conducted. Bootstrap methods were applied to obtain more reliable confidence intervals for the impulse responses. The graphical representation of the impulse responses to a shock of one standard deviation, along with the statistical significance of the responses, is provided in the appendix (Figures 1, 2, 3, 4).

The analysis of accumulated responses (Figure 2) shows that a positive shock in the salient goods index of 1 percentage point leads to an increase in perceived inflation by 0.63 percentage points after 12 months. For comparison, an analogous shock in the CPI results in an accumulated effect of 0.53 percentage points. This indicates a stronger sensitivity of the public's perception to changes in the salient goods index compared to the CPI.

At the same time, a decrease in the salient goods index by 1 percentage point leads to a more moderate reaction: perceived inflation decreases by only 0.3 percentage points over the 12-month period (Figure 3). This indicates the presence of asymmetric perception: the public reacts more strongly to price increases than to price decreases.

Furthermore, the response of perceived inflation to a negative shock in the CPI was found to be statistically insignificant (Appendix, Figure 4), highlighting the higher sensitivity of the public to changes in the salient goods index compared to the official consumer price index.

Figure 2. Impulse responses of perceived inflation to a positive shock in the CPI and the salient goods index.
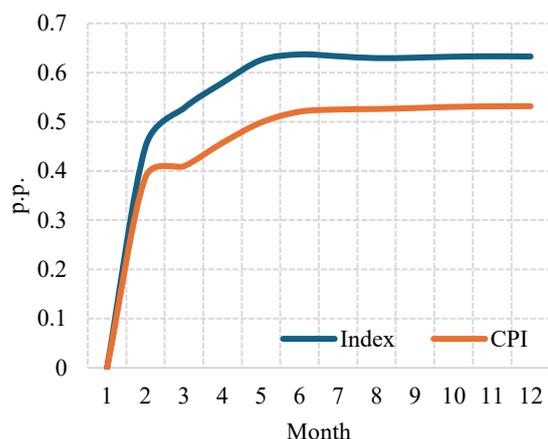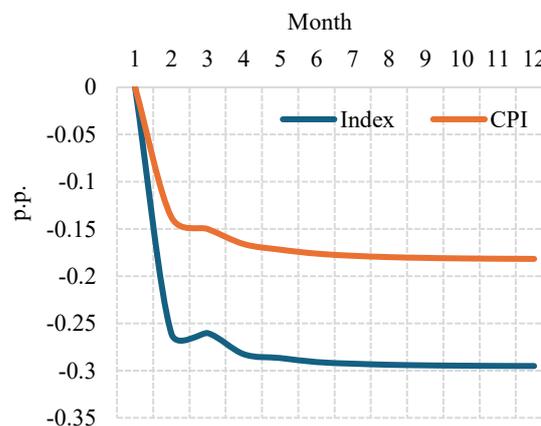
Figure 3. Impulse responses of perceived inflation to a negative shock in the CPI and the salient goods index.

Source: author's calculations.

The obtained results complement existing evidence of asymmetric adjustment in inflation perception: in the study by Stanislawska E. (2019), it is concluded that, even considering the sample covering a period of deflation, slower adaptation of inflation perception to its decrease persists. In another study, based on data from the University of Michigan survey, Curtin (2010) shows that inflation expectations react approximately twice as strongly to inflation increases as to decreases.

The dynamics of actual and perceived inflation in Kazakhstan show that throughout the entire period under consideration, the population consistently overestimates the actual level of inflation on average by 6.2 percentage points. Even during periods of moderate price growth, perceived inflation significantly exceeded the official figures, indicating the presence of a persistent "inflationary background" in public consciousness.

5. CONCLUSION

This study provides a comprehensive attempt to identify the categories of goods and services whose price dynamics most significantly determine the public's perception of inflation. The use of complementary quantitative methods allowed for the identification of salient goods that exert a persistent influence on subjective inflation assessments.

The automatic enumeration of indices, carried out in the expanding window format, allowed for the identification of combinations of goods and services at each

sampling step whose dynamics most closely align with perceived inflation. Subsequent selection based on maximum correlation formed a list of salient goods: fruits and vegetables, sugar, soft drinks, fuel and lubricants, vegetable oil, housing and communal services, education, bakery products and cereals, eggs, rent for housing, tobacco products, and others (Appendix, Table 1).

The next step was the use of the ElasticNet method. The results from the expanding window approach showed that the most frequently included variables in the model were fruits and vegetables, tobacco products, soft drinks, fuel and lubricants, housing and communal services, education, sugar, vegetable oil, and others. Moreover, the analysis revealed that housing prices, which are not included in the CPI calculation, are also significant in shaping consumers' inflation perceptions, which is consistent with the findings of international studies (Zekaite, 2020; Takahashi, 2022).

Thus, the goods and services identified in both methods were used to construct the salient goods index. The resulting index has a stronger and more stable correlation with perceived inflation compared to actual inflation.

The analysis of impulse responses within the vector autoregression model revealed a pronounced asymmetric effect. An increase in the salient goods index by 1 percentage point leads to a 0.63 percentage point increase in perceived inflation accumulated over 12 months, whereas an analogous shock to actual inflation causes a smaller effect 0.53 percentage points. Furthermore, a decrease in the salient goods index by 1 percentage point results in a 0.3 percentage point reduction in perceived inflation, while a negative shock to actual inflation was found to be statistically insignificant. These results confirm that the public reacts significantly more strongly to inflation acceleration than to its deceleration (Stanislawska, 2019). They also indicate that perceived inflation is more responsive to the salient goods index compared to actual inflation.

The identification of salient goods is the first step towards a comprehensive study of inflation perception. Prospective directions for future research include sentiment analysis of the information environment and expanding the analysis towards models of inflation expectations formation.

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Table 1. Frequency of inclusion of goods and services categories in the top 10 000 indices (expanding window, N=65)

Category	Share, %
Fruits and vegetables	96.8
Sugar	89.7
Soft drinks	86.8
Fuel and lubricants	86.5
Vegetable oil	78
Housing and communal services	72.2
Education	67.8
Bakery products and cereals	66.7
Eggs	63.9
Rent for comfortable housing	61.6
Tobacco products	52.7
Catering services	48.2
Detergents and cleaning products	44.1
Outpatient services	41.6
Hairdressing salon and personal service establishments	41.2
Telephone and fax services	35.9
Appliances	34.8
Fish and seafood	34.5
Cars	23
Pharmaceutical products	20.6
Dairy	12.2
Meat	7.5
Transport services	7.4

Table 2. Frequency of inclusion of goods and services in the ElasticNet model (expanding window, 65 models)

Category	Quantity
Fruits and vegetables	65
Tobacco products	65
Soft drinks	65
Fuel and lubricants	65
Housing and communal services	55
Education	54
Resale of apartments	52
Sugar	45
Vegetable oil	43
Rent for comfortable housing	19
Pharmaceutical products	14
Meat	8
Sale of new housing (apartments)	8
Eggs	5
Outpatient services	4
Bakery products and cereals	3
Catering services	2

Figure 1. Accumulated impulse response of perceived inflation change (D(Y)) over 12 months to a positive shock in the salient goods index of one standard deviation (POS_SHOCK), with a 95% confidence interval (bootstrap, 999 repetitions).
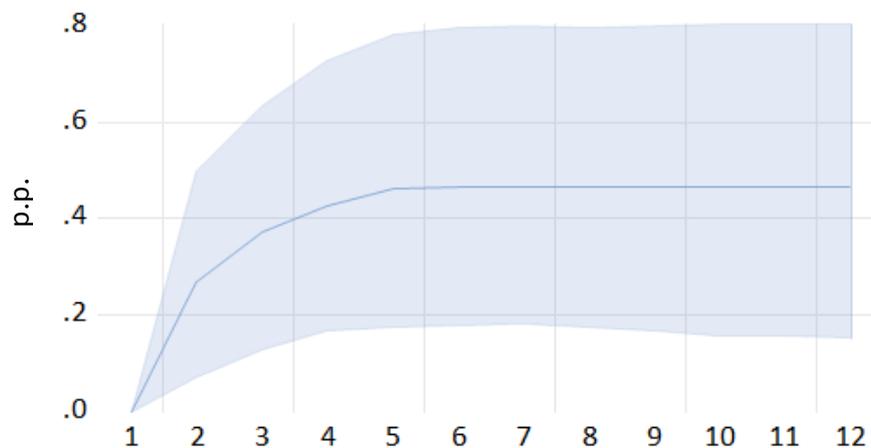

Figure 2. Accumulated impulse response of perceived inflation change (D(Y)) over 12 months to a positive CPI shock of one standard deviation (POS_SHOCKCPI), with a 95% confidence interval (bootstrap, 999 repetitions).
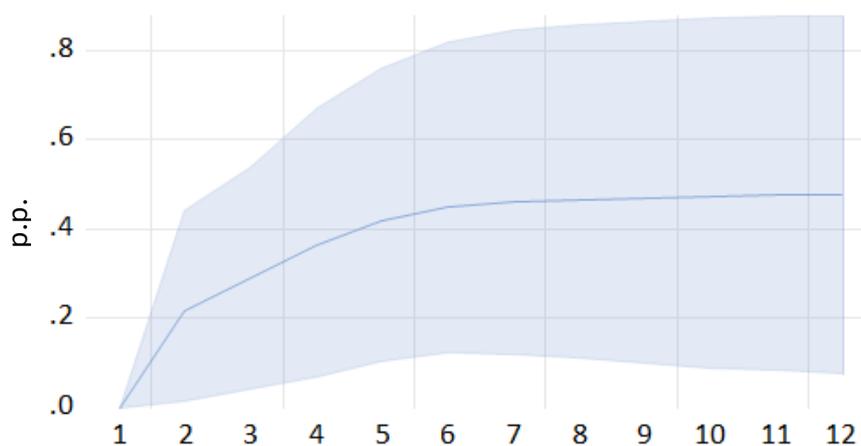
Figure 3. Accumulated impulse response of perceived inflation change (D(Y)) to a negative shock of one standard deviation (NEG_SHOCK), with a 95% confidence interval (bootstrap, 999 repetitions).
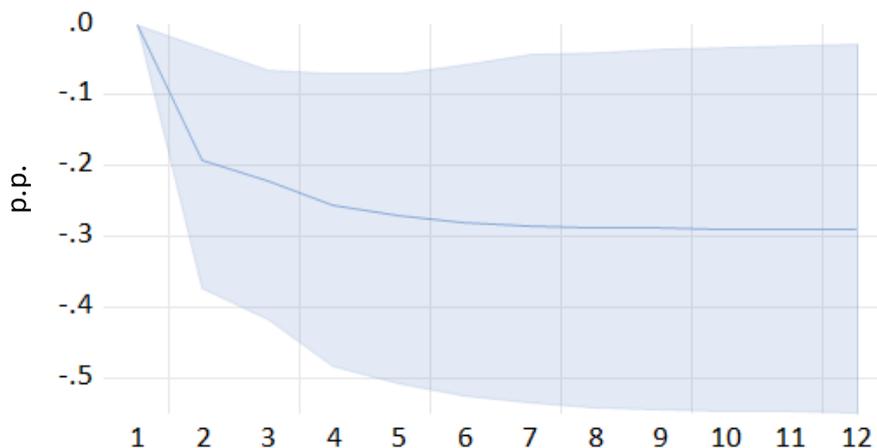

Figure 4. Accumulated impulse response of perceived inflation change (D(Y)) to a negative CPI shock of one standard deviation (NEG_SHOCKCPI), with a 95% confidence interval (bootstrap, 999 repetitions).