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Determinants of Inflation Expectations of the Population in Kazakhstan

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Expectations of the population regarding the current and future dynamics of prices for goods and services are one of the main factors influencing inflation. Low and stable level of inflation expectations contributes to the increasing effectiveness of monetary policy, especially in the context of inflation targeting. For this reason, central banks of many countries pay special attention to the analysis and control of inflation expectations. The purpose of this research is to study the determinants of inflation expectations of the population in Kazakhstan. It provides a review of the works of various researchers who managed to identify the objective and subjective reasons that in one way or another are key to the formation of the population's expectations regarding price growth. Using a number of approaches and largely relying on the results of a survey of the National Bank of Kazakhstan conducted from 2016 to the present, a list of factors that shape the expected inflation in Kazakhstan was identified. Also, the use of a number of methods[1] allowed searching for a list of products and services within the framework of this study, where the population's opinion on inflation is particularly sensitive to changes in prices. Based on the results of the analysis, a number of important conclusions were made about the specifics of inflation expectations in Kazakhstan: a significant impact of the exchange rate, news background, food inflation, as well as the presence of tracer products whose price dynamics have a pronounced impact on inflation expectations.

Key Words: inflation, inflation expectations, perceived inflation, central bank, monetary policy.

JEL-Classification: E31, E39, E52, E58

1. Preamble

It is difficult to find a more subjective indicator than the inflation expectations of the population. People's ideas about inflation depend on many factors: personal consumer basket, life experience, income, education, the country's economy and much more. Therefore, they are characterized by a large variance. Researchers from all over the world are trying to understand the nature of people's inflation expectations and how they are formed under the influence of various factors.

Household inflation expectations, unlike the expectations of the expert community and market participants, reflect the society's broader ideas about inflation, so their "anchoring" contributes to the stability of the monetary system as a whole.

In market conditions, the expectations of economic agents regarding the current and future dynamics of prices for goods and services shape their future consumer or savings behavior. This, in turn, will determine the level of demand in the economy and then future inflation. Without taking into account the expectations of the population, measures to control inflation may be less effective. For this reason, inflation expectations have become one of the key indicators considered by central banks in their decision-making.

The importance of inflation expectations, especially in a small open economy, also manifests itself in terms of financial stability. If the population expects high inflation, they may be

[1] Linear regression construction, Granger causality test, method of coherence assessment.

inclined to invest in riskier assets that can protect them from losses in value, such as foreign currencies, real estate, gold, etc. Strong and unexpected changes in inflation expectations in the context of various shocks can create instability in financial markets and increase the risk of financial turmoil.

Understanding and assessing inflation expectations helps the central bank determine what factors and events can influence inflation and take the necessary measures to achieve the set goal, and anchoring inflation expectations near the target will have a stabilizing effect on future price growth. As a result, successful management of the population's inflation expectations helps create a more favorable economic environment. Central banks seeking to anchor inflation expectations can do so in only one way – through accessible communication. Knowing the factors to which the inflation perceived and expected by the population reacts, it is possible to "more accurately adjust" the parameters of the central bank's communication policy. That is, to pay more attention to what people take into account when making their inflation estimates. This research work is devoted to finding these factors.

2. Literature Review

Researchers from different countries have analyzed and assessed various aspects of inflation expectations. Many studies are devoted to finding the reasons underlying the population's opinion about future price growth.

D'Acunto F. and Weber M., researchers specializing in the study of inflation expectations, noted in their work [1] that it is currently known how people form their inflation expectations. The first thing the authors pointed out is that expectations are always systematically overstated. The average and median numerical values of expected future inflation are usually higher than what actually happens. The second observed pattern is that household expectations about future inflation are characterized by a wide range of values, which is much greater than those of professional experts, whose expectations regarding inflation are relatively tightly concentrated near the central bank target. The third pattern, arising from the first two, is a fairly large difference between the average and median expectations, with the first being constantly higher than the second. This feature reflects extremely high levels of expected inflation in some households, resulting in that the arithmetic mean of inflation expectations, as a rule, always exceeds the median. Unlike the inflation expectations of experts, which, as a rule, rely on official statistics, that is, on objective indicators, the inflation expectations of the population are based on incomplete and selective information from everyday life, that is, on the subjective component. Therefore, statistical data or central bank announcements on monetary policy have a weak influence on the inflation expectations of consumers.

Price increases have a stronger impact on inflation expectations than equivalent price decreases. Research shows that inflation expectations are influenced by past experience of high inflation. For example, Americans who lived through the Great Inflation of the 1970s still have higher inflation expectations than their younger compatriots. Moreover, the traumatic experience of hyperinflation can be passed on from generation to generation: Germans from areas with the strongest price increases during the hyperinflation of the 1920s still expect higher inflation in the future 100 years later than Germans whose ancestors lived in places where inflation was relatively lower [2]. The authors of the study conclude that the recent surge in inflation experienced in the post-pandemic period may also have a lasting effect on inflation expectations.

Amid the surge in inflation after the coronavirus crisis, people have begun to pay more attention to it and have more information about its dynamics. This was shown by the results of a survey by the European Central Bank – in January 2023, more than 60% of respondents noted that they pay more attention to inflation than a year earlier. Central banks need to take into account another nature of people's inflation expectations, which was identified by an international group of researchers [3] – rational inattention or its endogeneity, which means that when inflation is low and stable, people are inattentive to information about it, so it is more difficult for regulators to attract attention to their communications. However, if the regulator manages to reach the audience,

the effect of this will be strong. In the case when inflation is high and people are sufficiently aware of it, it is easier for central banks to draw attention to their messages, but they will have a weak impact on expectations, since people are already less receptive to new information.

The same authors, D'Acunto F. and Weber M. [4], attempted to explain the formation of inflation expectations. They proposed a memory structure in which consumers rely on selective recall when forming beliefs – about the prices they remember. Selective recall is often "incorrect" – consumers tend to underestimate past price dynamics. Against this background, the current price increase will be perceived by people as higher than before and than it actually is. Therefore, inflation expectations and perceived inflation[2], as a rule, are by their nature overstated compared to reality.

The results of another study [5], which examined how people's subjective ideas about the macroeconomy and the relationships between macroindicators are consistent with theory, showed that people, when forming their expectations, are guided by a simple heuristic: good changes lead to good, and bad changes lead to bad. Thus, economists from Oxford, Bonn, Warwick and Copenhagen universities surveyed more than 6,500 ordinary people about their understanding of how changes in income tax, oil prices, the central bank rate and government spending would affect inflation and unemployment. The subjective economic models of more than half of the respondents diverged from macroeconomic theory – the majority assumed that an increase in taxes, oil prices and the key rate, as well as reduction in government spending lead to an increase in inflation and vice versa. Thus, if people perceive an increase in the rate as a negative change, they may mistakenly assume that this will lead to an increase in prices.

At the same time, information disseminated by the media has a strong impact on the perception and expectations of inflation. This impact is usually negative, since journalists tend to disseminate negative and "loud" news. News about future inflation growth or currency devaluation will attract more readers than news about inflation decreasing or the currency strengthening. Journalists skillfully exploit this pattern. Negative news have a greater impact on inflation expectations also because such information is "too expensive for consumers to ignore". The results of the work based on data from Google Trends show that in 2006–2018 in India, the Internet was a source of information on the basis of which agents formed their expectations regarding future inflation, and online search queries had a certain impact on inflation expectations [6]. Researchers at the Bank of Italy, who used machine learning to analyze data from X (Twitter), also found that X-based indicators correlate strongly with both monthly surveys and daily market inflation expectations [7]. In Russia, inflation expectations correlate strongly with news on inflation, the economic crisis, and the ruble exchange rate. A study by the Central Bank of the Russian Federation also showed that people without savings tend to pay more attention to news on geopolitics and the level of poverty, while for the subgroup with savings, the exchange rate dynamics are, on average, a more significant factor [8]. Inflation expectations have also been studied from the perspective of psychology and gender differences. Research results show that women's inflation expectations are higher and less accurate than men's [9]. The former is explained by the fact that women tend to make purchases more often, and the formation of inflation expectations depends on the frequency of purchases, and not on the share of spending on them [10]. As a result, women are more sensitive to price changes and more likely to overstate their inflation expectations. This, coupled with other financial literacy studies that point to a gender gap in financial literacy, explains why women make less accurate predictions about the future path of inflation.

Age also plays a role in the formation of inflation expectations. Researchers have found that young people change their expectations more often than older people, since recent experience makes up a larger part of their accumulated life experience [11]. Inflation expectations of older people are more stable.

[2] Household expectations for the coming year and the inflation they perceive over the past year.

However, the fact that the population's expectations regarding price growth are subjective rather than rational does not mean that they do not have fundamental factors. As a rule, the factors that shape inflation expectations are the so-called "tracer products" – goods or services that account for a large share in the consumer basket, are used more often, or the price increase of which is most noticeable to the population. Tracer products may differ across countries and even across regions within a country. However, research results indicate that there are also tracer products common to many countries of the world. Such goods and services that are significant for the population include food, gasoline, utilities, housing, public transportation, etc. In the United States, as shown by the results of a study of more than 90 thousand households [10], the main tracer products are non-durable goods – food and medicines. The calculated consumer price index (CPI) for the consumer basket consisting of tracer products, as well as the calculated frequency CPI, taking into account the frequency of purchases, have proven to be significant predictors of inflation expectations. Thus, an increase in the first index by one standard deviation coincides with an increase in expected inflation by 0.17 pp, the second – by 0.1 pp.

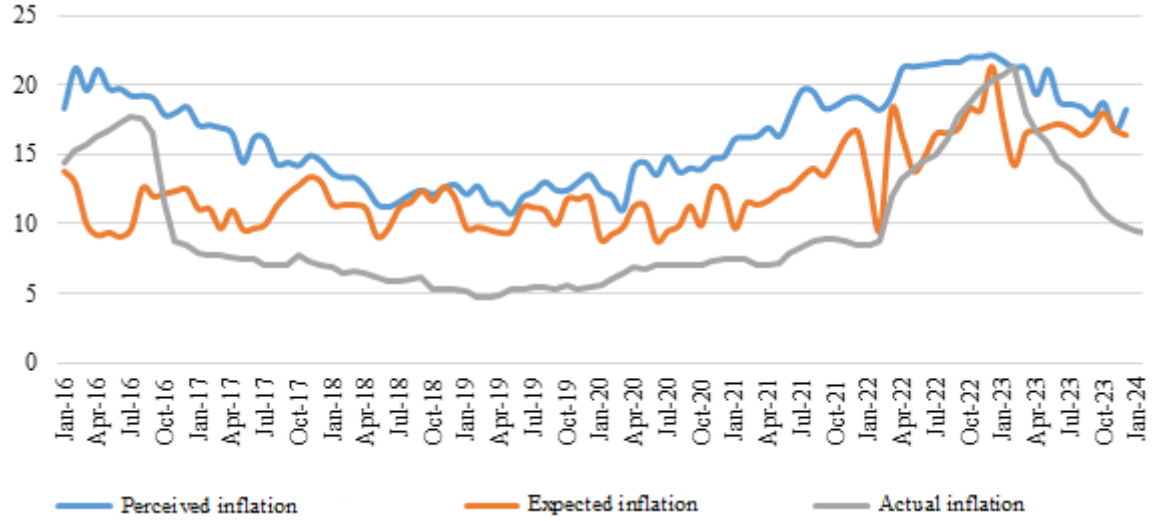
In Russia, statistically significant tracer products were mainly durable goods, as well as goods that determine the quality of life – cars and clothing [12]. Meanwhile, gasoline, one of the mandatory and main tracer products in most countries, showed a smaller correlation with the inflation expectations of Russians. The lower significance of changes in energy prices can be explained by the presence of government regulation. In another study, the authors, using correlation analysis, found that tracer products, along with food, can include tobacco products and medicines [13]. From the above, we can conclude that inflation expectations are formed under the influence of many factors: economic, subjectively perceived, psychological, time, and many others. It is impossible to assess the influence of each factor separately, but attempts to study and determine the factors continue due to the fact that today the significance and importance of inflation expectations for central banks remains high. This is also confirmed by the number of references to inflation expectations by central banks in their communications and the number of studies on this topic over the past few years.

3. Assessment of Inflation Expectations in Kazakhstan

Since 2016, the National Bank of Kazakhstan (National Bank) has been conducting a survey of public opinion on price increases and other indicators and, based on this, calculates and publishes the estimates of perceived and expected inflation in its communication materials (Figure 1).

Figure 1

Dynamics of Expected and Perceived Inflation, %



Source: National Bank survey on inflation expectations.

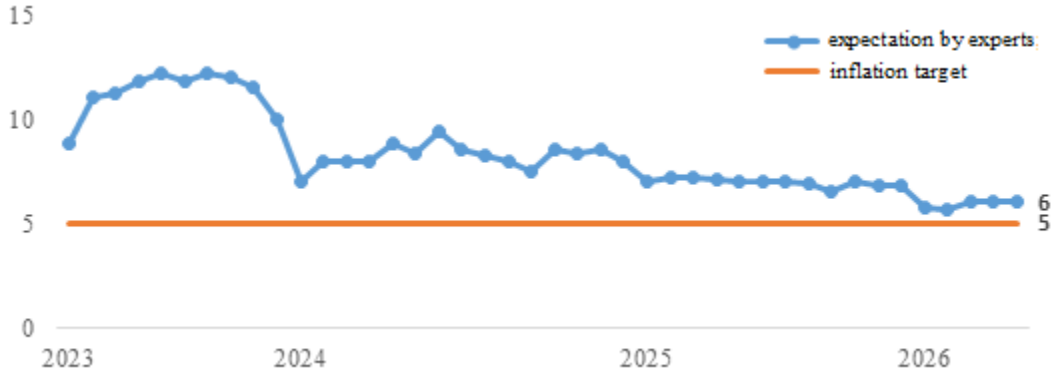
Some patterns noted in international studies are applicable to the historical dynamics of inflation expectations and perceived inflation in Kazakhstan. Thus, the expectations of the population are systematically overstated in most time periods – actual inflation after a year is much lower in reality. Perceived inflation also remains overstated even during periods when inflation is within the target range.

At the same time, as noted in international studies, the expectations of the expert community in Kazakhstan are closer to actual inflation and in the medium term are more anchored and descend to the National Bank's target of 5% (Figure 2).

To manage inflation expectations of the population, it is necessary to determine what the expected inflation indicator is and what us ley to the expectations about price growth and the perception of inflation by the population (factors). Perceived inflation is also important, since it is supposedly the basis on which people predict future inflation [15].

Figure 2

Inflation expectations of experts, %



Source: results of the NBK macroeconomic survey.

As already noted, the indicators of perceived and expected inflation (median estimates) are calculated on the basis of opinion surveys[3]. In this case, the results of the answers to two questions are used for the calculation. First, respondents are asked the following ("qualitative") question: "How, in your opinion, will prices for food, non-food products and services change in general in the next 12 months?" with answer options:

- Will be growing faster than now
- Will be growing in the same way as now
- Will be growing slower than now
- Will remain as is now \ unchanged
- Will be declining
- Don't know

Then, those respondents who assumed that prices would rise are asked a clarifying ("quantitative") question: "How much, in your opinion, prices for goods and services have grown over the past 12 months?" with answer options:

- by 1-5%
- by 6-10%
- by 11-15%
- by 16-20%
- by more than 20%
- Don't know

From the "qualitative" question, the proportion of the answers "will remain as is now/unchanged" and "will decline" is used for subsequent calculations, since these answers are

[3] The calculation methodology: https://www.nationalbank.kz/ru/page/inflyacionnye-ozhidaniya

not presented in the second question. Based on the aggregated data from these two questions, the expected inflation is calculated using the interval median formula:

$$Me = x_0 + i * \frac{\sum f_i - S_{Me-1}}{f_{Me}},$$

where x_0 – is the lower bound of the median interval (the median is the first interval whose cumulative frequency exceeds half of the total sum of frequencies);

i – median interval value;

S_{Me-1} – cumulative frequency of the interval preceding the median;

f_{Me} – median interval frequency.

For perceived inflation, the calculation process is similar. The only difference is in the wording of the questions that respondents answer: instead of the phrase "in the next 12 months," "in the past 12 months" is used. The answer options are also adjusted for the elapsed time.

As can be seen from the calculation methodology, the expected inflation indicator is a kind of cumulative assessment of the results of "qualitative" and "quantitative"[4] questions. In other words, its value cannot absolutely accurately reflect the level of price growth that people expect on average. Therefore, the dynamics of the indicator have a greater economic meaning here, since its actual value is quite difficult to interpret. At the same time, the above-described approach more accurately reflects inflation expectations than the probabilistic method[5], which uses a "link" to actual inflation (the J. Berk method [16], which is a modification of the approach proposed by J. Carson and M. Parkin [17]), which inevitably distorts the overall assessment.

For the purposes of comparative analysis, it is advisable to draw parallels between expected price growth and actual inflation data in order to denote the levels characteristic of a particular value of official inflation. For example, during the periods of actual price growth in Kazakhstan (2018–2019), expected inflation fluctuates at levels close to 10%. At the same time, in recent years, the population's expectations have become detached from this level in response to a significant increase in actual inflation in 2022–2023. Moreover, this process began already in 2021, when actual price growth was still below 10% (see Figure 1).

4. Searching for and Assessing Potential Factors that Affect the Expectations about Price Growth

Inflation expectations can be influenced by many factors. Moreover, as we understand, these factors are not always permanent, for example, individual news (mostly negative), shocks in various commodity markets, the past pandemic, etc. Due to their temporary nature, spontaneity and, importantly, difficulty in quantification, these factors will not be considered in this study. However, they must be mentioned, since their influence on inflation expectations can be great. This paper will attempt to identify those factors that influence expected inflation permanently. First, it is obvious that the inflation expectations of the population are based on their feelings and information about the rise in prices in the country. In this regard, this study will use a number of different inflation metrics and identify the dependence of expected inflation on them. Second, since current inflation cannot fully determine the opinion of the population (a significant portion of people simply do not monitor this indicator due to its uselessness), it is necessary to look for other variables that can potentially influence people's assessments of inflation processes (exchange rate indicators, income, financial situation, economic prospects, etc.).

At the same time, there is no need to use a large number of possible macroeconomic indicators due to the fact that people, as a rule, are far from economic issues and are unlikely to analyze the economic situation in detail when forming their expectations. In addition, as the results

[4] More quantitative, since the final position of the interval median is identified on its basis.

[5] Previously used and published by the National Bank as an assessment of inflation expectations.

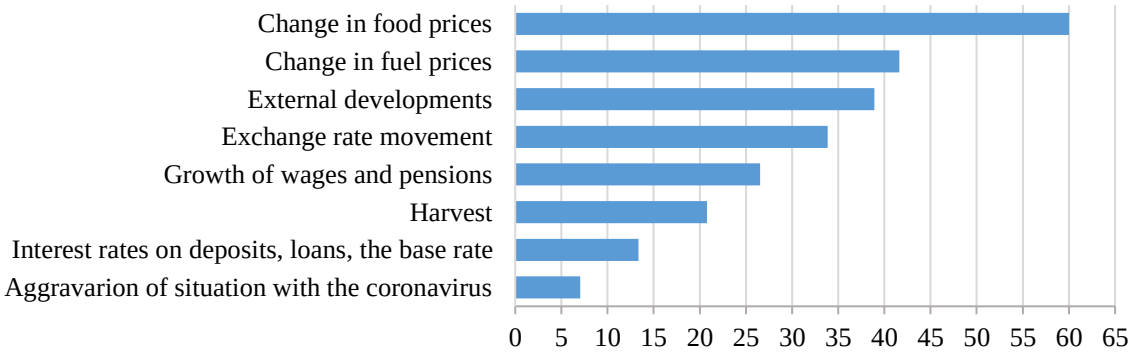
of international studies show[6], most people have their own, often erroneous, understanding of the relationships between economic indicators. On the other hand, certain indicators can influence the population's opinion on inflation, regardless of whether people notice them or not ("hidden factors"). These can be personal experience and preferences, the opinions of acquaintances, the frequency of purchases of goods, certain events and other factors. For example, if some of the respondents selected in a particular month rarely visit a store and pay less attention to the rise in the cost of everyday goods and services, this can underestimate the overall expected inflation.

It is interesting that the National Bank survey, which has been published since 2016, contains a direct question about the factors that determine the expectations of the population. It sounds like this: "On the basis of what information do you estimate the change in prices in the future?" The overwhelming majority of respondents (from 71% to 84%) note that they base their expectations on personal experience and purchases in stores. A significant part also forms their expectations on information from relatives, friends and acquaintances (from 18% to 40%). The third most important Source of information is the Internet and information from the media (from 22% to 30% in total). As you can see, only the first, most popular answer option gives a possible direction by which one can determine the quantitative factor that determines inflation expectations (food inflation, price dynamics of certain goods).

Of greater value in terms of searching for factors of expected inflation are the results of another question from the National Bank survey: "What factors have most influenced your opinion that prices will rise?" The most popular answers[7] to this question are presented in the graph in the Figure 3.

Figure 3

Factors that have influenced the opinion about the price growth, the share of responses in %



Source: the National Bank survey on inflation expectations.

The gradation of respondents' answers indicates that the greatest influence on inflation expectations is exerted by food and fuel prices, external events, exchange rate movements, and income growth.

As mentioned in the first section, when searching for the factors that shape the population's inflation expectations, it is also necessary to take into account the economic context and specific features of the economy and social situation. Some factors may be more significant in some countries or regions than in others. For example, in a country with a high level of import dependence, changes in world commodity prices may have a stronger impact on inflation expectations. An analysis of the economic and social context will help determine what factors are most significant for shaping inflation expectations in a particular situation. Given a relatively high

[6] Jordi Brandts, "Dispelling misconceptions about economics", 2022; Yew-Kwang Ng, "Common mistakes in economics by the public, students, economists, and Nobel laureates", 2011

[7] On average for the entire period, since the time when this quarterly question was had been included in the questionnaire: since March 2022

import component in consumption, the population of Kazakhstan is characterized by increased attention to the exchange rate of the tenge (as demonstrated by the survey results). The country has also experienced several periods of high inflation, therefore, inflation expectations will be elevated even during the periods of low inflation. Another feature of the economic environment in Kazakhstan is frequent shocks in individual commodity markets due to the fact that the country is a small open economy and is quite susceptible to such price fluctuations. All this is reflected in expected inflation.

It should be understood that despite the fact that the results of the National Bank survey already provide an area of focus for identifying factors influencing inflation expectations, it is necessary to verify this data using econometric methods. It may turn out that some of the reasons are missed, or the factors indicated by respondents are not reflected in the actual dynamics of expected inflation. In this regard, a wider range of indicators will be used to increase the likelihood of identifying factors influencing the inflation expectations of the population. In addition, two metrics of inflation expectations will be used: the median estimate, described in detail earlier, and the index of inflation expectations based on the "qualitative" question only[8]. This is necessary to check which indicator best characterizes the population's expectations about price growth in terms of the factors underlying them.

The list of indicators used to analyze the expected inflation from January2016[9] to December 2023 is presented in Table 1[10]:

Table 1

Indicators looked at as the expected inflation factors

Indicators	Assumption for use
Annual and monthly inflation	The population can base its expectations on current inflation
Annual and monthly food inflation	The indicator may be a more representative factor of expected inflation than the overall annual price growth rate, since the population most often faces rising food prices.
Annual and monthly non-food and service inflation	It is important to check potential effect of individual inflation components
Perceived inflation (median estimate)	The indicator may have a stronger link to expected inflation than actual price growth
Nominal exchange rate of the tenge against the US dollar (monthly average according to the National Bank's data)	The population in Kazakhstan is quite actively monitoring the exchange rate and, possibly, factors it into their estimates of price increases
Interest rates on retail loans and deposits	Interest rates influence consumer behavior and can shape the population's expectations of price increases
Dynamics of real income of the population and a perceived income level (assessment of income level by using the interval median method[11] based on the results of population survey)	People with lower income may have higher expectations of price increases because they spend a higher share of their income on consumer goods

[8] The index was obtained using the balance method: the proportion of respondents expecting inflation to accelerate minus the proportion of those expecting inflation to decrease, prices to remain unchanged, and prices to decline.

[9] The date when the population survey on inflation expectations was started

[10] The data taken from the population survey results are normalized. The "I don't know" response option is evenly distributed among the other answer options. Data for January 2022, when a sufficient sample was not collected, is taken as the average value of two adjacent months. Since some questions are asked quarterly, the answers to them were converted to monthly expression by averaging the values of adjacent quarters.

[11] The formula is shown in Section 1.

Perceived and expected financial position based on the results of population survey[12]	Assessments of the current and future financial position may correlate with their assessments of price growth since a high inflation has negative impact on the people's welfare
Availability of savings (the share of respondents who pointed to the availability of savings)	A change in savings may indicate that the population is spending more/less on consumer spending and has/does not have the ability to save
Expectations regarding the economy's development prospects (expectations taken from the results of the National Bank survey[13])	Estimates of current and future inflation may be linked to expectations of economic prospects, as crises are usually accompanied by high inflation
Availability of a loan and expectations about obtaining a loan (the share of respondents who plan to obtain a loan in the next 12 months)	According to economic theory, if people expect prices to rise faster, they may increase current consumption, including through increased borrowing
Dynamics of search query in Google for "inflation" term	Increase in search queries may indicate people's concerns about rising prices and influence expectations
Dynamics of search query in Google for "US dollar" term[14]	An additional metric that can show the relationship between inflation expectations and the exchange rate
Dynamics of search query in Google for "world news" term[15]	According to survey results, some respondents associate the growth of their inflation expectations with external events
Dynamics of search query in Google for "news of Kazakhstan" term	Domestic events (especially economic and financial) can potentially influence the population's expectations of price increases
Fuel prices (a weighted average price of AI-92, AI-95 gasoline and diesel fuel based on their weights in the CPI)	A significant portion of respondents cite fuel prices as the reasons for the growth of their expectations. In this regard, this product is looked at separately, in contrast to other product categories and product groups, which are analyzed in more detail in Section 4

Source: compiled by the authors.

As one can see, a significant part of the indicators are quantified from the same population survey[16], based on its results the expected inflation is calculated. This increases the chances of identifying indicators (savings, income, economic prospects, etc.) that people are likely to use when forming their assessments of current and future inflation (first-hand indicators). For the same purpose, data from "Google trends" (search queries on inflation, exchange rates, external and internal events) were used to analyze the possible dependence.

Before conducting the analysis, a basic assumption can be made that the main factors on which inflation expectations depend will be perceived inflation, food inflation and the exchange rate. The remaining factors will have a smaller impact on the dynamics of dependent variables.

Estimates of the dependence of expected inflation on the selected variables were made using a multivariate regression model, since it allows estimating the combined influence of factors, as well as the Probit model and the Granger causality test (as additional estimates).

To obtain correct equations, the following transformations of variables and analysis of available data were carried out:

[12] The proportion of those who expect their financial situation to improve minus the proportion of respondents who expect their financial situation to worsen. The neutral point is at 100. The calculations for expected financial situation are similar.

[13] The proportion of those who expect economic conditions in the country to be "good" minus the proportion of respondents who expect conditions to be "bad." The neutral point is at 100.

[14] From the list of similar queries about inflation and the exchange rate of the US dollar to tenge, the most popular one was taken.

[15] The most popular one was taken from the dynamics of similar queries (world news, external events, world situation, etc.).

[16] The survey contains more than 30 questions.

1) to achieve stationarity of time series and to bring most of the variables into standardized (comparable) form, a larger portion of variables[17] was normalized through differentiation;

2) all variables that show seasonality are adjusted (including the median estimate of expected inflation);

3) dependent variables in the equations are tested for multicollinearity[18];

4) of the variables that are estimates of the same indicator, those that had greater explanatory power[19] and statistical significance remained in the final equation;

5) when determining lags, it is important to take into account that the population will likely base its expectations on current, up-to-date information, so lags of no more than 3 months were tested for variables;

6) for the Probit model, the expected inflation data was converted into binary form according to the following principle: the indicator above the median is 1, below the median is 0. The purpose of using this model is to try and identify more factors that influence expected inflation. However, interpreting the degree of relationship with the factors will be difficult, since normalization is lost when converting the values of the dependent variable into the binary form.

Final equations of multi-factor regression are presented in Table 2.

Table 2

Results of inflation expectations estimate (a linear regression model)

Expected inflation – median estimate (94 observations)	β coeff.	t-stat.	**The index of inflation expectations based on a qualitative question (94 observations)**	β coeff.	t-stat.
Exchange rate	1.78	5.36	Exchange rate	2.18	8.9
Annual food inflation	0.23	2.52	Annual food inflation	0.14	2.13
Price of fuel (-1)	1.33	2.60	Availability of savings	0.15	2.39
Deposit rates	0.67	2.54	Perceived income level	-0.3	-2.19
The number of search queries for world news (-1)	0.18	3.42	The number of search queries for world news (-1)	0.10	2.54
The number of search queries for news of Kazakhstan (-1)	-0.16	-4.39	The number of search queries for news of Kazakhstan (-1)	-0.19	-7.68
C	-3.04	-4.45	C	-1.05	-4.53
R^2	**57%**		**R^2**	**69%**	

Source: authors' computations.

The following conclusions can be made from the resulting equations for two expected inflation estimates.

1. The most important factor (both in terms of statistical significance and based on the value of the β coefficient) for expected inflation is the current dynamics of the exchange rate. This is expected given how closely the population follows the movements in the exchange rate of the tenge against the US dollar.

2. Based on the value of the β coefficient, there is a high sensitivity of the median estimate of expected inflation to the price of fuel.

3. The news background has a certain influence on the formation of inflation expectations (as was noted by respondents in the direct question (see Figure 3)). Moreover, the external news background (the growth of Google queries), judging by the positive regression coefficient, has an

[17] All variables were tested for stationarity. Monthly inflation data was not transformed by the method of differentiation since it is already an estimate of price changes, but it excludes the seasonal factor.

[18] The test was conducted using the Centered VIF method. The VIF value for all variables in the final equations was below 5, indicating the absence of multicollinearity between the explanatory variables.

[19] That is, they had a greater influence on the value of R^2 when excluded from the equation.

upward effect on expectations of price growth, while the growing attention of the population to events within the country, on the contrary, reduces expectations. Presumably, this can be explained by the fact that the events in Kazakhstan from 2016 to 2023 were generally neutral (or positive), or the negative events were not so long-lasting as to have time to gain a foothold in the expectations of the population. Another explanation may be that negative changes in the country were often consequences of the external background (corona crisis, geopolitical events). At the same time, the situation in the world was characterized by a number of major negative and long-term events, especially in recent years.

4. The median estimate, which is largely based on the results of the quantitative question, depends on specific price factors (the cost of fuel, deposit rates and food inflation[20]). The factors for the expectations index based on the qualitative question were assessments of financial situation (income and availability of savings).

5. Based on the obtained coefficients of determination (R^2=69%) for the expectations index based on the qualitative question, it can be assumed that the authors were able to identify the main factors that have a constant influence on this indicator.

6. Based on the results of the median estimate of expected inflation, it is still impossible to admit that the constructed regression model (R2=57%) covers all the main factors. It can be assumed that the influence of "hidden" variables on the population's opinion is significant. It is also possible that it is quite difficult for people to give quantitative estimates of price growth, which can distort the results and increase the overall volatility of the median estimate[21].

7. The construction of the Probit model did not yield tangible results in identifying a larger number of factors. The dynamics of the dependent variable, on the contrary, was less sensitive to changes in the regressors of the equation[22]. Thus, the results of the Probit model appeared to be much less relevant.

8. The underlying assumption turned out to be generally correct, except for the presence of a link with perceived inflation.

Next, in order to further test the possible influence of the selected factors on inflation expectations, the Granger causality test was used (see the formula below). It is actually a special case of vector autoregression (VAR) and is aimed at identifying a causal relationship between two variables. It is worth noting that the test is a necessary but not sufficient condition for the presence of a causal relationship. It only checks that a change in one variable in the past preceded a change in the other, and this does not always indicate that there is a causal relationship between the variables. Also, the Granger causality test, unlike multivariate regression, does not take into account the combined influence of factors on the dependent variable, but provides only individual estimates.

The Granger causality:

$$Y_t = a_0 + a_1 Y_{t-1} + \cdots + a_p Y_{t-p} + b_1 X_{t-1} + \cdots + b_p X_{t-p} + \varepsilon_t$$
$$X_t = c_0 + c_1 X_{t-1} + \cdots + c_p X_{t-p} + d_1 Y_{t-1} + \cdots + d_p Y_{t-p} + u_t,$$

where *Y* and *X* – are the variables between which a causal relationship is alternately identified.

For each regression, the null hypothesis (H_0) lies in that the coefficients in the regression lags (*a*, *b*, *c*, *d*) are equal to 0.

[20] The higher the statistical significance and the higher the β coefficient.
[21] This is also confirmed by the presence of seasonality of the indicator.
[22] Low statistical significance (less coverage of factors), low coefficient of determination.

Table 3

Results of the Granger causality test with different lags (from 1 to 3)[23] with individual factors

Expected inflation – median estimate	Index of inflation expectations based on a qualitative question
Exchange rate	Deposit rates
The number of search queries for exchange rate	The number of search queries for world news
The number of search queries for world news	The number of search queries for news of Kazakhstan
The number of search queries for news of Kazakhstan	Perceived inflation (median estimate)
	Prices of fuel

Source: authors' computations.

The Granger causality test showed results similar to those of the regression analysis (Table 3). A possible causal relationship between the median estimate of expected inflation was identified with the exchange rate and the news background in the domestic and foreign sectors. At the same time, some of the factors that were identified as significant for one indicator – expected inflation – according to the Granger causality test are significant for another indicator – the inflation expectations index based on a qualitative question, for example, deposit rates and fuel prices[24].

The test also revealed a possible causal relationship between the inflation expectations index and perceived inflation, which is quite logical given that people have their own individual views regarding price increases, on the basis of which they can form an opinion about future inflation.

5. Identifying Tracer Products that Exert Effect om Expected Inflation

The opinions of the survey respondents and the results of the regression analysis indicate that the dynamics of food inflation is a significant factor in inflation expectations. At the same time, the question remains whether there is a specific list of certain goods and services, whose price dynamics more than others influence people's opinions about price increases in the future, the so-called tracer products.

Two approaches will be used to identify the tracer products that underlie the formation of inflation expectations of the population. The first, which can also be called "overall", involves collecting goods and services in a basket in order to further identify the connection with the metrics of expected inflation. Its advantage is that it takes into account the combined effect of goods and services on expected inflation, taking into account their weights in the basket. The second approach, "individualized", involves assessing the impact of tracer products on expected inflation separately (assessment of correlations, single-factor regressions, etc.).

5.1. Overall Approach. When using the overall approach, two tasks arise: selecting the necessary goods and determining their weights in the general basket. It is impractical to use the entire range of goods and services for analysis due to the high probability of error (casual relationship)[25], as well as a significant increase in the complexity of selecting items and weighing them. In this regard, to solve the tasks set in this study, the authors again use data from the National Bank survey on inflation expectations. The questionnaire includes the question: "In your opinion, prices for what types of goods and services have been growing faster over the past month?" In

[23] The Granger causality test was performed for all factors from Table 1. Changing the lags did not significantly affect the list of identified factors (with a low p-value). Among all the indicators considered, the factors listed in Table 3 remained significant (at a certain lag, p-value<0.05). In this regard, the Table with all factors depending on each lag is not presented.

[24] All conclusions from the paragraph are based on the results of the Granger test, which showed the significance of the listed factors (p-value < 5% at a certain lag), that is, it revealed the presence of a causal relationship.

[25] As noted earlier, the more factors, the higher the probability of detecting a random relationship.

their answers, respondents name a list of goods and services whose prices have changed noticeably over the past month. Based on this data, it is possible to identify goods and services that can presumably influence the population's inflation expectations.

The weights of the products will be calculated based on average frequencies of their mention in the respondents' answers (see Table 3). Since the sum of shares of the answers about the products does not equal 100% (respondents can select several groups of products and services as an answer), all frequencies will be normalized depending on their share according to the formula for calculating the weight of the product in the basket:

$$W_k = \frac{P_k}{\sum_{i=1}^{n} P_i},$$

where Wk – is the weight of a product or a service,
Pk – the share of a product or a service in respondents' feedback,
$\sum_{i=1}^{n} P_i$ – the sum of shares of products and services in the basket.

Further, the issue of product selection for the basket arises[26]. Since we have data only in the context of the most popular groups of goods and services, which, according to respondents, have risen in price the most, it is advisable to select goods and services in the basket by the size of the share of responses, conditionally dividing them into 3 groups: above 20%, 10% and 5%. These three baskets will sufficiently reflect the survey results and can be used for analysis. The first basket (response shares above 20%) will include meat and poultry, fruits and vegetables, milk and dairy products, and bread and bakery. The second basket (response shares above 10%), in addition to goods from the first basket, will include sugar, salt, utilities, cereals and pasta, vegetable oil, eggs, household chemicals. The third, most extensive basket (response shares above 5%), in addition to goods from the second basket, will include electronics and household appliances, cheeses and sausages, tobacco, confectionery, medicines, clothing and footwear, flour, tea and coffee, fuel and lubricants.

The test of the influence of the price index dynamics of the resulting baskets on inflation expectations using correlation analysis and inclusion in regression models showed no signs of any dependence. The correlation indicators were quite low (less than 0.2), and the baskets selected as regressors were statistically insignificant. At the same time, the Granger causality test estimates showed a possible causal relationship between the price dynamics in the most extensive basket (weight above 5%) and the median estimate of expected inflation.

Table 4

Average (in 2018–2023) shares of respondents' feedback about products and services whose prices have grown up faster over the past month, in respondents' opinion

Product / service	Share, as %	Product / service	Share, as %
Fruits and vegetables	28.16	Products for children	4.09
Meat and poultry	27.32	Fish and seafood	3.98
Bread and bakery	24.58	Passenger transportation services	3.58
Milk and dairy products	22.76	Household services (hairdressing, dry cleaning, tailoring, etc.)	3.57
Cereals, macaroni products	18.60	Healthcare services	3.55
Sugar, salt	17.90	Catering services	2.45
Vegetable oil	17.24	Perfumery and cosmetic products	1.87
Utilities	10.56	Services of cultural and entertainment establishments (cinema, sports, museums, theaters, etc.)	1.83
Household chemicals, detergents and cleaning products	10.06	Furniture	1.71

[26] That is, the question is whether it is worth selecting only some of the products and services from the feedback results in the basket or using all of them?

Eggs	10.04	Education services	1.69
Cheese, sausage	9.36	Stationery	1.47
Clothes, footwear	8.08	Travel services	1.39
Fuel and lubricants	6.94	Alcohol beverages	0.94
Electronics and household appliances	6.28	Real estate	0.75
Confectionery	6.22	Ptinted matter (newspapers, magazines, etc.)	0.67
Tobcco, cigarettes	6.17	Rental services	0.56
Pharmaceuticals, medicines	5.96	Products in general	0.48
Flour	5.76	Canned food	0.37
Tea, coffee	5.27	Coal	0.36
Cars and spare parts	4.70	Baby food	0.35
Construction materials	4.99	Fines/taxes	0.10
Soft drinks	4.44	Bank services	0.06
Internet, mobile communication services	4.40		

Source: National Bank survey on inflation expectations, authors' computations.

The insufficiently clear results of identifying the relationship within the framework of the overall approach can be explained by two possible reasons. First, the list of tracer products varies greatly among people (no single product or service exceeds 30% in the answers), which makes it difficult to correctly select them into a common basket. Second, the influence of non-price factors on inflation expectations is great (exchange rate, external events, interest rates, etc.).

5.2. Individualized approach. The second approach, which can be described as individualized, enables to partially avoid the shortcomings of the previous method. It involves assessing the impact of tracer products on expected inflation separately. This analysis will include all goods and services with response rates above 2% (30 people out of 1,500), since those goods and services whose price changes are unnoticeable or weakly noticeable to the population are unlikely to be tracers that affect inflation expectations[27].

In addition to the methods already used for assessment, an assessment of the coherence between inflation expectations and groups of goods and services will be used.

Table 5

Correlation between expected inflation estimates and products/services

Product/service	Median estimate of expected inflation	Index of inflation expectations based on a qualitative question
Fuel	-0.01	0.08
Meat and poultry	0.27	0.19
Fruits and vegetables	**0.37**	**0.44**
Milk and dairy products	0.28	0.24
Bread and bakery	0.16	0.03
Utilities	-0.11	-0.06
Cereals	0.26	0.10
Macaroni products	0.25	0.11
Vegetable oil	0.17	0.05
Eggs	0.13	0.21
Household chemicals	0.25	0.14
Sugar	**0.51**	**0.51**
Salt	**0.43**	**0.41**
Electronics and household appliances	**0.66**	**0.60**
Cheese	0.21	0.09
Sausage products	0.27	0.16
Tobacco	0.26	0.25
Confectionery	0.11	-0.04

[27] It also makes no sense to divide product groups into separate product items, since in this case the probability of identifying a casual relationship increases significantly.

Flour	0.06	0.02
Tea, coffee	0.01	-0.12
Internet, mobile communication services	-0.02	-0.05
Children products	-0.09	-0.15
Clothes	0.21	0.12
Footwear	0.02	-0.04
Fish	0.22	0.14
Construction materials	0.29	0.20
Medicines	0.08	-0.19
Healthcare services	**0.31**	**0.20**
Consumer services	0.01	-0.07
Catering services	**0.40**	**0.41**
Transportation services	0.08	0.16
Soft drinks	0.12	-0.04
Cars and spare parts	0.29	0.16

Source: authors' computations.

Table 6

Products with statistically significant coefficients* and explanatory power based on the results of linear regressions with one regressor**

Product/service	Median estimate of expected inflation	Index of expectations based on a qualitative question
Meat and poultry	*	
Fruits and vegetables	*	**
Milk and dairy products	*	*
Macaroni products	*	
Eggs		*
Household chemicals, detergents and cleaning products	*	
Sugar	**	**
Salt	**	**
Electronics and household appliances	**	**
Cheese	*	
Sausage products	*	*
Tobacco	*	
Fish	*	
Construction materials	*	
Healthcare services	*	
Catering services	**	**
Cars and spare parts	*	

* – the prices of products are statistically significant, but the coefficient of determination is quite low, R^2=5-10%;
** – the prices of products are statistically significant and the coefficient of determination is relatively high, R^2=15-30%
Source: authors' computations.

The results of the correlation analysis and regression construction (tables 5 and 6) largely coincide due to the partial coherence of the two methods of determining the relationship. A probable significant relationship was found between the metrics of expected inflation and sugar, salt, electronics and household appliances, cafe and restaurant services, fruits and vegetables[28]. The presence of a relationship with such categories as electronics and household appliances, cafe and restaurant services can be explained by the fact that people tend to notice changes in prices for rarer[29] and larger purchases. The price of fruits and vegetables often fluctuates significantly due to seasonality, which allows people to notice it. Sugar prices are also quite volatile. However, it is

[28] The most pronounced relationship (correlation above 50%, high R^2) based on both methods was found with sugar, electronics and household appliances.
[29] The longer the time between purchases, the greater the gap in prices.

quite difficult to find the reason for the relationship between the price of salt and inflation expectations. The cost of salt is low enough to be noticeable to the population, and also has low volatility.

Table 7

Results of the Granger causality test with different lags (from 1 to 3) with different products and services[30]

Median estimate of expected inflation	Index of expectations based on a qualitative question
Catering services	Pharmaceuticals, medicines
Sugar	Cars and spare parts
Cars and spare parts	
Milk and dairy products	
Macaroni products	
Construction materials	
Electronics and household appliances	

Source: authors' computations.

The results of the Granger causality test (see Table 7) in the median estimate of expected inflation partially coincided with the results of previous estimates. Such items as sugar, electronics and household appliances, cafe and restaurant services again demonstrated a possible high impact on expected inflation. At the same time, for the inflation expectations index based on the qualitative question, the test results were different. The common factor for both metrics of expected inflation was cars and spare parts.

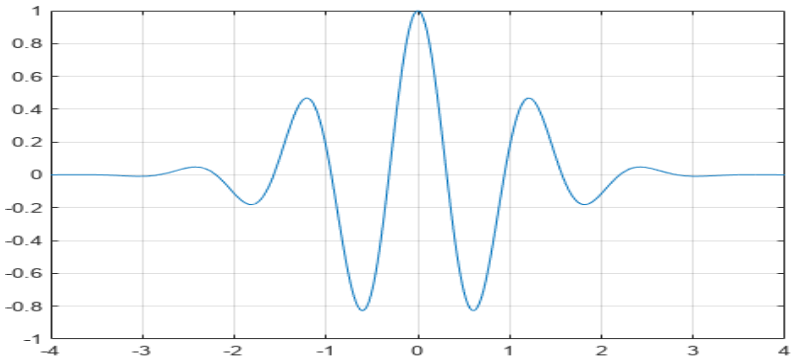
5.3. Assessing Coherence between Inflation Expectations and Groups of Products and Services. Previous methods enabled to identify the relationship between commodity items and inflation expectations over the entire time horizon. Coherence assessment, in turn, allows identifying the non-constant relationship between variables over individual time horizons.

The AST-toolbox for MATLAB designed by Aguiar-Conraria & Soares was used for the analysis[31].

Wavelets are mathematical functions that allow time series to be analyzed at different frequency levels and time horizons. The authors used the most popular type of wavelet in analysis – the Morlet wavelet (Figure 4), as it offers a balanced compromise between time and frequency analysis, and can also identify both long-term and short-term relationships.

Figure 4

Morlet Wavelet



Source: AST-toolbox for MATLAB.

[30] The test was conducted for the entire list of goods. Table 7 shows only those goods for which the test results showed causality with the inflation expectations indicator (at a certain lag p-value<0.05). Changing the lags had little effect on the test results (variables for which causality was not revealed, the p-value remained high at all lags). The overall test results are in Appendix 1.

[31] https://sites.google.com/site/aguiarconraria/wavelets-and-economics

The authors then proceeded to identify coherence between the target variables. Coherence measures the degree of synchronization between variables at different frequencies. Wavelet coherence is determined by the formula:

$$\frac{|Wxy(\tau,s)|^2}{\sqrt{|Wx(\tau,s)|^2}*\sqrt{|Wy(\tau,s)|^2}},$$

where s – is the scale which controls the wavelet width,

t – is parameter of the wavelet's location in time. Increasing *s* stretches the wavelet, and changing *t* shifts the wavelet in time.

$W_X(s,t)\ and\ W_Y(s,t)$ – continuous wavelet transform of variables *x* and *y* respectively.

The superscript "*" denotes complex conjugation, and *S* is the time-scale smoothing operator.

Wavelet coherence plots display the time and frequency correlation between inflation expectations and goods and services (Appendix 2).

The time axis (horizontal axis) shows the time span of the analysis.

The frequency axis (vertical axis) displays the frequencies of the cycles. Low frequencies (top) correspond to short-term cycles, high frequencies (bottom) to long-term cycles.

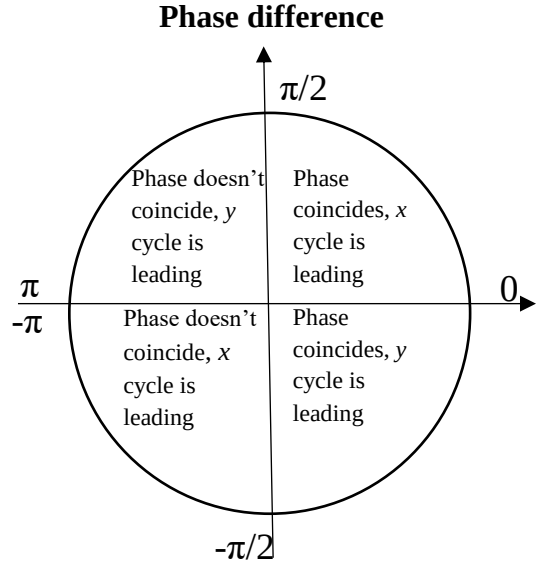
The color scale displays the degree of coherence between the two time series. Brighter colors (yellow and red) indicate high coherence, which means a strong correlation between the series at a given frequency and time.

The contours (black lines) indicate areas of high coherence significance, where it is statistically significant (significant at the 95% level).

The cone's influence region (the v-shaped region) marks the relationships that are not affected by the extreme point problem. Measures outside this region may be less reliable due to the bounds of time series.

The phase cycle difference plots indicate trends for *x* – inflation expectations and *y* – goods and services (Figure 5):

Figure 5



Source: AST-toolbox for MATLAB.

Based on the analysis of wavelet coherence between the median estimate of inflation expectations and the list of goods and services, individual patterns were identified (Appendix 3). At the same time, the links between the inflation expectations index based on the qualitative

question and the same list of goods and services turned out to be insignificant and implicit. Therefore, there is no need to designate them within the framework of the study.

As expected, a large number of goods have episodic short-term coherence – mainly at the moments when they were inflation triggers. At the same time, the phases in the short term are mostly unstable or have a slight advantage in favor of a certain degree of relationship. Goods with systematically high medium-term coherence are milk, household chemicals, cheese, clothing, products for children, construction materials, household services, cafe and restaurant services, cars and spare parts. At the same time, some of them are ahead of inflation expectations, which may indicate that they are goods that create an inflationary background for consumers. Meantime, goods such as milk, household chemicals, clothing, products for children, household services, cafe and restaurant services adjust to inflation expectations. This may mean that high inflation expectations can systematically drive up prices for these goods.

Thus, based on the analysis, short-term and medium-term relationships were identified between inflation expectations and groups of goods and services. However, the relationships between them vary. Thus, the rise in prices for some goods increases inflation expectations, while the prices of other goods change under the influence of inflation expectations. A special mention should be made that the baskets constructed on the basis of the shares of responses did not show signs of significant coherence with the median estimate of inflation expectations.

6. Findings

In the course of the work, the authors analyzed a number of studies concerning the reasons influencing inflation expectations, identified factors for two metrics of expected inflation in Kazakhstan, and also, using several approaches, searched for tracer products that significantly influence the population's opinion about future price increases.

A literature review showed that the significant influence of inflation expectations on many economic indicators and the dynamics of inflation processes is undeniable. At the same time, it is still not fully known and remains the subject of study, which factors influence these expectations. Inflation expectations are formed both under the influence of objective reasons such as the actual dynamics of inflation, the exchange rate of the national currency, economic crises, and under the influence of subjective reasons – the frequency of purchases, the level of financial literacy, personal consumer basket. A multitude of such factors enables to make only assumptions about their impact on the formation of inflation expectations individually.

The search for common factors of expected inflation in Kazakhstan showed the following.

1. The most important factor is the current dynamics of the exchange rate. Also, the world news and local news background, the dynamics of annual food inflation have a significant impact on inflation expectations. This was largely confirmed by the results of an additional method – the Granger causality test.

2. A number of regressors in the model for the two estimates of expected inflation differ. The median estimate (of the quantitative question) suggests that respondents are likely to take into account specific price factors (fuel costs, deposit rates, and the more pronounced impact of food inflation). The factors for the expectations index based on the qualitative question were assessments of financial status (income and availability of savings);

3. As regards the expectations index, based on the qualitative question, an assumption could be made that the authors were able to identify the main factors that have a constant impact on this indicator. For the median estimate of expected inflation, the combined effect of regressors was slightly less pronounced, which is probably due to the influence of "hidden" variables and the difficulty of obtaining quantitative estimates from the population, which can distort the results and increase the overall volatility of the median estimate.

The use of various approaches to identifying tracer products that influence the dynamics of inflation expectations showed that the median estimate of expected inflation is more sensitive to changes in prices for individual goods and services. The overall approach with the inclusion of goods in the general basket did not show any noticeable results in identifying tracer products. The

individualized approach turned out to be more effective, based on which a number of goods and services were identified that can influence the expectations of the population. Based on the results of several methods, it can be concluded that the most likely tracer products include electronics and household appliances, cafe and restaurant services, sugar, cars and spare parts, milk and dairy products, and construction materials. The rest of the list of goods and services shows a less pronounced or strong, but varying relationship with expected inflation, depending on the method used.

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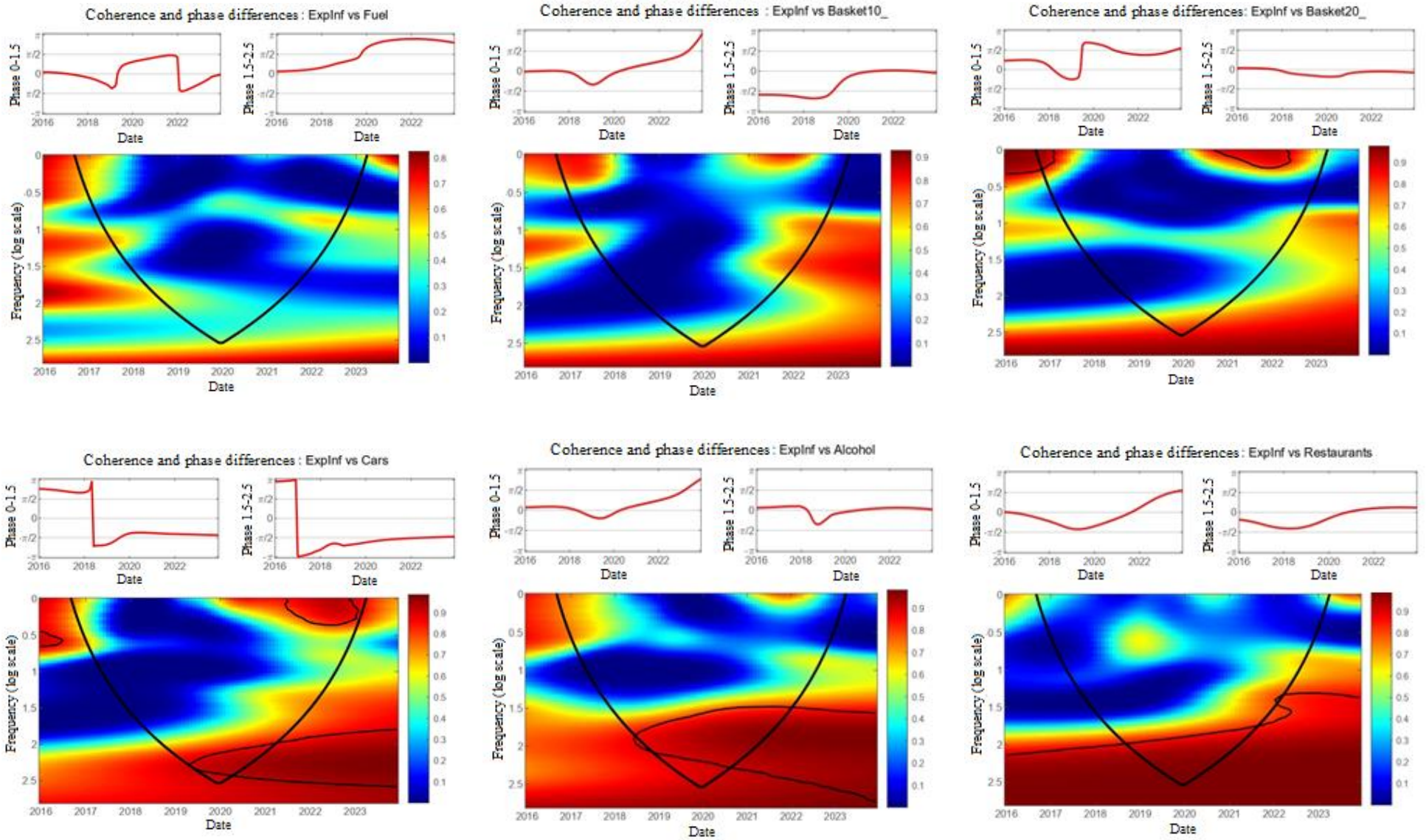
Annex 1

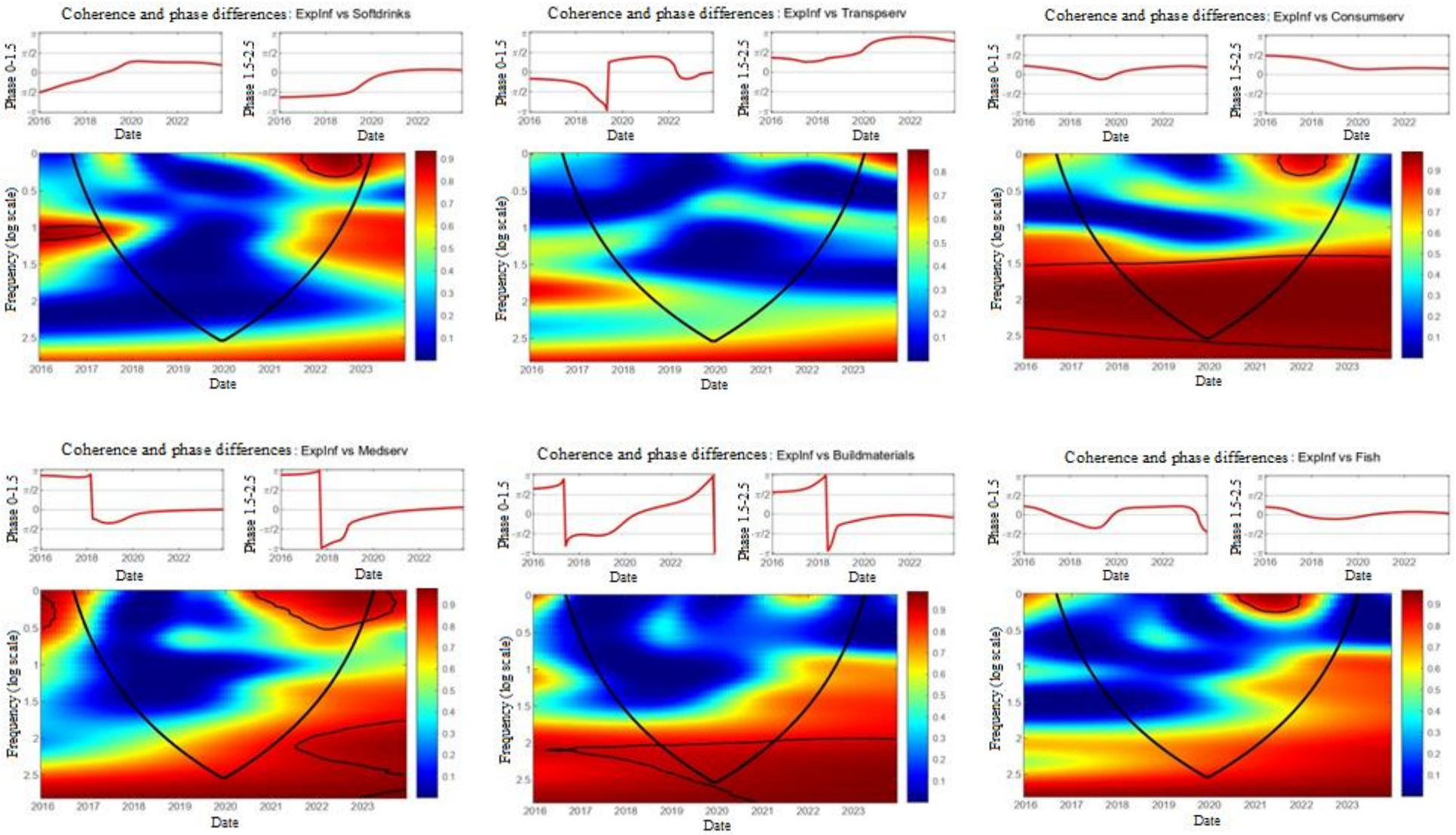
The Granger test for all reviewed product groups and services

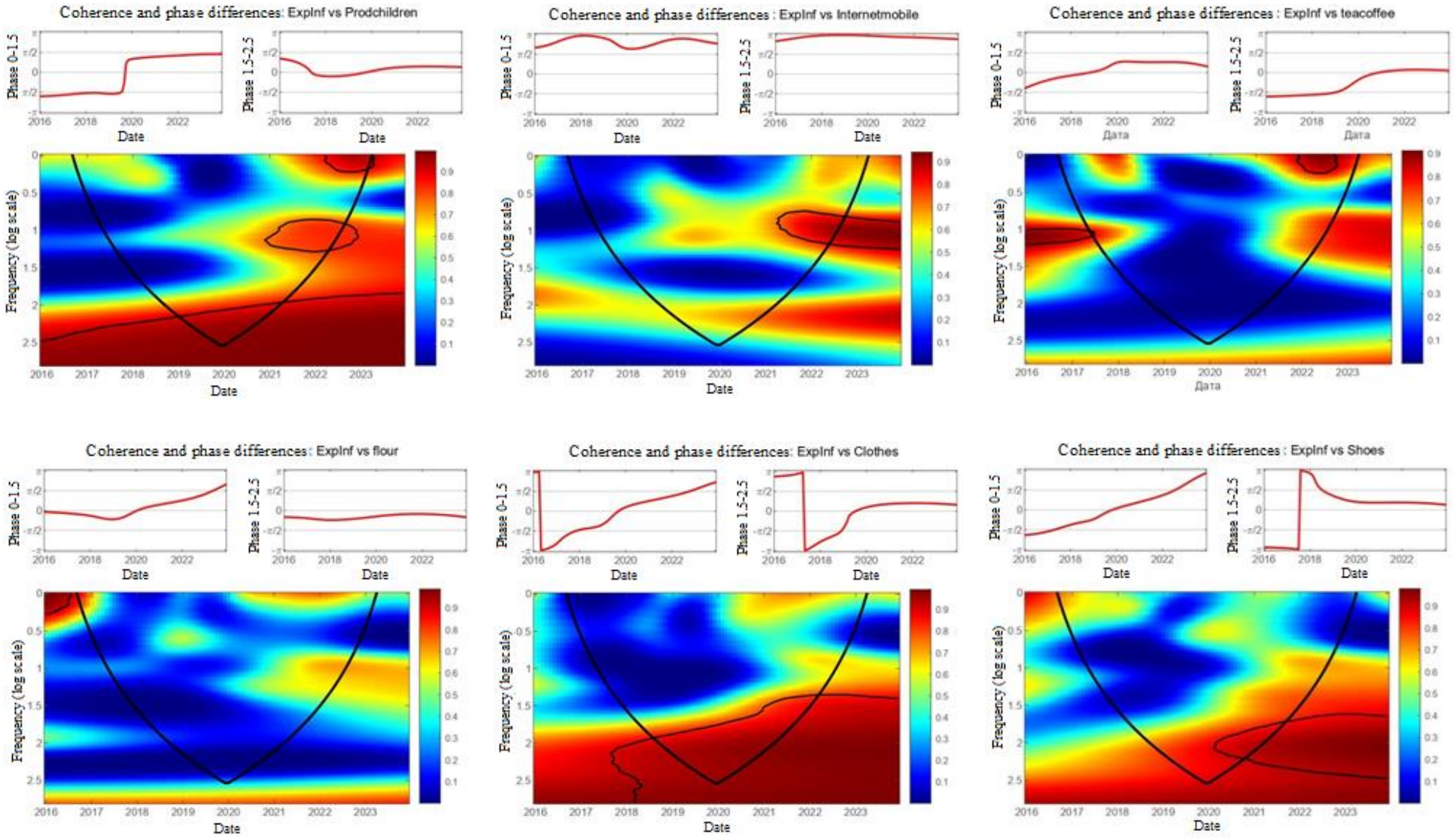
Product/service	Median estimate of expected inflation			Index of expectations based on a qualitative question		
Selected lag, p-value	**1, p-value**	**2, p-value**	**3, p-value**	**1, p-value**	**2, p-value**	**3, p-value**
Meat and poultry	0.74	0.35	0.58	0.46	0.75	0.73
Fruits and vegetables	0.33	0.51	0.37	0.37	0.73	0.81
Milk and dairy products	**0.08**	**0.05**	**0.02**	0.86	0.75	0.59
Bread and bakery	0.74	0.33	0.41	0.54	0.95	0.85
Utilities	0.44	0.82	0.85	0.26	0.74	0.78
Cereals	0.30	0.38	0.37	0.90	0.97	0.21
Macaroni products	**0.06**	**0.04**	**0.12**	0.26	0.74	0.74
Vegetable oil	0.38	0.30	0.13	0.22	0.65	0.73
Eggs	0.85	0.70	0.95	0.40	0.50	0.67
Household chemicals	0.55	0.39	0.28	0.41	0.75	0.55
Sugar	**0.02**	**0.04**	**0.02**	0.50	0.31	0.29
Salt	0.17	0.11	0.10	0.96	0.25	0.20
Electronics and household appliances	**0.09**	**0.15**	**0.05**	0.46	0.60	0.20
Cheese	0.81	0.31	0.18	0.26	0.89	0.97
Sausage products	0.87	0.54	0.63	0.22	0.51	0.77
Tobacco	0.82	0.34	0.53	0.50	0.39	0.42
Confectionery	0.58	0.97	0.61	0.24	0.28	0.62
Flour	0.79	0.47	0.48	0.97	0.94	0.89
Tea, coffee	0.55	0.81	0.81	0.48	0.78	0.67
Internet, mobile communication services	0.74	0.91	0.64	0.54	0.67	0.48
Children products	0.41	0.36	0.66	0.42	0.87	0.95
Clothes	0.54	0.79	0.91	0.48	0.55	0.83
Footwear	0.69	0.94	0.67	0.61	0.44	0.14
Fish	0.31	0.12	0.12	0.22	0.35	0.39
Construction materials	**0.14**	**0.12**	**0.02**	0.76	0.95	0.49
Medicines	0.53	0.14	0.54	**0.01**	**0.01**	**0.20**
Healthcare services	0.41	0.22	0.12	0.78	0.83	0.82
Consumer services	0.43	0.25	0.31	0.92	0.92	0.99
Catering services	**0.02**	**0.03**	**0.05**	0.32	0.17	0.13
Transportation services	0.23	0.37	0.65	0.63	0.70	0.90
Soft drinks	0.81	0.30	0.22	0.46	0.89	0.96
Cars and spare parts	**0.16**	**0.03**	**0.01**	**0.12**	**0.04**	**0.03**

Annex 2

Wavelet coherence charts




Coherence and phase differences: ExpInf vs Softdrinks
Coherence and phase differences: ExpInf vs Transpserv
Coherence and phase differences: ExpInf vs Consumserv
Coherence and phase differences: ExpInf vs Medserv
Coherence and phase differences: ExpInf vs Buildmaterials
Coherence and phase differences: ExpInf vs Fish
Phase 0-1.5
Phase 1.5-2.5
Frequency (log scale)
Date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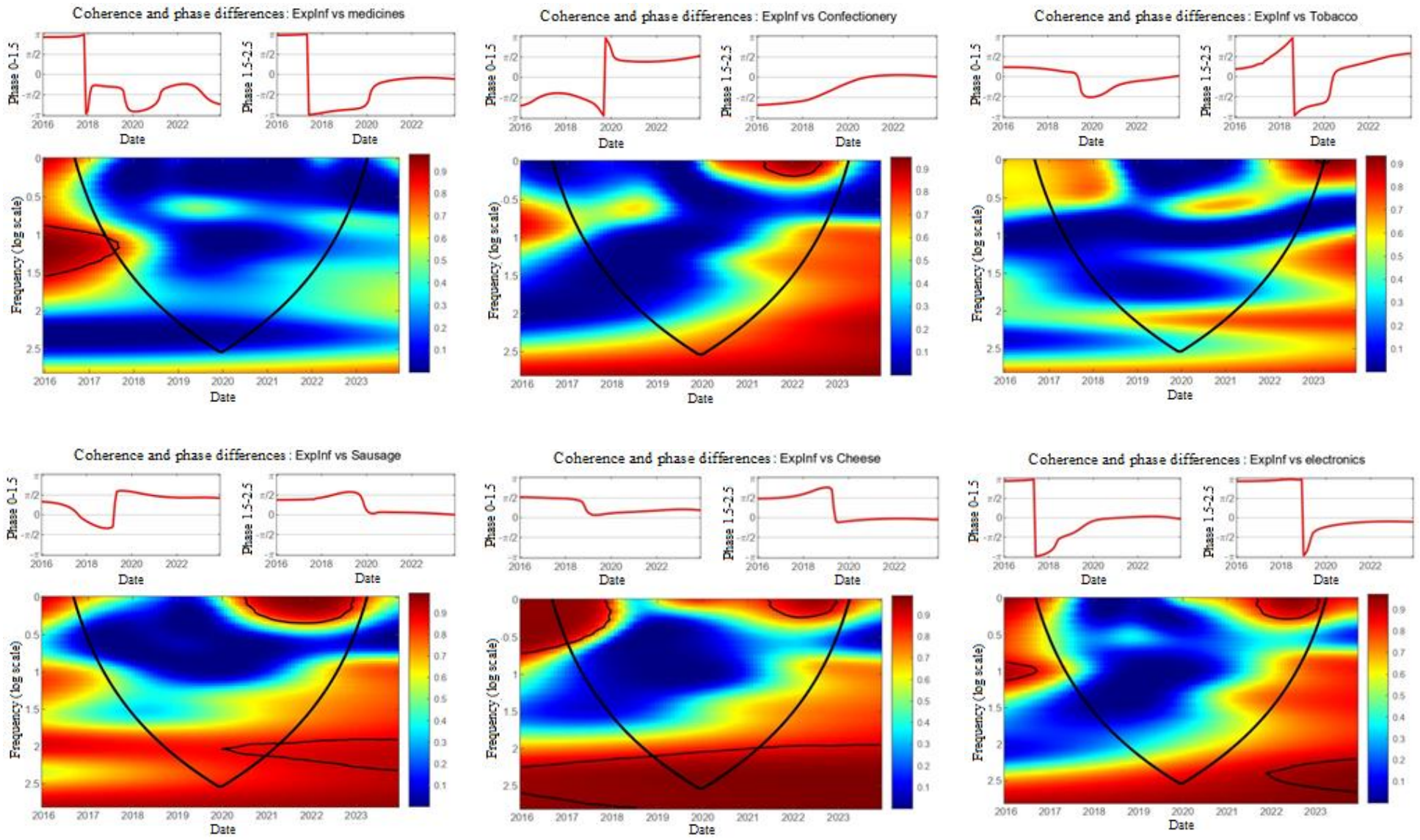
Coherence and phase differences : ExpInf vs Internetmobile
Coherence and phase differences : ExpInf vs teacoffee
Coherence and phase differences: ExpInf vs flour
Coherence and phase differences: ExpInf vs Clothes
Coherence and phase differences : ExpInf vs Shoes
Phase 0-1.5
Phase 1.5-2.5
Frequency (log scale)
Date
Дата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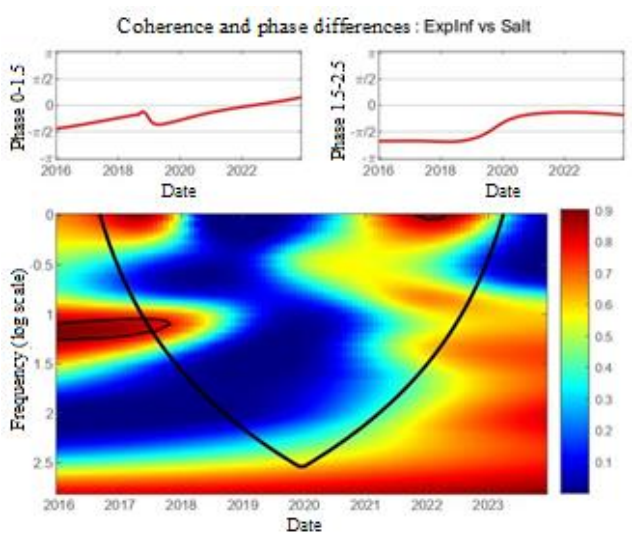
Coherence and phase differences : ExpInf vs Confectionery
Coherence and phase differences : ExpInf vs Tobacco
Coherence and phase differences : ExpInf vs Sausage
Coherence and phase differences : ExpInf vs Cheese
Coherence and phase differences : ExpInf vs electronics
Phase 0-1.5
Phase 1.5-2.5
Frequency (log scale)
Date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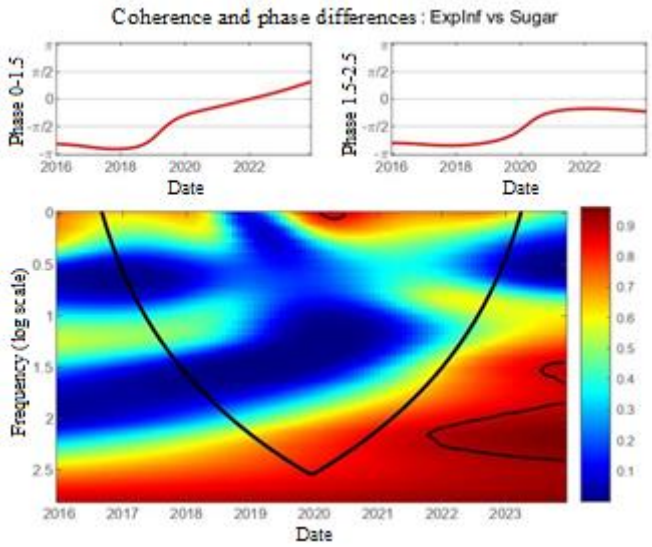
Phase 0-1.5
Phase 1.5-2.5
Date
Frequency (log scale)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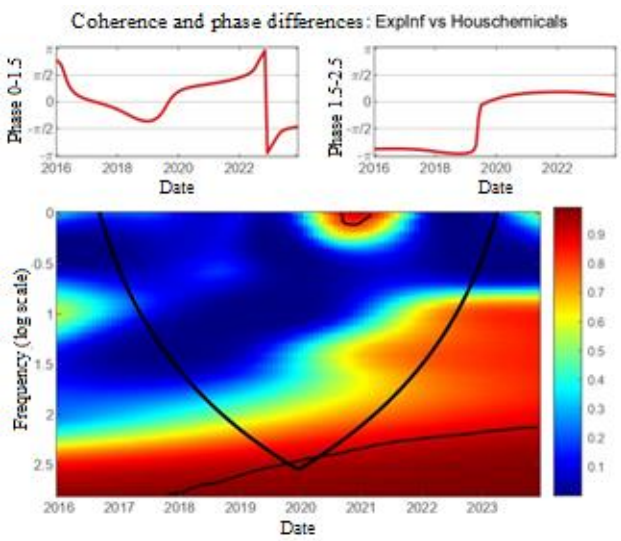
Phase 0-1.5
Phase 1.5-2.5
Date
Frequency (log scale)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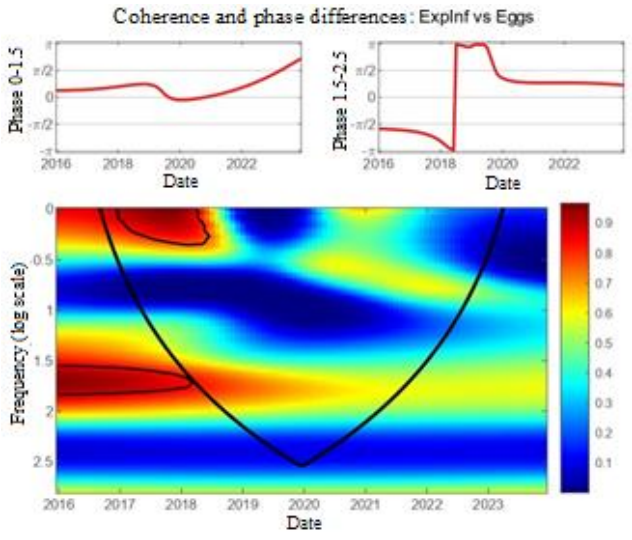
Phase 0-1.5
Phase 1.5-2.5
Date
Frequency (log scale)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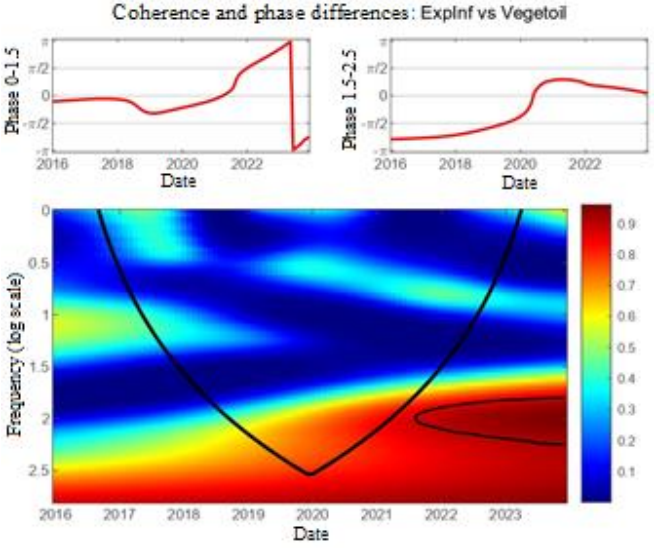
Phase 0-1.5
Phase 1.5-2.5
Date
Frequency (log scale)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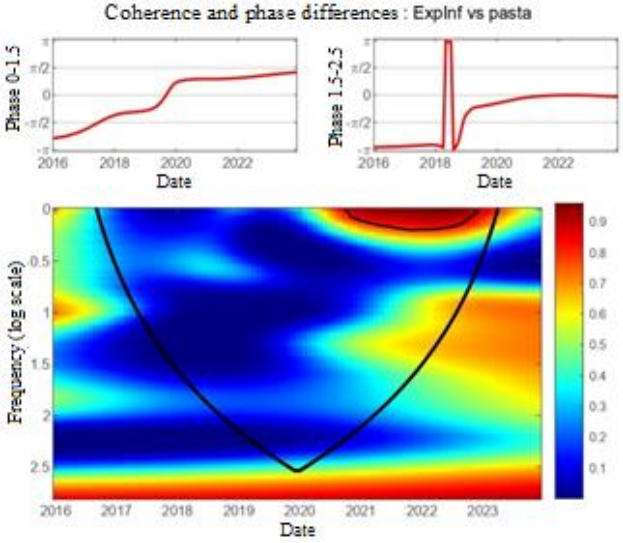
Phase 0-1.5
Phase 1.5-2.5
Date
Frequency (log scale)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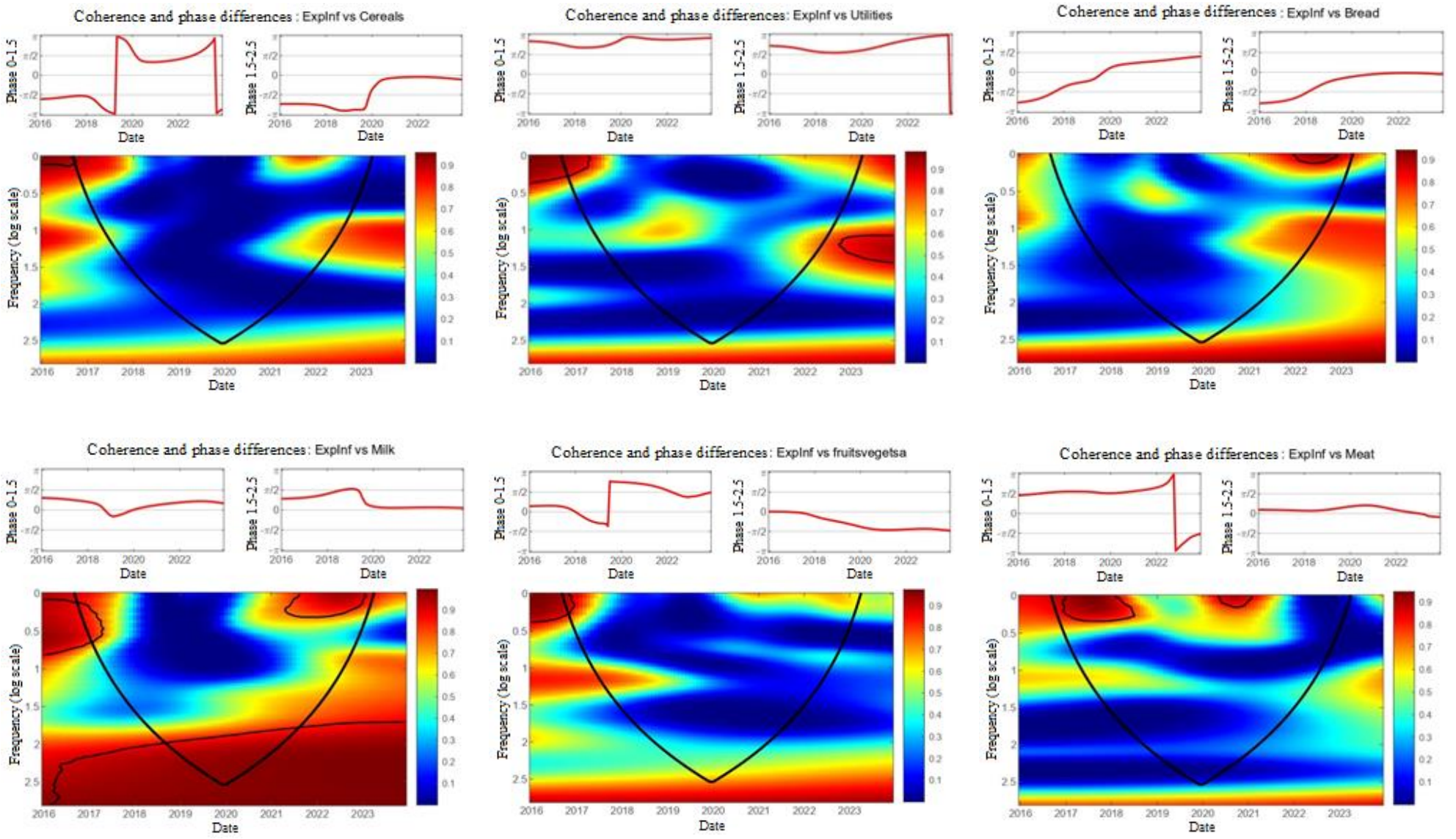
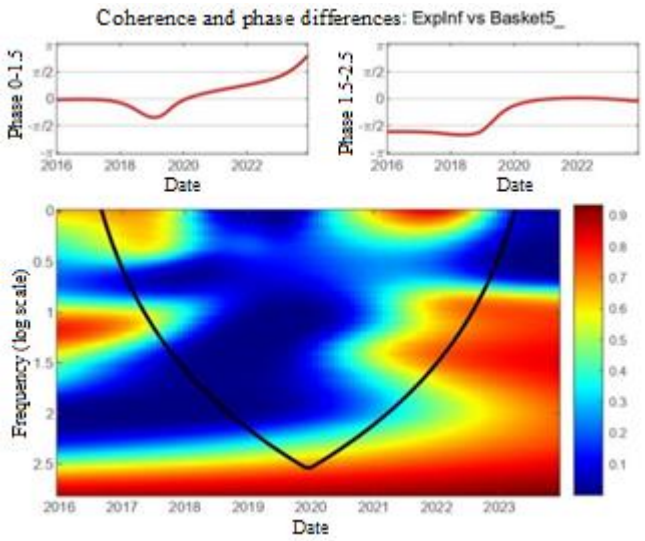
Phase 0-1.5
Phase 1.5-2.5
Date
Frequency (log scale)


Coherence and phase differences : Explnf vs Cereals
Coherence and phase differences: Explnf vs Utilities
Coherence and phase differences : Explnf vs Bread
Coherence and phase differences: Explnf vs Milk
Coherence and phase differences: Explnf vs fruitsvegetsa
Coherence and phase differences : Explnf vs Meat
Phase 0-1.5
Phase 1.5-2.5
Frequency (log scale)
Date


Coherence and phase differences: ExpInf vs Basket5_
Phase 0-1.5
Phase 1.5-2.5
Date
Frequency (log scale)
2016
2017
2018
2019
2020
2021
2022
2023

Annex 3

Coherence between tracer products and inflation expectations

Item	Frequency 0-1.5 years		Frequency 1.5-2.5 years	
	Current phase difference	High coherence	Current phase difference	High coherence
Fuel	no coherent phase	no	no coherent phase	no
Meat	no coherent phase	sporadically	no coherent phase	no
Fruits and vegetables	no coherent phase	no	no coherent phase	no
Dairy products	adjusts to expectations	sporadically	adjusts to expectations	yes
Bread and bakery	adjusts to expectations	sporadically	ahead of expectations	no
Utilities	no coherent phase	sporadically	no coherent phase	no
Cereals	no coherent phase	no	ahead of expectations	no
Macaroni products	adjusts to expectations	sporadically	no coherent phase	no
Vegetable oil	no coherent phase	no	adjusts to expectations	sporadically
Eggs	no coherent phase	sporadically	adjusts to expectations	sporadically
Household chemicals	no coherent phase	sporadically	adjusts to expectations	yes
Sugar	no coherent phase	sporadically	ahead of expectations	sporadically
Salt	no coherent phase	sporadically	ahead of expectations	no
Electronics and household appliances	no coherent phase	sporadically	ahead of expectations	sporadically
Cheese	adjusts to expectations	sporadically	ahead of expectations	yes
Sausages	adjusts to expectations	sporadically	adjusts to expectations	sporadically
Tobacco products	no coherent phase	no	no coherent phase	no
Confectionery	no coherent phase	sporadically	no coherent phase	no
Medicines	no coherent phase	sporadically	ahead of expectations	no
Footwear	no coherent phase	no	adjusts to expectations	sporadically
Clothes	no coherent phase	no	adjusts to expectations	yes
Flour	no coherent phase	no	ahead of expectations	no
Tea and coffee	adjusts to expectations	sporadically	adjusts to expectations	no
Mobile communication and Internet	ahead of expectations	sporadically	ahead of expectations	no
Children products	adjusts to expectations	sporadically	adjusts to expectations	yes
Fish	no coherent phase	sporadically	no coherent phase	no
Construction materials	no coherent phase	no	ahead of expectations	yes
Healthcare services	no coherent phase	sporadically	no coherent phase	no
Consumer services	adjusts to expectations	sporadically	adjusts to expectations	yes
Transportation services	no coherent phase	no	no coherent phase	no
Soft drinks	adjusts to expectations	sporadically	adjusts to expectations	no

Cafes and restaurants	no coherent phase	no	adjusts to expectations	yes
Cars and spare parts	ahead of expectations	sporadically	no coherent phase	yes
Basket – 20%	no coherent phase	sporadically	ahead of expectations	no
Basket – 10%	no coherent phase	no	no coherent phase	no
Basket – 5%	no coherent phase	no	no coherent phase	no

International Experience in Implementing Natural Disaster Insurance as in the Case of Turkey

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The purpose of this paper is to analyze the international experience of creating a national fund for insurance against catastrophes caused by natural disasters and the possibility of its adaptation in the domestic insurance market.

The paper examines the history, experience of implementation and specifics of the insurance framework for protecting against the consequences of natural disasters of the Turkish Catastrophe Insurance Pool. It also shows the international experience of insurance against natural disasters in other countries and the possibility of adapting compulsory insurance in domestic conditions.

Key Words: insurance fund for natural disasters, insurance policy, insured amount, insurance premium, insurance pool, voluntary and compulsory insurance, reinsurance.

JEL-Classification: G220.

Preamble

The devastating consequences of the severe flood in the spring of 2024 were perhaps the largest disaster in the history of Kazakhstan in the last 80 years. Because of the floods, a state of emergency was announced in 10 regions of the country, more than 60 communities were cut off from the outside world, more than 96 thousand residents were evacuated, the total damage from the flood, according to preliminary estimates, may exceed 200 billion tenge.

In this regard, talks about an adequate, systematic and timely system of compensation for victims have resumed. Despite the public and quasi-public support for the population in the flooded areas, extensive charity from businesses and people, the need in a well-built framework for covering the damage to victims is more relevant than ever.

The financial burden on the government stemming from such disasters is unpredictable in its size and time of occurrence. Natural disasters such as floods, earthquakes, hurricanes, etc., despite modern forecasting technologies, can occur at any time, in any place and cause completely unpredictable consequences. In this case, the Government needs to redirect budget flows, which takes time and, in the long run, negatively affects socio-economic development. As a result, which is confirmed by international experience, the state budget system lacks "flexibility" and the means for a timely and proportionate response in the case of devastating disasters.

In this regard, the international practice of creating and managing disaster insurance pools in countries exposed to natural disasters was analyzed.

Turkish Catastrophe Insurance Pool (TCIP)

Turkey is located in one of the most seismically active regions of the world; about 96% of the country's territory, 70% of the population and 75% of the country's industrial facilities are exposed to earthquakes of varying strength. For example, between 1932 and 1999, Turkey experienced fifty-five earthquakes with a magnitude of over 6.8 on the Richter scale. The expected annual damage from earthquakes in Turkey is estimated at 100 million US dollars. However, the most dangerous is the probability of a catastrophic event that may exceed the expected annual damage[1] by many times. The issue of creating a flexible framework for compensation for damage from natural disasters has been raised in Turkey on a regular basis. At the same time, the system

[1] The expected damage from an earthquake occurring once every 200 years (probability of occurrence >0.5% per year) is estimated at more than 11.4 billion US dollars.

of covering losses from earthquakes in the country has existed for a long time, but was traditionally considered as an addition to fire safety, and its distribution among the population was minimal (about 5% of residential buildings).

Serious study of specialized insurance against natural disasters began in Turkey after the devastating earthquake in Erzincan in March 1992. But the lack of balance between the development of a private insurance market and the creation of a national insurance fund, as well as the dependence on the international reinsurance market[2] have been an obstacle to achieving any results. However, after the Adana earthquake in June 1998, the debate was revived. A study on the insurance issue was initiated by the Deputy Minister of Finance of Turkey, who also regulated the country's insurance market, together with local insurance companies and the World Bank (WB) (Yazici, 2005). As a result, the Turkish Ministry of Finance (MoF) developed a new insurance program, which, following the devastating earthquake in the Marmara region in 1999, which claimed many lives, caused damages of US$20 billion and led to an economic downturn (from a projected 3.4% in 1999 to 5.7% in 2001), was adopted and presented to the Turkish public in 2000.

On September 27, 2000, a government decree in Turkey legalized the compulsory insurance framework for all residential buildings located on registered land in urban areas and established the Turkish Catastrophe Insurance Pool (TCIP). Furthermore, the government's obligation to provide loans and housing to earthquake victims as required by the Disaster Management Act was abolished on March 27, 2001 (Yazici, 2005).

The main objectives of the Insurance Pool include:

– providing insurance coverage in case of a natural disaster;
– limiting financial burden on the state budget;
– distributing risks among the population;
– creating long-term reserve against future damages from natural disasters;
– obtaining access to the international reinsurance market through an economically effective way.

Over time, the new insurance system shared and transferred most of the financial burden that the government bears in the event of natural disasters, but before the Pool accumulated a satisfactory amount of financial resources, a significant part of the risk was transferred to the international reinsurance market.

The Pool, established under the leadership of the Turkish MoF, was the first national disaster insurance fund to provide insurance to homeowners and small and medium-sized enterprises in the client countries of the World Bank, which provided significant financial and technical support for the implementation of the insurance program in Turkiye. Financial assistance to the Pool from the World Bank was provided within the framework of the loan for the Marmara Earthquake Emergency Reconstruction Project after the earthquake in the Marmara region of 1990. The financing included 2 areas:

1) a technical assistance in establishing the Pool and ensuring its operating efficiency and financial soundness during the first five years;

2) initial capitalization of the Pool via a contingent loan facility.

The Turkish Pool was the first successful WB project to implement a comprehensive disaster management system, including financial risk management, disaster mitigation and emergency preparedness. It was the first time in the history of the WB that 50% of the loan amount was allocated to investments aimed at establishing a national disaster protection system.

In the first five years since its establishment, the Pool has grown from an unknown and controversial government-sponsored program to one of the most trusted brands in the Turkish insurance industry, with international recognition. Today, half of all Turkish households have compulsory insurance against natural disasters. Inspired by Turkiye's example, more than a dozen countries, including China, Colombia, Greece, India, Iran, Italy, the Philippines, Romania and nine

[2]Reinsurance is the purchase by an insurer of insurance from another specialized insurance company (reinsurer) in order to distribute risk and reduce its own losses from major insurance events.

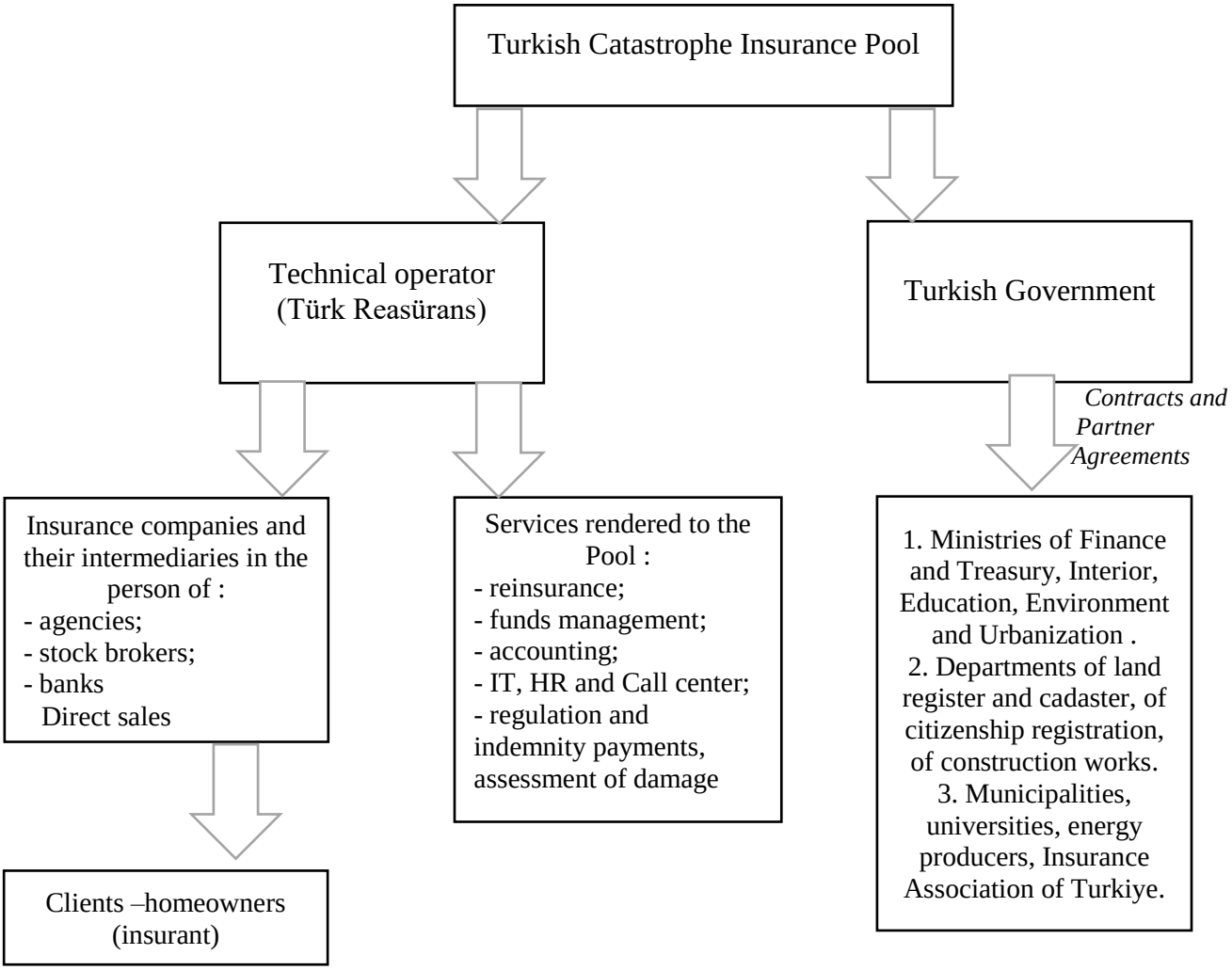
Caribbean island states, have begun technical and legislative preparations for accident insurance programs (Gurenko, 2006). Modeled after organizations such as the California Earthquake Authority (CEA) and the New Zealand Earthquake Commission (EQC), the Pool is structured as a public-private partnership and is responsible for implementation and management of household insurance.

The Pool is managed by a Board of Directors consisting of 7 members (one of whom is the Chairperson of the Pool) – representatives of the Ministries of Finance and Treasury, Environment and Urbanization, Interior, Disaster and Emergency Management Presidency, Capital Markets Board, Insurance, Reinsurance and Pension Companies Association of Turkiye and Istanbul Technical University. The Board of Directors consists of five senior government officials, representatives of the insurance market and the scientific community (www.dask.gov.tr). The Board of Directors determines the procedure for assessing damages and paying compensation, selects insurance companies to provide services on behalf of the Pool, determines investment policies, etc.

The MoF conducts audits (in addition to independent audit companies) and supervises the activities of the Pool, and is also the founder of the Pool's "technical operator" – Türk Reasürans, a company responsible for the technical and operational processes of the Pool and outsourced on a competitive basis.

Figure 1

The scheme of Pool's functioning



In order to minimize administrative costs and create an efficient operational structure, the Pool outsources its core business processes. Insurance companies and their subsidiaries implement the Pool's marketing and distribution policies, and most non-life insurance companies participate in the simplified operating scheme shown in Figure 1. Private insurance companies are compensated for their activities in selling insurance products and collecting premiums by commissions depending on the size of the latter.

A wide distribution network consisting of insurance companies, their subsidiaries and bank branches throughout the country provides broad access to the insurance product for the population due to the affordable cost of insurance policies[3]. As a result, the penetration rate of compulsory insurance reached 60% in 2021 (TCIP, annual report, 2021).

The Pool's public information policy is implemented with the help of a PR company in order to increase public awareness of insurance products. Compulsory insurance in Turkiye is positioned as a social responsibility of every citizen, and information about the earthquake risk insurance program is included in school textbooks. In addition, incentives have been introduced for developers to build in accordance with seismic safety standards, since the Pool does not provide insurance for residential buildings built in violation of the rules. The Pool is exempt from all types of taxes, fees and commissions to increase the speed of accumulation of resources, which are kept on a separate account. The accumulated funds were previously managed by the Pool's technical operator, but due to the buildup of resources, two investment companies had pitched in to manage the funds in 2004. Today, the Pool manages the funds in accordance with its own investment policy and the principles of Islamic finance.

Compulsory Insurance System

The compulsory insurance system in Turkey is based on the principles of mutual benefit, assistance and solidarity, where insurance premiums are accumulated in the Pool and, in the event of an earthquake and natural disasters caused by it (fires, explosions, landslides, tsunamis), the losses incurred by policyholders are compensated by the Pool.

The amount of insurance premiums is calculated depending on the type of construction of the residential premises, its total area, year of construction, number of floors and the risk group of the area in which it is located. Pool tries to determine the amount of insurance premium at a level accessible to all citizens. Benefits or surcharges are applied depending on the date of construction or the number of floors and discounts in case of timely renewal of the policy (www.dask.gov.tr).

The Pool's strategy is based on both insurance and reinsurance of risks. For example, in 2011, it was assumed that in the event of an insured event, the Fund would cover losses of US$ 80 million from its reserves, and would transfer further losses to international reinsurance markets. The maximum one-time payment by the Pool for an earthquake reached approximately US$ 1.4 billion. At the same time, the Turkish Government guarantees coverage of losses that exceed the Pool's overall solvency. Economies of scale occur due to the pooling of risks from the entire country into a single insurance pool[4], which affects the affordability of insurance premiums for the population.

Catastrophe insurance requires the use of sophisticated catastrophe risk modelling techniques to determine premiums that accurately reflect the underlying risk. At its inception, the Pool had sufficient reserves to cover claims from a 1-in-100 year earthquake and its aftermath. Since then, the Fund has increased its reserves and reinsurance capacity and can cover losses from a 1-in-350 year disaster. The main challenges for insurers selling catastrophe insurance were correlated losses and uncertainty. Since a catastrophe can affect a large number of insureds simultaneously, insurers' ability to diversify risk is greatly reduced. Insurers therefore need to

[3] An insurance policy is a document confirming the fact of contractual relations between the insurer and the policyholder.

[4] The combined risk of several insurance companies. Pooling contributes to the development of insurance markets, as it distributes risks among insurers that would otherwise not have the financial capacity to participate in the market. This allows insurers to provide affordable coverage in the event of high risk.

maintain reserves at all times or be able to transfer risk to international reinsurance markets. The lack of information needed to assess the likelihood of losses can affect the cost of the policies themselves – this tends to push insurance companies to overestimate policy premiums, which in turn slows down the penetration of compulsory insurance into the market.

The following factors influence customer decisions when purchasing catastrophe insurance:

1) property value. Insurance may become unattractive when expected losses and required premiums become high relative to the value of the property. Moreover, willingness to insure decreases when losses are expected to be frequent but small in size relative to the value of the property;

2) cognitive failure: Consumers may underestimate or even ignore the risks associated with the occurrence of natural disasters;

3) product terms and conditions. Insurance customers are sensitive to the expected level of compensation, and if the customer feels that the coverage is too limited and the premiums are too high, he or she is likely to refuse the service;

4) post-disaster assistance. Government intervention in the event of a major disaster reduces incentives to insure against natural disasters. Long-term subsidy programs reduce the effective cost of disaster damage to property owner (Gurenko, 2006).

In addition, the willingness of the international community to provide support in the form of free or low-cost financing for elimination of the consequences of natural disasters also has a restraining effect on the development of the national insurance system. The so-called “Samaritan dilemma” is a situation where the assistance provided negatively affects the independence of the beneficiary, reduces the ability to use methods of early risk management (reinsurance, etc.).

Due to the underdevelopment of the insurance system, lack of awareness and the absence of economic incentives to develop preliminary risk management measures, the Turkish Government responded to natural disasters after their occurrence. This approach implies the participation of the state budget in stabilizing the situation, the diversion of resources from other projects and international assistance. However, as experience shows, the response after the fact is ineffective, the lack of preliminary planning and resource allocation does not allow victims to receive timely and oftentimes proportionate compensation. In addition, the speed of distribution of funds allocated by the state budget is usually slowed down by bureaucratic processes.

The mechanism of adequate and timely assessment of damage due to the occurrence of natural disasters plays a huge role in stabilizing the situation, for which reason the pre-calculated assessment models based on historical data and similar cases are extremely important. As practice shows, most developing countries face the problem of a lack of budgetary resources for full compensation to the affected population and full restoration of infrastructure. As a result, delayed response significantly increases adverse social, economic and psychological consequences when natural disasters occur. Moreover, since natural disasters mainly affect the middle and lower middle classes of the population, and budget resources are diverted from other socio-economic programs, the gap between rich and poor increases.

Key Characteristics of Compulsory Earthquake Insurance

In the case of a compulsory earthquake insurance policy, the Turkish Insurance Pool covers material losses directly caused by an earthquake and natural disasters resulting from it, within the monetary limit specified in the policy.

The residential premises remain under warranty both in the event of complete and partial destruction. The policy can insure both the entire building and its individual parts, such as the foundation, load-bearing and internal walls, ceilings and floors, stairs, elevators, roofs, etc. However, the insurance does not cover losses related to damage to all types of movable things and objects, temporary accommodation costs for victims, loss of profit due to destruction/damage to property, garbage removal costs, depreciation of real estate not related to the insured event, etc.

The maximum coverage limit of the policy is determined annually taking into account the change in the cost per square meter and as of January 1, 2024 is 1,537,355 Turkish lira, which is approximately equivalent to 46 thousand US dollars. Also, when determining the guarantee amount, the costs of restoring the home (excluding the cost of the site), the size, type and purpose of the property are taken into account. In the event that the cost of possible damage exceeds the maximum coverage amount, the insured has the right to purchase additional insurance from private insurance companies.

Pursuant to the Insurance Law, the following types of buildings are insured in Turkiye:

– buildings constructed as residential premises on real estate registered on the right of ownership and located in private ownership;

– individual structures located in the listed buildings and used for commercial purposes, such as offices;

– housing built by the government or with loans issued in connection with natural disasters;

– cooperative housing for which title has not yet been issued;

– housing that does not yet have a title deed and that was built before 2000 may be insured based on the policyholder's application.

Rural communities are not covered by insurance due to low income levels, lack of municipal control over buildings and the difficulty of providing insurance in general. However, upon request, insurance can be purchased for buildings located in rural areas or for buildings used for commercial and industrial purposes (TCIP, annual report, 2021).

The amount of the insurance premium payable under the policy upon the occurrence of an insured event is calculated as follows:

insured amount (maximum amount of the insurer's liabilities) = total area of the residential premises (m^2) x cost per square meter depending on the type of building (TL);

insurance premium (insurance fee) = insured amount x rate.

There are 14 types of tariffs (Table 1), and the tariff depends on the type of building (steel/reinforced concrete structure, masonry/brickwork, etc.) and the risk group, depending on the seismic zone of the country. For buildings that use steel or reinforced concrete structures, as well as for less seismic zones, the tariff is respectively lower (www.dask.gov.tr). Thus, the greater the risk of damage or destruction of the building, the higher the insurance premium paid by the client, in addition, the amount of premium depends on the general change in the average cost per square meter in the country.

Table 1

Underwriting rates

	1 risk group	2 risk group	3 risk group	4 risk group	5 risk group	6 risk group	7 risk group
A- Concrete structures	2.33	2.07	1.76	1.65	1.24	0.88	0.60
B- Others	4.10	3.51	3.08	2.88	2.31	1.54	0.90

It is noteworthy that buildings damaged as a result of previous cataclysms can also be re-insured if the degree of damage falls under the criteria of "light" and "medium", while "severely" destroyed buildings are not subject to insurance. In this case, in the event of "medium" damage, the policyholder undertakes to repair and / or modernize the insured object.

In case of an insured event, the insured person needs a minimum package of documents to assess and compensate for the damage: a damage report; documents confirming property rights; the address of the territory affected by the cataclysm; the phone number of the insured and information about additional insurance policies of the damaged building. Damage reports prepared by the insured person or through authorized insurance companies are assessed by the Fund, which opens a claim case and appoints independent loss adjusters to assess the damage. Employees assessing the damage play an extremely important role in the functioning of the insurance mechanism, so considerable time is devoted to their training, licensing, and additional training.

The compensation level is calculated based on the current cost of reconstruction of the building under the current market conditions at the time of the insured event, but the insurance compensation cannot exceed the insured amount specified in the policy. The compensation amount is sent to the bank branches in the area affected by the disaster, which pay the compensation to the relevant beneficiary. For example, after the devastating earthquake that occurred on the border of Turkiye and Syria on February 6, 2023, the Pool paid more than 1.5 billion Turkish lira in compensation for damage caused by the disaster, the same amount was paid to the victims of the earthquake in Izmir on October 30, 2020. After the earthquake in the Sivrice district (Elazig province) that happened on January 24, 2020, the Pool paid more than 100 million Turkish lira in insurance benefit payments to the affected owners of the insured houses.

Adaptation of International Experience of Natural Disaster Insurance in the Domestic Insurance Market

The examples of the USA, UK, Turkey, Japan and New Zealand show that the government plays an active role in disaster risk management, ensuring the availability of insurance, compensation for losses and management of risks that private companies are reluctant to insure. These countries use various mechanisms, such as the "residual market", public pools and funds, to increase the availability and effectiveness of insurance against catastrophe risks. The role of the government in the introduction of compulsory insurance against natural disasters is extremely important, especially at the initial stage. Thus, a little less than 70 years ago, the Japanese government created a pool that acted as a reinsurance company for insurance organizations in the market. The government of the country did not sell insurance, but in order to interest insurance companies, it delimited risks between the budget and the insurance market. That is, a certain limit was set, for example, 5 million US dollars, and if this limit was exceeded, the government insured the amount exceeding the limit through the created pool. Thus, the government motivated insurance companies, which were protected by the established limit and could accumulate resources from the sale of policies.

Foreign practice shows various measures to expand the penetration of insurance in the market. Given the steadily developing mortgage market in Kazakhstan, we consider the example of the USA and Great Britain, where compulsory flood insurance is provided for recipients of mortgage loans, to be applicable in domestic conditions. Let us give several examples of combining voluntary and compulsory insurance against natural disasters. In the USA, most insurance policies against natural disasters are offered by private companies, but they exclude the risks of floods and earthquakes from coverage, which are covered by the government program. In Great Britain, flood insurance is already included in the standard home insurance policy. In Japan, in addition to the national insurance against earthquakes, there is cooperative insurance, which is managed by the cooperatives themselves. In New Zealand, the government program provides insurance against natural disasters for residential buildings and some land plots in addition to private insurance. In France, reinsurance of catastrophe risks with the government-owned Caisse Centrale de Réassurance (CCR) is voluntary, with insurance companies able to transfer between 40% and 90% of their risks to the CCR (https://www.ccr.fr/).

However, given the conditions of domestic insurance, we believe that the experience of Turkey is the most suitable for Kazakhstan for the following reasons. Turkey and Kazakhstan have similar geographical features – some regions are located in areas with high seismic activity. In Turkey, compulsory insurance covers not only private houses, but also apartment buildings, which, given the domestic level of urbanization and the development of large cities, will also be acceptable for Kazakhstan. The model in which the government plays a key role in the development of compulsory insurance in Turkey is acceptable for the level of development of the insurance market of Kazakhstan. Similarity of some economic indicators of the countries: despite the significant difference in the size of the economies (the GDP of Turkey and Kazakhstan in 2023 amounted to 1.1 trillion and 200 billion US dollars, respectively), the level of GDP per capita in

the countries in 2023 is close (the GDP per capita of Turkey and Kazakhstan in 2023 amounted to 12,500 and 10,500 US dollars, respectively).

The framework of compulsory insurance against natural disasters in Turkey is based on public-private partnership. Private insurance companies voluntarily cooperate with the Pool, acting as its agents, distributing compulsory insurance and offering additional products to it, while insurance companies continue their activities as independent financial institutions that are full participants in the insurance market.

When introducing compulsory insurance against natural disasters, close attention should be paid to the marketing component of the product. In other words, the acquisition of this insurance should be positioned as a socially responsible behavior of a conscious citizen and as a mandatory contribution of each person to the overall security of the country, regardless of region and status. The experience of Turkey is noteworthy, where the above-described Pool cooperates with the Ministry of National Education to raise awareness among primary school students about earthquakes and compulsory insurance against them. It is also necessary to actively use digital technologies in the implementation of compulsory insurance. For example, information technologies in Turkey make it possible to organize the provision of insurance policies, premium reservations, access to damage information, and manage claims and indemnity payments in real time online. The process of registration and payment of insurance should be as simple as possible and accessible to everyone, like tax payments or payment of utility bills.

Regional and natural-geographical features, such as the probability of a natural disaster or the income level of the local population, should be taken into account when calculating the insurance premium in favor of a fair and equal burden. The initial premium should be set at a minimum, the population should get used to the new obligation and – most importantly – understand why it is necessary. Despite the fact that there are certain regions and cities located in high-risk zones, such as Almaty, almost all regions of Kazakhstan are subject to some natural impact that leads to negative consequences. In this regard, a dimensional “grid” should be applied to the insurance premiums paid, depending on the risks of a catastrophe, the income of the population and other factors.

Large-scale coverage of compulsory insurance in the domestic market can be achieved through a developed distribution network (insurance companies, banks and post offices, etc.), digitalization of services, affordable and fair product cost, as well as information coverage. International experience shows the importance of cooperation between the government and the private sector to effectively cover the risks of natural disasters. Reinsurance, marketing policy, creating a roadmap and effective emergency response systems are key elements of successful insurance. In Kazakhstan, it is necessary to continue to develop the insurance market and introduce new approaches to managing catastrophe risks to ensure the safety of the population and the sustainability of the economy.

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Social Capital and its Significance for Consistent Economic Growth

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The paper is devoted to the analysis of social capital and its importance for high-quality economic growth. The international experience of social capital development is considered, social capital in Kazakhstan is analyzed. The problematic issues existing in this industry are raised. The article is prepared in the format of a review with the aim of discussing the prospects for the development of social capital.

Key Words: social capital, human capital, economic growth.
JEL-Classification: E22, E24, E71, J24.

1. Preamble

Social capital is an invisible but powerful resource that permeates all spheres of society and determines the quality of life in a country. It is closely related to the level of trust, mutual assistance and cooperation between people, as well as the presence of strong social networks and institutions. For economists, the term "social capital" is a conceptual instrument which takes into account social aspects that go beyond a traditional economic analysis. These social phenomena are complex elements that are often difficult to understand within the framework of economic theory built on the principles of rationality, reductionism and individualism. Therefore, measuring social capital in the economic analysis is difficult due to its intangibility. Its components, such as quality of life, the level of consciousness and trust in society, do not have clear indicators and are considered more abstract. This complexity prompts many economists to simplify the concept, breaking it down into more specific components or individual dimensions, which together provide an idea of the level of social capital in a country.

Thus, individual measurable indicators of human capital directly related to social capital, namely the labor market, the level of education and qualifications of workers, the growth of real wages, as well as indicators of infrastructure development, investments in social facilities, the development of research centers and other indicators affect the quality of life of the population and the economy of the country as a whole.

This paper will use a rational method for studying social capital in the form of its key components, such as the level of trust in society, the well-being of the population, the development of infrastructure, and some indicators of human capital.

The article is devoted to a review of the influence of social capital and its components through various channels on the sustainability of economic growth in the country. The objectives are a theoretical and literary review of the definition of the concept of "social capital", its indicators and their impact on economic growth, as well as an analysis of international trends in this area.

2. Literature Review

The term of social capital has been introduced into the economic analysis relatively recently, although the various elements of the social capital concept have existed under different names for a long time. The World Bank (1997) identifies three main components that determine national wealth, namely produced assets, natural capital and human capital, the latter including pure labor and an elusive but very important element known as social capital.

One of the early concepts of social capital is that of Putnam (1993), which is defined as a set of "horizontal connections" between people, consisting of social networks and associated norms, that affect the performance of the entire community. This concept is based on two empirical assumptions: 1) networks and norms are empirically related; 2) they have important economic consequences. Another concept of social capital was put forward by Coleman (1988), who defines

social capital as “a set of different objects with two common elements: they all consist of some aspect of the social structure, and they facilitate some actions by participants – individual or corporate – within the structure.” This is a more comprehensive concept than the above, since it also implies the presence of vertical connections, namely between individuals and corporations.

Social capital is a set of relationships that influence behavior and is associated with the expectation that other economic agents will fulfill their obligations. This expectation and obligation are interconnected through the concept of “trust”. The level of social capital increases with the increase in trust and obligations in society. It is through social capital that social order is maintained based on mutual trust. In a review of the concept of social capital and its theoretical and practical significance, such authors as Robinson and Schmid (2002) provide a critical overview of various definitions of social capital, considering it as resources that individuals or groups obtain through social connections and networks, and which can contribute to improving their well-being. Key aspects, as in other similar works, are trust, social networks and participation in social life. However, the work is distinguished by one of the central questions of the paper – a discussion of whether social capital can be considered as traditional economic capital, such as physical or human capital. The authors question the very concept of social capital as “capital” in the traditional economic sense and that social capital can be measured and used in economic calculations as easily as other types of capital.

Poder (2011) draws attention to the diversity of definitions and theoretical approaches to social capital, which complicates its use in research practice. The author begins by noting that the concept of social capital is not well defined. It is often used as a catch-all term to describe a wide range of social phenomena, such as mutual trust, social networks, and norms of mutual assistance, which makes it difficult to empirically measure and theoretically understand. The author concludes that for social capital to become a useful tool for analysis and intervention, it is necessary to develop a clearer and more consistent theoretical framework, as well as to take into account its multifaceted nature and possible implications for social policy. In the current economic literature, social capital research also includes works devoted to studying its impact on the economy. Some analysts have attempted to estimate the contribution of social capital indicators to economic growth using sociological survey data. For example, Knack and Keefer (1997) found, using survey data, that a moderate increase in the country-level trust significantly increases economic growth (a one standard deviation increase in the country-level trust increases economic growth by more than half a standard deviation). La Porta et al. (1997) found that across countries, a one standard deviation increase in the same trust measure increases judicial efficiency by 0.7 standard deviations and reduces government corruption by 0.3 standard deviations. Coyle and Lu (2020) also confirm that interpersonal trust, one of the most important components of social capital, has a significant positive relationship not only with the level of output in an economy, but, most importantly, with its growth rate.

Some research focuses on assessing the impact of individual measures of human capital, which includes social capital. The central bank of Singapore (2023) uses econometric methods to estimate the contribution of the labour force to Singapore’s GDP trend growth since the mid-1990s. It decomposes the contribution of the total labour force into the expansion of the labour force and the human capital component, which is further decomposed into the contribution of high-skilled and low-skilled workers, as well as residents and non-residents. The study concludes that improvements in human capital and the accumulation of high-skilled labour have been significant growth drivers for Singapore over the past three decades and remained so until the COVID-19 pandemic. Another influential paper by the central bank of Singapore (2010), which also focuses on identifying the key drivers of Singapore’s economic growth, highlights the impact of investment in information and communication technology (ICT) on economic growth and productivity. Given Singapore’s significant reliance on ICT in various sectors such as education, business services and communications, the methodology is particularly relevant. The analysis also takes into account changes in the quality of the labour force as an important factor in explaining economic growth, especially in light of the constraints on labour force growth in Singapore.

Economic progress has been achieved through the efficient accumulation and use of capital and labour resources, as well as positive growth in overall productivity factors. The paper's conclusions highlight the importance of effectively harnessing the benefits of ICT investment, complemented by the right amount and type of human capital.

The research paper by Hugo et al. (2022) analyzes the relationship between indicators such as the Human Development Index (HDI, described in more detail in the International Overview section), economic growth and investment. The authors analyzed the impact of investment on economic growth, HDI and social welfare in the Bekasi Regency of Indonesia. Here are some key points and findings. The HDI is defined as an indicator of the population's access to achievements in the field of income, health, education and is used to assess the level of development of a region or country and determine development policies and the allocation of funds. The HDI is formed on the basis of three main dimensions: a long and healthy life, knowledge and a decent standard of living. The study found that investment has a significant impact on economic growth and the HDI. However, economic growth itself does not have a significant impact on the HDI. It is also noted that economic growth significantly affects social welfare. The study confirms that increasing investment can contribute to job creation and an increase in the HDI. This is important for the development of the region and the improvement of the quality of life of its residents. Thus, the main conclusion of the study is that effective investment management and human resource development play a key role in ensuring sustainable economic development and improving the quality of life of the people in the Bekasi region.

3. The Concept of Social Capital and its Components

The concept of social capital is a set of prevailing norms and values in society, common rules and principles of behavior based on mutual trust, laws, institutions and organizations through which people gain access to power and resources and participate in decision-making and policy formation.

In the context of social capital, attention is paid to the relationships among economic agents and how their formal or informal organization can improve the efficiency of economic activities.

An alternative to public structures arises in the form of a kind of institutional network that contributes to economic development both in the "horizontal direction" and through the influence on formal institutions and the quality of public administration in the "vertical direction". The efficiency of formal institutions and the quality of public administration depend on the presence of social capital. The staff where people trust each other demonstrate more successful functioning. This is reflected in the examples of Israeli communes and Italian family clans.

Formal institutions and social capital complement each other, as they are aimed at solving common problems. With a sufficient supply of social capital, the need for state regulation is reduced, in particular, the minimal use of political and administrative capital associated with regulating access to resources and activities.

One of the most important components of social capital is social connections – trusting relationships between people. A high level of trusting relationships, as a rule, develops in a more developed and healthy society. This phenomenon can be explained economically using the following example. People in a society free from corruption, with a strong judicial and legal system, where citizens are confident in the protection of their rights, are more likely to trust each other. In such a society, there is a prevailing confidence that other people will act honestly, in each other's interests, in accordance with ethical and cultural values (Fukuyama, 1995). It is important to note that the level of trusting relationships is a significant indicator of democracy as a whole. In such a society, there are more opportunities to introduce new forms of organization with a minimum number of bureaucratic processes that replace trust, thereby contributing to the minimization of transaction costs and progress.

Measuring social capital is difficult due to the lack of specific measurable indicators and often relies on survey data, sometimes combined with other proxy data such as blood donation or voting rates. Such analysis has several advantages. For example, sociologists often use existing

data sets, reducing costs while still providing the longest possible time series of data. However, surveys are not standardized and may vary across countries, so internal measures of social capital may not match international survey data, making comparisons difficult. One way to identify trends in social capital is through Principal Component Analysis (PCA), which reduces the dimensionality of complex data and identifies key concepts or principal components (see the International Review for some of the studies using this method).

Social capital is a part of human capital and everything that surrounds it in one way or another. Human capital is the knowledge, skills, competencies and qualities of people that contribute to the creation of personal, social and economic well-being (OECD, 2001).

Human capital is developed through improving access to knowledge and the quality of education. Improving skills will provide opportunities for the workforce and will promote innovation and increase productivity. As a result, structural disadvantages in the economy are gradually eliminated, competition is promoted and a favorable business climate is created to stimulate entrepreneurship and investment.

Human capital, like any other type of capital, is one of the forms of "wealth" of a country. In most countries, human capital is the largest form of wealth. In countries rich in natural capital/resources, human capital often becomes a growing source of wealth (Managi and Kumar, 2018). Countries with a relatively young population can have significant advantages over countries with an older population in the long run. In the context of sustainable development, human capital indicators can be used to assess how well a country manages its overall national wealth, with a view to assessing its long-term sustainability (UNECE, 2009).

In 2018, the World Bank announced the Human Capital Project, an effort to build human capital in all countries. The Human Capital Project is expected to help create policy space for national leaders to prioritize transformational investments in human capital. The goal is to move quickly toward a world in which all children start school well-nourished and ready to learn, can expect real learning in the classroom, and can enter the labor market as healthy, skilled, and productive adults.

Since human capital is a key indicator of the current and future potential of a country and its people, its assessment, analysis, and measurement are critical. The World Bank project mentioned above introduced the Human Capital Index, which quantifies the contribution of health and education to the productivity of the next generation of workers. Countries can use it to estimate how much income they are losing due to a lack of human capital, and how much faster they can turn that loss into gain if they act now. In addition to the Human Capital Index, there are two broad methods for measuring human capital: indicative and monetary. The monetary method focuses on demographic indicators such as age and education by gender, as well as income; the indicative method has a wide range of component types, such as health, standard of living, and know-how. Standardized, single methods for measuring human capital allow for cross-country analysis. The methods for measuring human capital are described in more detail in Liu, G. and Fraumeni, B. (2020).

4. Impact of Social Capital on the Economy

The World Bank (2021) raises an important conceptual question: is social capital best viewed as an input to an economic production function or as an input to a utility function? There are strong arguments that can be made for both. It is widely accepted that living in a supportive and trusting society brings direct benefits. The key channel through which social capital transmits to economic outcomes is through reduced transaction and monitoring costs, which allows for efficient resource allocation in goods, labor, and capital markets. Societies waste resources when people do not trust or are dishonest with each other. In contrast, societies with strong social capital are better able to build and organize community while minimizing the associated costs.

At the macro level, social capital is important for constructive interactions between the government and entrepreneurs in economic development. Such interactions between government

structures and the private sector can help improve the market performance of both private and public organizations.

At the micro level, social capital serves as a tool for protecting the poor from unexpected events, such as illness or weather conditions, and as a means of pooling resources. Informal relationships often help create small businesses, increasing income and ensuring survival. At the micro level, social capital also facilitates the exchange of valuable information about products and markets, and reduces the costs of contracts and regulations. Repeated transactions and goodwill create incentives for mutually beneficial interaction.

The contribution of social capital to the economy is difficult to measure, since an accurate answer requires specific metrics for assessing social capital, which are currently lacking, as noted above. However, the fact that there is a contribution is obvious. Economic growth can be not only quantitative, but also, more importantly, qualitative. In this context, social capital is important precisely for ensuring high-quality or sustainable economic development. In economic literature, sustainable development is defined as a process by which future generations will receive per capita total capital no less than the level possessed by the current generation (World Bank, 1997). In turn, total capital consists of natural, physical (produced assets) and intangible capital, which includes social capital. Together, they constitute the wealth of the people and form the basis for economic development and growth. According to the concept of the World Bank (2018), the wealth of the people should be taken into account as an indicator of sustainability, complementing GDP, which measures only the current income of the economy.

The proportionality of the shares that make up the total capital is constantly changing. Natural capital is depleted and transformed into physical capital. The latter is depreciated, and it is expected that technology will find a more efficient replacement for it. This century has seen a massive accumulation of human capital. According to World Bank analysis, global wealth showed a significant increase from 1995 to 2014. During this period, low-income countries, where natural capital dominates the wealth structure, moved to middle-income status, in part by investing resource rents in infrastructure, education and health, which increases human and social capital. In most developed countries, intangible capital accounts for the lion's share of total wealth and, according to the World Bank estimates, may account for between 60% and 80% (World Bank, 2021).

Thus, economic growth itself is a positive factor, but it is necessary to consider how sustainable such growth is in the long term. Sustainable economic development is served by the development of social capital indicators, including the contribution of human capital and investment in infrastructure.

5. Problems Associated with a Low Level of Social Capital

Social capital as part of human capital plays a significant role in achieving economic equilibrium, when the volume of goods and services produced by the economy corresponds to the potential volume of production. The economy produces below the potential volume when there are unused resources – scientific, human and social capital. Thus, social capital is a valuable resource, and insufficient development of some of its components leads to certain challenges in the economy. Some of them will be discussed below.

Insufficient investments in the human capital and infrastructure. Despite government efforts to promote economic growth, it can be held back by factors such as human capital. Despite increased budget expenditures in anticipation of economic growth, if there is insufficient investment in human capital, education and R&D, output will not be maximized. By improving skills, health, knowledge and resilience – human capital – people become more productive, flexible and innovative. Human capital is the central driving force behind sustainable growth and poverty reduction. The impact of insufficient investment in human capital on economic growth can be examined pointwise using the example of one specific enterprise. Thus, the government pursues a policy of stimulating the growth of credits to the economy and private business, while easing monetary policy by reducing interest rates and encouraging the private sector to use cheaper

financing. The ultimate goal is to stimulate economic growth. An individual enterprise uses lending to expand its business. But high unemployment, low education and skills of the existing workforce will not allow business expansion. Thus, insufficient development of human capital limits economic growth.

Schultz (1961), an American agricultural economist, emphasizes that the vast growth of a country's national wealth occurs not only due to the expansion of land ownership and increased labor costs, but also due to the development of physical capital. According to his view, the main factor in this is investment in human capital and its constant growth.

The institutions and organizations that are part of social capital, through which people gain access to resources, also have a direct impact on economic growth. Underdevelopment and low investment in research and development do not allow maximizing production.

Houng et al. (2013) and Michael (2013) study the adequacy of investment in some regions of China. The authors conclude that investment in poor inland provinces of China is less productive, and such regions are less able to effectively absorb additional capital than rich coastal areas. The authors cite the underdevelopment of existing infrastructure in some regions as the reason for this, which limits the return on investment. The authors also conclude that, in general, countries with more developed infrastructure recover faster from crises than less developed countries with the corresponding infrastructure.

The impact of inclusion on social capital and the economy. Inclusion is the organization of public life in conditions of equal distribution of wealth among the people, which stimulates the participation of the population in economic life and allows the best use of the abilities and talents of people. Equal opportunities for all citizens in economic life create the appropriate ground for technological innovation, competitive and qualitative development. The creation of inclusive institutions contributes to economic growth, increased labor productivity and prosperity.

Socioeconomic inequality is expressed in differences in income and economic opportunities among the population or different regions of the country. Weak social capital in the form of uneven distribution of resources for regional development and the lack of reforms of institutions and infrastructure towards greater inclusiveness affect the limitation of the potential of the domestic consumer market. Uneven distribution of economic growth affects social stability, which, in turn, provokes conflicts in the country. According to one of the latest IMF studies (2024), conflicts in the country negatively affect human capital, as there is a "drain" of skilled personnel, a reduction in investment, an outflow of capital, and all this affects the reduction of economic growth. Uneven access to social capital can lead to the marginalization of certain groups of the population. People who do not have strong social ties or do not share common norms and values with the majority can be marginalized, which also affects social stability. In its report, the UN (2024) points to the growing level of marginalization, which hinders the sustainable development of many developing countries and is a limiting factor for foreign direct investment.

According to the World Bank (2024), reforms to support spatial transformation and regional development are needed to mitigate the impacts of marginalization and displacement. It is necessary to support the relocation of people so that they can access employment opportunities, education, health services and affordable housing. Investments in industry are needed to expand employment, which in the long term will reduce social tensions by increasing employment and their real income.

6. Cross-Country Review

Social capital, which is a set of social resources, acquires its own unique characteristics in each country, forming specific contexts that have a significant impact on economic development and the socio-cultural aspects of society. The analysis of social capital in the context of different societies highlights its influence on the formation of economic structures and development dynamics. Following the results of an analysis conducted in 2020 by the Office for National Statistics of the UK based on an opinion survey using the Principal Component Analysis (PCA) technique, researchers identified five main types of relationships in society that have the greatest

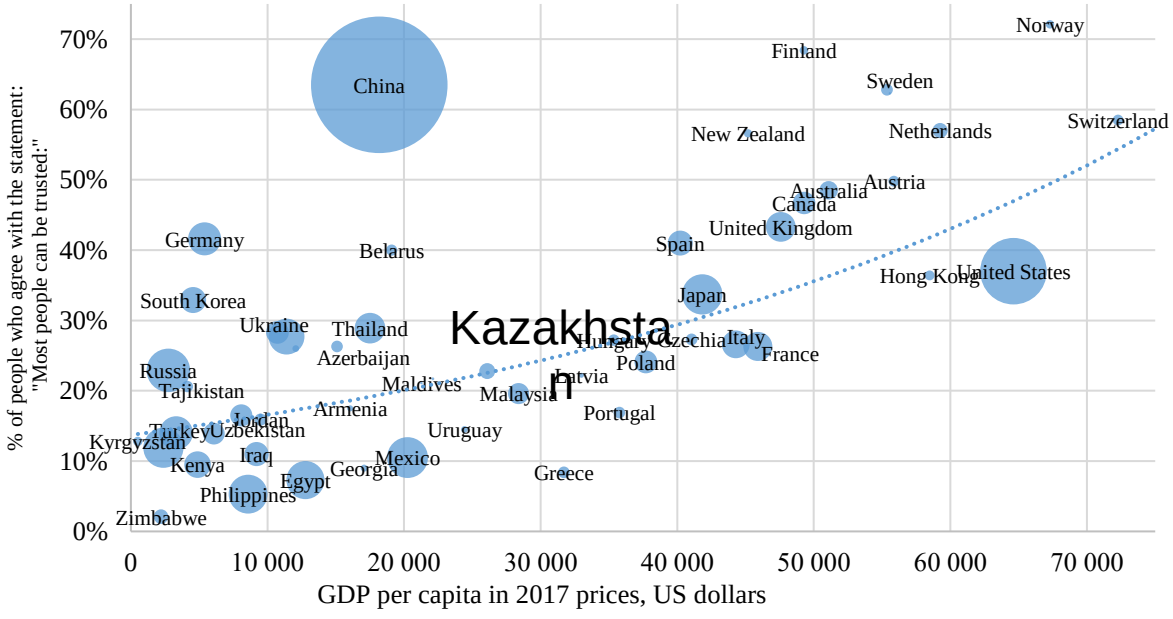
weight and are more characteristic of social capital in the UK: (1) relationships between neighbours, (2) social participation (such as volunteering and group membership), (3) political participation, (4) giving and receiving care, and (5) social relationships. In the United States, the same method has shown the following characteristic components of social capital: (1) family unity, (2) family interaction, (3) social support, (4) community health, (5) institutional health, (6) collective efficacy, and (7) philanthropic health. The Bennett Institute for Public Policy at the University of Cambridge also conducted a study on measuring social capital in Europe. In this study, the emphasis was not on identifying characteristic types of social ties, but on the group affiliation of respondents who were generally more likely to trust, depending on age and income level. Also, using the PCA technique, it was found that, in general, young people aged 15 to 30, as well as people with a high income level, are more likely to trust.

Such studies can be used by sociologists to better understand the cultural and social norms of certain countries. For example, the results of the above study showed that in the United States, the largest share of social capital is formed by relationships between immediate family members. As a result, this can affect the development of related industries in the economy. For example, in some places, individual insurance may be the general norm, while in others, family insurance will be more popular. In the context of a cross-country analysis of the level of trust, it can be noted that this indicator is subject to changes in society depending on cultural characteristics. Nevertheless, there is a general pattern of proportional relationship between the level of social capital and the development of the country. Conclusions drawn from the results of the study in Europe confirm that people with higher income tend to trust more. These findings are based on individual data. They are also consistent with statistics in country terms, according to which developed countries with higher income levels generally have higher indicators of social capital, such as the general level of trust among the population, human development and human capital. There are signs of a correlation between the level of trust and GDP: the more developed the country, the higher the level of trust in it.

The level of trust in countries reveals different dynamics between developed and developing countries. For example, more than 70% of respondents in Norway (with a GDP per capita of more than US$67,000) believe that most people can be trusted. The same picture is observed in Sweden, Switzerland, Finland and the Netherlands. While, for example, in Zimbabwe with a GDP per capita of US$2,000, only 2% of respondents think so.

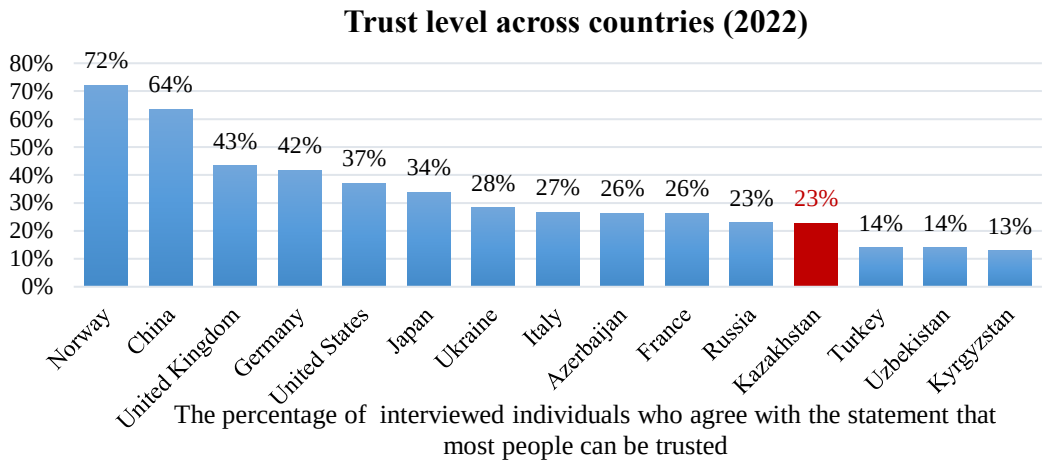
Figure 1

The relationship between the trust level and GDP in countries (2022)



Note: The circle size corresponds to the population in the country.
Source: [Interpersonal trust vs. GDP per capita (ourworldindata.org)]

Figure 2



Source: Interpersonal trust vs. GDP per capita (ourworldindata.org)

China stands out in Figure 1, with trust levels above 60% (Figure 2), which may indicate high social capital that supports trusting relationships between people, despite a comparatively lower GDP per capita than the Scandinavian countries above. However, China has strong GDP growth, and the Chinese government recognizes the importance of social capital and a cohesive society, is committed to addressing inequality, and acknowledges the need to take action to properly manage disruptions and risks, such as those associated with new digital technologies and the transition to low-carbon technologies. Harnessing the potential for innovation and investment requires a focus on social harmony, increasing opportunities for all, reducing inequality, and promoting social cohesion. The Chinese authorities recognize that the degradation of the social environment threatens health and social stability, while in many countries the sharp increase in wealth and income shares of the rich threatens social cohesion, and many are seeing a decline in trust in social and political institutions. In the UK, trust levels are slightly lower, which may be due to a more pronounced culture of individualism that affects relationships.

Despite the perception of Japan as a collectivist society and the United States as an individualist one, both societies have historically been noted for their high levels of trust. The United States has a rich tradition of voluntary associations, including private schools, hospitals, literary clubs, and businesses. This is a key element of American democracy, as it promotes social cooperation and public spirit. Historically, these societies have developed into large professionally managed organizations, in which owners were separated from management, which helped to moderate individualism in the political system. The contrast between Japan and China is reflected in the social capital that is evident in the different structures of their societies and economies. Chinese societies, including Hong Kong, Taiwan, and the market sector of the People's Republic of China, are characterized by small scale and a limited number of large, professionally managed corporations, unlike Japan. This is due to the central role of family in the Chinese culture, where family relationships take precedence over all other social obligations. This cultural feature makes it difficult to institutionalize a business after the departure of the family founders. In Japan, families are less influential and businesses are less dependent on kinship ties. Thus, social capital, linked to trust and social connections, plays a key role in shaping the structure of the economy and influences the long-term development of businesses in these societies. In Italy, where there are relatively few large private corporations, there is a dominance of small family businesses that create their own unique social capital, for example in regions such as la terza Italia.

France has proven to be less family-oriented, which has affected its private sector, lagging behind its German and American counterparts. Such differences in social structures affect the formation of social capital, including trust and cooperation, which has a direct impact on economic development.

The level of trust in Kazakhstan is below average: according to various sources, from 23% to 42% of respondents are ready to trust each other. These values are similar to indicators in

countries such as Russia, Latvia and Poland. Respondents are cautious and distrustful, which may be due to various factors, such as historical events, economic instability or other socio-cultural characteristics. For example, high levels of corruption or limited social support can undermine trust.

In Kyrgyzstan, Uzbekistan and Turkiye, where the level of distrust reaches 86%, the reasons may be related to political instability, economic difficulties or social conflicts.

People avoid investing due to fear of fraud or distrust of financial institutions in their country. They may prefer to keep their money in real estate or other assets rather than trust the banking system.

Societies where strong social capital is lacking have limited associational activity and weak social influence, which negatively affects the formation of business structures and social support.

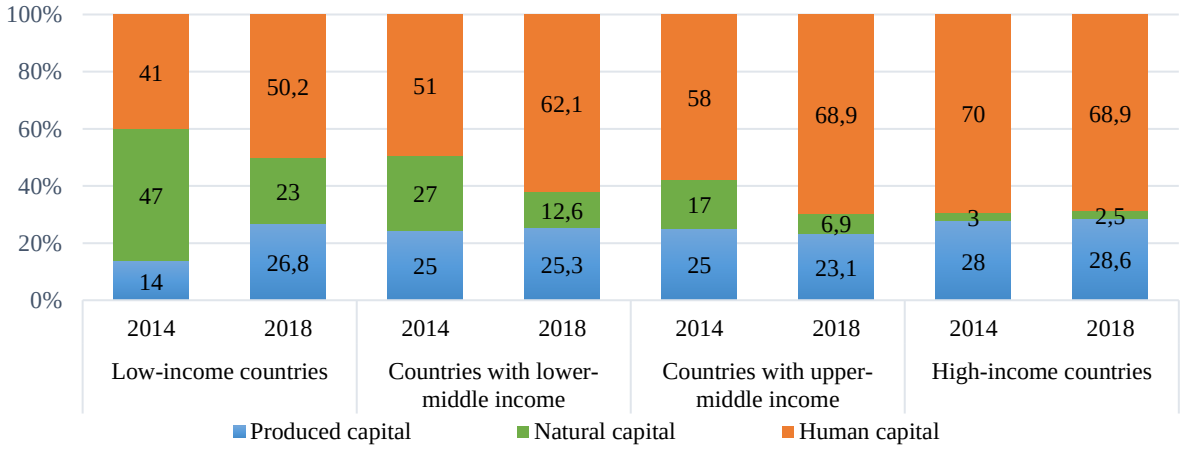
In conditions of limited social capital and low levels of trust in society, two scenarios for the formation of large-scale economic organizations are possible. The first case uses active government intervention in economic development, often implemented through the presence of state-owned enterprises. An example of this approach is Taiwan, where the public sector has historically accounted for a large share of GDP, significantly influencing the development of industries that require large-scale production, such as petrochemicals, aerospace, and defense. Other examples are Italy and France, where the government actively intervenes to support large private companies.

In the second scenario, large organizations can emerge through foreign direct investment or joint ventures with large foreign partners. This approach is widely used in Southeast Asian countries such as Singapore, Malaysia and Thailand, where the list of largest companies includes local subsidiaries of large transnational corporations. It is also common in Latin America and in some regions of the former socialist bloc. Such strategies for shaping economic structures in societies with limited social capital demonstrate the role of the government and international capital in supporting large enterprises, replacing private structures based on trust and social connections.

The main problem of developing countries in creating a favorable institutional environment for sustainable economic development is the low quality of human and social capital. As the World Bank (2021) data in Figure 3 shows, in high-income countries, human capital plays a key role in economic development (69%). In low-income countries, the share of human capital has also increased in recent years (from 41% in 2014 to 50% in 2018). However, non-renewable natural capital in such countries still accounts for a large share compared to other countries (in 2018, 23% in poor countries and 2.5% in rich countries). A high share of natural capital in a country's total capital translates into a higher dependence on this type of wealth. In such countries, there is a high risk that the value of a depleting non-renewable asset will be disposed of rather than compensated for through investment and accumulation of assets such as human or manufactured capital.

Figure 3

The structure of national wealth of nations worldwide in 2018



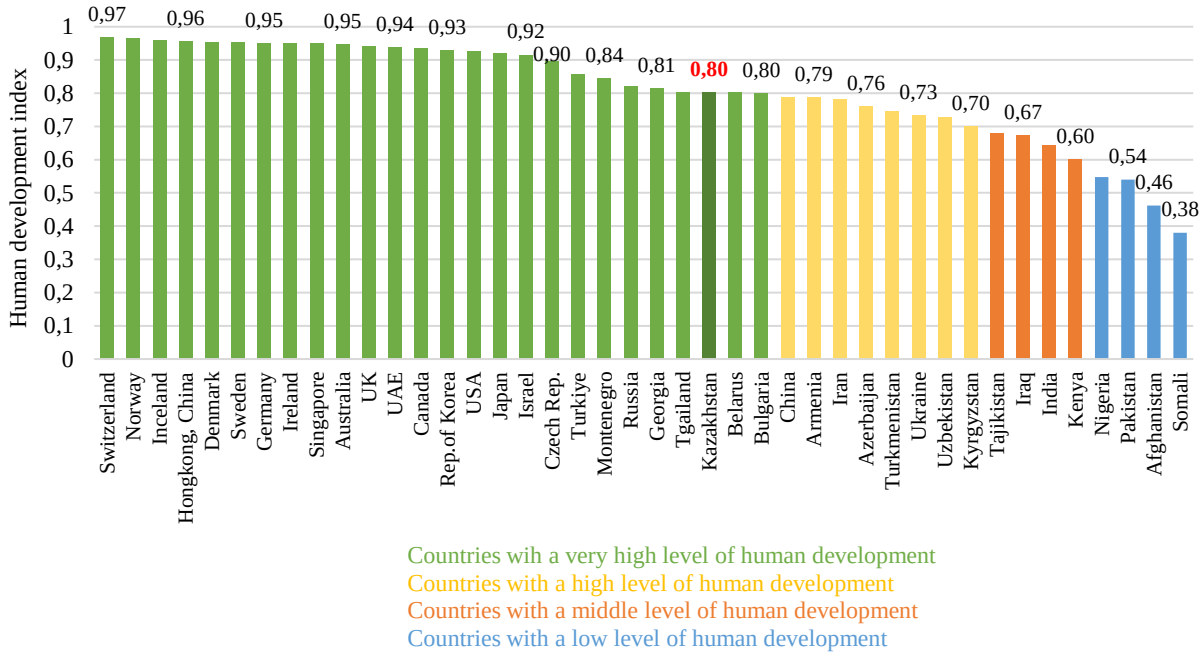
Source: World Bank "The changing wealth of nations 2018", "The changing wealth of nations 2021".

As mentioned in the UN report (2024), the gap in human development between rich and poor countries has been widening in recent years. Developed countries are achieving record levels of human development, while in half of the poorest countries this indicator is falling. This inequality is exacerbated by the significant concentration of economic activity. According to the data provided, about 40% of global trade is concentrated in no more than three countries; in 2021, the market capitalization of each of the world's three largest technology companies exceeded the GDP for the same year in more than 90% of countries.

To assess human development, the UN annually calculates and analyzes the Human Development Index (HDI) – an estimated indicator of cross-country comparison and measurement of the standard of living, literacy, education and longevity as the main characteristics of the human potential of the territory under study. This is a combined index measuring the average value of achievements in three main dimensions of human development: health and longevity, knowledge, standard of living. In 2022, Kazakhstan ranked 67th (out of 193 countries) in terms of HDI (0.8) and entered the category of countries with a very high level of human development (Figure 4).

Figure 4

Country rating based on the human development index, 2022



Source: United Nations Development Programme (UNDP), (2024). Human Development Report 2023-24.

7. Social Capital in Kazakhstan

In Kazakhstan, due to the inherent mentality of the population, social capital has historically played a critical role in the development of statehood. Today, according to research by the World Bank and other international organizations, trust between citizens of Kazakhstan and government agencies remains at a moderate level.

In 2022, the Almaty Management University AlmaU conducted a study on the level of public trust in Kazakhstan, in which 1,150 people participated. The results of the study showed trust levels higher than the World Bank data – 42%. According to the study, Kazakhstanis trust the country's president and the armed forces the most – the trust index is 68% and 60%, respectively. And only 45% of citizens trust local governments.

An important component of social capital is participation of people in public processes. In Kazakhstan, there is a relatively low level of involvement in public organizations: only about 10% of Kazakhstanis actively participate in volunteer activities or are members of non-government organizations.

However, in recent years, Kazakhstan has seen an increase in civic engagement, especially among young people. According to a report by the United Nations Development Programme in Kazakhstan, since 2018, the number of citizens participating in volunteer projects has increased by 15%, which is an evidence of a gradual strengthening of civil society. With the development of digital technologies in Kazakhstan, the role of social networks and Internet platforms in the formation of social capital has increased significantly. According to the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan, as of 2023, about 80% of Kazakhstanis use social networks for communication and information. This helps strengthen horizontal connections, especially among young people. However, the impact of social networks on trust and civic engagement remains ambivalent.

The level of social capital varies by region. For example, in large cities (Astana, Almaty, Shymkent) there is a higher level of civic activity and mutual trust than in rural areas. According to research, residents of large cities are 1.5 times more likely to participate in public initiatives and have higher network connections than residents of rural areas.

Human capital has impact on the strengthening of social capital. According to international statistics, Kazakhstan is included in the list of countries with a very high level of human development. In terms of trust, the country shows average figures. However, today the country is experiencing a number of problems and challenges that prevent it from developing and revealing the full potential of social capital. To a greater extent, problematic issues concern human capital, on which the level of social capital depends. Despite economic growth, there are problems with its sustainability. According to the Equitable Human Capital Development Framework Report for Kazakhstan prepared by the World Bank in 2021, there is a downward tendency in Kazakhstan for the contribution of human capital to the economy of Kazakhstan, which limits the country's ability to produce products with high added value. This is happening due to a decrease in the growth rate of labor productivity, inequality in regions, as well as disappointing health indicators of the population. This negatively affects the country's economic growth – the economy of Kazakhstan lags in some key indicators of innovative development and competitiveness, and the level of development of professional skills in the country is lower than in the countries of the Organization for Economic Cooperation and Development (OECD). The contribution of human capital to national welfare, which in Kazakhstan is 42%, is close to the average level of low-income countries – 40%. For comparison: countries with similar resource-based economies have successfully transitioned to a model where human capital makes up the majority of overall welfare – about 60-70%.

Another problem that prevents social capital from fully developing and contributing to the country's economy is the low level of inclusion of the country. Thus, the World Bank's Kazakhstan Economic Update (2024) "Shaping Tomorrow: Reforms for Lasting Prosperity" notes the inequality in the distribution of wealth in Kazakhstan, which creates social tensions, reduces solidarity and hinders the social cohesion of the country. Social tensions contribute to the outflow of population and have a negative impact on the development of the country. Thus, social capital in Kazakhstan continues to develop, but its level remains relatively moderate. In the context of current economic and social challenges, social capital plays a key role in ensuring the sustainable development of the country. Important factors for increasing the contribution of social capital to the economy are the strengthening horizontal ties between citizens, increasing trust in government and social institutions, as well as strengthening human capital by increasing the inclusion of the economy and increasing the level of education and healthcare.

8. Conclusion

Social capital is a factor influencing the efficiency of the economy in the context of global economic instability, and is becoming a key element in the system of innovative economic processes and relations, contributing to systematic and sustainable economic development, as well as the growth of competitiveness of firms and the country's GDP. Long-term and sustainable economic growth that meets social and environmental priorities is becoming an important task and

is an indicator of success of the modern government policy. Social capital is not a homogeneous indicator, it consists of various interconnected elements and, in general, represents a set of relations in society. These include network connections, which can be formal (membership in clubs, professional associations) and informal (friendship, neighborly relations); norms and values – general rules and principles of behavior that are shared by community members; social trust – confidence that other people will act honestly and in our interests; information resources – access to knowledge and information that can be useful for solving problems; social activity – participation in community life, volunteering, civic activity. At the same time, one of the most important components of social capital is trusting relationships between people.

Social capital is difficult to measure and even more difficult to assess its contribution to the economy. However, some indicators that make up social capital can be assessed using opinion surveys. In the academic literature, some works focus on assessing the impact of point indicators of human capital, which includes social capital. Most works prove the influence of social capital on the economy. At the same time, it is social and human capital that contribute to sustainable development and the quality of economic growth in the long term. Social capital is a valuable resource, and insufficient development of some of its components leads to certain challenges and problems in the economy. For example, a high level of social tension slows down production and, as a result, depresses the sustainability of the economy in the long term.

The relationship between social capital and the economy can be traced across countries. Thus, in developed and rich countries, social capital is significantly higher than in low-income countries. In general, social and human capital accounts for a significant share (70%) of the total capital in developed and rich countries. While developing countries and low-income countries still depend on natural capital. This can be explained by the fact that a society that is freer from corruption, with a strong judicial and legal system, where citizens are confident in the protection of their rights, are more likely to trust each other and build formal and informal social ties. In such a society, there is a prevailing confidence that other people will act honestly, in each other's interests, in accordance with ethical and cultural values. In such a society, there are more opportunities to introduce new forms of organizations with a minimum of bureaucratic processes that replace trust, thereby minimizing transaction costs and promoting progress. According to international statistics, Kazakhstan is included in the list of countries with a fairly high level of human development. But in terms of trust, the country has a value below average. Today, the country is experiencing a number of challenges related to the development of social capital.

Development of specific tangible indicators of human capital will lead to the natural development of abstract and intangible social capital and an increase in the quality of life in the country as a whole.

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Testing Banknote Substrates for Soiling Resistance

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In order to implement the task of designing banknotes for cash circulation, central banks are actively engaged in extending the service life of banknotes and optimizing the costs of their issuance. The introduction of automated banknote processing systems allows obtaining data for analysis and detailed study of the factors causing banknote deterioration. The subject of this study is the banknote of the lowest denomination – 500 tenge, which has the shortest service life. As part of the study, four laboratory tests were performed on the soiling resistance of eight banknote substrates. The results obtained can be used to increase the life cycle of banknotes due to increased soiling resistance and the selection of the optimal substrate for banknotes of the lowest denomination.

Key Words: banknotes, banknote substrate, durability, soiling resistance, testing techniques, simulation of cash circulation, life cycle.

JEL-Classification: C91, C92, A19, C83.

1. Preamble

Automation of the banknote processing by high-speed systems equipped with the necessary sensors for sorting banknotes into good and worn-out ones allows obtaining initial data to analyze the factors that reduce the life cycle of banknotes. Thanks to the introduction of an automated complex for banknote sorting by high-speed machines, the National Bank of Kazakhstan received technical capabilities for analyzing the causes of deterioration of national currency banknotes of the entire denomination series from 500 to 20,000 tenge. According to the data obtained on the banknote of the lowest denomination of 500 tenge (Annex 1), 93% of worn-out banknotes of this denomination are classified as worn-out due to their soiling, and only 3% due to mechanical wear or damage. The estimated current service life of a 500 tenge banknote is 14-16 months. Considering that banknotes of the lowest denomination have the shortest life cycle compared to other denominations, the subject of the first such study was a banknote of 500 tenge. The main cause of banknote soling is the contact with human fingers. Therefore, when choosing the optimal substrate for heavily used banknotes, the main focus should be on their soiling resistance, which will extend their service life and reduce their replacement costs. In response to the challenges of cash circulation, banknote paper manufacturers are actively introducing new technologies to improve the quality and durability of substrates. However, an effective assessment of these innovations requires an analysis of the results of banknote circulation in the economy or laboratory tests.

For our study, we chose the methodology of simulating the soiling of banknote substrates. We tested and assessed the soiling resistance of banknote materials, including approaches developed by various researchers and companies in the field of banknote production. The goal of our study is to develop and test a laboratory testing technique that allows determining the most soil-resistant banknote substrates.

2. Review of Literature and International Experience

Improving the durability of banknotes is an ongoing research topic for central banks (Marincovic et al., 2011; Meuer and Martin, 2011). According to a study by Crane Currency, the average lifespan of paper banknotes is 20 months, of varnished banknotes – 24 months, and of polymer banknotes – 48 months (Crane Currency, 2023). The researchers point out that the main factors affecting the lifespan of paper banknotes are soiling (80%) and mechanical wear (20%). The key point is the selection of a suitable substrate, which is essential for effective money management. According to IEEE Access (2019), the main source of banknote soiling is human sebum and sweat secreted from pores, which are transmitted to the banknotes through finger contact. Over time, sebum oxidizes, giving the banknotes a yellow color, and this type of soiling spreads over the entire surface of the banknote. The subject of this study is the banknote of the lowest denomination – 500 tenge. The estimated service life of a 500 tenge banknote is 14-16 months, and 93% of banknotes of this denomination become worn out because of soiling (NBK, 2023). Thus, when choosing the optimal substrate for a 500 tenge banknote, the main focus should be on the soiling resistance of banknotes. The purpose of this study is to conduct a comparative analysis of the soiling resistance of banknote substrates.

The selection of worn out banknotes can be carried out in two ways: by examining samples of banknotes that have been in actual circulation (Kyrychok et al., 2014) or by simulating circulation (Bartz and Crane, 2006). Artificial tests for soiling are widely used in the banknote production planning (Kyrychok et al., 2014). Simulated circulation uses circulation simulators that reproduce the mechanical and chemical effects on banknotes with a certain degree of reliability. This method was used to improve the durability of the Swedish 20 krona banknote (Bartz and Crane, 2006). Simulated circulation using a mixture of contaminants produced worn out banknotes with significantly reduced characteristics (breathability, double folds, stiffness, change in brightness). Another way to simulate circulation is to involve personnel in contact with the banknotes being tested at regular intervals (Meuer and Martin, 2011). People may be considered the most significant influencer on banknotes (Geusebroek et al., 2011). However, in real circulation, banknotes come into contact with many more people than the bank employees participating in the study (Meuer and Martin, 2011).

Investigation of banknote quality changes in real circulation can provide reliable results for forming opinions on banknote durability, banknote quality and correlation between banknote treatment in circulation simulators and the real state of banknotes when used during the relevant period (Kyrychok et al., 2014). However, given that the circulation period of a banknote in real circulation can be quite long, testing banknotes in real conditions is not a common practice, as it requires significant resources and time to collect and analyze a large amount of interrelated data and is a costly undertaking (SICPA, 2021). Simulated circulation is a more preferable method for testing and comparing the soiling resistance of the studied substrates.

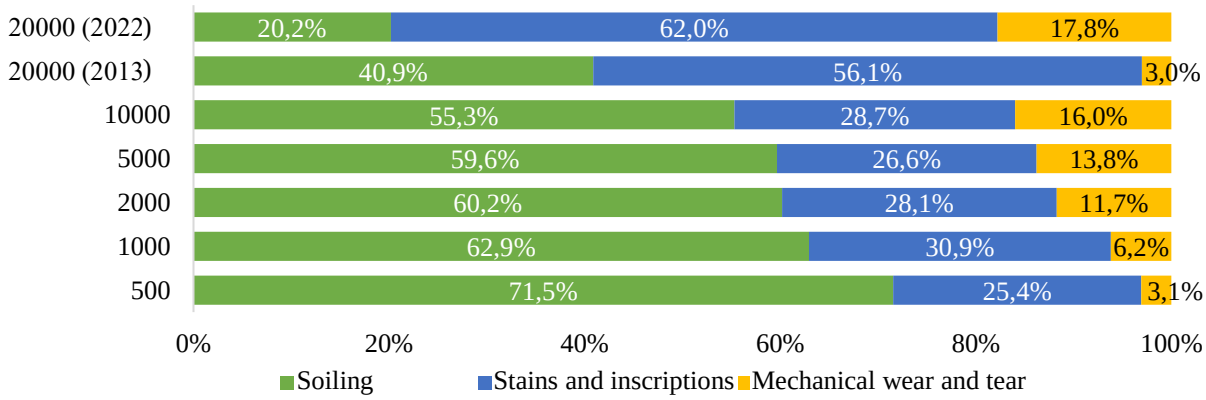
3. Key Factors Causing Deterioration of Banknotes

With the introduction of a high-speed banknote processing system in 2023, the National Bank of Kazakhstan gained the ability to perform a detailed analysis and study of banknote wear and tear, as well as identify the causes of their deterioration. An analysis was performed of the causes of wear and tear of banknotes of six denominations: 500, 1,000, 2,000, 5,000, 10,000 and 20,000 tenge. Figure 1 presents the results of the analysis for the first quarter of 2024, which classifies the causes of banknote deterioration into three main categories: soling, stains and inscriptions, and mechanical wear. It should be noted that one banknote can be classified by the sorting system as deteriorated for several reasons at the same time. Based on the banknote sorting data, we notice that for transactional banknotes, the main factor of deterioration is soiling. However, the cause of deterioration of 20,000 tenge banknotes of the 2013 sample differs significantly from other denominations. The main factor in this case is stains and inscriptions (56.1%). This is probably stemming from the fact that banknotes of higher denominations are more often used for accumulation, which helps to maintain their good condition, while extraneous

inscriptions can be applied to banknotes when counting savings by the population. The next significant factor of deterioration for banknotes of 20,000 tenge of the 2013 sample is soiling (40.9%), while mechanical wear is only 3.0%. For banknotes of 20,000 tenge of the 2022 sample, the main factor of deterioration remains stains and inscriptions (62%), followed by soiling (20.2%) and mechanical wear (17.8%). It is especially worth mentioning the high rate of mechanical wear in the form of glued tears, which is 6%. This is explained by the small number of worn out banknotes of 20,000 tenge denomination of the 2022 sample in circulation, so any factor can have a significant impact on the change in the share of reasons for banknote deterioration.

Figure 1

The reason for banknotes becoming unfit, as percentage



4. Methodology for Testing the Banknote Substrate

The methodology of this test is based on the simulation technique for cash circulation developed by Crane Currency in 2006. The composition of the soling mixture and its proportions were also determined based on Crane Currency experiments. Rubber balls were used due to the need to provide additional friction and more uniform soiling of the banknotes; this is based on the lifetime test of the banknotes conducted by Landqart in 2015. The purpose of the designed testing technique is to assess the resistance of banknote substrates to contamination. To achieve this goal, a specialized set of procedures is used, including a soiling method with a mixture of oils and clay in a centrifuge and the mechanical action of money counting machines (MCM) on the banknote substrate. The sample size is two copies of each tested substrate (a total of eight substrates, 16 tested copies).

Substrates shown in Table 1 were used for soiling test.

Table 1

Characteristics of substrates used in testing, with a breakdown by the substrate type

cotton paper	cotton reinforced paper	cotton paper with varnish	cotton reinforced paper with varnish
A1	A2	A3	A4
B1	B2	-	-
C1	C2	-	-

The methodology of the analysis involves measuring the lightness of the paper substrate before and after testing using a spectrophotometer. Changes in lightness are expressed as a percentage, which allows for a detailed comparative analysis. Measurements are taken on the front side of the substrate at four points and on the back side at one point (Annex 2). The front side of the substrate is the side with the test number, and the back side is without numbers. The average lightness of the substrate is calculated based on three measurements of five points of each substrate, which ensures statistical significance and reliability of the results.

The average lightness value of each point of the substrate is calculated using the formula:

$$\%\Delta L^* = (L^*0 - L^*)/L^*0 \cdot 100\% = (\Delta L^*/ L^*0) \cdot 100\%,$$

where L^*_0 – lightness index of white area of reference substrates;

L^* – lightness index of stained substrates;

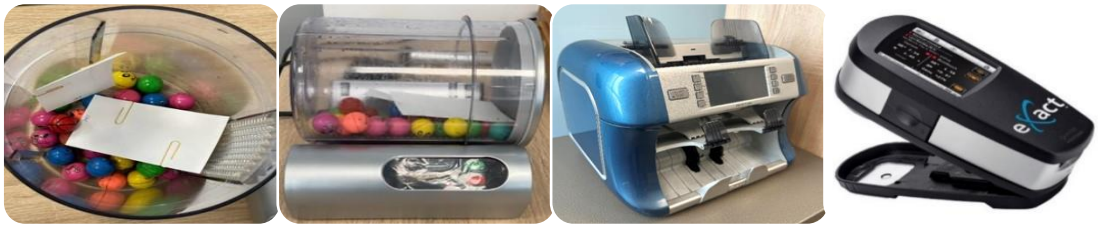
ΔL^* – absolute change of the lightness index;

$\%\Delta L^*$ – a relative (percentage) change of lightness index.

The testing was carried out using specialized equipment and materials (Figure 2): a centrifuge with set characteristics (one cycle is 81 revolutions), rubber balls with a diameter of 25 mm (32 pieces), a soiling mixture consisting of olive oil, vegetable oil, ethanol, clay and water (Crane Currency, 2006), banknote substrates (16 pieces), SDM and a spectrophotometer. Substrate preparation includes numbering of banknote substrates and measurement of initial lightness values.

Figure 2

Equipment and materials used



a) centrifugl machine b) banknote counter (BC) c) spectrophotometer

Testing procedures include the following stages:

1) measurement of initial substrate lightness values using a spectrophotometer;

2) placing rubber balls in a centrifuge and adding the soiling mixture, then running the centrifuge for one cycle to distribute the mixture evenly;

3) placing the substrates (two copies each) in a centrifuge and evenly distributing the rubber balls over the tested substrates;

4) starting the centrifuge for one cycle;

5) measuring the lightness of the substrate and recording the results in a table;

6) calculation of the average value of the measurement results using the above formula;

7) conducting one cycle of the impact of the mechanical tract of the BC on the substrate (20 times the recalculation of the tested substrate) with measurement and recording of the results after each cycle;

8) repeat testing in the amount of five cycles in a centrifuge (sub-paragraphs 2-5) and in the amount of five cycles of recalculation on the BC (subparagraph 7).

Analysis of Results

To compare the soiling resistance of banknote substrates, four types of tests were conducted on eight test substrates. These tests simulated soiling under conditions close to real cash circulation scenarios. Three tests were made with different soiling mixtures and one additional test to determine the number of cycles after which the substrates become deteriorated in terms of soiling.

Table 2

Four types of testing of banknote substrates for soiling resistance

	Test No.1	Test No.2	Nest No.3	Test No.4
Proportions of soiling mixture	0.4 g olive oil, 0.4 g vegetable oil, 0.4 g ethanol, 0.3 g clay, water – 0,15 ml	0.2 g olive oil, 0.2 g vegetable oil, 0.2 g ethanol, 0.15 g clay, water – 0.15 ml	0.3 g olive oil, 0.3 g vegetable oil, 0.3 g ethanol, 0.2 g clay, water – 0.15 ml	0.3 g olive oil, 0.3 g vegetable oil, 0.3 g ethanol, 0.2 g clay, water – 0.15 ml
Testing method	Total of 5 cycles in the centrifugal machine	Total of 5 cycles in the centrifugal machine and 5 cycles on the banknote counter	Total of 5 cycles in the centrifugal machine and 5 cycles on the banknote counter	The use of centrifugal machine and the banknote counter until their unfit state (less than 92%)
The substrates used	A1, A2, A3, A4, B1, B2	A2, A3, A4	A1, A2, A3, A4, B1, B2, C1, C2	A2, A4, B2, C2

Test No. 1. The obtained data showed that the level of soiling of the four banknote substrates corresponded to the state of worn-out banknotes after the first spin cycle in the centrifuge, with the exception of substrates A4 and A2. A4 demonstrated the best result: after 5 spin cycles in the centrifuge, it remained in the state of a suitable banknote, while maintaining 93.9% of the lightness of the reference. This corresponds to the maximum permissible deviations in the lightness of banknotes not exceeding 8%[1]. Detailed test results are presented in Table 3. Figure 3 clearly demonstrates the dynamics of lightness change for the A4 substrate: after the first rotation cycle, the substrate surface became soiled by 7.2% (lightness – 92.8%). After the second rotation cycle, the substrate became cleaner, and the lightness increased to 93.7%. After the third cycle, the substrate lightness reached 94.7%. After the fourth and fifth cycles, the substrate lightness stabilized at 93.9%, which corresponds to the state of a suitable banknote. Substrate A2 also showed a good result after the first cycle in the centrifuge. However, after the second rotation cycle, it became decrepit, which indicates its lower resistance to soiling compared to A4.

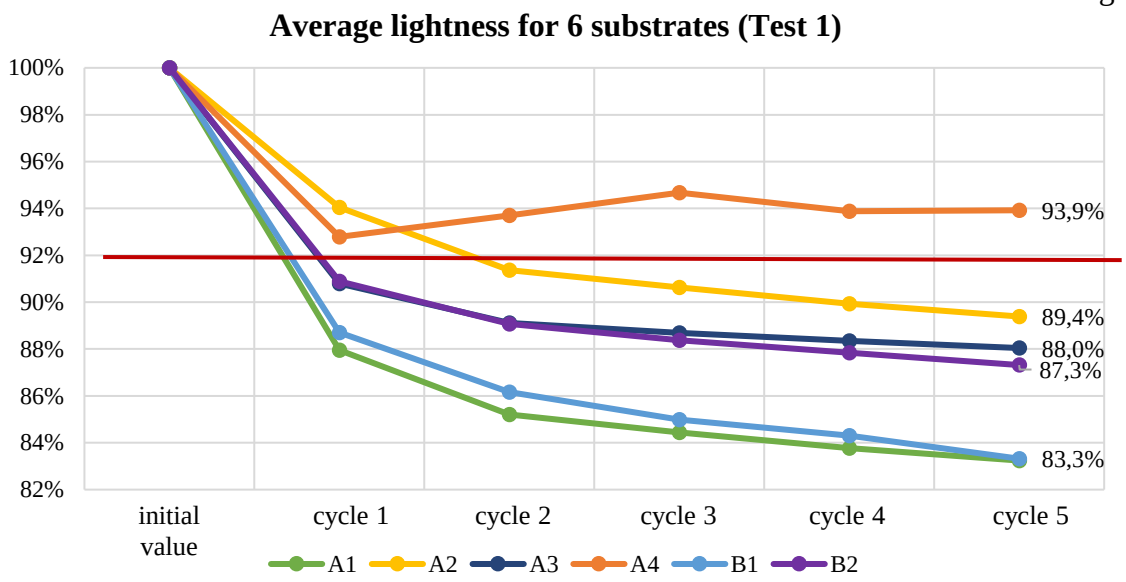
Table 3

Results of Test 1

Average result	Substrate codes	Substrate characteristics by type
93.9%	A4	1. reinforced paper with varnish
89.4%	A2	2. reinforced paper without varnish
88.0%	A3	3. cotton paper with varnish
87.3%	B2	4. cotton reinforced paper
83.3%	B1	5. cotton paper
83.2%	A1	6. cotton paper

[1] Methodological recommendations for determining signs of deterioration of banknotes of the national currency of the Republic of Kazakhstan and testing of sorting and counting machines.

Figure 3



Test No. 2. To evaluate the soiling rate of the banknote substrates, the amount of the soiling mixture was halved. To study the effect of BC on the contamination pattern of the banknotes, after each spin cycle, the substrates were recalculated on the BC 20 times (a total of 5 spin cycles and 5 BC cycles). The experiment was conducted for three banknote substrates. However, after five spin cycles and five BC recalculation cycles, no significant differences in the brightness values were found between the three substrates. The lightness varied from 94.1% to 94.9%. Since none of the banknote substrates reached the deterioration level after five testing cycles, the test was terminated. The results are presented in Table 4.

Table 4

Results of Test 2

Average results	Substrate codes	Substrate characteristics by type
94.7%	A4	1. reinforced paper with varnish
94.4%	A2	2. reinforced paper with varnish
94.3%	A3	3. cotton paper with varnish

Test No. 3. Eight types of banknote substrates were used for test No.3. Given that the test banknote substrates C1 and C2 were received with a delay and in limited quantities, they were not included in the previous two tests. Figure 4 displays the average value of the change in lightness for each substrate throughout the entire test cycle. The graph shows that substrate A4 demonstrated the best result, maintaining stable characteristics until the end of the test. The effect of the varnish on the A4 substrate can be clearly observed after the first cycle of counting the banknote on the BC: the lightness changed from 95.7% to 97.2%, indicating that the varnish really has a repellent effect and dirt from the banknote settles on the mechanical path of the BC. A similar effect is observed for substrate C2, which showed an increase in lightness after one cycle on the BC (from 94.9% to 95.5%). The remaining six substrates showed a gradual decline in lightness. Substrates A2 and B2 also showed good results, remaining usable until the end of the test. The results of test No.3 showed that cotton banknote A1 became decrepit after the first spin cycle in the centrifuge. After the second centrifuge cycle, cotton paper with A3 varnish also became worn out, which is probably explained by the insufficient efficiency of the varnish in repelling dirt during the constant recounting of banknotes on the BC. After three centrifuge cycles, cotton paper B1 became worn out, after four centrifuge cycles, cotton paper C1 also became worn out. The results are presented in Table 5.

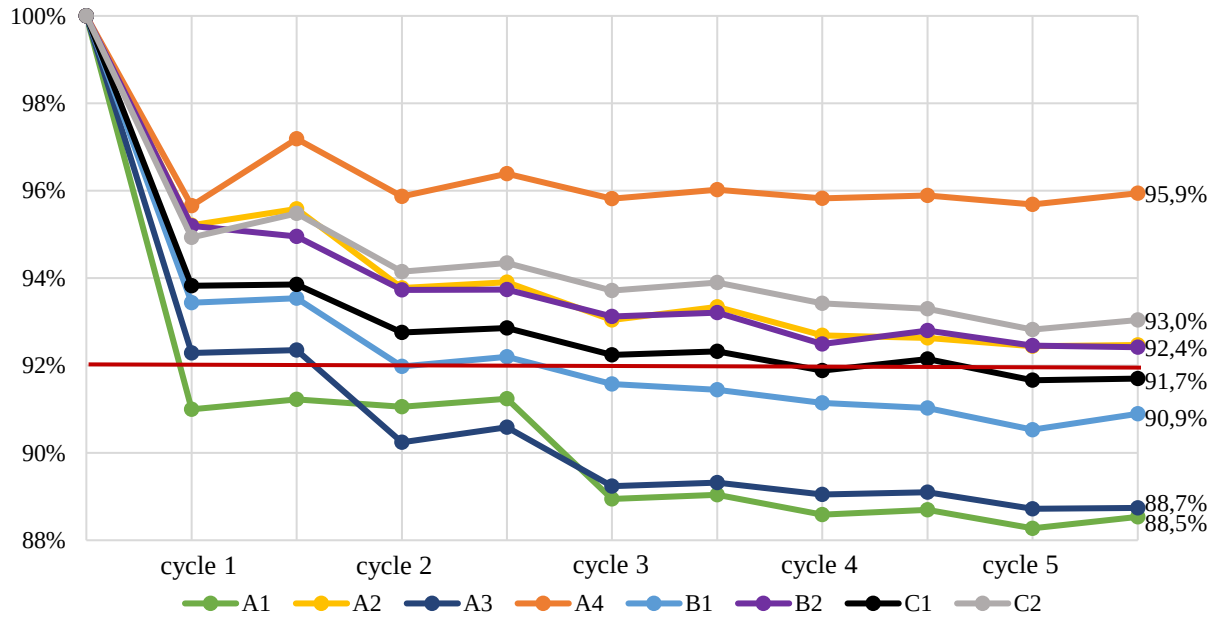
Table 5

Results of Test 3

Average results	Substrate codes	Substrate characteristics by type
95.9%	A4	1. cotton reinforced paper with varnish
93.0%	C2	2. cotton reinforced paper
92.5%	A2	3. cotton reinforced paper
92.4%	B2	4. cotton reinforced paper
91.7%	C1	5. cotton paper
90.9%	B1	6. cotton paper
88.7%	A3	7. cotton paper with varnish
88.5%	A1	8. cotton paper

Figure 4

Average lightness for 8 substrates (Test 3)



Test No. 4 (additional testing to test no. 3). To obtain more complete information on the life cycle of the banknote substrate resistant to soiling, additional testing was carried out using the method of test no. 3 with an increasing number of cycles until the results of the banknote deterioration are below 92% of the initial value. In the third test, five cycles of circulation testing were carried out, after which four of the eight banknote substrates were found to be deteriorated, and the remaining four remained suitable. Test No. 4 is a continuation of testing the substrates that remained suitable after Test No. 3 (A4, C2, A2, B2). The substrates were tested using the circulation simulation method, including the use of a centrifuge and the BC until the deterioration state was reached (less than 92% of the initial value), with the addition of a soiling mixture after every fifth cycle to simulate the ongoing soiling process (Table 6).

Table 6

Adding the mixture

Adding the mixture	Cycle
0.3 g olive oil, 0.3 g vegetable oil, 0.3 g ethanol, 0.2 g clay, water – 3 drops	after 5 cycles
	after 10 cycles
	after 15 cycles
	after 20 cycles

Figure 5 shows the average change in lightness for each substrate throughout the testing cycle. Substrate A4 showed the greatest soiling resistance, remaining suitable after 20 cycles of circulation testing and reaching deterioration in contamination only after the 21st cycle. While substrates C2, A2 and B2 showed limited resistance, becoming deteriorated after 7-8 cycles. The testing results are presented in Table 7.

Figure 5

Average lightness for 4 substrates

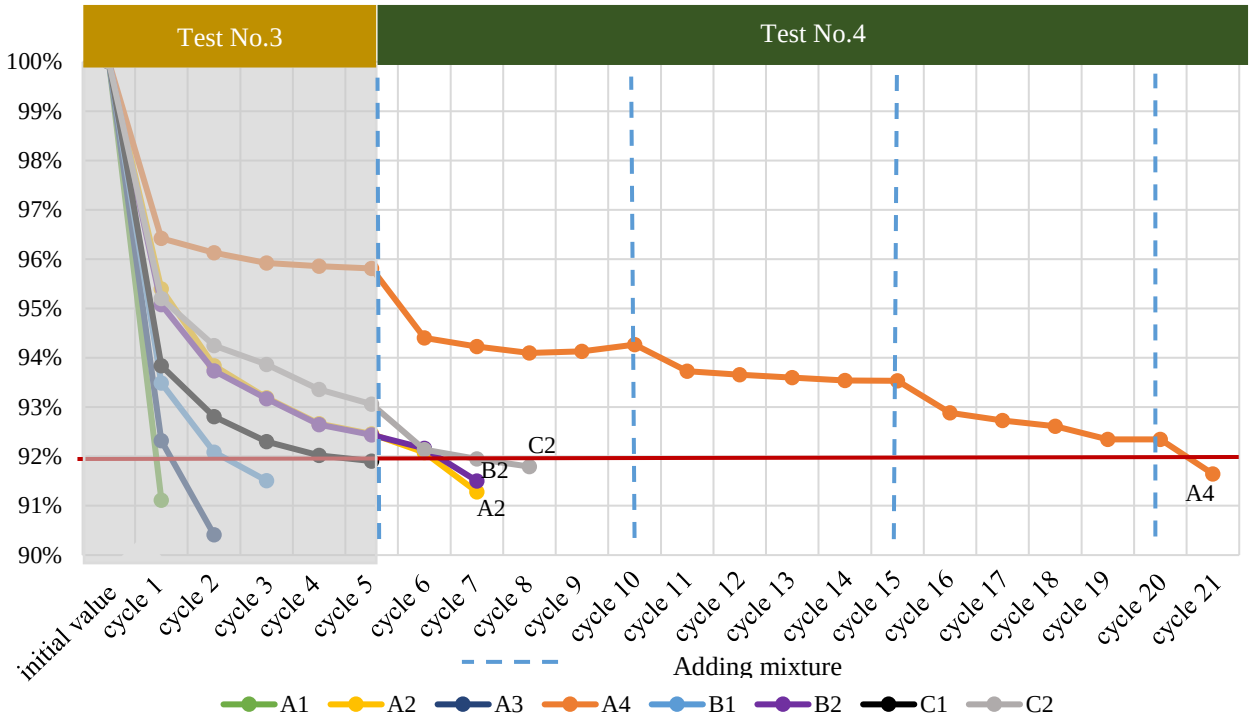


Table 7

Characteristics of substrates by type

Substrate codes	Duration until a banknote becomes worn out, the number of cycles	Characteristics of substrates by type
A4	21	1. cotton reinforced paper with varnish
C2	8	2. cotton reinforced paper
A2	7	3. cotton reinforced paper
B2	7	4. cotton reinforced paper

6. Findings and Suggestions for Future Studies

The study of banknote resistance to soiling and wear is an important task to ensure the durability of banknotes in circulation. According to the banknote sorting system, the main factor in the deterioration of 500 tenge banknotes is soiling. To extend the service life of such banknotes, four laboratory tests were conducted with eight substrates. The study is aimed at assessing the soiling resistance of materials using the circulation simulation method. This method involves the use of a centrifuge with the addition of a soiling mixture and taking into account the mechanical impact during recounting on the BC. The results of the study revealed that the A4 substrate showed the highest soiling resistance under conditions of cash circulation simulation. This material can be considered as preferable for the production of banknotes that require a long service life and are resistant to soiling. The effectiveness of the varnish on this substrate was confirmed by an increase in the lightness of the banknotes after each BC cycle, which indicates the ability of the varnish

coating to repel dirt. Other reinforced cotton substrates such as C2, A2, and B2 showed significantly lower resistance to soiling and became unfit after 7-8 cycles of the circulation test. According to the results of test No. 3, cotton paper B1, as well as cotton paper with and without varnish (A3, A1) became unfit after 2 cycles. This may be due to the fact that varnish on the regular cotton substrate is less effective in repelling dirt under intensive use.

This study confirms the properties of the banknote substrate reinforced against soiling as claimed by the manufacturers, as well as the effectiveness of combining such substrate with a surface varnish. The use of a substrate with enhanced protection against soiling and a varnish coating for low-denomination banknotes can increase their service life in terms of the soiling factor by 4 times, while a significant increase in the share of the "mechanical wear" factor is possible when banknotes deteriorate. It is also worth noting the potential limitations of this study of the soiling resistance of banknote substrates. First, the limited sample size (two copies of each substrate) may affect the representativeness of the results; increasing the sample size may lead to more statistically significant results. Second, although the simulation method effectively reproduces the results under controlled laboratory conditions, it may not fully reflect real banknote circulation scenarios, which must be taken into account when interpreting the results. For example, the use of a centrifuge and a BC to simulate soiling may not cover all aspects of real circulation. In addition, the limited testing time does not take into account the long-term impact of contaminants, which may affect the stability of the substrates and their behavior in real-world conditions.

The results of future research – tests on the mechanical properties of banknotes, such as resistance to physical wear, including mechanical friction, bending, tearing and washing cycles – will contribute to the development of more resistant and reliable banknotes that meet modern standards of security and durability.

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Annex 1

Reasons for deterioration of the 500 tenge banknote

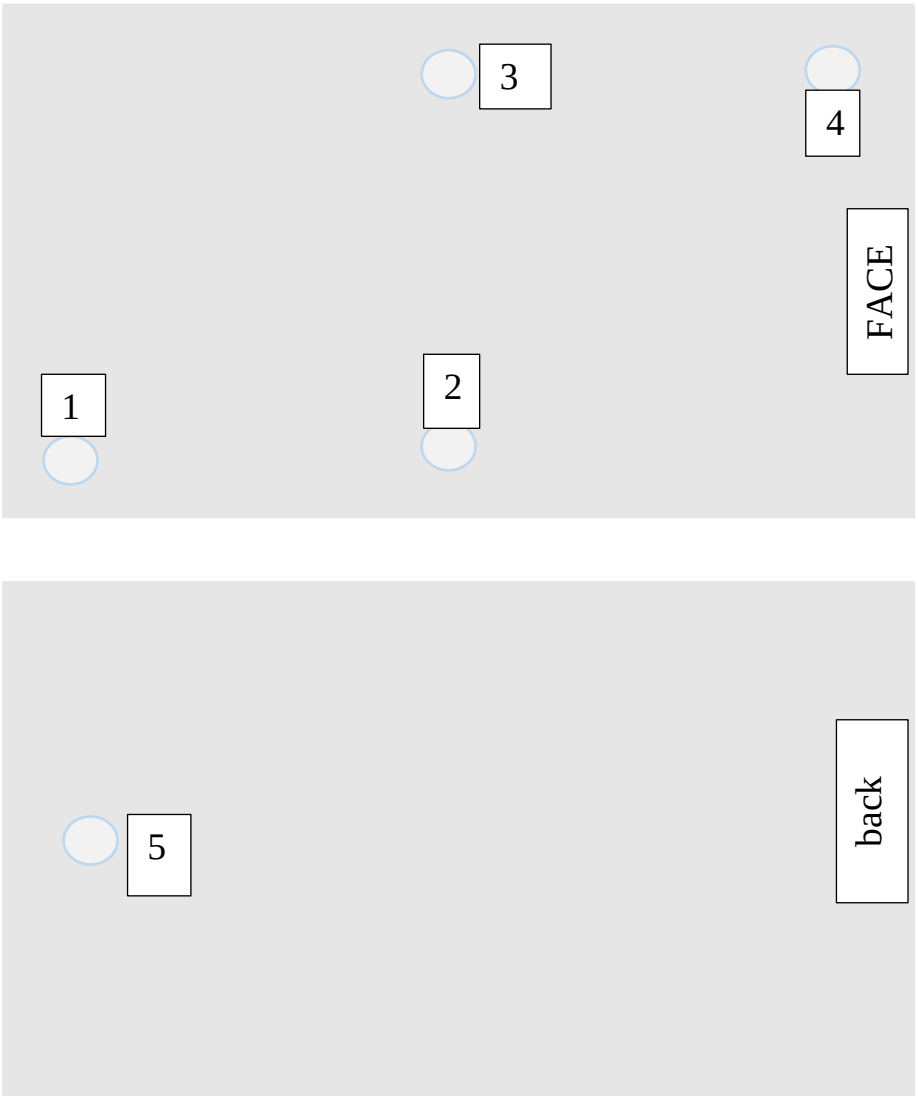
Currency: KZT Denomination: 500
Processed (without returning): 84,894

Quality: Unfit	reasons		%
	F_DISTape	78	0.09
	F_DISTear	1,127	1.33
	F_FLP_UVDull	304	0.36
	F_NSCHole	415	0.49
	F_NSCMisCorner	252	0.30
	F_NSC_Tear	365	0.43
	F_Soil_Center_Back	1,104	1.30
	F_Soil_Center_Front	6,312	7.44
	F_Soil_Dens_back	32,785	38.62
	F_Soil_Dens_front	24,593	28.97
	F_Soil_Mod_back	4,258	5.02
	F_Soil_Mod_front	10,033	11.82
	F_Stain_Border_Back	4,980	5.87
	F_Stain_Border_Front	568	0.67
	F_Stain_Print_Back	3,955	4.66
	F_Stain_Print_Front	7,795	9.18
	F_Stain_White_Back	12,820	15.10
	F_Stain_White_Front	8,395	9.89

Of the 84,894 worn-out 500 tenge banknotes identified, 93.2% had surface soiling, 34.2% had stains and inscriptions, 1.8% had tears, 1.2% had holes, a missing corner, and the presence of scotch tape. One banknote may have several signs of wear at the same time.

Annex 2

Points to measure areas of the substrate



Annex 3

Test results

Table 1

Test results No.1

	after cycle 1 (9 min)	after cycle 2 (18 min)	after cycle 3 (27 min)	after cycle 4 (36 min)	after cycle 5 (45 min)	after cycle 5
A1-8	87.8%	84.9%	83.9%	83.5%	83.1%	83.2%
A1-9	88.1%	85.5%	85.0%	84.0%	83.4%	
A2-6	93.5%	91.1%	90.5%	89.8%	89.2%	89.4%
A2-7	94.6%	91.7%	90.8%	90.1%	89.6%	
A3-6	91.8%	90.0%	89.5%	89.2%	89.0%	88.0%
A3-7	89.8%	88.3%	87.9%	87.4%	87.1%	
A4-6	93.0%	93.8%	94.4%	93.6%	93.8%	93.9%
A4-7	92.6%	93.6%	94.9%	94.1%	94.0%	
B1-6	88.8%	86.7%	85.4%	85.0%	84.0%	83.3%
B1-7	88.6%	85.7%	84.6%	83.6%	82.6%	
B2-6	91.4%	89.7%	88.8%	88.3%	87.7%	87.3%
B2-7	90.3%	88.4%	87.9%	87.3%	86.9%	

Note: if banknote lightness is less than 92%, banknotes are considered as unfit.

Table 2

Test results No.2

	after cycle 1 (9 min)	after 20 times on BC (1 cycles)	after cycle 2 (18 min)	after 40 times on BC (2 cycles)	after cycle3 (27 min)	after 60 times on BC (3 cycles)	after cycle 4 (36 min)	after 80 time on BC (4 cycles)	after cycle 5 (45 min)	after 100 times on BC (5 cycles)	after cycle 5
A3-10	97.5%	97.5%	96.5%	96.3%	95.5%	95.4%	94.7%	94.9%	94.6%	94.6%	94.3%
A3-11	97.5%	97.3%	96.1%	96.0%	94.9%	95.1%	94.1%	94.3%	93.8%	94.1%	
A4-8	97.2%	97.2%	95.9%	96.1%	94.9%	95.0%	94.6%	94.5%	94.3%	94.4%	94.7%
A4-9	98.3%	98.1%	96.5%	96.5%	95.8%	95.8%	95.3%	95.3%	95.0%	94.9%	
A2-8	95.1%	96.2%	95.2%	95.6%	94.9%	95.0%	94.6%	94.7%	94.5%	94.5%	94.4%
A2-9	94.9%	95.7%	95.0%	95.2%	94.7%	94.7%	94.1%	94.1%	94.1%	94.3%	

Note: if banknote lightness is less than 92%, banknotes are considered as unfit.

Table 3

Test results No. 3 and No. 4

	after cycle 1 (9 min)	after 20 times on BC (1 cycles)	after cycle 2 (18 min)	after 40 times on BC (2 cycles)	after 3 cycles (27 min)	after 60 times on BC (3 cycles)	after 4 cycles (36 min)	after 80 times on BC (4 cycles)	after 5 cycles (45 min)	after 100 times on BC (5 cycles)	after 6 cycles (54 min)	after 120 times on BC (6 cycles)	after 7 cycles (63 min)	after 140 times on BC (7 cycles)	after 8 cycles (72 min)	after 160 times on BC (8 cycles)
	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.
A1-10	91.9%	91.9%	91.6%	91.7%	90.5%	89.9%	89.4%	89.7%	89.1%	89.5%	-	-	-	-	-	-
A1-11	90.1%	90.5%	90.5%	90.8%	88.3%	88.2%	87.7%	87.7%	87.5%	87.6%	-	-	-	-	-	-
A2-8	95.3%	95.7%	94.0%	94.3%	93.3%	93.5%	93.1%	93.0%	92.8%	92.8%	92.3%	92.2%	91.6%	91.6%	-	-
A2-9	95.1%	95.5%	93.6%	93.6%	92.8%	93.1%	92.3%	92.3%	92.1%	92.2%	91.9%	91.9%	90.8%	91.0%	-	-
A3-8	91.9%	92.0%	89.8%	90.1%	88.7%	88.7%	88.4%	88.5%	88.1%	88.2%	-	-	-	-	-	-
A3-9	92.7%	92.7%	90.7%	91.0%	90.4%	90.0%	89.7%	89.7%	89.3%	89.3%	-	-	-	-	-	-
A4-8	95.6%	97.3%	95.8%	96.3%	95.6%	95.7%	95.6%	95.6%	95.5%	95.8%	94.3%	94.4%	94.0%	94.5%	94.0%	94.3%
A4-9	95.7%	97.1%	95.9%	96.5%	96.1%	96.3%	96.0%	96.2%	95.9%	96.1%	94.4%	94.4%	94.0%	94.3%	93.9%	94.2%
B1-8	93.7%	94.1%	92.4%	92.7%	92.3%	91.9%	91.7%	91/6%	91,3%	91.5%	-	-	-	-	-	-
B1-9	93.2%	92.9%	91.6%	91.7%	90.9%	91.0%	90.6%	90.5%	89.8%	90.3%	-	-	-	-	-	-
B2-8	95.7%	95.4%	94.4%	94.3%	93.7%	93.7%	93.1%	93.5%	93.0%	92.9%	92.4%	92.0%	91.9%	91.8%	-	-
B2-9	94.7%	94.5%	93.0%	93.2%	92.6%	92.7%	91.9%	92.1%	91,9%	91.9%	92.1%	92.1%	91,1%	91.3%	-	-
C1-1	93.9%	93.9%	92.8%	92.7%	92.4%	92.2%	91.7%	92.0%	91.4%	92.0%	-	-	-	-	-	-
C1-2	93.8%	93.8%	92.7%	93.0%	92.2%	92.5%	92.1%	92.3%	91.9%	92.3%	-	-	-	-	-	-
C2-1	95.2%	95.6%	94/4%	94.5%	94.1%	94.1%	93.6%	93.4%	93.1%	93.4%	92.1%	92.3%	91.9%	92.2%	91.8%	91,9%
C2-2	94.7%	95.3%	93.9%	94.2%	93.5%	93.7%	93.2%	93.2%	92.6%	93.2%	91.9%	92.2%	91.8%	91.9%	91.7%	91.8%

	after 9 cycles (81 min)	after 180 times on BC (9 cycles)	after 10 cycles (90 min)	after 200 times on BC (10 cycles)	after 11 cycles (99 min)	after 220 times on BC (11 cycles)	after 12 cycles (108 min)	after 240 times on BC (12 cycles)	after 13 cycles (117 min)	after 260 times on BC (13 cycles)	after 14 cycles (126 min)	after 280 times on BC (14 cycles)	after 15 cycles (135 min)	after 300 times on BC (15 cycles)
	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.
A1-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A1-11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A2-8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A2-9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A3-8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A3-9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A4-8	94.0%	94.2%	94.0%	94.4%	93,5%	93.9%	93.4%	93.6%	93.5%	93.7%	93.5%	93.3%	93.4%	93.6%
A4-9	94.2%	94.2%	94.3%	94.3%	93,6%	93.9%	93.8%	93.8%	93.5%	93.7%	93.8%	93.6%	93.5%	93.7%
B1-8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B1-9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B2-8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B2-9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C1-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C1-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C2-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C2-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	after 16 cycles (144 min)	after 320 times on BC (16 cycles)	after 17 cycles (153 min)	after 340 times on BC (17 cycles)	after 18 cycles (162 min)	after 360 times on BC (18 cycles)	after 19 cycles (171 min)	after 380 times on BC (19 cycles)	after 20 cycles (180 min)	after 400 times on BC (20 cycles)	after 21 cycles (189 min)	after 420 times on BC (21cycles)
	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.	Aver.
A1-10	-	-	-	-	-	-	-	-	-	-	-	-
A1-11	-	-	-	-	-	-	-	-	-	-	-	-
A2-8	-	-	-	-	-	-	-	-	-	-	-	-
A2-9	-	-	-	-	-	-	-	-	-	-	-	-
A3-8	-	-	-	-	-	-	-	-	-	-	-	-
A3-9	-	-	-	-	-	-	-	-	-	-	-	-
A4-8	92.7%	92.9%	92.6%	92.8%	92.6%	92.6%	92.2%	92.5%	92.2%	92.5%	91.8%	91.6%
A4-9	92.8%	93.1%	92.6%	92.9%	92.4%	92.8%	92.4%	92.3%	92.4%	92.3%	91.8%	91.4%
B1-8	-	-	-	-	-	-	-	-	-	-	-	-
B1-9	-	-	-	-	-	-	-	-	-	-	-	-
B2-8	-	-	-	-	-	-	-	-	-	-	-	-
B2-9	-	-	-	-	-	-	-	-	-	-	-	-
C1-1	-	-	-	-	-	-	-	-	-	-	-	-
C1-2	-	-	-	-	-	-	-	-	-	-	-	-
C2-1	-	-	-	-	-	-	-	-	-	-	-	-
C2-2	-	-	-	-	-	-	-	-	-	-	-	-

Note: if banknote lightness is less than 92%, banknotes are considered as unfit.

Changes in Payment Preferences of Economic Entities in Using Cash based on the National Bank Opinion Surveys

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Changes in payment preferences of economic entities, especially regarding the use of cash, has been a fundamental trend over the last decade. With the revolutionary development of digital technologies and payment systems, such as credit and debit cards, digital banking, e-wallets, the shift in focus to cashless means of payment should be an obvious phenomenon. This change has a direct impact on both the society as a whole and business, financial institutions as well as public policy. That is why conducting research in the field of preferences of economic entities regarding cash or cashless payment methods is of such importance and significance. In 2022, the National Bank of the Republic of Kazakhstan (NBK) conducted an opinion survey, where the main objective was to identify trends in the development of cash circulation, determine the factors that largely shape the demand for cash; the survey also contributed to a detailed study of the use of cash forms of money and their nominal structure by economic entities. It is important to conduct such opinion surveys on a regular basis. In Germany, such surveys are conducted every three years, and every year in the Russian Federation. The NBK conducted a similar survey in 2024. Hence, the main goal of this analytical work is to identify the key changes in payment preferences of both households and businesses.

Key Words: payment preferences, cash, opinion survey, cashless payments, regional preferences.

JEL-Classification: D12, E41, E42.

Preamble

Payment preferences of economic entities are subject to continuous changes due to various factors, with innovations in the technological sphere being the main one. Indeed, over the past 10 years, the world has witnessed unimaginable changes in the area of payment systems and finance. Previously, cash was the undisputed number one, and now cashless forms of payment – transfers by phone number, payments using QR codes, electronic wallets and bank cards – are gradually becoming more and more relevant. Changes in the preferences of consumers and entrepreneurs are justified not only by technological changes but also by a larger-scale socio-economic transformation process that extends throughout Kazakhstan. This is clearly seen in the Republic of Kazakhstan, where the role of digital transformation in economic development is undeniable. Modern digital platforms are becoming more and more accessible to the society and business, providing them with greater variability in making payments. In this context, research in the field of payment preferences takes on special importance, as it provides an understanding of trends in demand for cash and cashless payment options, which ultimately has an impact on the economy of the entire country.

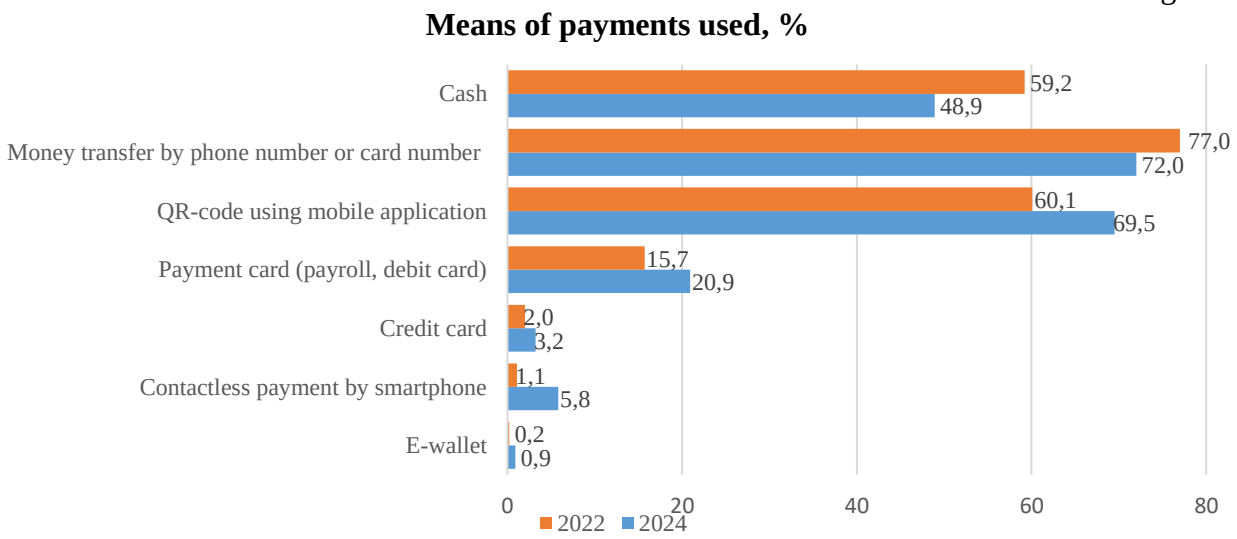
The National Bank of Kazakhstan has been conducting opinion surveys of preferences of the population and businesses on a regular basis since 2022. One of the main objectives of the research is to identify factors influencing the choice of payment methods under various conditions. The purpose of this analytical study is to identify and analyze changes in the payment preferences of the population and businesses within the territory of the Republic of Kazakhstan based on opinion surveys conducted by the NBK in 2022 and 2024. The study will look into changes in preferences for the use of cash, differences in payment preferences by regions, age and social groups. The work will also allow enable to more accurately determine the factors influencing the growth in the use of cashless forms of payment and the structure of changes in money circulation in Kazakhstan. In addition, the structure of coin and banknote denominations and their popularity

among the population and businesses will be considered in detail. This will help to study the main trends and propose measures for the subsequent improvement of the payment system and recommendations for finding a balance between the use of cash and cashless ways of payment in the context of digital transformation of the economy.

Household Surveys

First of all, it is necessary to compare the results of the surveys of 2022 and 2024. The most popular payment method among the population in 2022 was transfers by phone number; it was used by about 77% of the respondents, the second most popular payment method was payment in cash – 59.2%, payment by QR code – 60.1%, payment by payment card – 15.7%, credit card – 2.0%, payment using contactless payment methods – 1.1% and electronic wallets – 0.2% (Figure 1). In 2024, the trend has changed slightly: money transfers by phone number also accounted for the largest percentage – 72.0%, and the second most popular method was payment by QR code using a mobile application – 69.5%, followed by payment in cash – 48.9%.

Figure 1



Among the interesting trends, it is worth mentioning the decreasing number of people who use cash payments – from 59.2% in 2022 to 48.9% in 2024 (an overall decline of 10.3%). This can only indicate that cashless payment options have become more popular among the people. But such method of payment as money transfer by phone number, in turn, has also become less popular among the population (a decrease from 77.0% in 2022 to 72.0% in 2024). Other payment methods showed significant growth during the period under review: QR code began to be used more often by 1.2 times, payment by credit card – by 1.6 times, contactless payments showed the most significant growth in relative values – by 5.3 times, and payment using electronic wallets increased by 4.5 times. Based on these data, we can come to the following conclusions. First of all, it is worth noting that payment by cash has become less popular. Transfers by card number or phone number have become less relevant among the population due to changes in legislation and the introduction of a universal tax return. Other methods of non-cash payment showed significant growth, payment by QR code became the leader in terms of change in absolute terms (an increase of 9.4%), and contactless payments by smartphone showed a sizable growth in relative terms (a change of 5.3 times).

Figure 2 shows the impact of the transaction amount on the choice of payment method. In 2024, for 84% of respondents, the amount did not matter when paying by cashless means, which is significantly more than in 2022, when this figure was 79%. And the share of people who pay only in cash decreased to 9%, while in 2022 the same figure was 15%.

Figure 2

The impact of the amount on the form of payment

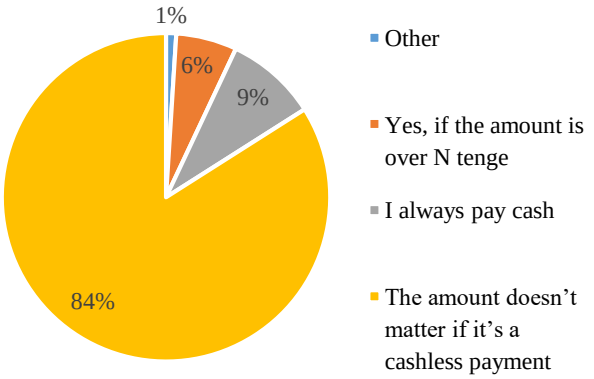
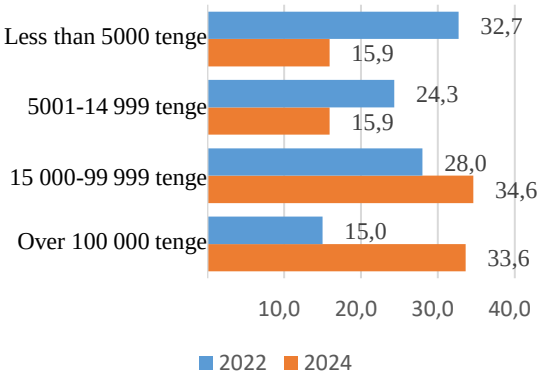


Figure 3

The amount of payment that affects the choice of payment option,%



The share of respondents for whom the transaction amount is an important factor in using cashless payments did not show significant changes. In this case, the change affected the amount that influences the decision to choose cashless payments (Figure 3). The popularity of cashless payment methods decreased in cases if the amount does not exceed 15,000 tenge. For transactions and payments exceeding this amount, there is a noticeable trend towards increasing popularity among the population. It is worth mentioning the increase in the share of people using cashless payments and a decrease in the number of respondents who chose the answer option "I always pay in cash" from 15% to 9%. And among the population actively using cash, there are more of those who do not carry large amounts with them but keep them on a card.

Further, we consider how the population's preferences regarding the choice of cash payments have changed across regions. In 2022, according to the survey, the following regions were the leaders in the use of cash: Atyrau region (81% of respondents), Pavlodar region (77%), West Kazakhstan region (74%), Zhambyl (73%) and Kostanay (73%) regions. The lowest demand for cash was recorded in Aktobe region (42%), the cities of Astana (42%) and Almaty (36%). On average, 60% of the population preferred to use cash in the country.

Figure 4

Preferences for using cash for payment, from region to region, in 2024, %

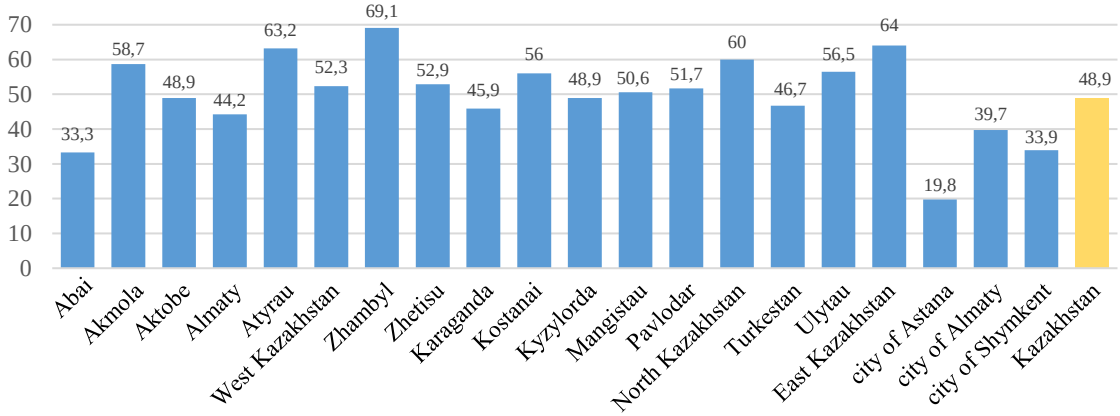


Figure 4 shows the population's preferences for using cash in 2024 by regions. The 5 regions where people prefer to use cash the most are: Zhambyl region (69%), East Kazakhstan region (64%), Atyrau region (63%), Akmola region (59%), Ulytau (57%). The lowest demand for

cash is in the city of Shymkent (34%), Abay region (33.3%), and Astana (20%). It should be noted that in the city of Almaty, the number of people who prefer cash increased by 3% during the period under review, while in Astana this figure decreased by more than 2 times. On average, 49% of people in Kazakhstan preferred to use cash in 2024, which is by 11.1 percentage points less than in 2022.

The population's preference for cashless payments is influenced by such factor as proximity to cities of national significance. Table 1 shows statistics on cash preferences: in rural areas in 2024, 67% of the population prefers cash, while in cities of national significance – 32% only.

Table 1

Payment options used, by the type of locality, %

Payment option used	City of national significance	Regional center	Town	Rural district center	Village
Cash	32.1	46.9	50.7	51.6	67.0
Money transfer by phone number	66.3	76.8	70.7	72.1	71.0
QR code using mobile applications	75.1	67.9	66.0	73.0	64.5
Payment card	19.3	25.9	20.7	20.5	14.3
Credit card	2.9	3.8	3.3	1.9	4.0
Contactless payments by smartphone	9.6	5.8	2.7	7.2	2.2
E-wallet	0.5	2.2	0.3	0.2	0.3

There is a dependence of the payment option preferences on the age of respondents: while among people aged 18-19 years old, only 31% prefer cash, this figure is 74% among people aged 50 to 60 years old. This may driven by factors such as the habits of the older generation to use cash, as well as a lower level of digital literacy in this age group. There is also an influence of the level of education: 70% of people with incomplete secondary education prefer to use cash, while only 42% of people with higher education prefer cash. Figure 5 shows the main reasons for choosing cash. The population prefers cash for the following reasons: lack of Internet at the point of purchase (23%), request from the seller of goods or services (22%), habit (21%), speed and simplicity (21%), lack of a terminal at the seller (18%), safety (17%). It is noteworthy that one of the most significant reasons for the population's choice of cash is not related to personal preference or convenience; people use cash because they are unable to pay for goods or services by cashless means.

Figure 5

The reason for choosing a cash form of payment, % of responses

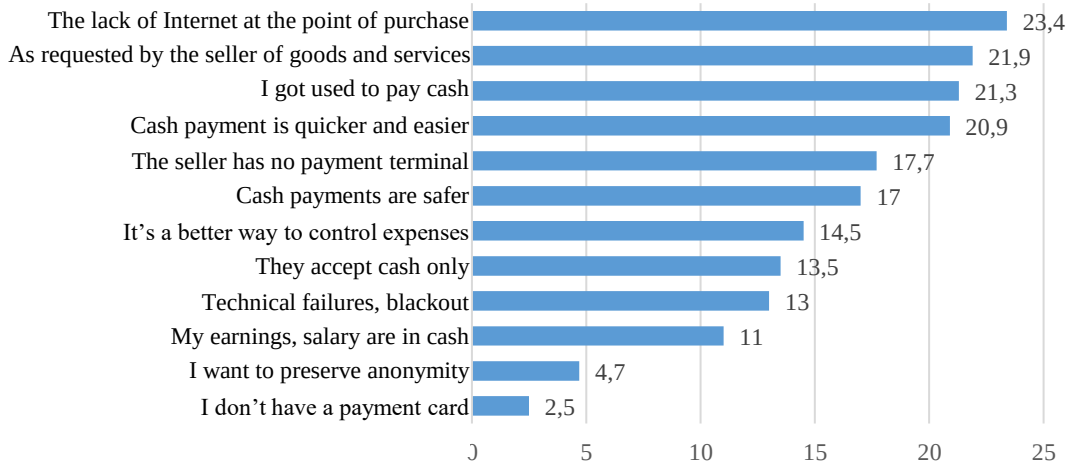
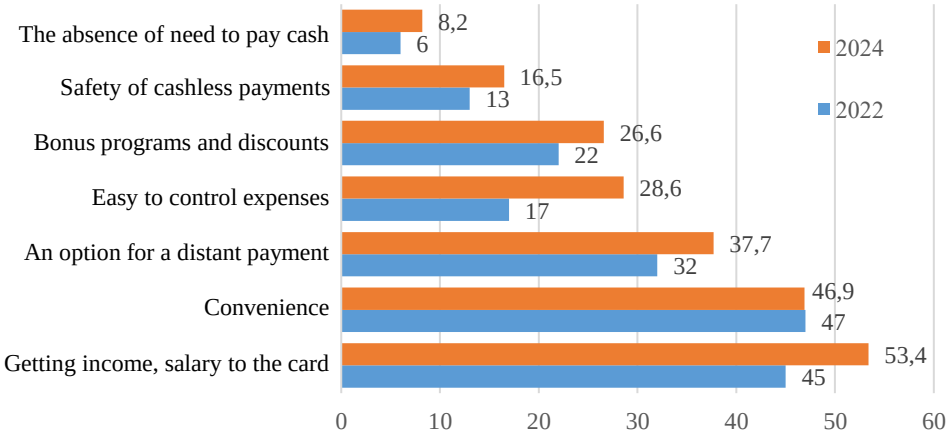


Figure 6 shows the reasons why people choose a cashless payment option.

Figure 6

Reasons for choosing a cashless form of payment, % of responses



6It is noteworthy that the number of people receiving salaries and wages on a bank card has increased, i.e. more people have bank cards, and more and more companies pay their employees legally, positively contributing to the development of the country's economy. Also, compared to 2022, the indicators of the possibility of remote payment have increased, which is an evidence that the popularity of services providing this type of payment increased. Another criterion that has shown significant growth is the controllability of expenses, which may indicate an increase in the level of financial literacy of the population. Also, the growing popularity of cashless payments is driven by the availability of bonus programs and discounts for cashless payments, which is associated with the improvement of mobile banking in the market – more and more banks are offering favorable conditions for attracting customers.

It is necessary to point out that there is a tendency among the population to reduce the use of cash in favor of cashless payments. However, these processes are uneven. The demand for cash remains at a fairly high level among various groups of the population, which may indicate that, with the growing popularity of cashless payment options, cash remains an important instrument despite the fact that its importance is beginning to weaken. These findings coincide with the expectations of the population – 75% of respondents said that both cash and cashless means of payment should exist in the world. Table 2 presents an assessment of sufficiency of banknotes in circulation. In 2022, among the survey respondents, the share of those who believe that all banknotes are fully sufficient was 62%, and in 2024 – 53% only. This means that the population feels the shortage of banknotes to a greater extent than before.

Table 2

Insufficiency of banknotes in circulation, according to the interviewed, %

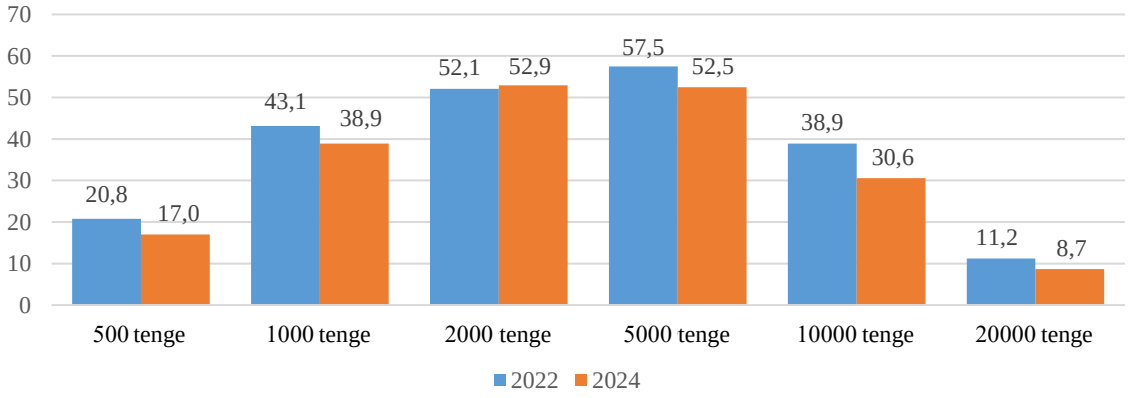
Banknotes	2021	2022	2024
500 tenge	26.8	17.4	16.6
1 000 tenge	15.6	7.8	11.8
2 000 tenge	9.8	5.6	7.5
5 000 tenge	4.3	2.7	4.7
10 000 tenge	4.3	2.7	5.6
20 000 tenge	10.5	9.1	9.2
All denominations are sufficient	44.8	61.9	52.6

Only half of the population estimates the level of banknote supply in the country as sufficient. By 2024, among all banknote denominations, the population showed an increased demand for 1,000 tenge (increased by 1.5 times), 2,000 tenge (by 1.3 times), 5,000 tenge (by 1.7 times) and 10,000 tenge (by 2.1 times). The need for the 20,000 tenge banknote has not changed significantly, although its deficit is estimated at a fairly high level. The only banknote whose demand has decreased is 500 tenge. As for the coin deficit, the population is experiencing a major shortage of 200 tenge coins, although the percentage of the deficit is decreasing every year.

Figure 7 shows the dynamics of consumer preferences of the population for banknotes in the wallet.

Figure 7

Population's preference regarding the availability of banknote denominations in their wallet, % of the interviewed



The concept of the population's preference for banknotes in the wallet implies interest in certain banknote denominations for use. As can be seen, banknotes with denominations of 5,000 and 2,000 tenge are the most popular among the population. The least popular are the banknotes with denominations of 500 and 20,000 tenge. Also, in comparison with 2024, there is a tendency for preferences to decrease for all banknote denominations, except for 2,000 tenge, the demand for which has increased slightly. The general trend is explained by the growing popularity of cashless payment options, as well as the proportionate development of digital infrastructure.

Enterprise Surveys

Figure 8 shows the results of the survey among entrepreneurs in 2022 and 2024. The question was how often the respondents use cash in their business activities. In 2022, as in 2024, most entrepreneurs answered that they use cash on a regular basis. If we take into account the group of people who noted the periodic use of cash, the figure will be more than 70%. In turn, in 2022, 14.5% of entrepreneurs answered that they do not use cash at all in their operations. However, in 2024, this group increased to 21.2%.

The constant development of digital technologies offers new challenges and significant opportunities that require business entities to quickly respond and adapt to new conditions.

Figure 9 shows the share of entrepreneurs who constantly use cash, broken down by types of payments. At the time of the study in 2022, there was a clear dependence of the frequency of cash use and distance from cities: only 23% of entrepreneurs in cities of national significance constantly used cash, against 61% of entrepreneurs in rural areas. That is, the closer a business entity is located to rural areas, the more often it will use cash. This is largely due to the fact that large cities have more bank branches that offer their digital services and access to ATMs. Another important factor is the level of development and availability of the Internet. To solve this problem, it is necessary to comprehensively develop digital communications throughout Kazakhstan, then residents and entrepreneurs in remote areas will use cashless payments more actively. In 2024, the situation underwent some changes. In cities of national significance, regional centers and in villages, the share of entrepreneurs who prefer to use cash has increased to 30%, 42% and 64%

respectively. In cities and rural district centers, there was a decrease in the share of entrepreneurs who use cash often or constantly: in the city, such percentage went down to 43%, and in the rural district centers – to 59%. However, even with such opposite changes, the share of entrepreneurs using cash in the regional center is lower than in the city. It follows that the location of the enterprise affects the attitude to cash.

Figure 8

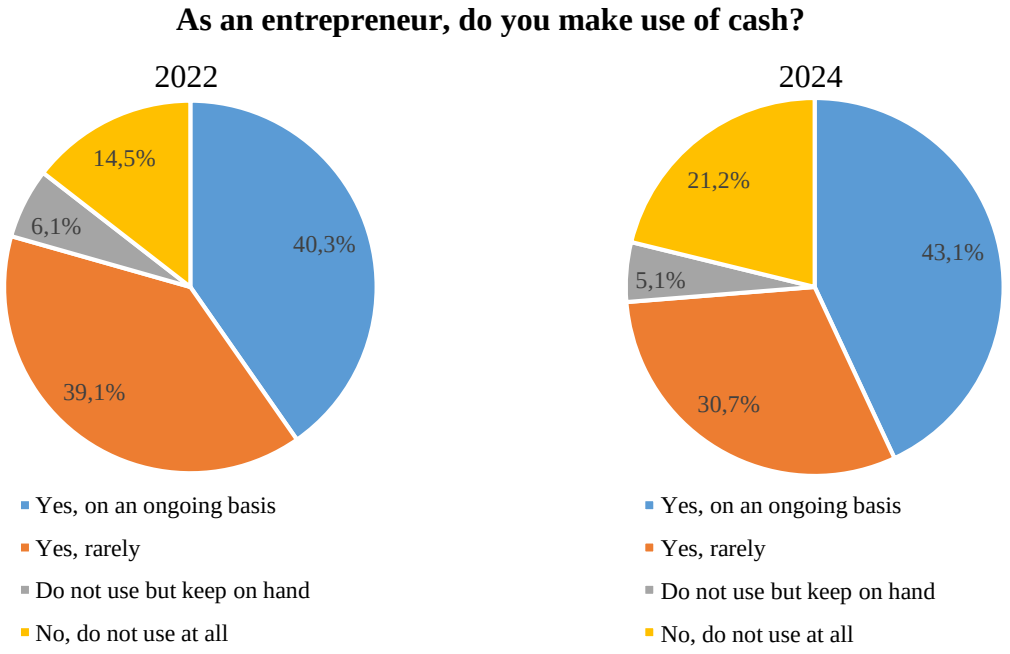


Figure 9

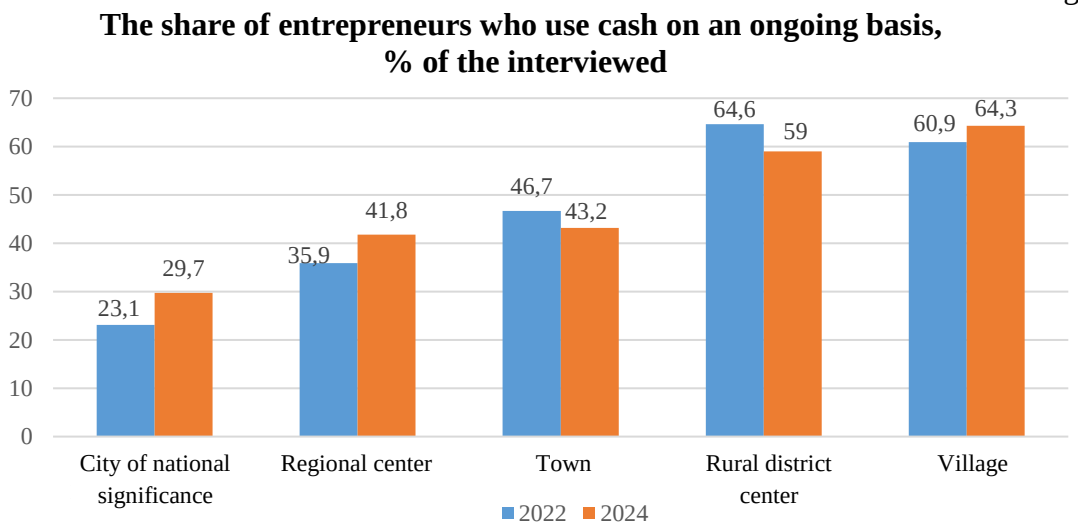
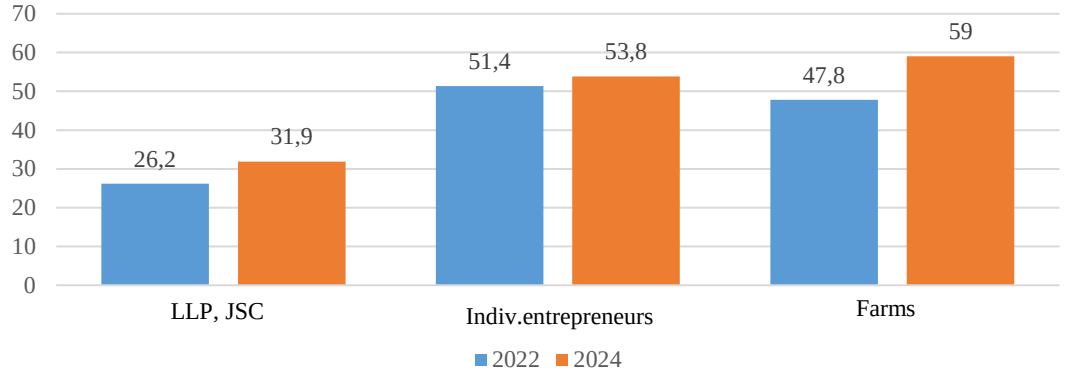


Figure 10 shows the classification of entrepreneurs who prefer to use cash, by the form of organizational ownership. Individual entrepreneurs prefer cash more than others, followed by farms, and limited liability partnerships and joint-stock companies complete this list.

Figure 10

Classification by the form of ownership of entrepreneurs that make use of cash, % of the interviewed



In 2024, there was a sharp increase in the share of farms using cash, this indicator has grown significantly among LLPs and JSCs, the smallest growth was seen among individual entrepreneurs. There is a general trend towards an increase in the popularity of cash among all types of entrepreneurship, which may be due to the tracking of online transfers and the introduction of the general income tax return.

There is also an inverse correlation between the size of the business and the demand for cash: the smaller the business, the more entrepreneurs prefer to make payments using cash. For micro-businesses, this is 52% of respondents, for small businesses – 35.4%, for medium-sized and large businesses – 28.3%.

It is interesting that the study did not reveal any significant differences in the age breakdown among entrepreneurs, while this relationship was clearly traced among the population. However, the preferences for cash among entrepreneurs are influenced by the gender of the entity. Men prefer to use cash to a lesser extent than women (38% and 47% of respondents, respectively). However, the larger the business becomes, the less noticeable this relationship becomes.

Table 3 shows statistics on cash usage by industry. The average figure for all industries in 2022 was 36%, and in 2024 – 43%.

Table 3

Lines of business of entrepreneurs that make use of cash on an ongoing basis (2024), %

	Sample	% of sample
Agriculture	100	61.0
Industry	77	35.1
Construction	86	26.7
Trade, car repair	312	50.0
Transport and warehousing	66	43.9
Catering/accommodation services	46	54.3
Information and communication	22	45.5
Real estate operations	14	50.0
Professional, scientific and technical activities	44	39.5
Administrative and ancillary services	47	21.3
Education	17	11.1
Healthcare and social services	47	31.9
Arts, entertainment and lesiure	36	33.3
Electricity and gas supply, water supply	21	47.6
Other services	24	20.8
Total (respondents)	1006	

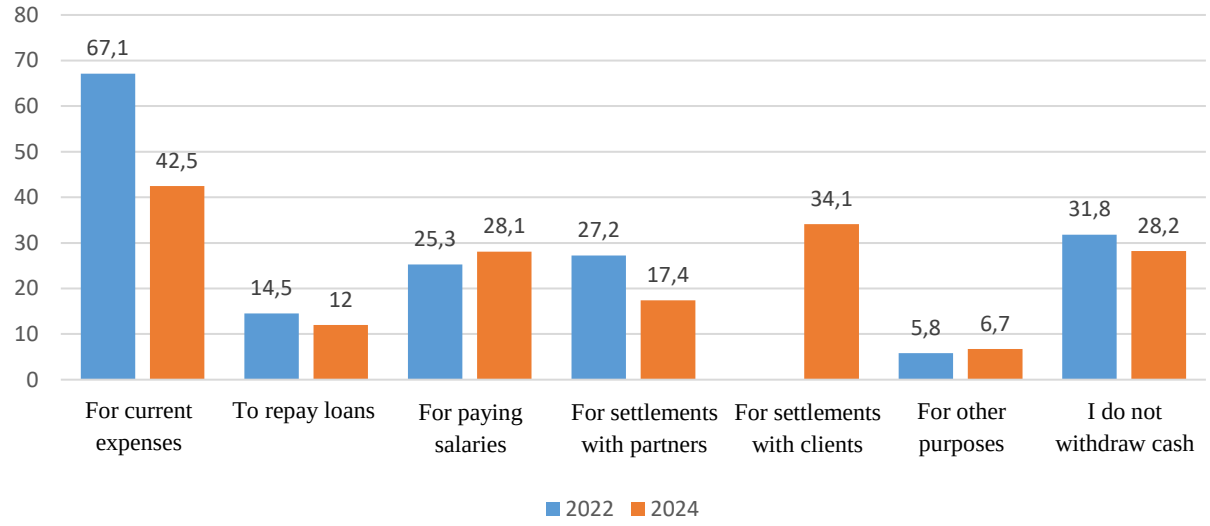
Entrepreneurs who do not use cash in their turnover were asked to answer the question: “What are the reasons for not using cash in your operations?” Among the reasons why

entrepreneurs do not use cash, the overwhelming majority mentioned that there is simply no need to use it, because all settlements with clients and business partners are made in cashless form. 3.1% of respondents said that the nearest cash desks or ATMs are too far away, 0.4% noted that they do not use cash due to expensive cash services. Based on this, it follows that the cashless payment system is developed sufficiently so that everyone can use it. However, cash remains a fairly important instrument for doing business in Kazakhstan. The total share of entrepreneurs who use cash to this or that extent remains quite high (79%), but this figure has decreased compared to the situation as of the summer of 2022 (86%). This trend is supported by the fact that the share of interviewed entrepreneurs who do not use cash at all has increased significantly (from 15% in 2022 to 21% in 2024).

In the course of the survey, a large-scale analysis was performed to identify possible reasons for using cash and its significance. The most significant reason for entrepreneurs was that the income received by companies consists mainly of cash (41% of respondents). The second most popular reason is the entrepreneurs' concern about the convenience of customers (24%). Respondents pointed to a more convenient and high-quality control of expenses (17%) as the third most important reason for using cash in business. Figure 11 shows the main reasons why entrepreneurs withdraw cash: first of all, to support the current expenses of the enterprise, settle accounts with clients and pay salaries to employees.

Figure 11

The main reasons for cashing out, % of the interviewed



Note: in 2022, the response option "For settlements with clients" was not offered.

It is worth paying attention to the dynamics of cash use in the regions. To support current business expenses, cash is most often withdrawn by entrepreneurs from the Abai region (75% of respondents), Akmola region (73%), Almaty and Pavlodar regions (69% and 68%). In the city of Almaty, this reason is the least popular – only 16% of entrepreneurs withdraw cash to support current business expenses. The share of entrepreneurs who refuse to withdraw cash for business at all is the largest in the city of Almaty – 65% of respondents, followed by the Ulytau region with a value of 53% and Aktobe region – 52%. The fewest entrepreneurs who have completely abandoned cash are in the Kostanay (5%) and Almaty regions (2%). These statistics emphasize the heterogeneity of the regions of Kazakhstan in relation to cash withdrawals for business, from which it follows that cash remains a popular financial instrument in many regions of Kazakhstan. Previously, the data on the preferred denominations of banknotes and coins for the population was provided. This survey is of great importance for the National Bank, as it will provide an understanding of preferences for denominations of banknotes and coins, because the denomination range should be convenient for all categories of people and entrepreneurs. A survey was also

conducted among business entities (Figure 12). The most popular coin denominations for entrepreneurs are large and medium coin denominations – 50, 100 and 200 tenge. In 2024, small coin denominations became even less in demand among business entities, while the demand for coins with denominations of 50, 100 and 200 tenge increased. Among entrepreneurs, similarly to households, the demand for large coin denominations is growing, while small coins are losing their relevance.

Figure 12

Preferred denominations of coins, % of the interviewed entrepreneurs,

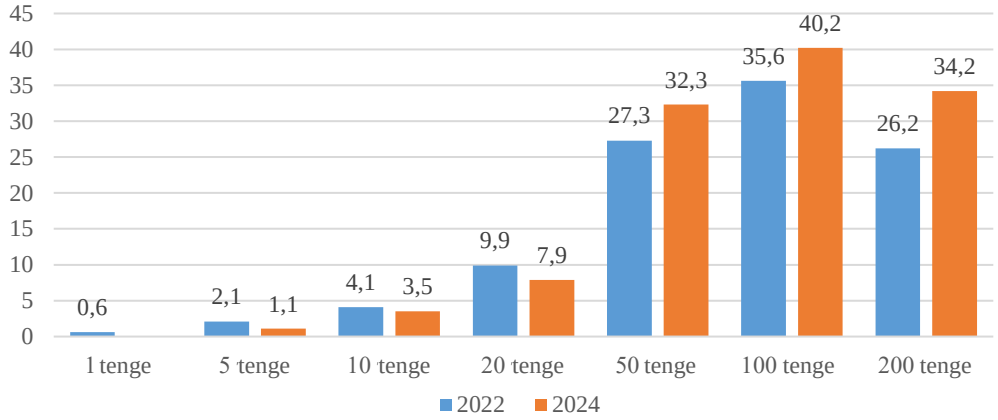
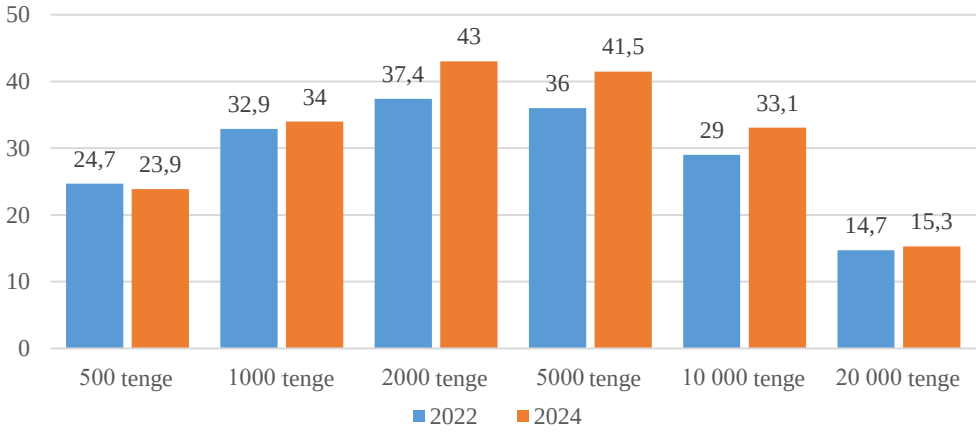


Figure 13 shows the preferred banknote denominations among businesses. The most popular banknote was the 2,000 tenge banknote. Demand for 5,000 and 10,000 tenge banknotes also increased, while preferences for the 20,000 tenge banknote remained virtually unchanged.

Figure 13

Preferred denominations of banknotes among entrepreneurs, % of the interviewed



Conclusion

The results of household and business surveys on the use of cash payments, including the dynamics of the structure of banknote and coin denominations and their preferences, were studied. During the population survey, the majority of respondents (75%) stated that both cash and cashless forms of money are necessary for the successful functioning of money circulation. Cash is one of the most common forms of settlements between economic agents, and the growing importance of other forms of settlements should also be highlighted: transfers by card/phone number, QR payments, payments using debit and credit cards, etc. The share of those businesses that do not use cash at all in their settlements increased from 15% to 21%. However, it is worth noting that the share of entrepreneurs using cash remains quite high in rural areas, agriculture and forestry, finance, insurance, and catering and accommodation services. Based on this, it should be concluded that the further a community is located from a city of national significance, the more

cash is in demand among both the population and businesses. The medium-term trend in the use of cash is determined by a gradual reduction in demand for cash among all economic agents.

The main factors that determine the demand for cash are: demographic parameters (region of residence, age, gender), infrastructure development (availability of Internet connection, provision of POS terminals, agreements with banks); economic determinants of enterprises (such as the size of the enterprise); behavioral factors (the level of public confidence in cashless money). Currently, there is a significant discrepancy between the structure of denominations of coins and banknotes operating in the economy and the preferences of the population. This brings significant inconvenience and leads to a constant need to exchange cash through alternative channels.

It is obvious that cashless payment options have a number of advantages for all economic entities, but nevertheless cash remains an indispensable instrument that supports the entire financial system of Kazakhstan. That is why it is necessary to ensure the right of consumers to use cash. In this regard, there is a need to optimize the costs associated with the issuance and distribution of cash throughout the country. The best solution is to use a hybrid model, which is an access for all citizens to cash, where the costs of the National Bank are minimal. This solution is implemented through the development of innovative technologies such as digital transformation of the economy or automation of processes.

Literature

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