“The impact of socio-economic factors on the dynamics of social pressure in Kazakhstan”

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THE IMPACT OF SOCIO-ECONOMIC FACTORS ON THE DYNAMICS OF SOCIAL PRESSURE IN KAZAKHSTAN

Abstract

The purpose of the study was is to assess the impact of key factors (including employment, income, poverty level, prices and social support) on the dynamics of social pressure in Kazakhstan. The analysis covered the period from 2014 to 2024 and utilized official data. The methodology combines entropy-based ranking of indicators, calculation of the Socio-Economic Pressure Index (SEPI), Social Stability Index (SSI), and Social Inertia Index (SII), as well as phase-portrait visualization. The entropy ranking revealed that the share of population below the food basket cost (d_i = 0.71; W_i = 0.2381) and housing assistance (d_i = 0.516; W_i = 0.1728) had the highest variability and the strongest influence on SEPI. Moreover, SEPI rose from 0.0967 in 2014 to its peak in 2023 – over 20 times higher – before falling to 0.53 in 2024. SSI dropped from 4.94 in 2017 to 0.44 in 2023, with minimal adaptive capacity, and partial recovery to 1.87 in 2024. There was recorded instability of positive changes and a high likelihood of renewed pressure due to the lowest value of SII (–3.24) in 2024. Thus, long-term stability and a reduction in the social sphere's susceptibility to external and internal shocks require integrated policy measures that combine targeted support, income regulation, and adaptive governance.

Keywords socio-economic pressure, social stability, social inertia, socio-economic management, poverty, targeted social assistance, income inequality

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INTRODUCTION

Social inequality in modern conditions is one of the key destabilizing factors for socio-economic systems. Increased disparities in income levels, access to basic benefits, and quality of life create pressure in society, which in turn translates into socio-economic pressure. At the macro level, this reduces the stability of state institutions, limits the potential for economic growth, and increases the costs of maintaining the social sphere. For the state, the problem is exacerbated by the fact that the consequences of socio-economic pressure are complex, ranging from a decline in labor activity and deterioration in demographic indicators to an increase in social conflict. Under these conditions, an assessment of the factors that form socio-economic pressure becomes a prerequisite for developing effective socio-economic management measures aimed at strengthening the system's stability.

At the same time, the methodological approaches most often used to study social sustainability are typically limited to either individual indicators or composite indices, which fail to capture structural differences and dynamic shifts. Such measurements make it difficult to distinguish between periods of stability and instability, and do not allow for the identification of indicators that exert the strongest pres-

sure on the system. As a result, a scientific problem remains related to the lack of comprehensive tools for assessing socio-economic pressure, which would combine the structural decomposition of key indicators with dynamic analysis of their variability. The absence of such an approach complicates the development of long-term management strategies and reduces the effectiveness of public policy in responding to social challenges.

1. LITERATURE REVIEW

In the literature, social stability is studied not only from the perspective of politics or institutional structure, but also as a complex phenomenon that encompasses economic, social, and institutional factors. At the same time, macroeconomic indicators such as unemployment, income distribution, poverty levels, and access to social protection are analyzed jointly, taking into account their mutual influence on the state of society. The theoretical basis for studying social pressure was initially formed within the framework of sociological approaches to analyzing collective action and conflict. Social pressure is regarded as both a structural and a behavioral factor often caused by the introduction of a new social system (Dodd, 1939). Therefore, such prerequisites for conflicts were considered a kind of stabilizer or favorable condition (Coser, 1957). Thus, social pressure is dependent on structural conditions, social roles, and the distribution of resources affecting the labor market by increasing unemployment and increasing the poverty level (Hodder, 1979; Aneshensel, 1992). It is the aggregate burden on households and local communities, measured by socioeconomic indicators, including poverty, labor market conditions, and the provision of state social policies.

Several studies have linked social pressure to economic crises, focusing mostly on long-term factors such as unemployment, inflation, inequality, and poverty. Moreover, in the presence of corruption, weak governance, and an unfair distribution of resources, there is an increase in health disparities, protests, and violent conflicts (Rogers et al., 2012; Marmot et al., 2013; Evans & Kelikume, 2019). Thus, price fluctuations reduce food security and increase absolute poverty (Akter & Basher, 2014; Menyhert, 2024). Due to low income levels, vulnerable groups are at risk of limited access to basic services, including housing, safe drinking water, sanitation, basic education, and guaranteed social support, such as pensions and benefits (Ahmad et al., 2016; Rao & Min, 2018). Therefore, sustainable and reliable sources of income increase the ability of households to adapt to external pressures, while high sensitivity to economic downturns reduces living standards (Lázár et al., 2020; Das, 2021; Agyepong et al., 2024). Hence, social pressure is measured with either standalone or groups of related indicators.

Inflation and price volatility affect inequality in complex ways, through direct income losses, indirect effects on human capital, and increased socio-political pressures, including the risk of political violence. Rising prices exacerbate social inequality, especially food price volatility, by reducing the well-being and deteriorating the health of vulnerable groups (Wisman & Capehart, 2010; Piazza, 2013). Thus, inflation affects human capital by limiting access to education and increasing income polarization through changes in the labor market and taxation (Hayakawa & Venieris, 2019; Nolan et al., 2019). The unbalanced distribution of the inflation burden across population groups leads to a noticeable decline in the level of well-being (Prati, 2024). Inflation exacerbates income inequality by increasing consumer prices, and households and businesses have limited ability to protect themselves from the erosion of their income and savings due to inflation (Aprea & Raitano, 2025; Mutascu et al., 2025).

Other studies suggest that weak governance exacerbates social pressure, resulting in social deprivation in various aspects. The effectiveness of social protection and benefit systems is determined by a combination of universal measures that cover the entire population, with targeted support, and the ability of state and administrative structures to consistently perform their functions, regardless of economic and political fluctuations. The level of social assistance benefits often remains below the poverty line, and convergence is limited (Nelson, 2010). During crises, social security serves a stabilizing function, but its effectiveness depends

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on institutional preparedness for shocks (Bonnet et al., 2010). Cash transfers reduce poverty when integrated into comprehensive strategies that combine short-term support with long-term human capital development measures (Slater, 2011; Levitt et al., 2017). Thus, social insurance and means-tested targeted transfers significantly reduce poverty, but in different ways (Meyer & Wu, 2018). Institutional support further cushions the impact of economic downturns by strengthening the capacity of national systems (Miró et al., 2024). Since social pressure is a multifaceted dimension shaped by both economic and institutional factors, a composite approach is required to consider its broader effects.

Recent studies have shown a growing interest in the application of composite indices. Their distinctive feature is their flexibility: the index composition varies depending on the research question. Moreover, the used blocks of indicators are consistent with each other and could be used as separate indices (Witulski & Dias, 2020). Additionally, the research context is also important, as it determines which indicators should be used. To accurately reflect the current situation, indicators may need to be updated. Therefore, for future studies, the indicators for the Multidimensional Poverty Index (MPI) should be different from the initial ones (such as radio or bicycle ownership), as they do not show the level of access to basic needs and conveniences (Vollmer & Alkire, 2022). Rijpma et al. (2025) and Unerbayeva et al. (2025) analyzed the living standards of the population, but based on their research goals, different sets of indicators were used.

An analysis of international and Kazakh studies showed that a complex interaction of socio-economic pressure factors, vulnerability, and institutional support determines community stability. Thus, an integrated assessment is needed that includes both the level of vulnerability and the adaptive capacity, which implies the use of multicomponent indicators (Sherrieb et al., 2010; Bergstrand et al., 2015). Fraser (2021) noted that social vulnerability and capital indices enable the identification of long-term trends in regional stability, which can be either decreasing or increasing. In times of crisis, the effectiveness of social protection systems is largely determined by their ability to respond to changes and combine the use of universal and targeted measures (Pereirinha & Pereira, 2021). In Kazakhstan, income disparities showed that persistent differences in remuneration increase social pressure and influence overall stability (Kireyeva & Satybaldin, 2019). In the context of rural areas, structural constraints and limited opportunities for economic development are primary factors that exacerbate household vulnerability (Kireyeva et al., 2024). Other studies examine the role of targeted economic investments in reducing poverty, demonstrating that their effectiveness is determined by the spatial distribution of resources and the specific conditions of urban and rural territories (Serikbayeva & Abdulla, 2022; Kenzhegulova et al., 2024).

Since the studies focus on individual aspects of socio-economic sustainability, their results provide the basis for an integrated approach that will combine the impact of employment, resource allocation, and investment policy in a single analytical model. Thus, it is necessary to apply an integrated methodology that includes an analysis of socio-economic pressure, social sustainability, and social inertia, which allows for simultaneous consideration of institutional, economic, and behavioral determinants of sustainability.

Therefore, the aim of the study is to assess the impact of key factors (including employment, income, poverty level, prices, and social support) on the dynamics of social pressure in Kazakhstan in 2014–2024.

2. METHODOLOGY

The current study applies an integrated methodological framework for assessing and managing socio-economic pressure within the socio-economic environment. The novelty of the methodology is in its complex approach, which combines dynamic analysis of socio-economic pressure levels and rates of change with structural identification of indicators with the highest influence on the index. Unlike traditional methods, the proposed methodology captures temporal patterns, identifies periods of stability and instability, and reveals priority areas of socio-economic management.

Table 1. Socio-economic indicators and their measurement parameters

Indicator	Category	Code	Unit of measurement	Explanation
Unemployed persons	Employment	UEMP	persons	Number of unemployed persons
Consumer price index	Prices	CPI	percent	Consumer price index
Special state benefits	Social support	BENSP	KZT	Average monthly special state benefits
Minimum pension		PENMIN	KZT	Minimum pension amount
Public social benefits		BENSO	KZT	Average monthly state social benefits
Housing assistance		ASSTH	KZT	Average state housing assistance
Below subsistence share	Poverty level	SHRSUBS	percent	Share of population below the subsistence minimum
Below food basket share		SHRFOOD	percent	Share of population below the cost of the food basket
Poverty gap		POVGAP	percent	Poverty gap
Consumption income	Income	INCCONS	KZT per person	Household income used for consumption per capita
Income to subsistence ratio		INCSUBS	percent	Ratio of income used for consumption to the subsistence minimum
Nominal income		INCNOM	KZT per person	Per capita nominal monetary income
Monetary expenditure		EXPMON	KZT per person	Per capita monetary expenditure
Gini index		GINI	index	Gini index of income inequality

The analysis is based on official statistics of the Bureau of National Statistics of the Republic of Kazakhstan for the period 2014–2024 (Table 1).

The dataset covers five key domains that describe household well-being and are sensitive to external shocks, thereby providing a representative basis for assessing socio-economic stability: income, prices, poverty, social support, and employment. The complete dataset has been uploaded to an open-access repository (Zenodo), ensuring transparency and reproducibility of the results (Vasa, 2025).

The research methodology included six consecutive stages. At the first stage, data were collected and normalized to ensure comparability. At the second stage, the Shannon entropy method was employed, enabling the assessment of indicator variability, calculation of divergence, and determination of weights for subsequent constructions. At the third stage, the integral socio-economic pressure index (SEPI) was calculated as a weighted sum of normalized indicators. The fourth stage involved calculating the system sustainability index (SSI) as the inverse of SEPI, which enabled the assessment of the system's ability to withstand external loads. The fifth stage included calculating the social inertia index (SII), based on a combination of SSI and annual changes in SEPI, using the mechanical analogy of "mass-speed". At the sixth stage, a phase-portrait analysis of the SEPI dynamics was carried out to identify periods of stability and instability in socio-economic pressure. The analysis stages are described in Figure 1.

The indicators obtained from the Bureau of National Statistics of the Republic of Kazakhstan for 2014–2024 were collected and normalized to ensure comparability. Normalization was performed to eliminate dimensional differences and prepare the dataset for subsequent entropy-based weighting and index construction.

Next, Shannon entropy was applied to assess the variability of each indicator and its informational contribution to the system. The procedure involved calculating entropy (H), divergence (d_i), and normalized weights (W_i). The Shannon entropy method was calculated using the classical formula (1):

$$H = -\sum_{i=1}^{n} p_i \cdot \log_2(p_i), \quad (1)$$

where H – Shannon entropy, expressed in bits; n – the number of elements in the sample; p_i – the relative proportion of the i-th element, determined as the ratio of the indicator's value in the i-th position to the sum of the indicator's values across all positions; x_i – the absolute value of the indicator in the iii-th position; $\log_2$ – logarithm to base 2, used to express entropy in bits.

The negative sign ensures a non-negative entropy value, as for $0 < p_i < 1$ the logarithm $\log_2(p_i)$ is negative. The data were transformed from absolute values to relative proportions, ensuring their comparability and the possibility of using them in entropy calculations. Entropy measures the degree of un-

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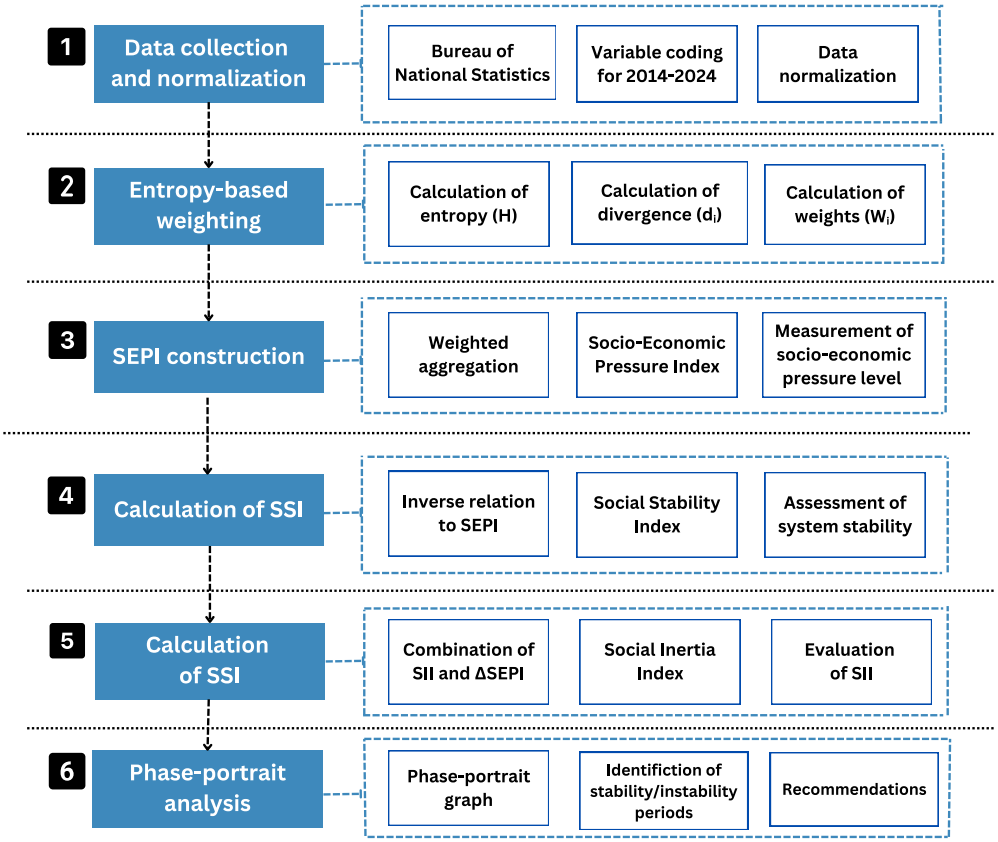

Figure 1. Research methodology stages

certainty in indicator values over time, with higher values indicating greater randomness and lower values indicating a stronger concentration of the distribution of indicator values. Further, the degree of divergence was calculated by the formula (2):

$$d_i = 1 - H_i, \quad (2)$$

where H_i – Shannon entropy for indicator i; d_i – degree of divergence for indicator i.

The results showed the extent to which the distribution of indicator values deviates from maximum entropy, i.e., from complete uniformity, identifying indicators with greater structural differentiation and stronger potential impact on the composite index. The calculation of normalized weights was carried out using the following formula (3):

$$W_i = d_i / \sum d_i \quad (3)$$

where W_i – normalized weight of indicator i; d_i – degree of divergence of indicator i; $\sum d_i$ sum of divergence values for all indicators.

The results allowed for assessment of which time periods made the greatest or least contribution to the overall entropy value.

The composite index was calculated as a weighted sum of indicators, representing the aggregate level of socio-economic pressure during the study period, according to the formula (4):

$$SEPI_j = \sum_{i=1}^{n} w_i \cdot x_{ij}, \quad (4)$$

where $SEPI_j$ – the composite index value for year j; x_{ij} – the normalized value of indicator i in year j; W_i – the entropy-based weight of indicator i; n – the total number of indicators.

The results revealed indicators with higher variability and informational value, which have proportionally greater influence on the overall index.

SSI was defined as the inverse of SEPI, reflecting the system's capacity to withstand external disturbances and maintain stability. The concept is

analogous to elasticity in mechanics (Young's modulus). The index was calculated by the following formula (5):

$$SSI_J = \frac{1}{SEPI_J}, \quad (5)$$

where SSI_j — social stability index for year *j*; $SEPI_j$ – Socio-Economic Pressure Index for year *j*.

Higher SEPI values indicate stronger socio-economic pressure and correspond to lower *SSI*, while lower values indicate weaker pressure and imply higher SSI, characterizing greater system stability.

SII was determined by combining SSI with year-to-year changes in SEPI to evaluate the inertia of socio-economic development and to identify whether the system tends to preserve or alter its state under fluctuations. The concept follows a mechanical analogy, where SSI represents "mass" and the annual change in SEPI represents "velocity." SII was calculated by the following formula (6):

$$SII_j = SSC_j + \Delta SSI_J, \quad (6)$$

where SII_j – Social Inertia Index in year *j*; SSI_j – Social Stability Index in year *j*; $SEPI_j$ – year-to-year change in the Socio-Economic Pressure Index.

This formulation explains the idea that a socio-economic system's ability to maintain or change its state depends on both its stability (capacity to absorb shocks) and the magnitude of socio-economic pressure variation over time. As a result, both temporal patterns of stability and instability were identified, along with the priority areas of socio-economic management.

At the final stage, the methodology combined a phase-portrait analysis of SEPI dynamics with a sensitivity assessment of the index to changes in indicator weights, to visualize the relationship between socio-economic pressure levels and their rate of change, identifying periods of stability, increase, and decrease in socio-economic pressure.

A sensitivity analysis was performed based on the results for 2023, representing the maximum level of socio-economic pressure during the entire period. Sensitivity testing enables the identification of indicators exerting the strongest influence. A 10% change in the weights of individual indicators' impact on the final value of the index was calculated using the formula (7):

$$S_i = \frac{SEPI_{new} - SEPI_{base}}{SEPI_{base}} \cdot 100, \quad (7)$$

where S_i index sensitivity to change in the weight of the *i-th* indicator, %; $SEPI_{new}$ – index value after increasing the weight of the *i-th* indicator by 10%; $SEPI_{base}$ – initial index value; 10% – value of relative change in indicator weight.

The combined approach addresses two tasks: (1) assessing system behavior over time by identifying stages of stability, growth, and decline, and (2) determining key indicators whose changes have the most significant potential to reduce socio-economic pressure.

The phase portrait visualizes socio-economic pressure dynamics by year and the rate of change, allowing the identification of stability, accelerated growth, or sharp decline, as well as the system's response speed to external and internal factors. Sensitivity analysis complements this by showing the structural contribution of each indicator and the extent to which changes in their weights affect the index value.

3. RESULTS

Analysis of the dynamics of key indicators reflecting economic trends and social consequences in the sphere of population provision allows for identifying the degree of stability and predictability of the processes under consideration. Partial contributions to the overall measure of uncertainty for each year make it possible to determine the periods in which the greatest and least fluctuations occurred, affecting the efficiency of the functioning of the social security system (Table 2).

Three groups of indicators were identified based on their level of resilience to external shocks. The first group includes the most stable indicators, with minor changes throughout the period (≤ 0.04). These include employment, price dynamics, minimum pensions and social benefits, and the poverty gap. The slight increase in social benefits did not

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Table 2. Contribution of socio-economic indicators to SSI variability, 2014–2024

Indicator	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
UEMP	0.03	0.03	0.01	0.00	0.01	0.00	0.02	0.02	0.04	0.03	0.02
CPI	0.02	0.00	0.04	0.02	0.01	0.00	0.01	0.01	0.02	0.03	0.02
BENSP	0.00	0.00	0.00	0.00	0.02	0.02	0.10	0.01	0.01	0.02	0.02
PENMIN	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.04
BENSO	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.04	0.04
ASSTH	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.02	0.02	0.17	0.01
SHRSUBS	0.01	0.00	0.00	0.00	0.03	0.03	0.05	0.05	0.05	0.05	0.04
SHRFOOD	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.24	0.00
POVGAP	0.01	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03
INCCONS	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.05
INCSUBS	0.04	0.04	0.04	0.04	0.02	0.02	0.01	0.01	0.00	0.01	0.02
INCNOM	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.04	0.05	0.06
EXPMON	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.04	0.05	0.06
GINI	0.00	0.00	0.00	0.02	0.03	0.03	0.04	0.04	0.02	0.03	0.05

Note: Red – (≤ 0.04) most stable indicators; grey – (0.05–0.06) moderate stability indicators; blue – (≥ 0.17) the least stable indicators.

significantly expand the protection of vulnerable groups. The stability of the poverty gap indicator denotes that society is polarizing into well-off and low-income groups, rather than indicating the presence of a developed middle class. Therefore, the results that indicate government policy has not changed and lacks structural shifts are more significant for the successful formation of a balanced social system.

The second group of indicators is characterized by moderate stability (0.05–0.06) and includes indicators of household income and expenditure, as well as the share of individuals living below the subsistence level. Firstly, people have been experiencing an increase in food expenses. Secondly, the income level decreased, increasing the number of low-income households. State support has remained virtually unchanged. The targeted support system responds slowly and to a limited extent. Consequently, the social system is insufficient in adapting to the changing COVID-19 situation.

The third group of indicators is the least stable. The results showed sharp fluctuations, especially in the post-pandemic period. Housing assistance reached 0.17 in 2023. The share of the population with incomes below the cost of the food basket showed extreme values of 0.24 in 2020 and 2023. The income-to-subsistence minimum ratio, although formally low, demonstrated a consistent downward trend throughout the period. Social policy often fails to yield sustainable results, even though government support is usually fast but short-term. The third group of indicators is highly sensitive to external shocks.

To assess the sustainability of individual components of socio-economic management in the area of population support, a ranking of indicators by stability levels (low, medium, and high) was conducted to distinguish indicators with the most stable dynamics from those with the most variable dynamics for the period 2014–2024 (Table 3).

Table 3. Entropy-divergence assessment of socio-economic indicators, 2014–2024

Indicator	Entropy (H)	Divergence (d_i)	Normalized weight (W_i)	Tier
UEMP	0.898	0.102	0.034	Low
CPI	0.887	0.113	0.038	Low
BENSP	0.709	0.291	0.098	Medium
PENMIN	0.874	0.126	0.042	Low
BENSO	0.877	0.123	0.041	Low
ASSTH	0.484	0.516	0.173	High
SHRSUBS	0.859	0.141	0.047	Low
SHRFOOD	0.289	0.711	0.238	High
POVGAP	0.897	0.103	0.035	Low
INCCONS	0.837	0.163	0.055	Medium
INCSUBS	0.883	0.117	0.039	Low
INCNOM	0.834	0.166	0.055	Medium
EXPMON	0.835	0.165	0.055	Medium
GINI	0.852	0.148	0.050	Low

Based on the entropy and divergence assessment, three categories of indicators were identified: high, moderate, and low stability. High entropy values

reflect stability and smoothed fluctuations, while high divergence values indicate instability and increased sensitivity to external and internal shocks.

The first category, low variability, included basic social policy indicators (employment, prices, minimum pension, social benefits, poverty gap, inequality). The entropy and divergence indicators in this category demonstrated stability with low variability. However, this stability does not reflect the actual situation and is purely formal. The indicators remain stable due to policy inertia. Thus, the social system is inflexible and unable to adapt to modern challenges. Consequently, the SSI appears stable, which in reality signifies a lack of structural change and a weak response to new social challenges.

The second category, medium variability, included indicators of household income and expenditure, as well as special government payments. The results revealed moderate variability, indicating a moderate level of resilience to shocks. Consequently, indicators in this category respond to external changes more quickly than the baseline indicators, but remain within manageable limits.

The third category, high variability, included indicators of targeted support and food security. The results showed that these indicators exhibit the most tremendous variability and low resilience. During external shocks, they become the source of maximum pressure on the social system. In these areas, government policy is lacking consistency. Although the government responds quickly to fluctuations in these indicators, the actions taken are short-term and do not yield long-term positive results.

Next, the assessment of the dynamics of the Integrated Socio-Economic Pressure Index (SEPI) describes the cumulative effect of changes in key socio-economic indicators from 2014 to 2024. The graphical representation of the index values is presented in Figure 2.

In 2014, the level of pressure on the population was minimal (SEPI = 0.10), which meant relative calm and balanced living conditions. By 2018, the index had almost tripled (0.29). There was an accumulation of problems: people had fewer resources, and social benefits were losing their effectiveness. In 2020, the indicator rose sharply to 0.62 due to the COVID-19 pandemic: a significant part of the population faced a loss of income, increased unemployment, and the need to rely on state assistance, which did not always cover their needs. In 2021, the index dropped to 0.44, but the system never returned to the "pre-pandemic calm", and people continued to feel instability. In 2022, the pressure increased again (0.51). In 2023, it reached a critical level of 2.27, which meant that socio-economic pressure was the highest in a decade: households were experiencing an acute shortage of funds, assistance could not cope with the

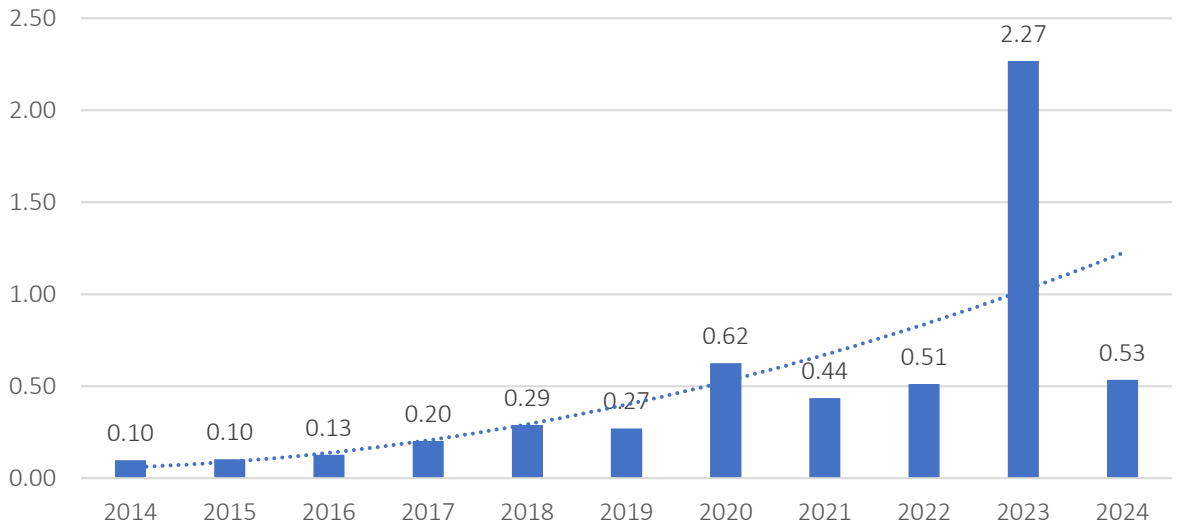

Figure 2. Dynamics of the Socio-Economic Pressure Index for 2014–2024

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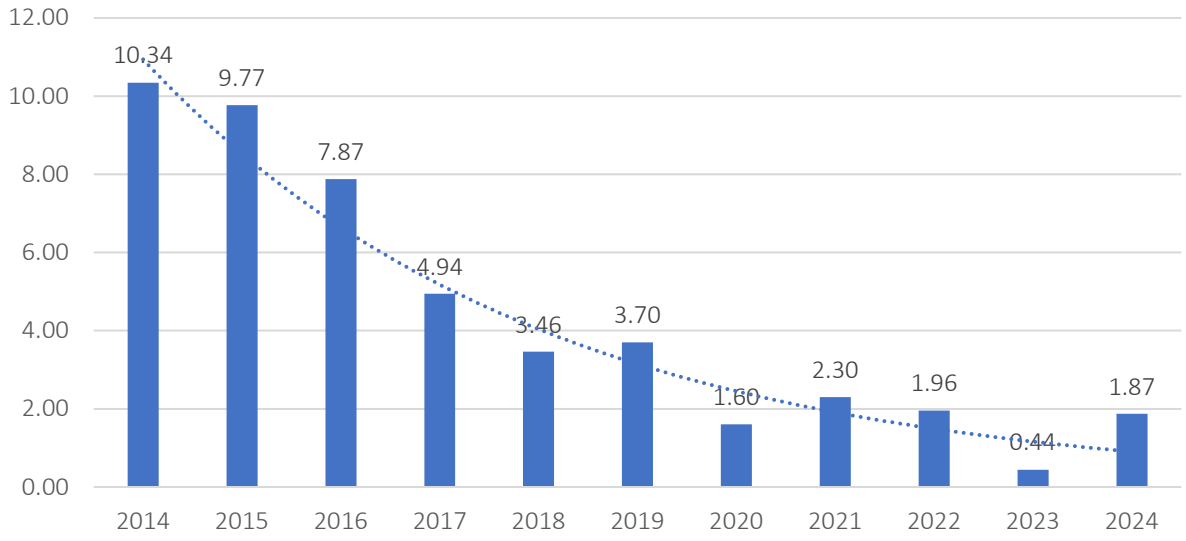

Figure 3. Dynamics of the Social Stability Index, 2014–2024

growth in needs, and there was virtually no sustainability. In 2024, the index fell sharply to 0.53, which can be regarded as a partial relief of pressure. Nevertheless, it was not a return to baseline stability as the level remained above the average values of 2014–2019 (0.27), and the feeling of constant pressure persisted.

Further, the Social Stability Index (SSI) was calculated to assess changes in the ability of the socioeconomic system to adapt to internal and external challenges (Figure 3).

The results of the SSI showed a high level of budget reserves to maintain the stability of the socioeconomic system at the beginning of the period. By 2017, the value had decreased more than twice, indicating a weakening of the adaptive potential. In 2019, there was a partial increase, marking the restoration of individual elements of sustainability. In 2020, there was a sharp decrease in the index due to the consequences of the COVID-19 pandemic and the increased burden on social support mechanisms. Already in 2021, an improvement in the indicator was observed, but its level remained significantly below the values of the first half of the period under review. In 2023, the index reached a minimum value (0.44), or a minimal capacity of the system to adapt to a combination of unfavorable factors. In 2024, there was a partial recovery to a level of 1.87, but this result was still significantly lower than the indicators of the initial stage of the observation period.

Further, the Social Inertia Index (SII) is examined to evaluate the sustainability of changes in socioeconomic pressure and to identify the direction of dynamics (Table 4).

Table 4. Dynamics of Social Inertia Index, 2015–2024

Year	Δ*SEPI*	SII	Relative *SII* change (%)	Direction
2015	0.01	0.06	–	Growth
2016	0.02	0.19	+216.7	Growth
2017	0.08	0.37	+94.7	Growth
2018	0.09	0.30	–18.9	Growth
2019	–0.02	–0.07	–123.3	Decline
2020	0.35	0.57	+914.3	Growth
2021	–0.19	–0.44	–177.2	Decline
2022	0.08	0.15	–134.1	Growth
2023	1.76	0.77	+413.3	Growth
2024	–1.73	–3.24	–521.2	Decline

Based on the assessment results for ΔSEPI, SII, and relative rates of SII change, two dynamic categories were identified: growth and decline. Positive SII values reflect the accumulation of adaptive potential and increased system resilience. In contrast, negative values indicate a weakening of adaptability and a reduced ability to withstand internal and external shocks. For ΔSEPI, an increase indicates an increase in pressure (a negative trend), while a decline indicates a decrease in pressure (a positive trend).

The growth category includes periods when the SII had positive values, reflecting increased system

adaptability, and can be divided into two stages: pre-COVID (2015–2018) and post-COVID (2020, 2022, 2023). The pre-COVID stage is characterized by the gradual accumulation of social policy stability. At the post-COVID stage, not all indicators showed growth, characterized by sharp fluctuations. Government policy remains unsystematic and lacks a lasting impact. Conversely, those indicators where growth was observed both before and after COVID reflect the strongest and most institutionally anchored areas of social policy. Consequently, strong indicators include employment, prices, and the basic revenue-expenditure structure, while weak indicators include targeted assistance and special benefits.

The second category, decline, includes periods in 2019, 2021, and 2024 when the SII values were negative, primarily post-pandemic, and signify a sharp decline in adaptability. The social system is unable to consolidate its accumulated resilience and maintain positive momentum. Social policy is unprepared for external shocks. Moreover, the vulnerability of the socioeconomic sphere has increased.

Thus, the state system as a whole is unprepared for external shocks. Most indicators respond only in extreme situations, without creating long-term stability.

Further, a dynamic and structural assessment of the Socio-Economic Pressure Index (SEPI) is carried out using a phase portrait to visualize the relationship between the level of socio-economic pressure and its changes (Figure 4).

In the pre-COVID period (2014–2019), SEPI values were low, ranging from 0.10 to 0.29. Overall, the socioeconomic environment remained stable, exhibiting no significant fluctuations. Consequently, public institutions were able to maintain SEPI values within limits that did not threaten the functioning of the social sector. Key social policy areas, including employment, consumer prices, and social and pension payments, demonstrated stability without significant fluctuations.

In the post-COVID period (2020–2024), the Socio-economic Pressure Index (SEPI) values exhibited sharp fluctuations. In 2020, the burden on the social system increased sharply due to the pandemic, reaching 0.62, compared to 0.27 in 2019. Subsequently, in 2021–2022, the index fell to 0.44 and 0.51, respectively.

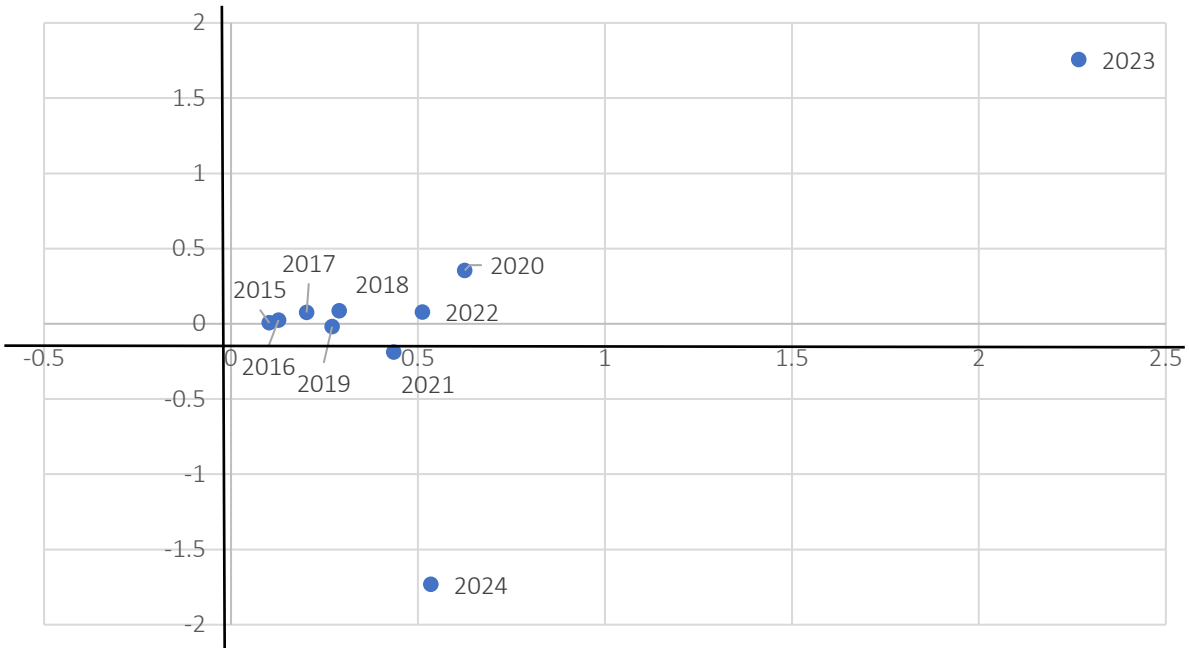

Figure 4. Phase portrait of Socio-Economic Pressure Index

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However, in 2023, it recovered and reached its highest point for the entire observation period, 2.27. Nevertheless, it fell to 0.53 in 2024. Following a sharp increase in population support costs, the social system requires stabilization, which is reflected in a sharp decline in government payments, rising unemployment, and low household incomes. Consequently, systems quickly mobilize in times of crisis but are just as exhausted soon. The result indicated a lack of preparedness of state social systems for long-term stabilization. So, areas where the state can maintain manageability remain a priority.

4. DISCUSSION

The ranking of indicators by entropy showed that low-variable elements, basic social and pension payments, form a stable core of social governance, while highly variable segments depend on situational decisions. Sherrieb et al. (2010) and Bergstrand et al. (2015) emphasized that the stability of communities requires not only crisis response. The obtained results not only align with these findings but also specify them, showing that the division of indicators into stable and highly variable groups makes it possible to capture compensatory dynamics, when the growth of socio-economic pressure in one segment is offset by a decline in another, thereby providing a more realistic assessment of social governance. Entropy ranking and SSI dynamics revealed that indicators related to ensuring minimum consumption standards and targeted support play a decisive role in the formation of socio-economic pressure. Aprea and Raitano (2025) and Mutascu et al. (2025) also found that in conditions of high inflation and price instability, the most vulnerable groups are those with fixed incomes and limited access to protection mechanisms.

The dynamics of the SSI showed a sharp decline in adaptive capacity in 2020, followed by a partial recovery in 2021, but without returning to the initial values. Pereirinha and Pereira (2021) noted that periods of crisis are accompanied by an increase in the burden on the social protection system and a decrease in its stability; a similar trend is observed in the Kazakhstani data, where the decline in SSI in 2020 coincided with the peak values of SEPI, reflecting the overload of state support mechanisms. The study's results showed that in Kazakhstan from 2020 to 2023, the share of the population with incomes below the cost of the food basket and the volume of housing assistance demonstrated the highest sensitivity of SEPI, confirming Slater's (2011) observations on the key role of targeted support in reducing social pressure. At the same time, the combined interpretation of SSI and SEPI dynamics highlights the compensatory role of targeted transfers, demonstrating that even under conditions of declining adaptive capacity, specific social support instruments can mitigate the overall level of socio-economic pressure.

However, some results differ from existing studies. Wisman and Capehart (2010) linked inflation with chronic socio-economic pressure and deterioration in the health of vulnerable groups. In Kazakhstan, however, inflation-related indicators within the SEPI structure exhibited low variability between 2014 and 2019, with only a minimal impact on socio-economic pressure, which may reflect the stabilizing role of basic payments during that period. Nolan et al. (2019) noted a rapid increase in income polarization resulting from a combination of inflationary processes and labor market changes. In the Kazakhstani case, a comparable effect appeared only after 2020, when the simultaneous decline in SSI and increase in SEPI coincided with the end of the compensatory measures introduced during the pandemic. This time lag indicates a slower transmission of income inequality in the national economy, due to the buffering effect of basic payments and compensatory measures, which have not been previously considered significant.

Existing studies have shown that targeted investments reduce poverty (Kenzhegulova et al., 2024). The SSI and SII indicators in the present analysis revealed the short-term nature of the investment effect in the absence of comprehensive integration of social support, income policy, and adaptive governance mechanisms. Thus, the findings extend previous studies, which show that the positive effect of targeted investments in Kazakhstan remains unsustainable. Temporary improvements are often followed by renewed socio-economic pressure.

CONCLUSION

The aim of the study is to assess the impact of key factors (including employment, income, poverty level, prices, and social support) on the dynamics of social pressure in Kazakhstan in 2014–2024. The applied methodological approach enabled the identification of both the structure of factors that form socio-economic pressure and their relative importance within the overall management system.

The most significant impacts on social pressure levels are provided by food availability, the provision of targeted assistance for housing, and the size and structure of social and pension payments. More stable indicators, such as employment, price dynamics, and income distribution, form the basis for maintaining predictability in the socio-economic environment, but are not highly sensitive to changes. The stability of basic social policy indicators proved that state social policy has a weak adaptability capacity.

The most significant instability is observed in the areas of targeted support and food security, where policy remains unsystematic and sensitive to external influences. The dynamics of the integrated indices confirmed that the system remained manageable in the pre-crisis period, whereas in subsequent years, sharp fluctuations and a decline in stability were observed. Government policy responds quickly, resources are depleted rapidly, and long-term effects are not consolidated. Thus, to ensure sustainability, institutional strengthening of the most vulnerable areas of social policy and a transition from situational measures to systemic regulatory mechanisms capable of maintaining stability in the face of external and internal shocks are required.

Therefore, it is recommended to direct management efforts on enhancing the mechanisms of targeted social support and refining the social and pension payment system. The implementation of measures in these areas can increase the stability of the socio-economic system and reduce the risk of critical levels of social pressure.

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STATEMENT ON AI USE

The authors declare that no artificial intelligence tools were used for data analysis or interpretation. Grammarly software was used for grammar and language editing.

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