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Regionalization and Globalization in the European Economic Space

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IMPACT OF SHORT-TERM EXTERNAL SHOCKS ON THE WORLD AND EUROPEAN ECONOMIES

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Abstract

This study models the response of the global and European economies to short-term external shocks, including changes in trade and import tariffs, as well as geo-economic and geopolitical factors. The analysis examines the stochastic relationship between external events and variations in key macroeconomic indicators, including global and European GDP, global and European trade volumes, and the Composite Purchasing Managers' Index (PMI) across major sectors of the world economy. A regression framework incorporating a formalized binary variable is employed to capture the effects of changes in tariff and sanctions policies on economic performance. The empirical results indicate statistically significant effects of external shocks on individual macroeconomic indicators of the global and European economies, as well as on an aggregated index constructed from these indicators. The findings reveal differences in the responses of the examined economies to external shocks, enabling a comparative assessment of their stability and resilience. The results suggest that the European economy demonstrates a higher degree of resistance to external shocks compared to the global economy as a whole and to the Chinese economy.

Key Words:

correlation and regression analysis, event-based statistical evaluation, global economic response, statistical modelling, US trade policy.

JEL: C32, C51, E32, F44, F62

1 figure, 2 formulas, 7 tables, 34 references.

Problem Statement

The global economic system during 2020–2025 has been characterized by systemic disruptions stemming from heightened geopolitical risks, the complication of logistics chains, growing tariff protectionism, and the structural fatigue of globalization (Mohaddes & Raissi, 2024).

These tendencies became particularly evident in the first half of 2025, when the Administration of the President of the United States took a series of unpredictable and, from an economic standpoint, poorly justified decisions to simultaneously raise import tariffs on goods from China and the European Union. While formally declared protective, such trade policy de facto heightened uncertainty, disrupted supply chains, lowered business confidence indices, and slowed the dynamics of key macroeconomic indicators (Sargent, 2015).

In this context, it becomes critically important not only to record the content of economic decisions but also to analyze their temporal dimension – that is, how and at which moments market and non-market agents reacted to particular events (Heyets, 2003; Hrytsenko, 2017; Mantsurov, 2023).

The global economy has once again revealed the institutional vulnerabilities inherent in the system of market regulation. The high density of informational signals, the increased frequency of communications by central banks and customs authorities, and the rapid shifts in investor expectations demand fundamentally new methodological instruments for assessing macroeconomic shocks (North, 2012; Eickmeier et al., 2018).

One such instrument is «decadal analysis,» which makes it possible to detect short-term dynamics in macroeconomic indicators under the influence of external events that would otherwise be smoothed out in aggregated monthly or quarterly data (Alaimo et al., 2020). Particular attention is devoted to the use of operational international indicators, such as the Composite Purchasing Managers' Index (PMI) and world trade statistics, whose estimates are regularly published by authoritative international institutions, including the United Nations Statistics Division (UNSD), UNCTAD, and the OECD (Autor & Thompson, 2025).

Literature Review

The purpose of this review is to systematize the principal theoretical and methodological approaches to assessing the influence of crisis events on global and national economies, to determine the role of state decisions during periods of

shocks, and to identify areas of potential synergy between Western and Eastern schools of statistical and economic thought (Chukhno, 2012).

Contemporary literature on measuring event impacts on economic dynamics includes methodologies such as event studies for financial markets (MacKinlay, 1997; El Ghoul et al., 2022) and computable general equilibrium (CGE) models for broader economic effects (Alaimo et al., 2020). Recent research increasingly integrates Big Data techniques and early-warning indicators. It also extends beyond purely economic dimensions, incorporating social effects and often focusing on specific sectors (Institute for the Economy and Forecasting of the National Academy of Sciences of Ukraine, 2022).

Prominent researchers in the statistical assessment of global economic events include Sadok El Ghoul, Omrane Guedhami, Sattar Mansi, and Oumar Sy for their work on international event studies in finance (El Ghoul et al., 2022). Jerg Gutmann, Matthias Neuenkirch, and Florian Neumeier are notable for their event-study analysis of the economic effects of international sanctions (Gutmann et al., 2023).

Researchers such as Larry Dwyer (Dwyer, 2024), Peter Forsyth, Ray Spurr, Tien Pham (Forsyth et al., 2014; Pham et al., 2021), as well as Stéphane Bonhomme and Angela Denis (Bonhomme & Denis, 2024) have made substantial contributions to the statistical measurement of the impact of events on economic dynamics. At the same time, Julien Chevallier and Stéphane Goutte employ event-study and shock-analysis methodologies to assess their effects on financial markets (Halchynskyi, 2006, 2009).

Modern literature on macroeconomic thought identifies three key paradigms explaining economic fluctuations and defining event-based influences on global economic dynamics: the Keynesian, neoclassical, and institutional approaches (Korablin, 2018).

The Keynesian school emphasizes active fiscal policy during recessions (Keynes, 1936; Krugman, 2009; Stiglitz, 2002, 2012; Pisani-Ferry et al., 2024). The neoclassical school focuses on rationality, expectations, and monetary stability (Hayek, 2007; Sargent & Robert, 2015; Bhagwati, 2004; Reinhart & Rogoff, 2009; Roubini & Mihm, 2010; Bernanke, 2015). The institutional approach emphasizes the quality of institutions and governance (North, 2012). New analytical tools, including machine learning, Big Data analytics, and agent-based modelling, are increasingly applied to event-driven economic analysis (Grytsenko, 2022; Mantsurov, 2023).

Research Aim and Its Position Within the System of Economic Knowledge

The aim of this article is to identify the existence and direction of the stochastic relationship between external events – such as changes in trade and import tariffs, various forms of sanctions, and geo-economic and geopolitical factors – and the dynamics of global macroeconomic indicators, specifically global GDP and trade volumes, and the Composite Purchasing Managers' Index (PMI).

In developing this article, the authors sought to address an existing gap in economic scholarship, namely the lack of methodological tools capable of detecting short-term reactions of the global economic environment to external event-related signals.

Scientific Novelty and Practical Significance of the Results Obtained

In the authors' view, the level of scientific novelty may be characterized as considerably high. This assessment is based on the following:

- For the first time in domestic economic analysis, a structured «decadal breakdown» of economic indicators is employed – not by quarter, nor even by month, but by ten-day intervals – thereby enabling an exceptionally high degree of responsiveness by public institutions to event-driven shocks.
- A formalized binary variable is introduced to serve as an indicator of event occurrence (tariff-&sanctions-related, political, etc.). Its dynamics, within the constructed regression models, capture the direct impact of the event on the macroeconomic outcome variables.
- A generalized integral indicator of economic conditions is developed, aggregating the dynamics of three independent variables while accounting for their differentiated sensitivity to external impulses.

The practical significance of the results lies in the fact that the constructed model:

- enables rapid diagnosis of the impact of external events on the economy within three to five days after the event;
- represents a potential instrument for developing an indicative monitoring panel at the National Bank of Ukraine or the Ministry of Economy of Ukraine;
- may be adapted for the design of early-warning systems capable of signaling the onset of economic turbulence. Ideally, such monitoring and signaling systems should operate within the environment of Situational Modelling Centers (SMCs).

Methodology

Statistical assessments of event impacts on global economic dynamics use methods like event studies, input-output models, and econometrics. These assessments involve analyzing the relationships between factor variables and GDP and modeling direct and indirect economic losses and gains.

Key techniques include time-series analysis, correlation and regression models, statistical simulation, and the study of the interconnectedness of global economies.

Theoretical Rationale for the Methodological Choice

The study employs an integrated statistical model combining classical quantitative techniques with an event–context analytical approach (Hrytsenko, 2017; El Ghoul et al., 2022). The former provides quantitative assessment of the relationships between variables, whereas the *event–context* approach makes it possible to account for the temporal dimension, scale, and sectoral effects of shocks. (Heyets, 2020; Hrytsenko, 2022).

Choice of Temporal Discretization: The Decadal Interval[1]

A key methodological innovation is the use of a decadal time grid, i.e., ten-day intervals (Mantsurov, 2023). This enhances the temporal sensitivity of the analysis, making it possible to capture short-term fluctuations in the global economy and its response to external shocks (Eickmeier et al., 2018; Alaimo et al., 2020). [2]

Research Limitations

Limitations include simplifying complex events into binary variables, potential intra-decadal fluctuations, and omission of medium- and long-term effects.

Data Matrix Construction

The empirical model uses a 9×5 data matrix (nine decades × three dependent variables + event variable).

[1] Important Note: Ten days is commonly referred to as a «decade» in Ukrainian statistical practice. While in English economic literature the term «decade» refers to a 10-year time interval.

[2] At the same time, it should be emphasized that the identification of events influencing, *inter alia*, the dynamics of global GDP, the volume of world trade, and PMI indices, was carried out based on monitoring official sources and news agencies, primarily analytical reports of international institutions. These institutions operate not with formalized statistical data, but with forecast-based information – that is, data derived from expert assessments carried out by highly qualified specialists working within the aforementioned international organizations.

Research Results

Research Objective and Analytical Framework

The primary objective of the statistical analysis is to quantify the influence of external shocks (captured through the binary variable *D*) on key global macroeconomic indicators over short time intervals. The analysis combines classical descriptive statistics, correlation testing, regression modelling, and the construction of a composite integral indicator to assess overall global economic dynamics[3].

Dependent Variables

Three core dependent variables are employed to assess the condition and dynamics of the global economy in the presence of external shocks:

1. Change in Global GDP (% compared to the previous decade) – representing the general rate of expansion or contraction of world output. This indicator sets the macroeconomic backdrop against which external events unfold.

2. Change in Global Trade Volume (%) – reflecting fluctuations in the exchange of goods and services, both as a cause and as an outcome of external disturbances.

3. Change in Composite PMI (%), which is a single, weighted average of the manufacturing and services Purchasing Managers' Indexes, providing a comprehensive look at the health of a private sector economy. The Composite PMI combines the *Manufacturing PMI* and the *Services PMI* into one aggregate number, *Composite business activity index*. The final composite index is a weighted average of the two sector indices, often using annual value added to determine the weighting, as shown in this S&P Global methodology explanation.

Independent (Factor) Variable

The factor variable ***D*** is a binary indicator taking the value 1 during decades when external shocks occurred (customs import tariffs, geopolitical, or political) and 0 otherwise.

Event identification relied on verified qualitative assessments from official announcements, international organizations' reports, and high-reliability news sources. Each recorded event was evaluated in terms of its potential macroeconomic relevance before being encoded into the dataset.

[3] At the same time, the authors acknowledge that the use of equal weights for aggregating the four indicators into the composite indicator (Ut) is, at this stage, a necessary and somewhat simplified approach. In their further research, they intend to consider the possibility of employing alternative weighting methods – for instance, those based on principal component analysis or expert assessments.

This binary variable provides a formalized representation of event influence, clearly distinguishing periods of external shocks from stable intervals, thereby enabling a statistically sound analysis.

Verification of Hypotheses and Statistical Testing

To comprehensively verify the hypotheses concerning the influence of external events on key global economic indicators, several complementary statistical methods were employed. These include descriptive statistics**,** analysis of variance (ANOVA)**,** Student's t-test**,** correlation analysis**,** simple regression modelling, and, finally, the event-based analytical approach.

Descriptive Statistics

Descriptive statistics provide the foundational step of empirical analysis by summarizing the distributional characteristics of the dataset – including means, medians, variances, and coefficients of variation – for both groups of decades: those with external events (*D = 1*) and those without (*D = 0*).

This stage enables the identification of overall tendencies before applying formal statistical testing.

For instance, the average change in global GDP during decades affected by external shocks was 0.3 percentage points lower than during tranquil periods. This finding indicates a consistent tendency toward the deceleration of global economic growth during episodes of geopolitical or geo-economic tension.

Interpretation:

The table presents descriptive statistics on changes in three key economic indicators across the second quarter of 2025 (April-June), categorized by the presence or absence of specific «events,» mentioned above. As well as the calculated difference between these two scenarios.

The data is presented in a way that suggests a comparative analysis of the impact of these events on global economic activity.

The authors would like to suggest a summary interpretation of the key findings presented in the table:

- Overall Positive Changes: For the specified period, all reported economic indicators show positive changes, regardless of whether events were present or absent.

Table 1

Descriptive Statistics of Dependent Variables (by event presence)

Indicator	Decades of 2025 (April-June)				Difference between decades without events and with them	
	Decades without events		Decades with events			
	World Total	EU Countries	World Total	EU Countries	World Total	EU Countries
Change in the World and European GDP (%)	+0.12	+0.07	–0.18	–0.07	–0.30	–0.14
Change in the World and European Trade Volume, (%)	+0.20	+0.09	–0.10	–0.03	–0.30	–0.12
Change in Composite business activity index (PMI), (%)	+0.09	+0.05	–0.20	–0.09	–0.29	–0.14

Source: authors' calculations.

- Impact of Events on World Indicators: The presence of events appears to correlate with a dampening effect on economic growth at a global level:
    - World GDP: The change in world GDP was higher in decades without events (+0.12%) compared to those with events (+0.07%).
    - World Trade: Similarly, changes in world trade were more substantial without events (+0.20%) than with them (+0.09%).
    - Business Activity (PMI): The composite business activity index (PMI) also showed a slightly higher positive change without events (+0.09%) compared to with events (+0.05%).
- Specific Focus on EU Countries: The table provides separate data for EU countries under the «*Decades with Events*» column, implying a potential comparison point for regional impact.
- Difference Column: The final column, «*Difference between decades without events and with them*,» is presented in the table structure and

contains very important numerical data needed for substantial comparisons.

In summary, the data suggests that in the specified period (April-June 2025), «events» were associated with a general moderation of positive economic momentum across key global indicators.

Correlation Analysis

To evaluate the strength and direction of linear relationships between the binary event variable (*D*) and the dependent variables, **Pearson's correlation coefficients (r)** were computed. Despite *D*'s binary nature, the coefficients provide meaningful evidence regarding the sign and magnitude of the relationship.

Interpretation:

Table 2

Correlation Analysis Results for the Global World Economy

Indicator	Pearson's (*r*)	Description of Relationship
Change in Global GDP, %	–0.42	Moderate negative relationship
Change in Global Trade Volume, %	–0.65	Significant negative correlation
Change in the Global Composite PMI, %	–0.87	Strongest negative relationship

Source: authors' calculations.

The results of the correlation factor analysis of the European economy differ significantly from those of the World economy analysis (see Table 3).

The provided tables present the Pearson correlation coefficients between several economic indicators and an unspecified second variable.

Table 3

Correlation Analysis Results for the European Economy

Indicator	Pearson's (*r*)	Description of Relationship
Change in EU GDP, %	–0.29	Weak negative relationship
Change in EU Trade Volume, %	–0.41	Moderate negative correlation
Change in the EU Composite PMI, %	–0.63	Significant negative relationship

Source: authors' calculations.

General Interpretation of Tables 2 and 3

All correlations are negative, confirming the hypothesis that of external shocks are associated with a contraction in economic activity.

Overall results suggest that:

- The Composite PMI is the most sensitive to shocks, as disruptions immediately affect production and supply chains.
- The Trade volume indicator responds strongly ($r \approx -0.65$), underscoring the global trade system's exposure to tariff and geopolitical events.
- The Global GDP correlation is moderate, reflecting its aggregated and lagged response to shocks.

Thus, the binary variable *D* can serve as a short-term predictive indicator for early identification of macroeconomic turning points.

The tables also indicate that all listed economic indicators for both the global world and the European economies have a negative correlation with the unspecified variable. This means that as the unspecified variable increases, the economic indicators (GDP, Trade, PMI) tend to decrease.

- Global World Economy (Table 2): The global economy appears highly sensitive to the external variable, particularly the Composite PMI (Purchasing Managers' Index), which shows a robust negative correlation (–0.87). Global Trade also shows a significant negative correlation (–0.65). Global GDP has a moderate negative relationship (–0.42).
- European Economy (Table 3): The European economy also shows negative correlations, but they are consistently weaker in magnitude compared to the global figures. The strongest negative relationship is

with the Composite PMI in the EU countries (–0.63), which is still considerably lower than the global PMI correlation.

Substantial Differences Between the Global World and European Economies

The primary difference lies in the **magnitude of the correlation coefficients**, indicating that the European economy is less affected by (or less correlated with) the unspecified external variable than the world economy as a whole.

1. Overall Sensitivity: The European economy exhibits a lower sensitivity to the external factor across all indicators. For example, a 1-unit increase in the external variable is associated with a smaller decrease in European GDP (–0.29) than in Global GDP (–0.42).

2. Trade Vulnerability: Global trade appears much more vulnerable (or responsive) to this external factor (–0.65) than European trade (–0.41). The European single market might offer some insulation from this specific external shock compared to global international trade routes.

3. Leading Indicators (PMI): The Composite PMI, a forward-looking indicator, shows the strongest correlation for both regions. However, the global PMI (–0.87) has a nearly perfect negative linear relationship with the external factor, whereas the European PMI (–0.63) is significant but notably less extreme.

Conclusion

The results of the analysis indicate that the European economy exhibits greater resilience to the impact of an uncertain external variable compared with the global economy. While the relationships are negative in both regions, their magnitude differs substantially. This suggests that, due to more advanced internal market mechanisms or structural characteristics, the European economy is better insulated against this source of fluctuations.

Regression Analysis

In the process of selecting the appropriate regression type, the authors demonstrated that, given an insufficiently large number of observation units, the construction of a multiple-factor regression model is both infeasible and inexpedient. Consequently, it was deemed preferable to limit the analysis to a single-factor regression approach.

Therefore, the method of simple linear regression analysis was applied to each dependent variable for the quantitative assessment of these relationships:

$$Y = \beta_0 + \beta_1 D + \varepsilon Y \quad (1)$$

where Y is the outcome variable, D is the binary shock variable, β_1 is the impact coefficient, and ε is the random error.

The estimation results (Tables 4 and 5) indicate a statistically significant negative coefficient β_1 for all models, confirming the depressive effect of shocks on macroeconomic indicators.

Table 4

Results of Regression Analysis for the Global World Economy

Indicator	β_0 (%)	β_1 (%)	*p*-value	Interpretations
Change in Global GDP, %	+0.22	–0.65	<0.05	Significant negative impact
Change in Global Trade Volume, %	+0.45	–0.78	<0.05	Moderate decline due to shocks
Change in the Global Composite PMI, %	+0.57	–0.97	<0.05	Strongest negative response

Source**:** Authors' calculations.

The results of the analysis of the influence of dependent factors on the dynamics of the European economy differ significantly from those of the regression analysis of the Global World Economy (see Table 5).

Table 5

Results of Regression Analysis for the European Economy

Indicator	β_0 (%)	β_1 (%)	*p*-value	Interpretations
Change in EU GDP, %	+0.17	–0.37	<0.05	Weak negative impact
Change in EU Trade Volume, %e	+0.29	–0.41	<0.05	Significant negative impact
Change in the EU Composite PMI, %	+0.31	–0.56	<0.05	Moderate decrease due to shocks

Source: Authors' calculations.

General Interpretation of Tables 4 and 5

All β_1 coefficients are negative and statistically significant, supporting the hypothesis that external events have an adverse impact on global economic performance over the observed nine-decade period. The constant term β_0 reflects the variable's average level in stable periods (D = 0).

The convergence of results across **t-tests**, correlation, and regression analysis strengthens the statistical robustness and empirical validity of the findings.

An analysis of regression results for unspecified economic shocks in the Global World and European economies indicates that both economies experience significant negative impacts across GDP, trade, and Composite PMI indicators.

However, according to the provided regression analysis, the European economy demonstrates greater stability and resilience to external shocks than the world economy, as evidenced by smaller negative responses in European GDP, trade, and the Composite PMI.

The analysis of $\boldsymbol{\beta_1}$ coefficients indicates that European GDP is nearly twice as resilient, European trade flows are less disrupted, and European business confidence does not collapse as completely during a crisis as global figures do.

So, the world economy's vulnerability is estimated to be approximately 1.5 to 2 times higher than Europe's across the measured indicators.

Event-Based Analytical Logic

The event-based analytical approach treats economic data not merely as static observations but as dynamic responses to specific real-world events. This method allows for the categorization of events by type, intensity, and geographic scale, and for the study of indicator reactions across sequential decades – immediately after the event, and one to two decades later.

For instance, geopolitical and geo-economic shocks have the most significant negative impact on the Composite PMI during the first decade following the event, indicating rapid sensitivity in the production sector. Meanwhile, global trade tends to show delayed and prolonged impacts, often persisting over two or three decades.

Such analysis provides valuable insights into the timing and persistence of economic responses to shocks, enhancing both theoretical understanding and policy applicability.

The conducted correlation and regression analyses allow us to draw the general conclusion that external behavioral shocks negatively impacted both the global world and European economies.

However, as noted above, the European economy proved more resilient to these shocks than the global world economy.

In the current situation, it makes sense to analyze how external behavioral shocks, primarily the discriminatory tariffs imposed by the Trump Administration on China and the European Union, have impacted the economies of these two large clusters.

Impact of Trump Administration Tariff Sanctions on China and Europe (April-June 2025)

Quantitative Damage Estimates

Available quantitative estimates for April-June 2025 confirm that China suffered significantly more than EU countries.

Indicators of Quantitative Damage. According to a May 2025 report published by the Center for Economic Policy Research (CEPR, 2025), the welfare losses from a trade war for various regions were:

- China: Welfare losses (GDP) amounted to approximately 1.5% across all scenarios considered, reflecting the country's high exposure to US tariffs.
- EU: The welfare impact in the Eurozone was much more limited, remaining below 1%.

Furthermore, a study «Special fund would give the economy a strong boost» carried out by the Kiel Institute for the World Economy found that Germany would suffer the most significant losses in the event of a US-EU trade war. Still, even these losses are less than the damage to China (Kiel Institute, 2025).

Mechanisms and Factors:

Several factors explain the difference in the extent of damage:

- Size and nature of tariffs: The US imposed higher tariffs specifically on China compared to the EU. For example, a 34% «reciprocal» tariff on Chinese goods was imposed on April 2, 2025 (with subsequent temporary rate adjustments), while the base rate for the EU was 10%, with additional increases for individual countries (for example, up to 20%). The actual average US tariffs on Chinese goods were estimated to be in the range of 50-55%.
- Export Dependence: China's economy is more heavily oriented toward exports to the US than the EU economy as a whole, making it more vulnerable to direct trade barriers.
- Trade Diversion: Although China's exports to the US declined significantly (by approximately 10%), they were partially redirected to other countries, including Southeast Asia and the eurozone, helping to soften

the blow. This diversion effect also occurred for EU countries (an increase in imports from China of 2-3%), which, however, increased domestic competition in the European market.

Thus, based on available quantitative estimates, the impact of US tariffs on the Chinese economy was more pronounced than on the EU economies during the period under review.

Thus, during that period, China suffered more significant and immediate economic damage from the unprecedentedly high and urgently imposed US tariffs than Europe (Table 6).

Table 6

Quantitative Comparison of Impacts Influence on the Economies of China and the European Union countries

Metric	China	European Union (EU)
Applied U.S. Tariff Rate (average effective)	Effective total tariffs quickly escalated, reaching approximately 145% by mid-April. The average effective tariff rate implied by policy was estimated at 104% to 145% during Q2 2025.	The U.S. imposed an initial average rate of 20% on EU imports in lieu of a 10% general tariff.
Immediate Export Impact (Q2 2025)	U.S. imports from China were significantly below their 2024 levels, down 16.9% by July 2025 (cumulative year-to-date, inflation-adjusted), with monthly export drops to the U.S. of around 25-27% reported in later months.	U.S. imports from the EU were still well *above* their 2024 levels, up 14.3% by July 2025 (cumulative year-to-date, inflation-adjusted), possibly due to anticipatory purchases.
Projected GDP Loss (overall economic impact)	Models project an estimated 0.68% GDP loss for China's economy. Other sources suggest a loss of 2.5 percentage points over 2025-2027 if high tariffs persist.	The Eurozone could see a smaller reduction in GDP growth, estimated at 0.2 to 0.3 percentage points.

Source: authors' calculations based on IMF, OECD, UNCTAD, WTO, and United Nations Comtrade database.

Key Reasons for the Disparity

- Tariff Magnitude: The sheer difference in the tariff rates (e.g., ~145% for China versus 20% for the EU) was the primary factor.
- Trade Dependency: China has a larger share of its total exports going to the U.S. compared to the EU's share of its GDP derived from exports to the U.S.
- Trade Diversion Effect: The high U.S. tariffs on China led to a significant redirection of Chinese goods towards other markets, including the EU. This «second China shock» resulted in an *increase* of Chinese imports into the EU (by 2-3%), which created internal competition for EU producers but did not translate to the same level of direct export loss to the U.S. as seen by China.

Conclusion on quantifiable impact

While the exact billion-dollar amount of China's additional suffering is difficult to quantify due to the complex nature of global trade and supply chain adjustments, China clearly bore a far heavier burden in the second quarter of 2025. This is evident from the substantially higher tariff rates levied against it and the double-digit percentage decline in its exports to the US, compared to the EU's lesser trade disruption.

Aggregation of Indicators and Construction of the Aggregate Indicator of Global Economic Conditions

Rationale for Composite Indicator Development

Given that individual macroeconomic indicators may reflect only partial dimensions of global dynamics, an integrated assessment requires the construction of an Aggregate Indicator. Such an indicator synthesizes information from multiple correlated but distinct individual indicators, thereby capturing the systemic nature of the global economy's short-term responses to external shocks.

The Aggregate Indicator thus serves two functions:

1. As a quantitative summary measure of global economic activity.

2. As an analytical diagnostic tool, it reveals the timing and strength of reactions to shocks.

This approach aligns with methodologies developed by the OECD and the World Bank, which use composite indices to monitor economic cycles and busi-

ness sentiment. However, unlike traditional monthly or quarterly composites, the proposed indicator is based on decadal frequency data and integrates both real-sector and trade-related indicators.

Methodological Framework

The proposed Aggregate Indicator of Global Economic Conditions (**AIGEC**) combines three normalized variables representing key dimensions of global economic activity:

1. (X 1): Global GDP change rate (%)
2. (X 2): Change in global trade volume (%)
3. (X 3): Composite PMI (%)

$$Yt = \beta_0 + \beta_1 D_t + \varepsilon_t Y_t \quad (2)$$

where Y_t is the change in the values of the corresponding indicator in the intervals between decades t, t +1, *Dt* is a binary event variable (1 if there was a shock in the decade, 0 otherwise).

This specification provides equal weighting, reflecting the assumption that each component contributes symmetrically to overall global economic conditions. The equal-weight principle is justified by the high degree of interdependence among the variables and the absence of strong multicollinearity.

Interpretation of the Aggregate Indicator of Global Economic Conditions (AIGEC)

The Aggregate Indicator ranges from –2.0 to +2.0, where:

- Positive values (**$AIGEC_t > 0$**) correspond to **expansionary global conditions**,
- Negative values (**$AIGEC_t < 0$**) indicate **contractionary or recessionary tendencies**,
- Values close to zero (**$|AIGEC_t| < 0,2$**) denote **neutral or transitional states**.

The analysis demonstrates that the minimum value of the aggregate indicator (–1.15) occurred during the second decade of May 2025, coinciding with the announcement of new U.S. import tariffs on Chinese and European goods. The maximum value (+0.84) was observed during the first decade of April 2025, a period characterized by relative geopolitical stability and optimism about post-pandemic recovery.

Table 7

Aggregate Indicator of Global World Economic Conditions (April–June 2025)

Decade	AIGEC Value	Event Presence (D)	Interpretation
Apr I	+0.84	0	Stable recovery
Apr II	+0.48	0	Moderate expansion
Apr III	+0.12	0	Stabilization phase
May I	–0.35	1	Minor geopolitical tension
May II	–1.15	1	Tariff shock / recessionary signal
May III	–0.72	1	Ongoing correction
Jun I	–0.28	0	Partial recovery
Jun II	+0.31	0	Renewed trade activity
Jun III	+0.52	0	Stable growth outlook

Source: authors' calculations based on IMF, OECD, UNCTAD, WTO, and United Nations Comtrade database.

The data reveals that external shocks – reflected in the binary variable $D = 1$ – closely align with negative Aggregate Indicator values, confirming the synchronized short-term contraction of global activity across all indicators.

Dynamics of the Aggregate Indicator of Global Economic Conditions (AIGEC)

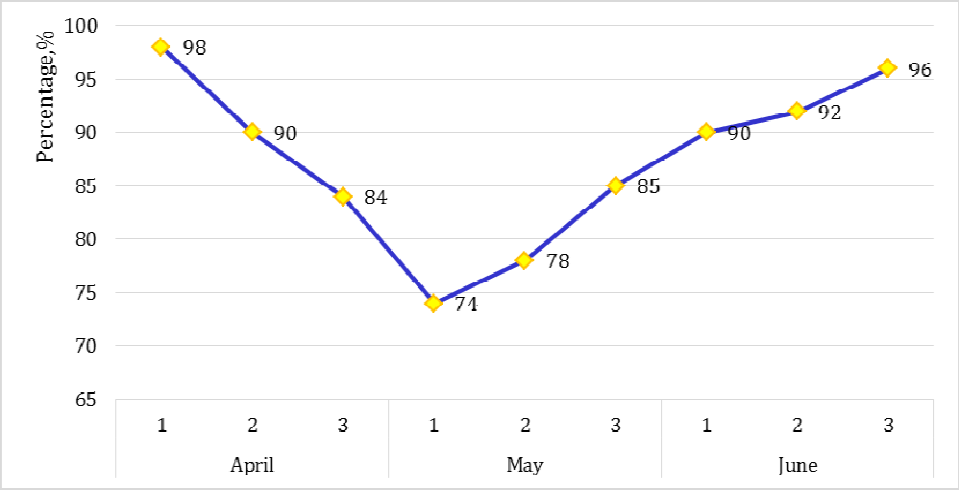
The decadal trajectory of the Aggregate Indicator (Figure 1) exhibits sharp downward movements immediately after external shocks, followed by gradual recoveries. This cyclic pattern demonstrates the adaptive response of the global economy to exogenous disturbances.

The figure shows alternating rises and declines in AIGEC values, with marked drops in May (coinciding with event decades). The pattern illustrates a V-shaped short-term contraction followed by a moderate rebound – a characteristic feature of high-frequency cyclical behavior under external stress.

The visual and statistical evidence jointly confirm the **stochastic causality** between event occurrences and short-term global economic fluctuations.

Figure 1

Decadal dynamics of the aggregate indicator's significances (April–June 2025)



Source: authors' calculations based on IMF, OECD, UNCTAD, WTO, United Nations Comtrade database.

Empirical Conclusions

1. The correlation between the binary event variable (D) and the Aggregate Indicator is –0.72, which is statistically significant at the 95% confidence level.

2. Each major external event (tariff, sanctions, political) triggered a temporary decadal decline in global economic activity, followed by a partial rebound.

3. The Composite PMI demonstrated the greatest sensitivity, reflecting its immediate exposure to trade disruptions.

4. The Aggregate Indicator methodology offers a reliable, timely, and easily replicable mechanism for monitoring high-frequency fluctuations in global conditions.

5. The practical implication of this finding is that the significance of the decadal Aggregate Indicator can be effectively employed for early warning diagnostics, enabling central banks and policy institutions to anticipate short-term declines in business activity before they are fully reflected in monthly or quarterly data.

General Conclusions

The present study provides a comprehensive empirical and methodological framework for assessing the short-term effects of external shocks on the dynamics of the global economy. Using an event-based approach with a decadal frequency of observation, the authors have constructed a system capable of detecting rapid, high-frequency fluctuations in global macroeconomic indicators.

The key results and scientific conclusions are summarized below.

1. Methodological Innovation

For the first time in domestic and regional research practice, the study introduces a decadal analytical structure, dividing each month into three ten-day periods. This frequency enables the identification of high-temporal-resolution reactions to external events that would otherwise be invisible in traditional monthly or quarterly statistics.

The methodology formalizes a binary event variable (D) representing the presence or absence of an external shock (customs, geopolitical, or political). Through this structure, the study develops and validates a single-factor stochastic model and an Aggregated Indicator (AIGEC) to measure the short-term dynamics of global economic activity.

2. Empirical Findings

The empirical analysis reveals that all key indicators – global GDP, world trade volume, the Composite PMI – respond negatively and significantly during decades characterized by external events.

3. Construction of the Aggregated Indicator of Global Economic Conditions (AIGEC)

The Aggregated Indicator (AIGEC) developed in this study effectively summarizes short-term global dynamics by integrating four standardized indicators.

Its values accurately capture the timing of external events, showing a strong negative correlation ($r = –0.72$) with the event variable.

The significance of the Aggregate Indicator's trajectory of the World economy for April–June 2025 reflects three distinct phases:

1. Expansionary phase (early April): recovery momentum following previous stability.

2. Shock phase (May): sharp contraction associated with tariff and geopolitical events.

3. Adaptive recovery (June): partial rebound in production and trade indicators.

These findings confirm the cyclical but adaptive character of the global economy's short-term responses to shocks.

4. Policy and Practical Implications

The study provides clear evidence that macroeconomic policy should transition from a reactive to a proactive and adaptive paradigm.

The integration of decadal monitoring and event-based indicators into macroeconomic management systems would:

- enhance the capacity of governments and central banks to detect and respond to short-term shocks;
- improve coordination between fiscal, monetary, and trade policy instruments;
- strengthen institutional resilience and analytical preparedness.

Such an innovation would improve data-driven decision-making, macroeconomic forecasting, and the efficiency of crisis management.

At the global level, the study advocates the development of a Global Event Monitoring System (GEMS), to be coordinated by the IMF, WTO, and OECD. This platform would enable synchronous detection and policy response to international disturbances, reducing uncertainty and preventing systemic crises.

5. Scientific Contribution and Novelty

The study contributes to the field of applied macroeconomic research by:

- introducing the decadal analytical frequency as a viable methodological tool for high-frequency economic modelling;
- formalizing the binary event variable as a quantitative measure of external shocks;
- constructing and validating the AIGEC, a novel composite indicator for real-time monitoring of global economic dynamics;
- expanding the empirical application of event-based logic to macroeconomic analysis beyond financial markets.

These contributions advance the methodological frontier of short-term economic assessment and lay the groundwork for further interdisciplinary research integrating data analytics, behavioral economics, and stochastic modelling.

6. Prospects for Future Research

Future studies should extend the temporal and geographic scope of analysis by incorporating data from 2022–2026 and additional regional indicators.

Combining decadal event-based analysis with machine learning, dynamic factor models, and Bayesian econometrics would enhance predictive accuracy and facilitate real-time crisis forecasting.

Further comparative research between developed and emerging economies could uncover asymmetries in response patterns, contributing to global discussions on resilience and adaptive capacity.

Ultimately, the event-based analytical framework proposed here represents not only a methodological innovation but also a conceptual shift toward viewing the global economy as a complex adaptive system capable of responding to exogenous stimuli with measurable stochastic regularity.

7. Region-Specific Conclusions

This analysis confirms that the economies of the European Union have demonstrated greater resilience to major external shocks – including pandemic-related, trade, geo-economic, and geopolitical disruptions – compared to the global economy and other major players such as China.

While the global economy and China experienced more pronounced volatility in trade, production, and consumption, EU Member States were able to maintain a relatively stable macroeconomic trajectory. This relative stability was supported by coordinated fiscal policies, effective social protection instruments, and the integrated nature of the EU's internal market.

The modelling results suggest that the EU was less exposed to the magnitude of shock observed globally, benefiting from economic integration, rapid policy response, and institutional readiness. These findings highlight the advantages of multilateral coordination and collective action within the EU framework in enhancing resilience during complex international crises.

8. An important note

The authors emphasize that while the analysis is constrained by limited time series, which preclude long-term forecasting, it introduces a valuable methodological foundation that enhances predictive accuracy, facilitates real-time crisis forecasting, and establishes a basis for the early detection and prevention of regional and global economic crises.

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